# Substrata

Archaeological Geophysical Surveyors

An archaeological magnetometer and resistance survey

# Land at Saltram House, Plympton Plymouth, Devon

Centred on NGR (E/N): 252071,55573 and 252070,55348

Report: 1702SAL-R-1

Ross Dean BSc MSc MA MCIfA

19 May 2017

Client
National Trust
Saltram
Plympton,
Plymouth
Devon PL7 1UH

# Contents

# Figures

# Tables

# Project archive

Report ...................................................................................................................... Adobe PDF format
Copies of report figures ......................................................................................... Adobe PDF format
Raw and processed  grid & composite files ....................... DW Consulting TerraSurveyor 3 formats
Minimal processing data plots and metadata .................... DW Consulting TerraSurveyor 3 formats
Final data processing data plots and metadata .................. DW Consulting TerraSurveyor 3 formats
GIS project, shape files and classification schema
    GIS project ......................................................................................... Manifold 8 '.map' file
    GIS shape files ............................................................................................ ESRI standard
    GIS classification schema ................................................................... Adobe PDF format
AutoCAD version of the survey interpretation ....................................................... AutoCAD DXF

---

*Website: substrata.co.uk*

*For an overview of Substrata, our archaeological geophysical surveying techniques and the results we obtain.*

---

# 1    Survey description and summary

## 1.1    Survey

| | |
|---|---|
| Type: | magnetometer survey: twin-sensor fluxgate gradiometer |
| | resistance survey: twin-probe |
| Dates: | 13 March 2017 to 20 March 2017 |
| Area: | Mansion lawns magnetometer survey: 0.4ha |
| | Mansion lawns resistance survey: 0.4ha |
| | Pond area magnetometer: 2.4ha |
| | Pond area resistance survey west: 0.3ha |
| | Pond area resistance survey east: 0.35ha |
| Lead surveyor: | Mark Edwards BA |
| Author: | Ross Dean BSc MSc MA MIfA |

## 1.2    Client

National Trust, Saltram, Plympton, Plymouth, Devon PL7 1UH

## 1.3    Site information

| | |
|---|---|
| Site: | Land at Saltram House |
| District: | City of Plymouth |
| County: | Devon |
| NGR: | SX 521 556 and SX 521 553 (points) |
| NGR E/N: | 252071,55573 and 252070,55348 (points) |
| Post code: | PL7 1UH |
| Site HER entries: | NT HBSMR Numbers: 104000, 100813, 100816 |

## 1.4    Archive

| | |
|---|---|
| OASIS number: | substrat1-285335 |
| Archive: | At the time of writing, the archive of this survey will be held by Substrata. Depending on local authority policy, an archive of the unprocessed data may be deposited with the Archaeological Data Service |

## 1.5    Introduction

This report was commissioned by the National Trust, Saltram as part of a wider research project at Saltram. Two areas within the vicinity of the main house and stable block were identified as in need of a geophysical survey to develop the understanding of the history of the site, encourage public involvement and develop new interpretations, thereby enabling informed management and increased enjoyment and understanding of its environmental, historic, cultural and natural features.

The two sites for geophysical survey were:
Lawns to the east and south of the mansion. It is thought that the approach to the earlier sixteenth to seventeenth century house would have been within this area. Archaeological observation of a service trench excavated through the east lawn area in 2005 recorded the remains of stone walls (one 2m wide) and a culvert which it was thought may have been part of a gatehouse or gatehouse range, associated with that earlier house.

An area of gently sloping parkland with a pond at its western extent. This area was selected on the basis that there are a number of subtle earthworks visible which appear to relate to the pond and may be indicative of pre-seventeenth century activity on the estate. There is a need to understand the site to its fullest and inform ongoing management.

## 1.6    Summary

*Both the magnetic and resistance responses were sufficient to be able to differentiate anomalies representing possible archaeological features.*

*Fourteen magnetic anomaly groups and twenty resistance anomaly groups were identified as possibly representing archaeological deposits or features. The magnetic survey on the*

*Mansion lawns was compromised by the presence of iron or steel services and iron lawn edgings. The resistance survey, however, suggests the presence of linear features on both lawns which may indicate archaeological deposits although some may relate to relatively recent service trenches. The majority of the magnetic and resistance anomaly groups recorded on the western side Pond area are likely to relate to informal tracks although one may indicate a former ditch or leat and another a ditch. Ploughing disturbance, possibly from ridge-and-furrow ploughing, was also recorded in the same area. The combination of tracks and ploughing may be responsible for slight, extant earthworks noted in previous work. A curvilinear feature is indicated in both the magnetic and resistance datasets to the east of the pond which may be natural but could relate to a former wall or drainage feature. Two relatively high resistance features were recorded within the Pond area. These indicate the presence of two stony or concrete deposits. Speculatively, they may indicate the presence of capped wells or platforms associated with the former World War 2 military camp at Saltram. A large area of rubble recorded in the magnetic survey of the Pond area is likely to denote an area of hardstanding associated with the army camp.*

## 2 Survey aims and objectives

### 2.1 Aims

The site investigations proposed within this document are concordant with a Level 3 archaeological assessment, with the overarching aim being to provide 'an enhanced and integrated, multidisciplinary record of an archaeological field monument or landscape, resulting from the process of field investigation'. The results from the geophysical survey will be used to aid and inform future targeted evaluation, management and interpretation of the site.

The aims of the targeted geophysical survey within the study areas are to:
- Identify and accurately record the location of any anomalies that may be related to archaeological deposits, structures or artefacts known to exist within the survey areas;
- Within the limits of the techniques and dataset, archaeologically characterise any such anomalies or patterns of anomalies; and,
- Produce a summary with interpretation based on the survey that is sufficiently detailed to inform any subsequent archaeological investigation about the location and possible archaeological character of the recorded anomalies.

## 3 Standards

The standards used to complete this survey are defined by the Chartered Institute for Archaeologists (2014a) and Historic England (2010). The codes of approved practice that were followed are those of the Chartered Institute for Archaeologists (2014b) and Archaeology Data Service/Digital Antiquity Guides (undated).

## 4 Site description

### 4.1 Landscape and land use

The Mansion lawns within the survey area lies to the east and south of the mansion house at approximately 25m AOD as shown in Figure 3. The two lawns are separated by a gravel drive which is bordered by an iron lawn containment edge a few centimetres high. The southern edge of the southern lawn is defined by a Ha Ha.

The pond area comprises two pasture fields in an east-to-west sloping valley descending from approximately 30m to 15m AOD within the survey area. The pond lies at the western end of the survey area as shown in Figure 6.

### 4.2 Geology

The geology across the survey area and surrounds comprises slate of the Upper Devonian Slates. The superficial geology was not recorded in the source used (British Geological Society undated).

# 5    Archaeological background

5.1    Historic landscape characterisation
Park/garden.
A park planted with ornamental trees or a garden round a house (Devon County Council, undated).

5.2    Archaeological background
The National Trust Historic Buildings, Sites and Monuments Record (NT HBSMR) was examined via the Heritage Gateway (Historic England, undated) to gain an appreciation of historic assets pertinent to the geophysical survey data within 500m of the survey area perimeter.

This Section is not designed to provide a comprehensive understanding of the historic environment of the surrounding area and should not be used as a source for further work.

Saltram House (NT HBSMR number 104000, NGR SX 520 555) is a Grade I listed middle to late 18th century house. It is a remodelling of a 16th to 17th century building built round a small central courtyard. The remains of the earlier house are visible in the yard. The present mansion of Saltram is built round the inner quadrangle of the old house. The quadrangle is a complete small rectangular court, still cobble-paved, though considerably altered at the west and east. At the south-east is a square stair-tower of four stages. On the opposite side of the court rises a double chimney-stack. Within this part of the house are a doorway or two of the earlier period.

The southern boundary of the Mansion lawns survey area is a Ha Ha (NT HBSMR number 100813, NGR SX 520 555) which is thought to be Modern rather than Post-medieval in date.

The intact pond in the southern survey area is shown on an Ordnance Survey surveyors draft of 1784. The date of construction is unknown (NT HBSMR number 100816, NGR SX 520 553).

An area of rubble recorded in the survey (Section 6) coincides with an area of hard-standing shown on an aerial photograph taken in 1946 which may be associated with an United States army camp situated at Saltram during the Second World War (Teasdale, 2017).

# 6 Results, discussion and conclusions

## 6.1 Scope and definitions
This survey was designed to record magnetic and resistance anomalies.

A magnetic anomaly is a local variation in the Earth's magnetic field. Such variations can result from differences in the chemistry or magnetism of underlying solid geology, superficial geology and other near-surface deposits including those altered and created by past human activities. Near-surface artefacts can also create magnetic anomalies.

A resistance anomaly is a local variation in the electrical resistance of a soil and is related to its porosity, permeability, saturation, and chemical nature of entrapped fluids (Heimmer and De Vore, 1995:30), all of which can be altered by past human activities.

The terms 'archaeological deposit', 'structure' and 'feature' refer to any artefacts, material deposits or disturbance of natural deposits thought to be the result of human activity, excluding recent land maintenance and farming.

Magnetic and resistance anomalies cannot be regarded as physical archaeological deposits, structures or features and the dimensions of the anomalies shown do not represent the dimensions of any associated archaeology. They can be, however, indicative of archaeological deposits, structures, features or past human activity.

The analysis presented below identifies and characterises anomalies and anomaly groups that may relate to archaeological deposits, structures, features and past human activity.

The reader is referred to section 7.

## 6.2 Results

Figure 2 shows an overview of the interpretation of the magnetometer (gradiometer) and resistance survey data sets for anomalies relating to archaeology only. It is designed to be a quick guide as to the location and density of potential archaeological deposits.

Figures 3 to 8 are plots of the survey interpretation in greater detail and include the identifiers of the mapped anomaly groups of all types. Table 1 is an extract of the detailed analysis of the survey data sourced from the attribute tables of the GIS project provided in the project archive.

Figures 3 to 8 and Table 1 comprise the analysis of the survey data.

Various plots of the processed data as specified in Tables 3 and 4 are provided in Figures 9 to 19.

Figures 20 to 22 are plots of the unprocessed magnetometer and resistance data.

## 6.3 Discussion

### 6.3.1 General points
Discussion scope
Not all anomalies or anomaly groups identified in Table 1 are necessarily discussed below. All identified anomaly groups are recorded in the GIS project held the survey archive.

Data collection
Data collection during the magnetometer survey was restricted as shown in the figures due to the presence of magnetic materials in adjacent fences and other objects, including iron lawn edging around the Mansion house drive. Strong magnetic responses mapped close to survey

boundaries and elsewhere are likely to relate to these materials except where otherwise indicated in the interpretation figures.

<u>Anomaly characterisation and mapping</u>
There are a number of anomaly groups that could be interpreted as relating to large postholes or pits although most will have natural origins. Anomalies of this sort are only mapped as potential archaeology if they are clustered in groups or otherwise form recognisable patterns.

Anomalies thought to relate to natural features and recent man-made objects such as manholes, water management equipment, drains, cables and other services were only mapped where they comprised significant magnetic responses across the dataset that needed clarification.

Numerous dipole magnetic anomalies are scattered across the magnetometer data set. These are likely to represent recent ferrous objects. They are only mapped if they could influence the analysis of anomaly groups thought to have an archaeological origin.

6.3.2    Mansion lawns surveys

It is thought that the approach to the earlier sixteenth to seventeenth century house would have been within this area. Archaeological observation of a service trench excavated through the east lawn area in 2005 recorded the remains of stone walls (one 2m wide) and a culvert which it was thought may have been part of a gatehouse or gatehouse range, associated with that earlier house (National Trust South West Region (Cornwall), 2017).

Referring to Figures 4 and 12, resistance anomaly group **r2** is most likely to relate to a filled ditch whilst groups **r1** and **r5**, which may be related to **r3**, are more likely to relate to stony linear deposits. Magnetic anomaly groups **g2**, **g1** and possibly **g3** (Figure 3) coincide with r2, r1 and r3 respectively (Figure 5) and are likely to relate to the same ground disturbance albeit at shallower depths. These anomaly groups, and the resistance groups **r4 to r8**, also imply ground disturbance and linear deposits with a similar trend with the lower resistance anomalies probably relating to earthen-filled features and the higher resistance anomalies to relatively stony deposits. It is not possible to discern whether they relate to historical features or recent services. The slight, apparent return on group r5 may be significant as such a right angle is less likely in a service trench.

On the southern lawn (Figure 4), groups **r9** and **r11** relate to higher resistance, probably relatively stony deposits which could be either gravel-filled service trenches or wall footings whilst group **r10** is more likely to represent a filled ditch or earth-filled service trench. Unfortunately, the magnetic response in this area of lawn was dominated by iron or steel services and so no analysis of the magnetic data for archaeological deposits was possible (Figures 10 and 11).

6.3.3    Pond area surveys

This was selected for geophysical survey on the basis that there are a number of subtle earthworks visible which appear to relate to the pond and may be indicative of pre-seventeenth century activity on the estate (National Trust South West Region (Cornwall), 2017).

The gradiometer and resistance data collected in the western side this area has clear east-north-east to west-south-west linear trends on the western side around the pond (Figures 14, 15 and 17). For the most part, these anomaly groups have characteristics indicative of informal tracks of either human or animal origin (anomaly groups **g4 to g6**, **g9**, **g12** and **g13** in Figures 6 and 8, anomaly groups **r13**, **r14** and **r16 to r19** in Figures 7 and 8). Soil creep may also be a possible origin for some of these anomaly groups. Group **g7** may relate to a similar feature but is clearer in the data set and may be indicative of a former drainage ditch

or leat. Groups **g10** and **g1**1 may also indicate the presence of a ditch although an informal track cannot be ruled out (Figures 6, 7 and 8).

In the same area, both the magnetic and resistance data display a curvilinear deposit to the east of the pond (groups **g8** and **r12** in Figures 6, 7 and 8). In broad terms, these anomalies may represent an archaeological feature or a palaeochannel although the magnetic anomaly g8 has characteristics that may indicate a fragment of a former field boundary. A drainage feature associated with the pond may also be a possibility.

Groups **g101** (Figure 6) and **r101** (Figure 7) are most likely to represent former ploughing disturbance and the resistance anomalies have characteristics suggesting that it may be ridge-and-furrow ploughing. It is a possibility that slight earthworks left by ridge-and-furrow ploughing when combined with the informal tracks also recorded in the dataset have produced the slight earthworks noted in the area.

Resistance anomaly groups **r15** and **r20** (Figures 7 and 8) show a high resistance deposit surrounded by relatively low resistance deposits. Such anomaly groups often indicate the presence of stone or concrete placed within a pit with earthen filling. Given the presence in the Saltram grounds of a World War 2 United States military camp (Teasdale, 2017), these anomaly groups may relate to former gun or searchlight platforms. They are, however, situated in a shallow valley and so it is also a possibility that they indicate the sites of former wells. The third alternative is that they represent buried stones or stony deposits of unknown origin. These two anomaly groups are unlikely to relate to natural deposits.

Group **g14** (Figures 6 and 8) probably relates to a filled ditch or drainage ditch but it lies adjacent to a probable palaeochannel represented by groups **r201** (Figure 7) and **g20**1 and **g202** (Figure 6), and may represent the edge of the former stream channel.

Magnetic anomaly group **g305** (Figures 6 and 8) coincides with an area of hard standing recorded in an aerial photograph taken in 1946. This area is thought to associated with the World War 2 military camp at Saltram (Teasdale, 2017).

6.4    Conclusions

Both the magnetic and resistance responses were sufficient to be able to differentiate anomalies representing possible archaeological features.

Fourteen magnetic anomaly groups and twenty resistance anomaly groups were identified as possibly representing archaeological deposits or features. The magnetic survey on the Mansion lawns was compromised by the presence of iron or steel services and iron lawn edgings. The resistance survey, however, suggests the presence of linear features on both lawns which may indicate archaeological deposits although some may relate to relatively recent service trenches. The majority of the magnetic and resistance anomaly groups recorded on the western side Pond area are likely to relate to informal tracks although one may indicate a former ditch or leat and another a ditch. Ploughing disturbance, possibly from ridge-and-furrow ploughing, was also recorded in the same area. The combination of tracks and ploughing may be responsible for slight earthworks noted in previous work. A curvilinear feature is indicated in  both the magnetic and resistance datasets to the east of the pond which may be natural but could relate to a former wall or drainage feature. Two relatively high resistance features were recorded within the Pond area. These indicate the presence of two stony or concrete deposits. Speculatively, they may indicate the presence of capped wells or platforms associated with the former World War 2 military camp at Saltram. A large area of rubble recorded in the magnetic survey of the Pond area is likely to denote an area of hardstanding associated with the army camp.

# 7 Disclaimer and copyright

The description and discussion of the results presented in this report are the authors, based on his interpretation of the survey data. Every effort has been made to provide accurate descriptions and interpretations of the geophysical data set. The nature of archaeological geophysical surveying is such that interpretations based on geophysical data, while informative, can only be provisional. Geophysical surveys are a cost-effective early step in the multi-phase process that is archaeology. The evaluation programme of which this survey is part may also be informed by other archaeological assessment work and analysis. It must be presumed that more archaeological features will be evaluated than those specified in this report.

Substrata Ltd will assign copyright to the client upon written request but retains the right to be identified as the author of all project documentation and reports as defined in the Copyright, Designs and Patents Act 1988 (Chapter IV, s.79). This report contains material that is non-Substrata Limited copyright or the intellectual property of third parties. Such material is labelled with the appropriate copyright and is non-transferrable by Substrata Ltd.

# 8 Acknowledgements

Substrata would like to thank Judith Teasdale, Project Assistant Curator, National Trust, Saltram, for commissioning us to complete this survey.

# 9 Bibliography

Archaeology Data Service (undated) *Archaeology Data Service/Digital Antiquity Guides to Good Practice: Geophysical Data in Archaeology,* [Online] Available: http://guides.archaeologydataservice.ac.uk/g2gp/ Geophysics_Toc [March 2017]

British Geological Survey (undated) *Geology of Britain viewer, 1:50000 scale data*, [Online] Available: http:// www.bgs.ac.uk/discovering Geology/geologyOfBritain/viewer.html [March 2017

Chartered Institute for Archaeologists (2014a) *Standard and guidance archaeological geophysical survey*, [Online] Available: http://www.archaeologists.net/sites/default/files/CIfAS&GGeophysics_1.pdf [March 2017]

Chartered Institute for Archaeologists (2014b) *Code of conduct*, [Online] Available: http://www.archaeologists.net/ sites/default/files/CodesofConduct.pdf [March 2017]

Clark, A. (2000) *Seeing Beneath the Soil, Prospecting methods in archaeology*, London: Routledge

Dean, R. (2017) *A Written Scheme of Investigation for an archaeological magnetometer and resistance survey across land at Saltram, Plympton, Plymouth, Devon*, Substrata unpublished document 1072SAL-W-1

Devon County Council (undated) *Historic environment* [Online], Available: https://new.devon.gov.uk/ historicenvironment/ [May 2017]

Gaffney, C. and Gater, J. (2003) *Revealing the buried past: geophysics for archaeologists*, Stroud, Tempus Publishing

Heimmer, Don H., and Steven L. DeVore (1995) *Near-Surface, High Resolution Geophysical Methods for Cultural Resource Management and Archaeological Investigations,* Revised edn., National Park Service, Denver, Colorado

Historic England (undated a) *Heritage Gateway* [Online], Available: http://www.heritagegateway.org.uk/gateway/ [May 2017

Historic England (2010) *Geophysical Survey in Archaeological Field Evaluation*, [Online] Available: https:// content.historicengland.org.uk/images-books/publications/geophysical-survey-in-archaeological-field-evaluation/ geophysics-guidelines.pdf/ [April 2017]

Teasdale, J. (2017) *National Trust, Saltram. Geophysical Survey - 1946 aerial photo*, email to R. Dean (rossdean57@outlook.com), 24 April 2017 [24 April 2017]

National Trust South West Region (Cornwall) (2017) *National Trust Brief for a geophysical survey, Saltram, Plymouth*, National Trust unpublished document

# Appendix 1    Figures

## General Guidance

The anomalies represented in the survey plots provided in this appendix are magnetic anomalies. The apparent size of such anomalies and anomaly patterns are unlikely to correspond exactly with the dimensions of any associated archaeological features.

A rough rule for interpreting magnetic anomalies is that the width of an anomaly at half its maximum reading is equal to the width of the buried feature, or its depth if this is greater (Clark, 2000: 83). Caution must be applied when using this rule as it depends on the anomalies being clearly identifiable and distinct from adjacent anomalies. In northern latitudes the position of the maximum of a magnetic anomaly will be displaced slightly to the south of any associated physical feature.

A rough rule for interpreting resistance anomalies is that if an x-y trace is drawn of the resistance over an anomaly, then the width of an anomaly at half its maximum height is equal to the width of the buried feature. Caution must be applied when using this rule as it depends on the anomalies being clearly identifiable and distinct from adjacent anomalies and it should be noted that the relationship between change in resistance response and depth is not linear (Gaffney and Gater, 2003: 112).

Figure 1: location map

Figure 2: magnetometer and resistance survey interpretation, archaeology overview

**Legend:**

- resistance survey area
- magnetometer survey area
- *Notation: certainty, anomaly type (2)*

**Potential archaeology**

**Magnetometer survey**
*certainty, anomaly type (2)*
- possible, positive
- possible, negative
- possible, parallel linears

**Resistance survey**
- possible, high
- possible, low
- possible, linear trends

British Grid
  centre X: 252163.46 m, centre Y: 55461.02 m

0       80 m

Scale: 1:1700 @ A3. Spatial Units: Meter. Do not scale off this drawing

Notes:
1. All interpretations are provisional and represent potential archaeological deposits.
2. 'Anomaly type' is a description of the magnetic anomaly. See the report text or GIS for an archaeological characterisation.
3. Anomalies designated "likely archaeology" have supporting evidence e.g. historical maps and or visible earthworks.
4. Not all instances are mapped.
5. Anomalies likely to represent geological or other natural deposits are not mapped unless relevant to potential archaeological events or deposits.

An archaeological magnetometer and resistance survey
Land at Saltram House, Plympton, Plymouth, Devon
Centred on NGR (E/N): 252071,55573 and 252070,55348
Report: 1702SAL-R-1

252000 m

252100 m

N

252000 m

252100 m

55600 m

55600 m

g2
g1
g3
g2
g3
g2
g1

g301

g302

**Legend**

*certainty, anomaly type (2)*

<u>Magnetometer survey</u>

— magnetometer survey area

**Potential archaeology**

■ possible, positive

■ possible, negative

■ possible, parallel linears

**Potential cultivation traces**

— possible, repeated parallels (4)

**Potential natural**

▨ possible, positive sinuous

▨ possible, negative sinuous

**Potential services & modern**

▨ possible, mixed spread

— possible, high contrast linear

— possible, regular narrow linears (4)

0                    40 m

Scale: 1:500 @ A3. Spatial Units: Meter. Do not scale off this drawing

Notes:

1. All interpretations are provisional and represent potential archaeological deposits.

2. 'Anomaly type' is a description of the magnetic anomaly. See the report text or GIS for an archaeological characterisation.

3. Anomalies designated "likely archaeology" have supporting evidence e.g. historical maps and or visible earthworks.

4. Not all instances are mapped.

5. Anomalies likely to represent geological or other natural deposits are not mapped unless relevant to potential archaeological events or deposits.

Figure 3: magnetometer survey interpretation, Mansion Lawns

252000 m   252100 m

55600 m   55600 m

N

r3  r1
r4
r2
r6  r5
r7
r8  r1

r9  r11
r301  r10
r302

0   40 m

252000 m   252100 m

*certainty, anomaly type (2)*

<u>Resistance survey</u>
☐ resistance survey area

**Potential archaeology**
■ possible, high
■ possible, low
▨ possible, linear trends

**Potential cultivation traces**
— possible, repeated parallels (4)

**Potential natural**
☐ possible, sinuous broad linear

**Potential services & modern**
— possible, linear

British Grid
centre X: 252076.93 m, centre Y: 55575.40 m

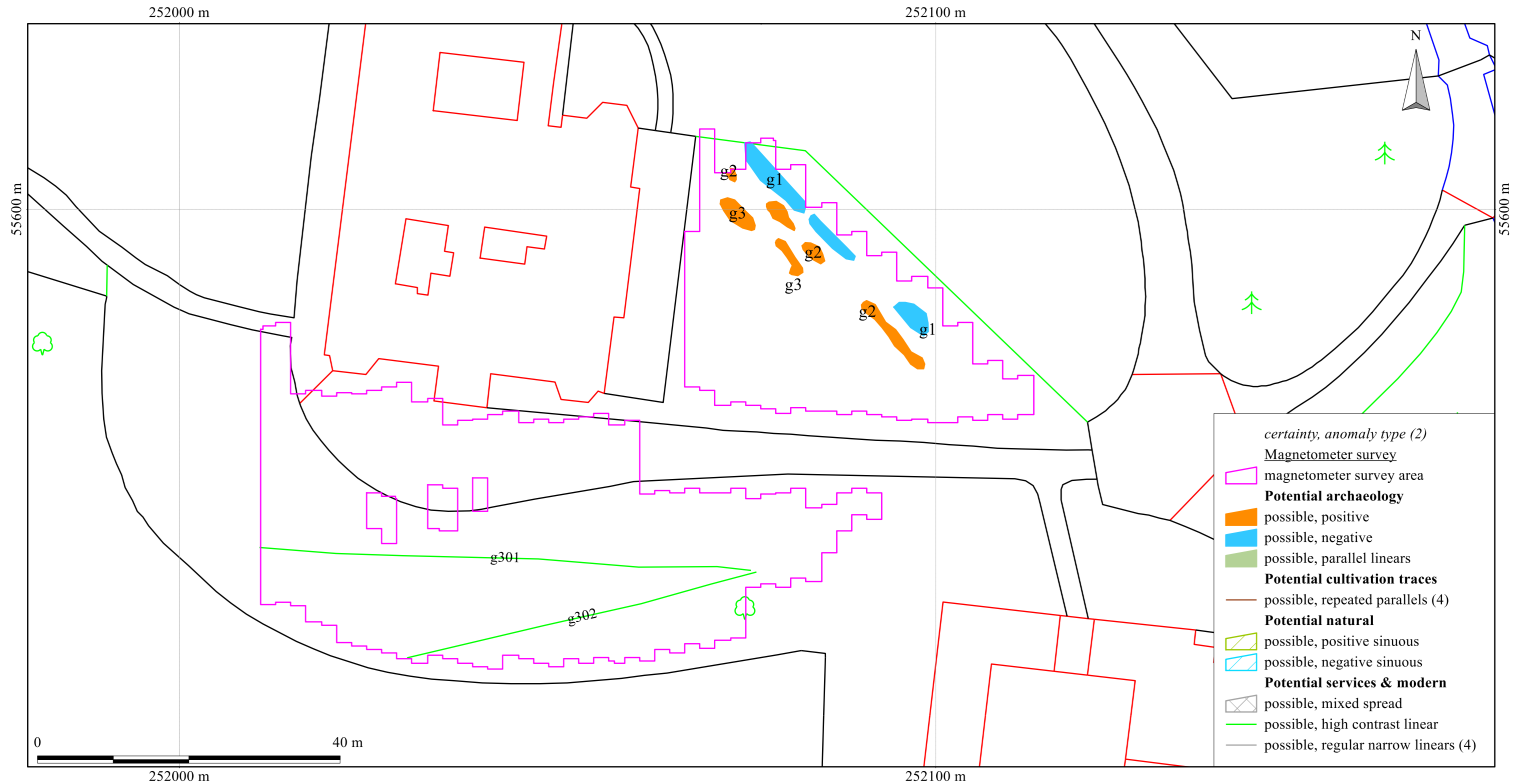Scale: 1:500 @ A3. Spatial Units: Meter. Do not scale off this drawing

Notes:
1. All interpretations are provisional and represent potential archaeological deposits.
2. 'Anomaly type' is a description of the magnetic anomaly. See the report text or GIS for an archaeological characterisation.
3. Anomalies designated "likely archaeology" have supporting evidence e.g. historical maps and or visible earthworks.
4. Not all instances are mapped.
5. Anomalies likely to represent geological or other natural deposits are not mapped unless relevant to potential archaeological events or deposits.

Geophysical survey: Copyright Substrata Limited.
Base map: Ordnance Survey (c) Crown Copyright 2017.
All rights reserved. Licence number 100022432

An archaeological magnetometer and resistance survey
Land at Saltram House, Plympton, Plymouth, Devon
Centred on NGR (E/N): 252071,55573 and 252070,55348
Report: 1702SAL-R-1

Figure 4: resistance survey interpretation, Mansion Lawns

Substrata Limited
Langstrath, Goodleigh
Barnstaple, Devon EX32 7LZ
Tel: 01271 342721
Email: geophysics@substrata.co.uk
Web: substrata.co.uk

**certainty, anomaly type (2)**

**Magnetometer survey**
- magnetometer survey area

**Potential archaeology**
- possible, positive
- possible, negative
- possible, parallel linears

**Potential cultivation traces**
- possible, repeated parallels (4)

**Potential natural**
- possible, positive sinuous
- possible, negative sinuous

**Potential services & modern**
- likely, mixed spread (3)
- possible, high contrast linear
- possible, regular narrow linears (4)

**Resistance survey**
- resistance survey area

**Potential archaeology**
- possible, high
- possible, low
- possible, linear trends

**Potential cultivation traces**
- possible, repeated parallels (4)

**Potential natural**
- possible, sinuous broad linear

**Potential services & modern**
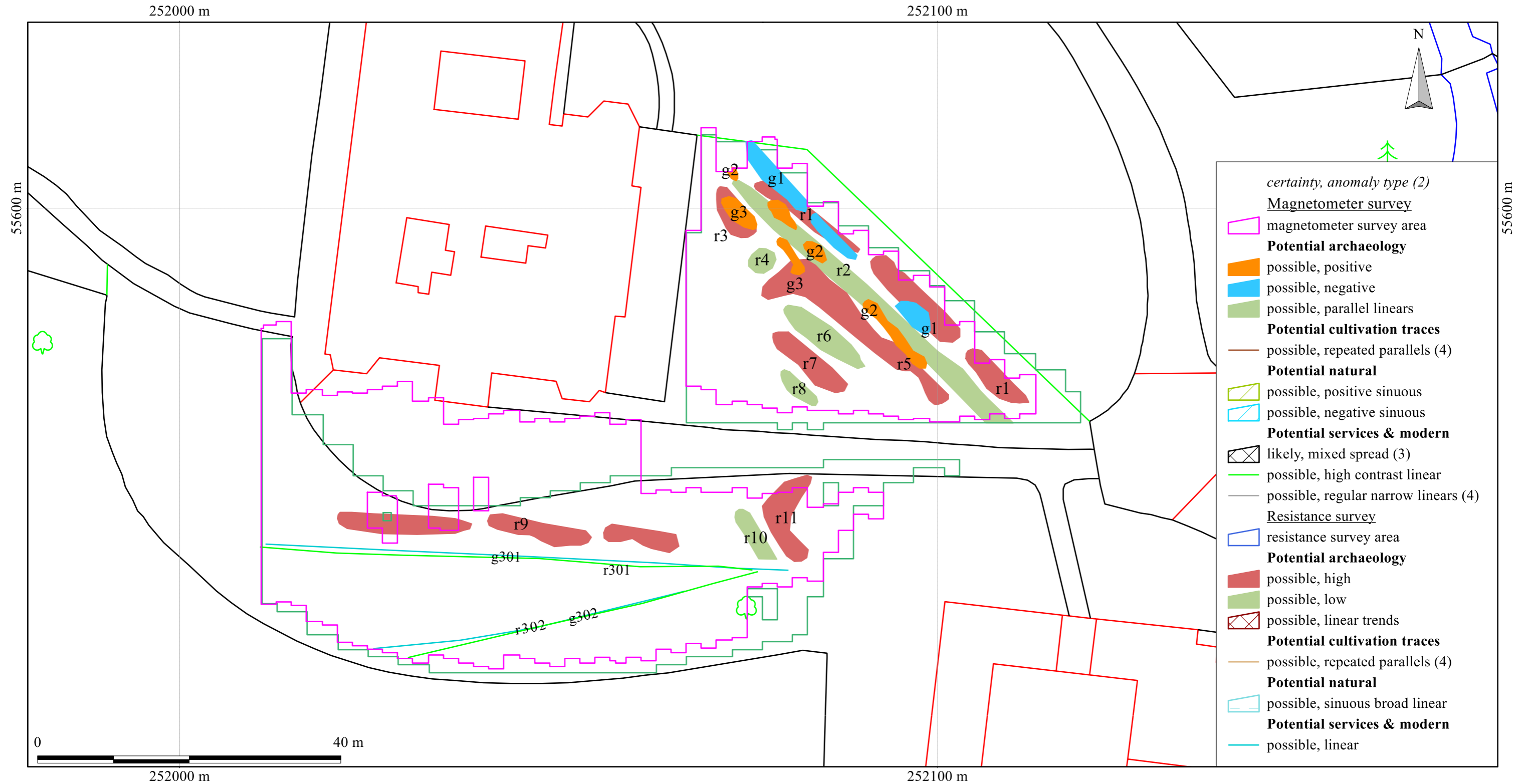- possible, linear

British Grid
centre X: 252076.93 m, centre Y: 55575.40 m

Scale: 1:500 @ A3. Spatial Units: Meter. Do not scale off this drawing

Geophysical survey: Copyright Substrata Limited.
Base map: Ordnance Survey (c) Crown Copyright 2017.
All rights reserved. Licence number 100022432

Notes:
1. All interpretations are provisional and represent potential archaeological deposits.
2. 'Anomaly type' is a description of the magnetic anomaly. See the report text or GIS for an archaeological characterisation.
3. Anomalies designated "likely archaeology" have supporting evidence e.g. historical maps and or visible earthworks.
4. Not all instances are mapped.
5. Anomalies likely to represent geological or other natural deposits are not mapped unless relevant to potential archaeological events or deposits.

An archaeological magnetometer and resistance survey
Land at Saltram House, Plympton, Plymouth, Devon
Centred on NGR (E/N): 252071,55573 and 252070,55348
Report: 1702SAL-R-1

Figure 5: magnetometer and resistance survey interpretation, Mansion Lawns

Substrata Limited
Langstrath, Goodleigh
Barnstaple, Devon EX32 7LZ
Tel: 01271 342721
Email: geophysics@substrata.co.uk
Web: substrata.co.uk

252100 m  252200 m  252300 m

N

55400 m  55400 m

55300 m  55300 m

*certainty, anomaly type (2)*

<u>Magnetometer survey</u>

☐ magnetometer survey area

**Potential archaeology**

■ possible, positive
■ possible, negative
■ possible, parallel linears

**Potential cultivation traces**

— possible, repeated parallels (4)

**Potential natural**

▨ possible, positive sinuous
▨ possible, negative sinuous

**Potential services & modern**

▨ likely, mixed spread (3)
— possible, high contrast linear
— possible, regular narrow linears (4)

<u>Resistance survey</u>

**Potential archaeology**

■ possible, high
■ possible, low
▨ possible, linear trends

**Potential cultivation traces**

— possible, repeated parallels (4)

**Potential natural**

▨ possible, sinuous broad linear

**Potential services & modern**

— possible, linear

g4  g4  g5  g6  g7  g7  g303  g304  g305
g8 & r12  g9  g10  g11  g306  g307  g307  g309  g102  g201  g202  g201  g14
g13  g12  g101  g102  g102  g308

0  40 m

Scale: 1:1000 @ A3. Spatial Units: Meter. Do not scale off this drawing
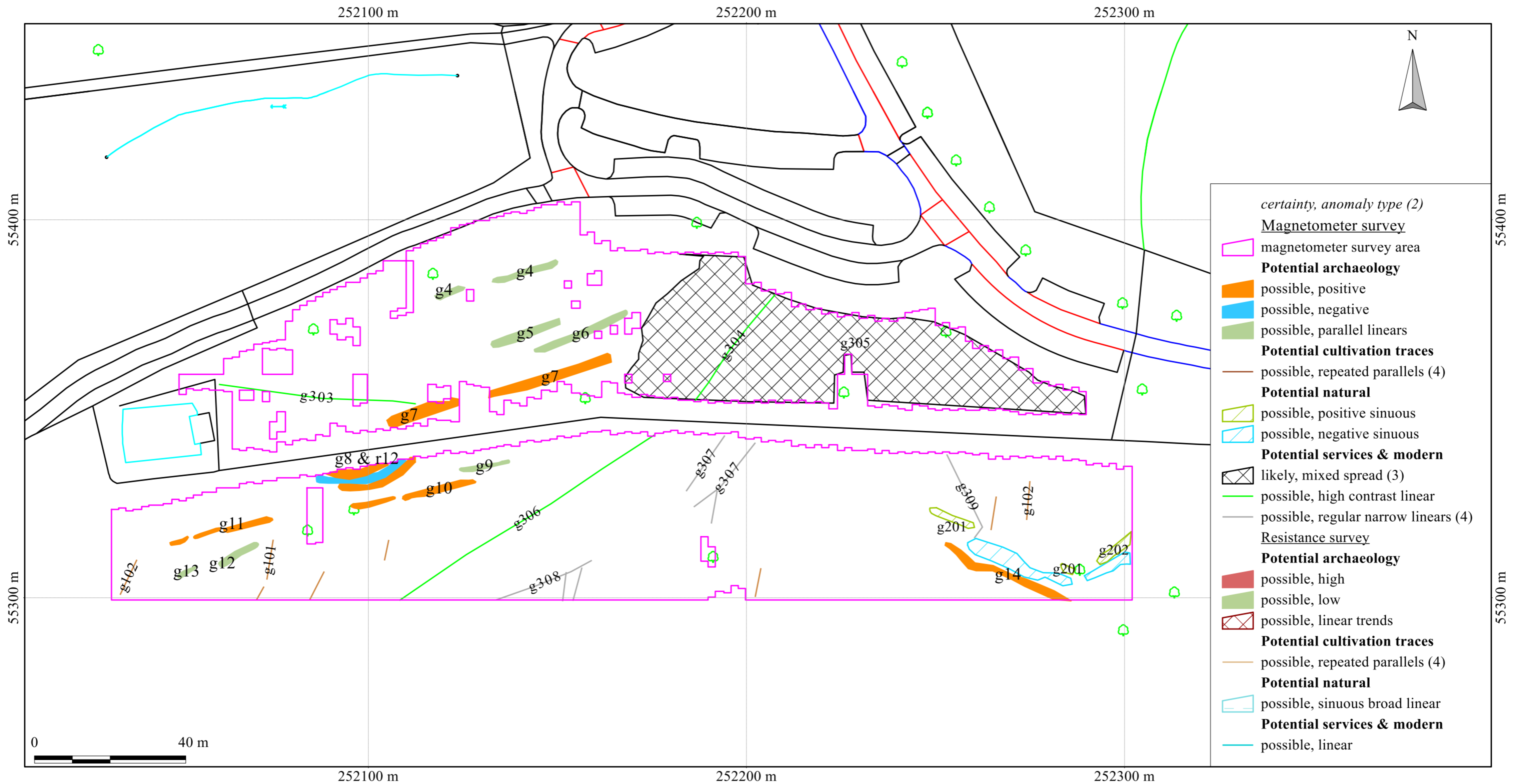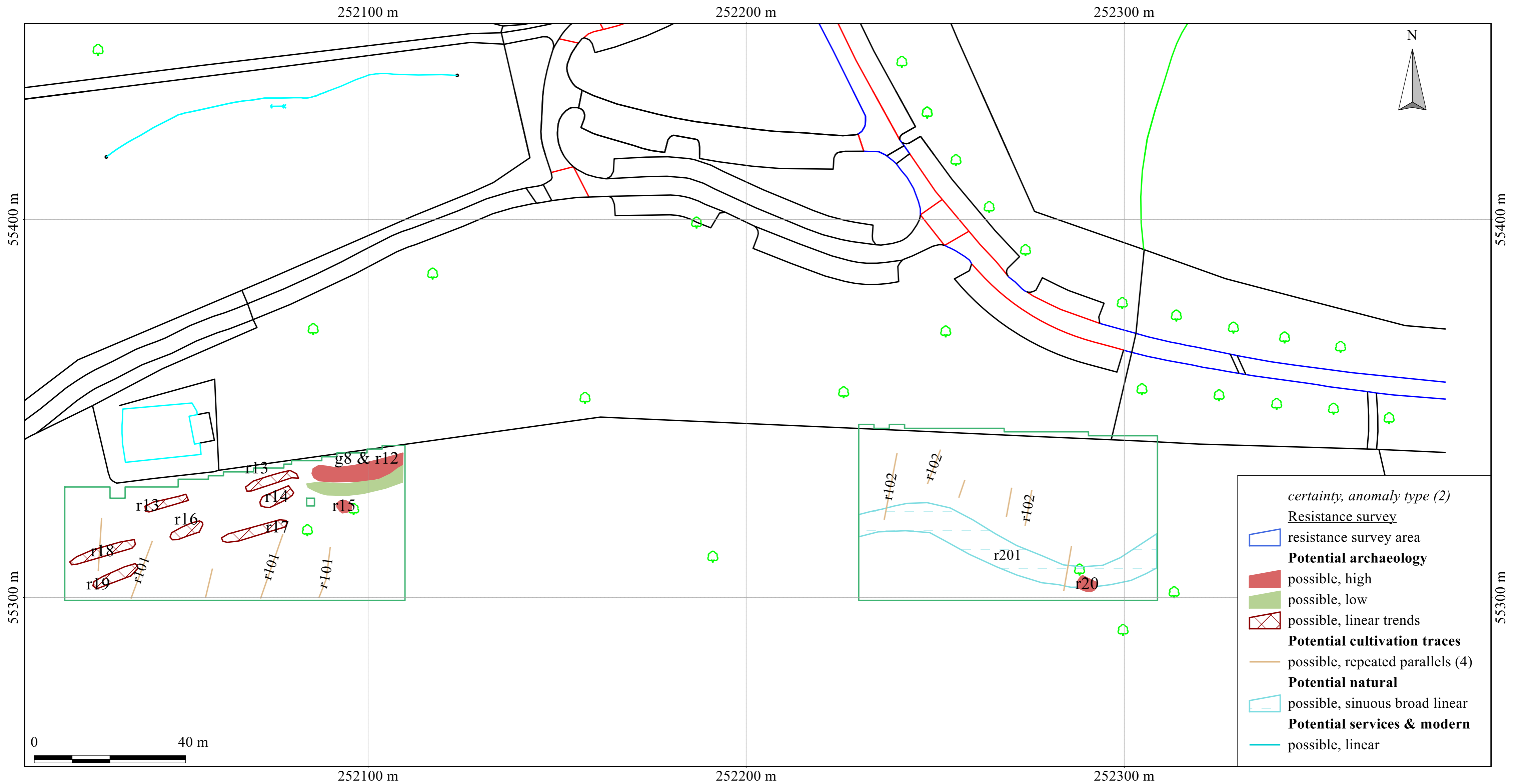
British Grid
centre X: 252203.05 m, centre Y: 55353.58 m

Geophysical survey: Copyright Substrata Limited.
Base map: Ordnance Survey (c) Crown Copyright 2017.
All rights reserved. Licence number 100022432

Notes:
1. All interpretations are provisional and represent potential archaeological deposits.
2. 'Anomaly type' is a description of the magnetic anomaly. See the report text or GIS for an archaeological characterisation.
3. Anomalies designated "likely archaeology" have supporting evidence e.g. historical maps and or visible earthworks.
4. Not all instances are mapped.
5. Anomalies likely to represent geological or other natural deposits are not mapped unless relevant to potential archaeological events or deposits.

An archaeological magnetometer and resistance survey
Land at Saltram House, Plympton, Plymouth, Devon
Centred on NGR (E/N): 252071,55573 and 252070,55348
Report: 1702SAL-R-1

Figure 6: magnetometer survey interpretation, Pond area

Substrata Limited
Langstrath, Goodleigh
Barnstaple, Devon EX32 7LZ
Tel: 01271 342721
Email: geophysics@substrata.co.uk
Web: substrata.co.uk

252100 m  252200 m  252300 m

N

55400 m

55300 m

g8 & r12

r13

r13  r14

r16  r15

r17

r18

r19  r101  r101  r101

r102  r102

r102

r201

r20

**certainty, anomaly type (2)**
Resistance survey
◻ resistance survey area
**Potential archaeology**
▮ possible, high
▮ possible, low
▨ possible, linear trends
**Potential cultivation traces**
— possible, repeated parallels (4)
**Potential natural**
▭ possible, sinuous broad linear
**Potential services & modern**
— possible, linear

0                    40 m

British Grid
centre X: 252203.05 m, centre Y: 55353.58 m

Scale: 1:1000 @ A3. Spatial Units: Meter. Do not scale off this drawing

Notes:
1. All interpretations are provisional and represent potential archaeological deposits.
2. 'Anomaly type' is a description of the magnetic anomaly. See the report text or GIS for an archaeological characterisation.
3. Anomalies designated "likely archaeology" have supporting evidence e.g. historical maps and or visible earthworks.
4. Not all instances are mapped.
5. Anomalies likely to represent geological or other natural deposits are not mapped unless relevant to potential archaeological events or deposits.

An archaeological magnetometer and resistance survey
Land at Saltram House, Plympton, Plymouth, Devon
Centred on NGR (E/N): 252071,55573 and 252070,55348
Report: 1702SAL-R-1

Figure 7:  resistance survey interpretation, Pond area

**Legend:**

*certainty, anomaly type (2)*

Magnetometer survey
- magnetometer survey area

**Potential archaeology**
- possible, positive
- possible, negative
- possible, parallel linears

**Potential cultivation traces**
- possible, repeated parallels (4)

**Potential natural**
- possible, positive sinuous
- possible, negative sinuous

**Potential services & modern**
- likely, mixed spread (3)
- possible, high contrast linear
- possible, regular narrow linears (4)

Resistance survey
- resistance survey area

**Potential archaeology**
- possible, high
- possible, low
- possible, linear trends

**Potential cultivation traces**
- possible, repeated parallels (4)

**Potential natural**
- possible, sinuous broad linear

**Potential services & modern**
- possible, linear

British Grid
centre X: 252203.05 m, centre Y: 55353.58 m

Scale: 1:1000 @ A3. Spatial Units: Meter. Do not scale off this drawing

Notes:
1. All interpretations are provisional and represent potential archaeological deposits.
2. 'Anomaly type' is a description of the magnetic anomaly. See the report text or GIS for an archaeological characterisation.
3. Anomalies designated "likely archaeology" have supporting evidence e.g. historical maps and or visible earthworks.
4. Not all instances are mapped.
5. Anomalies likely to represent geological or other natural deposits are not mapped unless relevant to potential archaeological events or deposits.

An archaeological magnetometer and resistance survey
Land at Saltram House, Plympton, Plymouth, Devon
Centred on NGR (E/N): 252071,55573 and 252070,55348
Report: 1702SAL-R-1

Figure 8: magnetometer and resistance survey interpretation, Pond area
(anomaly groups pertaining to archaeology only are numbered)

Figure 9: shade plot of processed magnetometer data, overview

251900 m    252000 m    252100 m    252200 m    252300 m    252400 m

55600 m
55500 m
55400 m
55300 m

N

0    80 m

**Legend:**

magnetometer survey area
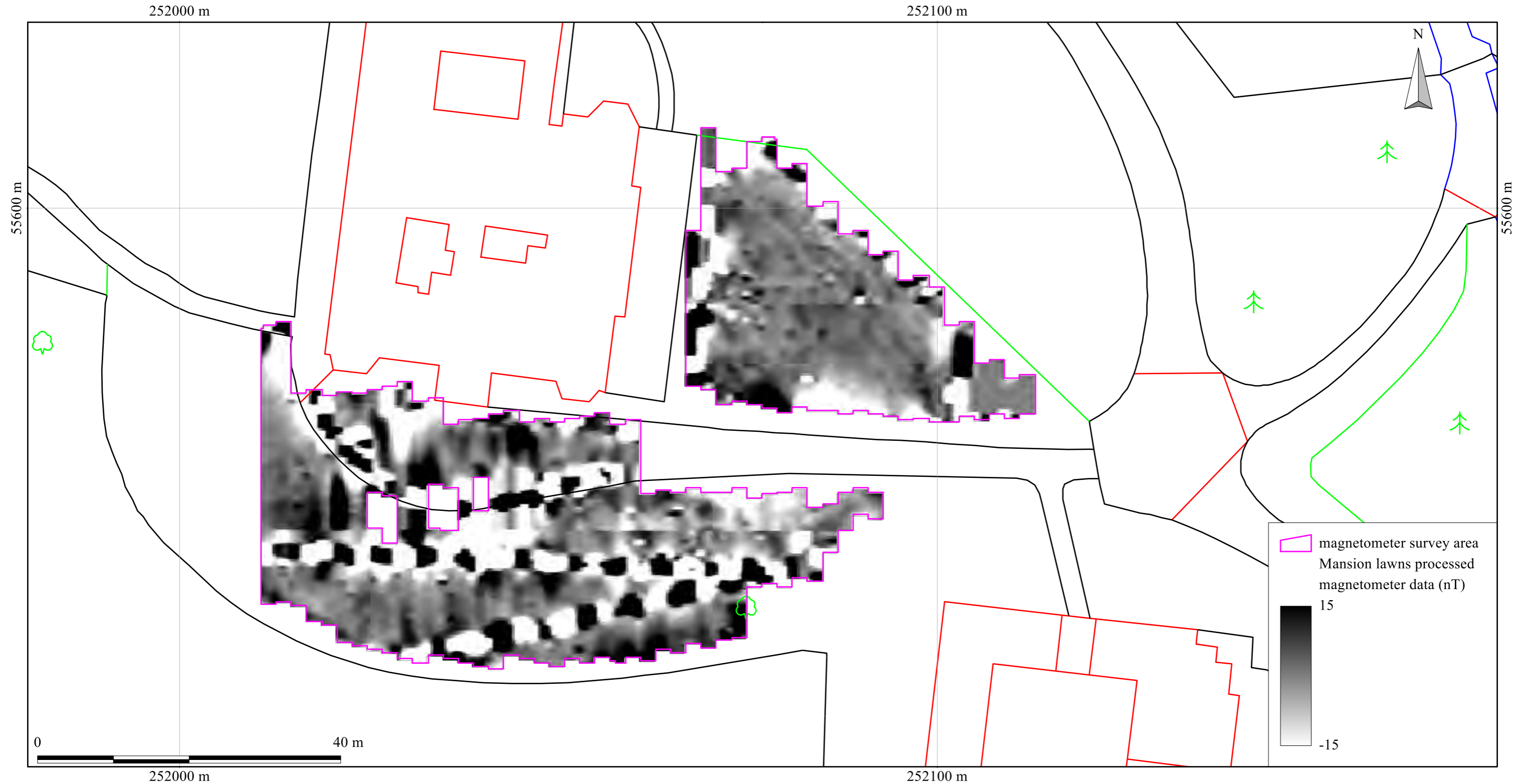Processed magnetometer data (nT)
Mansion lawns
15
-15
Pond area
8
-8
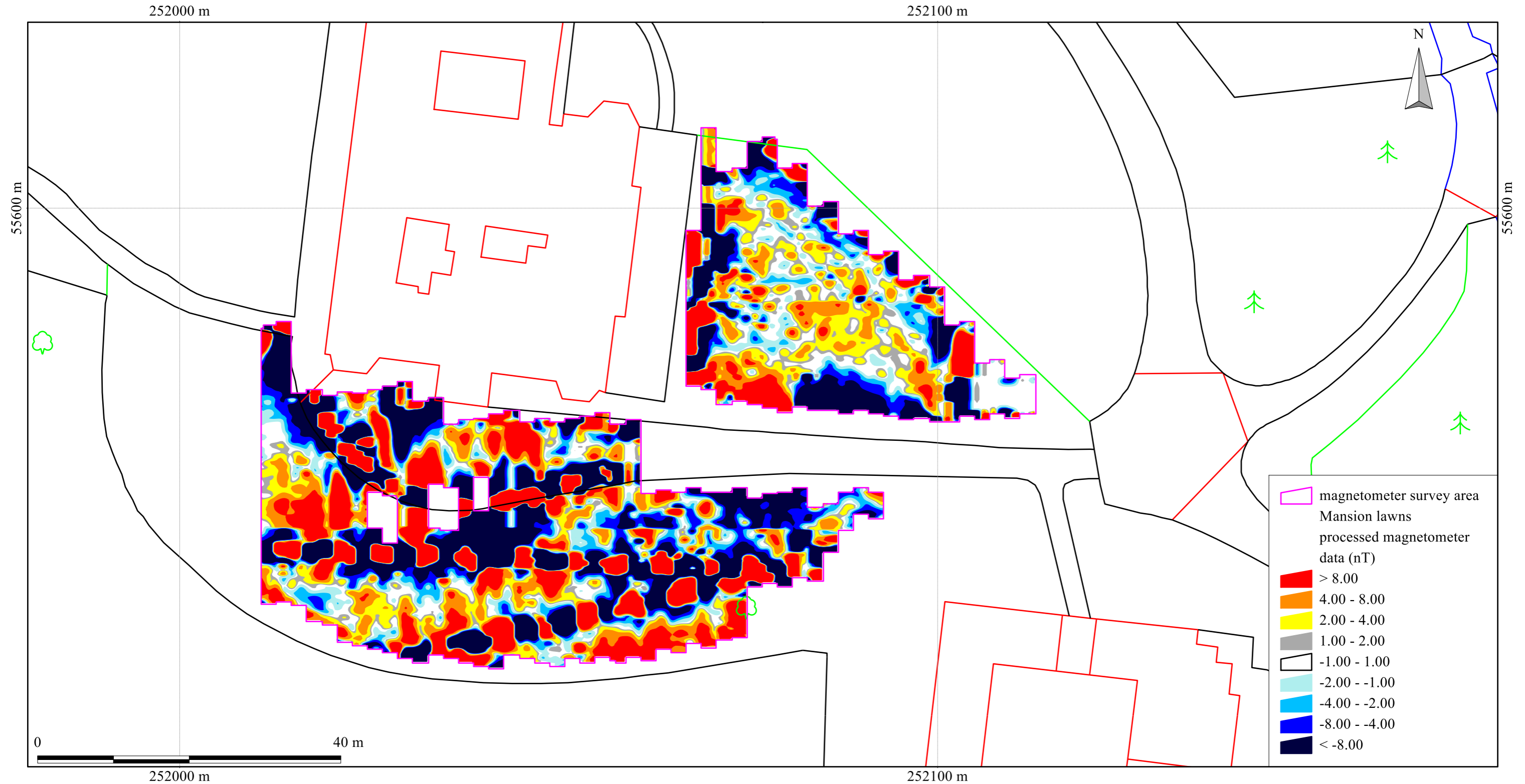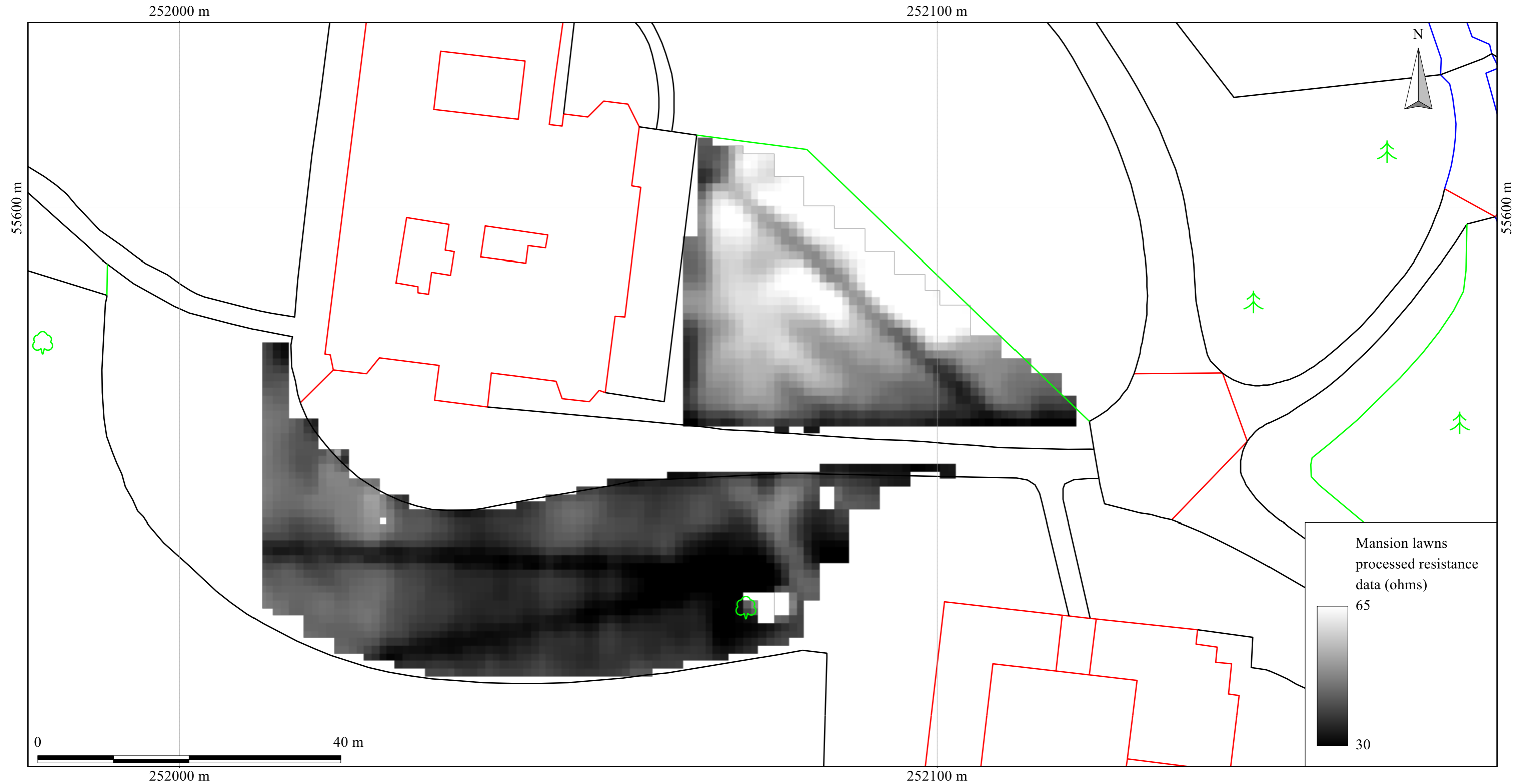
British Grid
centre X: 252163.46 m, centre Y: 55461.02 m

Scale: 1:1700 @ A3. Spatial Units: Meter. Do not scale off this drawing

An archaeological magnetometer and resistance survey
Land at Saltram House, Plympton, Plymouth, Devon
Centred on NGR (E/N): 252071,55573 and 252070,55348
Report: 1702SAL-R-1

Figure 10: shade plot of processed magnetometer data, Mansion lawns

252000 m

252100 m

55600 m

55600 m

N

magnetometer survey area
Mansion lawns processed
magnetometer data (nT)

15

-15

0

40 m

252000 m

252100 m

An archaeological magnetometer and resistance survey
Land at Saltram House, Plympton, Plymouth, Devon
Centred on NGR (E/N): 252071,55573 and 252070,55348
Report: 1702SAL-R-1

Figure 11: contour plot of processed magnetometer data, Mansion lawns

252000 m
252100 m
55600 m
55600 m
252000 m
252100 m

N

0        40 m

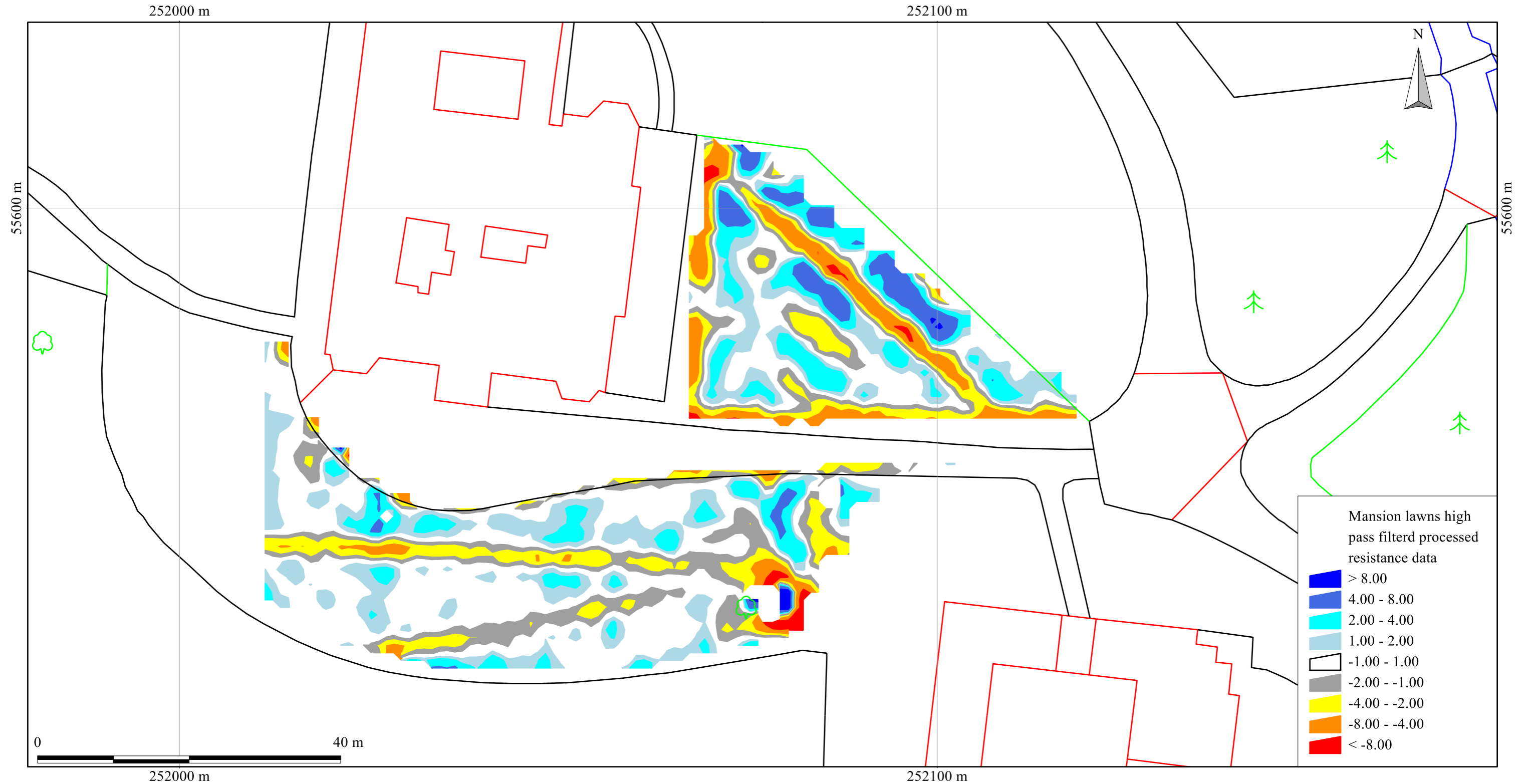| | magnetometer survey area Mansion lawns processed magnetometer data (nT) |
|---|---|
| ⬛ red | > 8.00 |
| ⬛ orange | 4.00 - 8.00 |
| ⬛ yellow | 2.00 - 4.00 |
| ⬛ grey | 1.00 - 2.00 |
| ⬜ white | -1.00 - 1.00 |
| ⬛ light cyan | -2.00 - -1.00 |
| ⬛ cyan | -4.00 - -2.00 |
| ⬛ blue | -8.00 - -4.00 |
| ⬛ navy | < -8.00 |

British Grid
centre X: 252076.93 m, centre Y: 55575.40 m

Scale: 1:500 @ A3. Spatial Units: Meter. Do not scale off this drawing

An archaeological magnetometer and resistance survey
Land at Saltram House, Plympton, Plymouth, Devon
Centred on NGR (E/N): 252071,55573 and 252070,55348
Report: 1702SAL-R-1

Figure 11: contour plot of processed magnetometer data, Mansion lawns

Figure 12: shade plot of processed resistance data, Mansion lawns

252000 m

252100 m

55600 m

55600 m

N

0          40 m

252000 m

252100 m

British Grid
centre X: 252076.93 m, centre Y: 55575.40 m

Scale: 1:500 @ A3. Spatial Units: Meter. Do not scale off this drawing

An archaeological magnetometer and resistance survey
Land at Saltram House, Plympton, Plymouth, Devon
Centred on NGR (E/N): 252071,55573 and 252070,55348
Report: 1702SAL-R-1

Figure 12: shade plot of processed resistance data, Mansion lawns

Figure 13: contour plot of high pass filtered processed resistance data, Mansion lawns

252000 m

252100 m

55600 m

55600 m

252000 m

252100 m

0                    40 m

N

British Grid
centre X: 252076.93 m, centre Y: 55575.40 m

Scale: 1:500 @ A3. Spatial Units: Meter. Do not scale off this drawing

An archaeological magnetometer and resistance survey
Land at Saltram House, Plympton, Plymouth, Devon
Centred on NGR (E/N): 252071,55573 and 252070,55348
Report: 1702SAL-R-1

252100 m

252200 m

252300 m

N

55400 m

55400 m

g8 & r12

magnetometer survey area
Pond area processed
magnetometer data (nT)

55300 m

55300 m

8

-8

0          40 m

252100 m

252200 m

252300 m
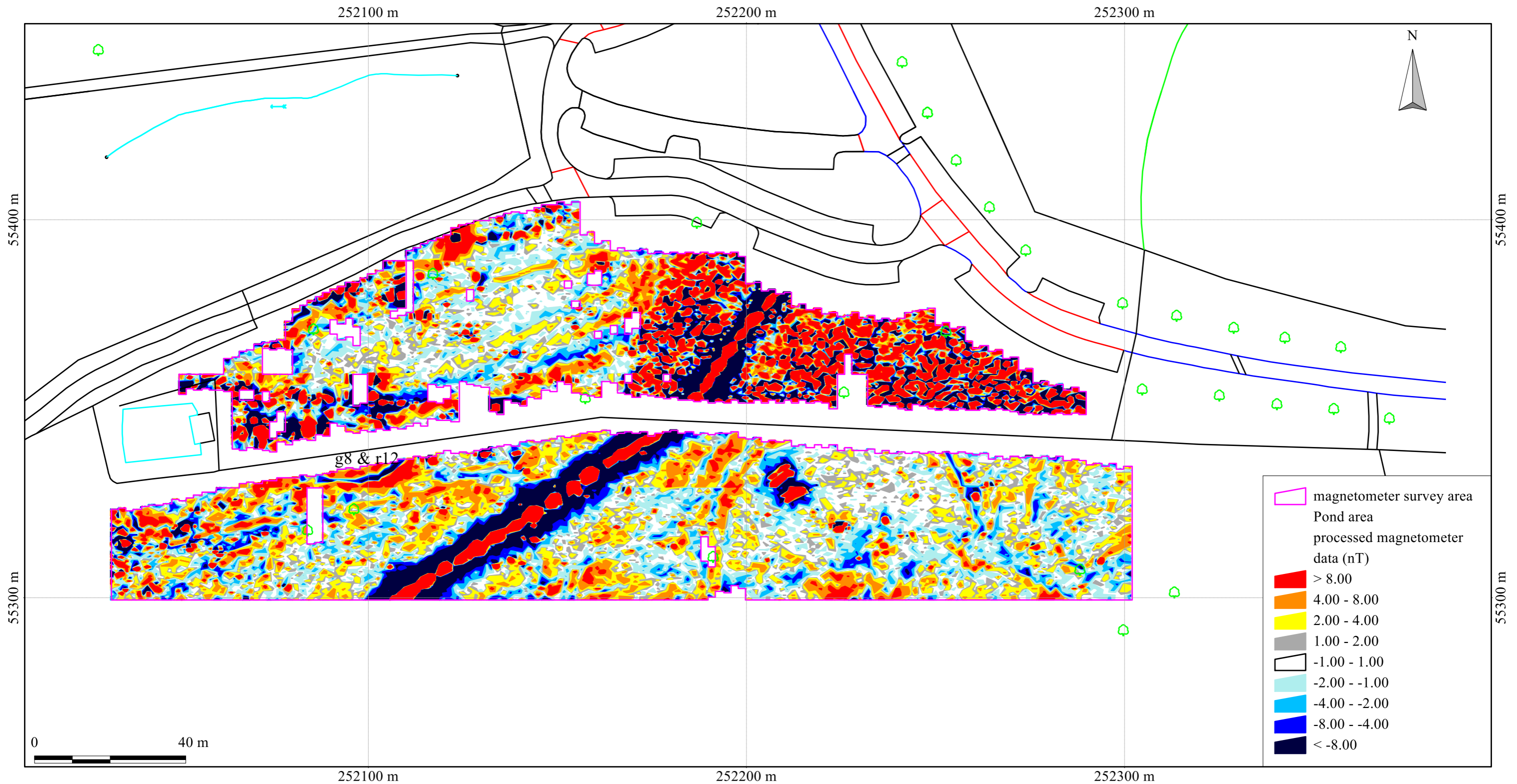
British Grid
centre X: 252203.05 m, centre Y: 55353.58 m

Scale: 1:1000 @ A3. Spatial Units: Meter. Do not scale off this drawing

An archaeological magnetometer and resistance survey
Land at Saltram House, Plympton, Plymouth, Devon
Centred on NGR (E/N): 252071,55573 and 252070,55348
Report: 1702SAL-R-1
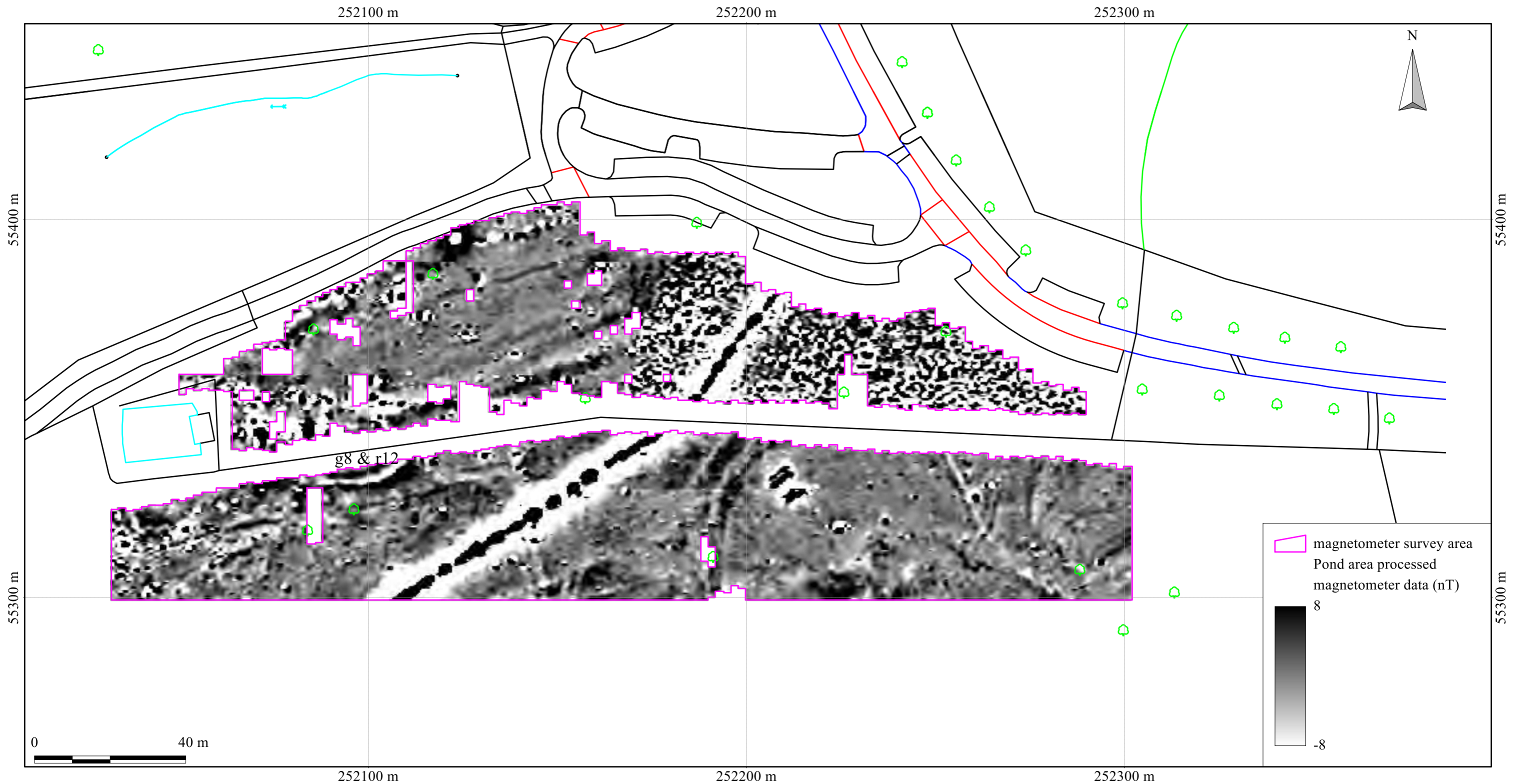
Figure 14: shade plot of processed magnetometer data, Pond area

252100 m   252200 m   252300 m

55400 m

55300 m

g8 & r12

N

0        40 m

252100 m   252200 m   252300 m

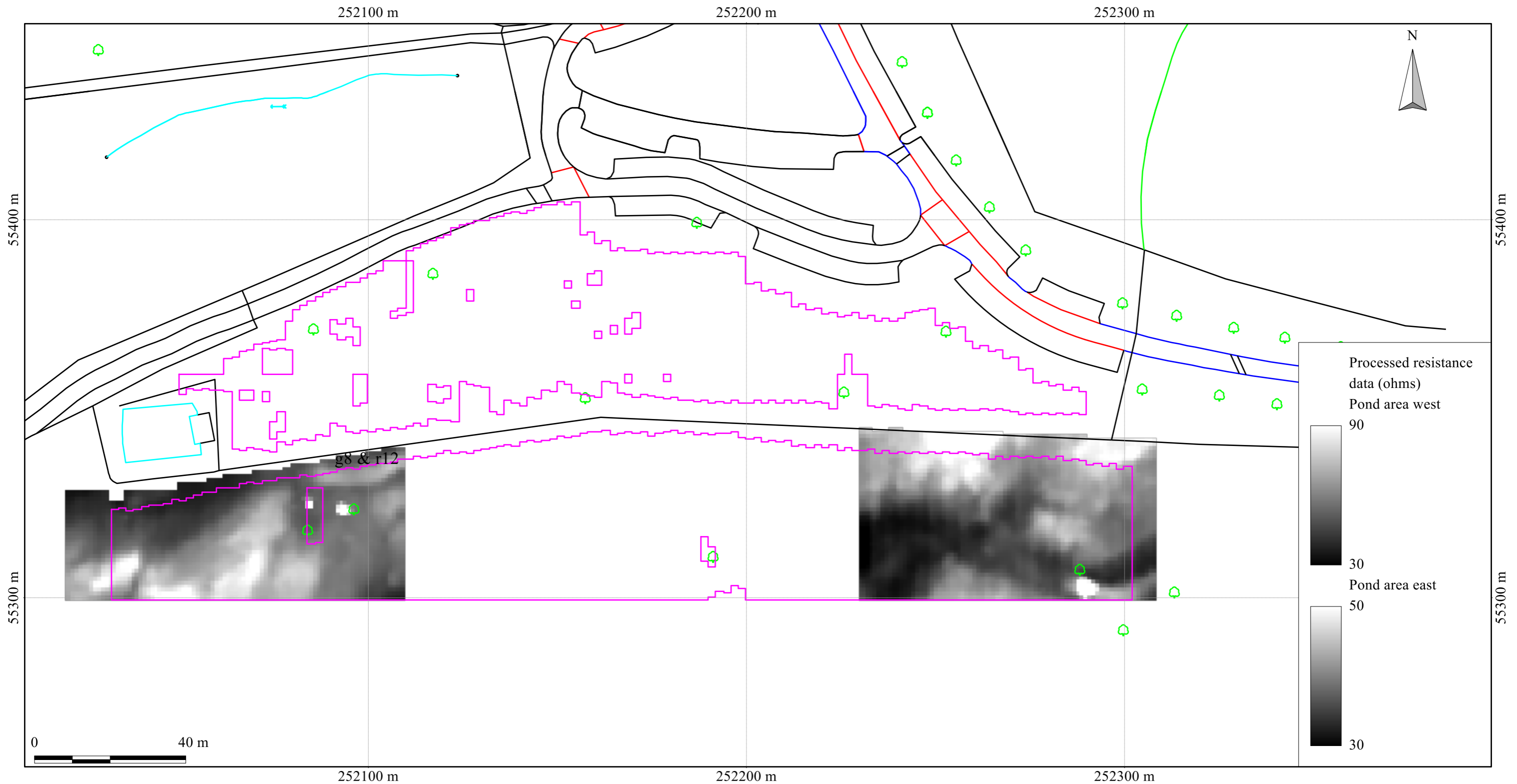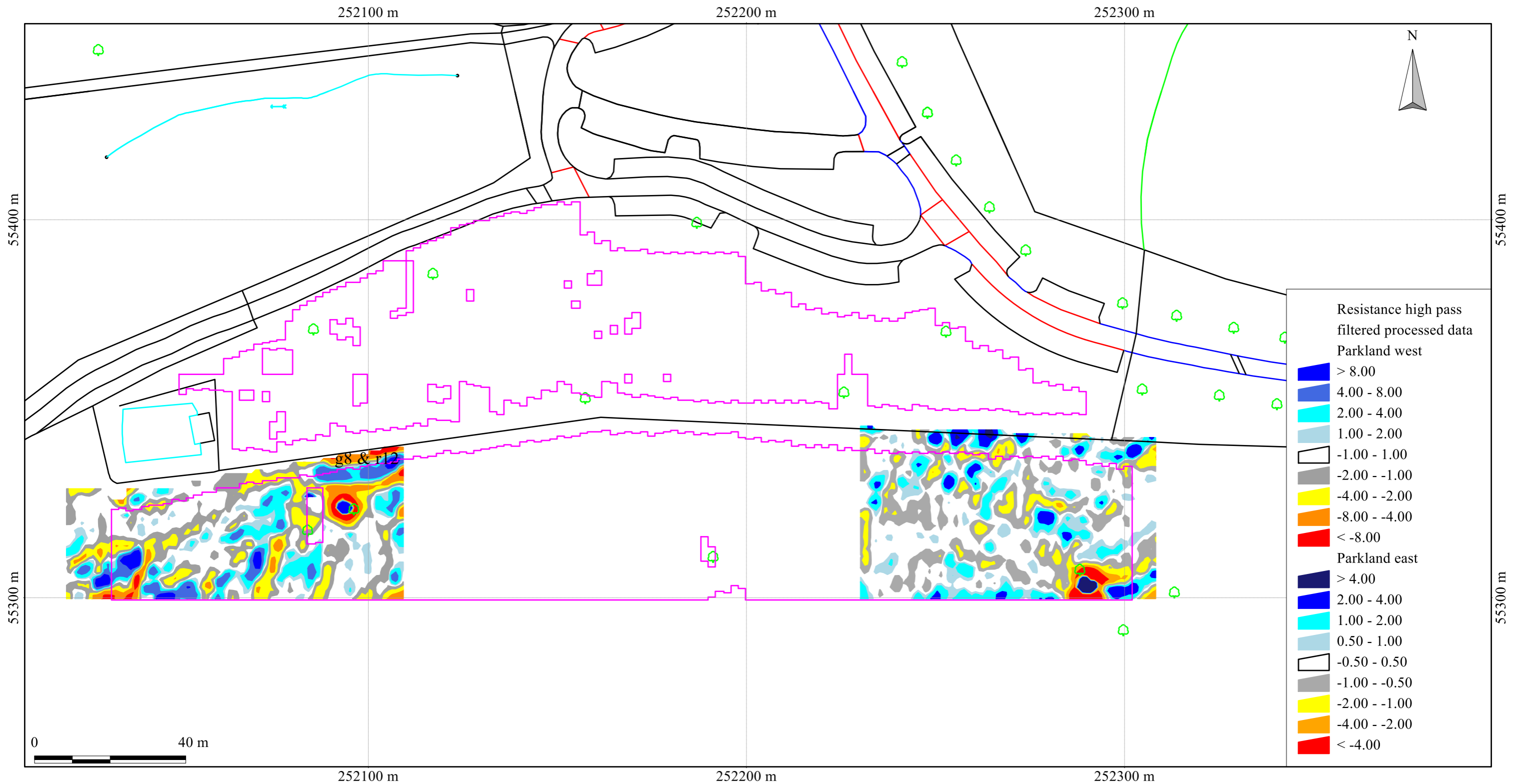British Grid
centre X: 252203.05 m, centre Y: 55353.58 m

Scale: 1:1000 @ A3. Spatial Units: Meter. Do not scale off this drawing

An archaeological magnetometer and resistance survey
Land at Saltram House, Plympton, Plymouth, Devon
Centred on NGR (E/N): 252071,55573 and 252070,55348
Report: 1702SAL-R-1

Figure 15: contour plot of processed magnetometer data, Pond area

Figure 16: shade plot of processed resistance data, Pond area

252100 m  252200 m  252300 m

55400 m

55300 m

**Processed resistance data (ohms)**

Pond area west

90

30

Pond area east

50

30

N

g8 & r12

0  40 m

Scale: 1:1000 @ A3. Spatial Units: Meter. Do not scale off this drawing

British Grid
centre X: 252203.05 m, centre Y: 55353.58 m

An archaeological magnetometer and resistance survey
Land at Saltram House, Plympton, Plymouth, Devon
Centred on NGR (E/N): 252071,55573 and 252070,55348
Report: 1702SAL-R-1

**Resistance high pass filtered processed data**

**Parkland west**
- > 8.00
- 4.00 - 8.00
- 2.00 - 4.00
- 1.00 - 2.00
- -1.00 - 1.00
- -2.00 - -1.00
- -4.00 - -2.00
- -8.00 - -4.00
- < -8.00

**Parkland east**
- > 4.00
- 2.00 - 4.00
- 1.00 - 2.00
- 0.50 - 1.00
- -0.50 - 0.50
- -1.00 - -0.50
- -2.00 - -1.00
- -4.00 - -2.00
- < -4.00

g8 & r12

0                40 m

British Grid
centre X: 252203.05 m, centre Y: 55353.58 m

Scale: 1:1000 @ A3. Spatial Units: Meter. Do not scale off this drawing

Geophysical survey: Copyright Substrata Limited.
Base map: Ordnance Survey (c) Crown Copyright 2017.
All rights reserved. Licence number 100022432

An archaeological magnetometer and resistance survey
Land at Saltram House, Plympton, Plymouth, Devon
Centred on NGR (E/N): 252071,55573 and 252070,55348
Report: 1702SAL-R-1

Figure 17: contour plot of high pass filtered processed resistance data, Pond area

3000 nT
36.7
9.5
3.6
0.3
-2
-4.8
-9.4
-18
-50.7
-3000 nT
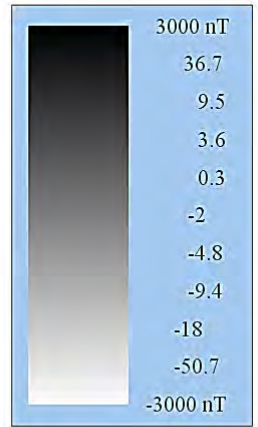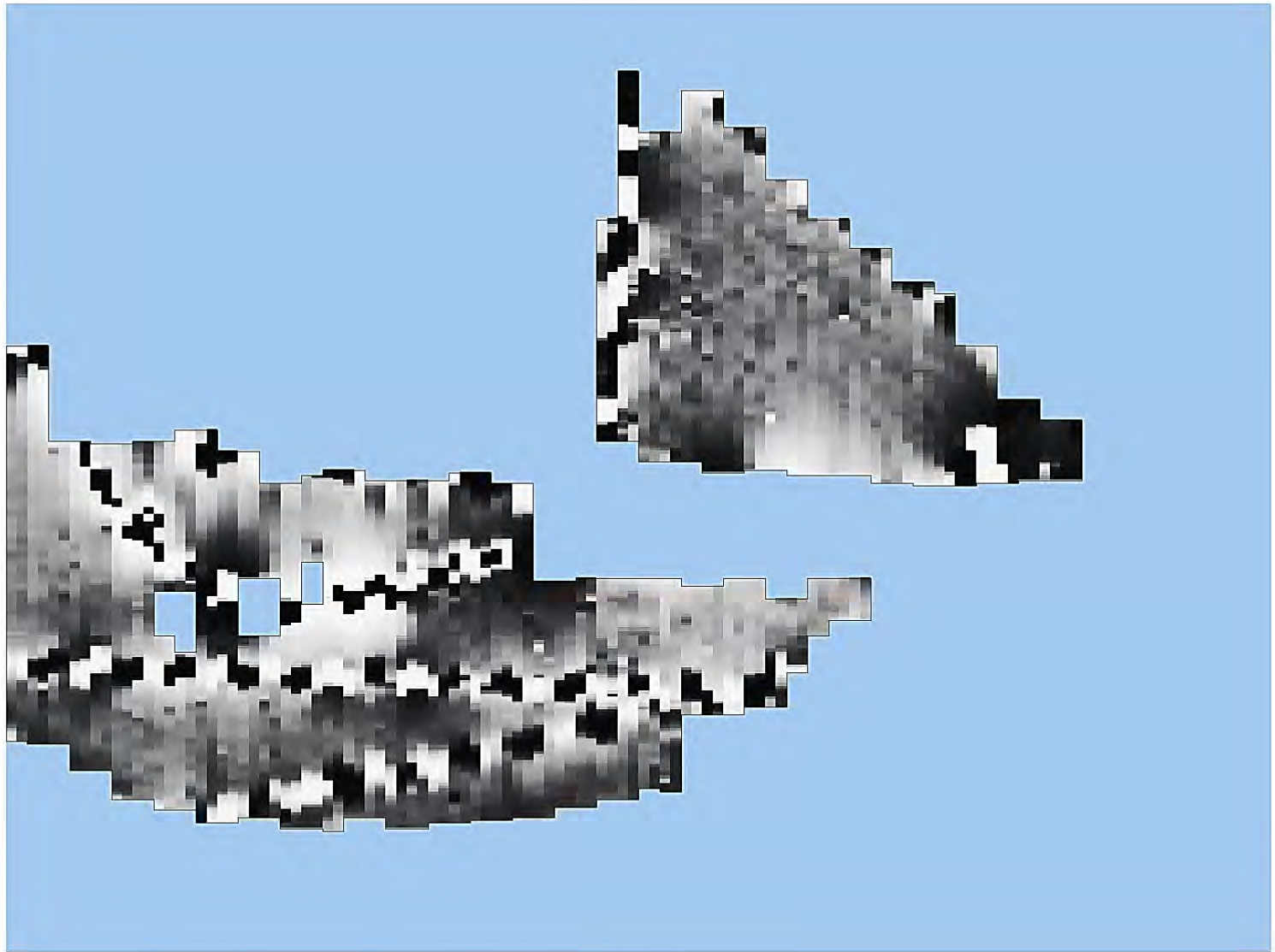
Instrument type: Bartington grad601-2
Units:                              nT
Direction of 1st Traverse:  0 deg
Collection Method:          ZigZag
Sensors:                      2 @ 0.00 m spacing.
Dummy Value:                32702
Dimensions
Grid Size:                    30 m x 30 m
X Interval:                    0.25 m
Y Interval:                    1 m
Stats
Max:                           3000.00
Min:                            -3000.00
Std Dev:                       934.16
Mean:                          -21.82
Median:                        -2.00
PROGRAM
Name:                          TerraSurveyor
Version:                       3.0.31.0
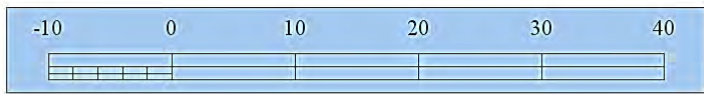
Processes:    1
 1   Base Layer

Figure 18: shade plot of unprocessed magnetometer data, Mansion lawns

0°

3000 nT
7.2
3.2
1.6
0.5
-0.3
-1.3
-2.7
-5.5
-16.3
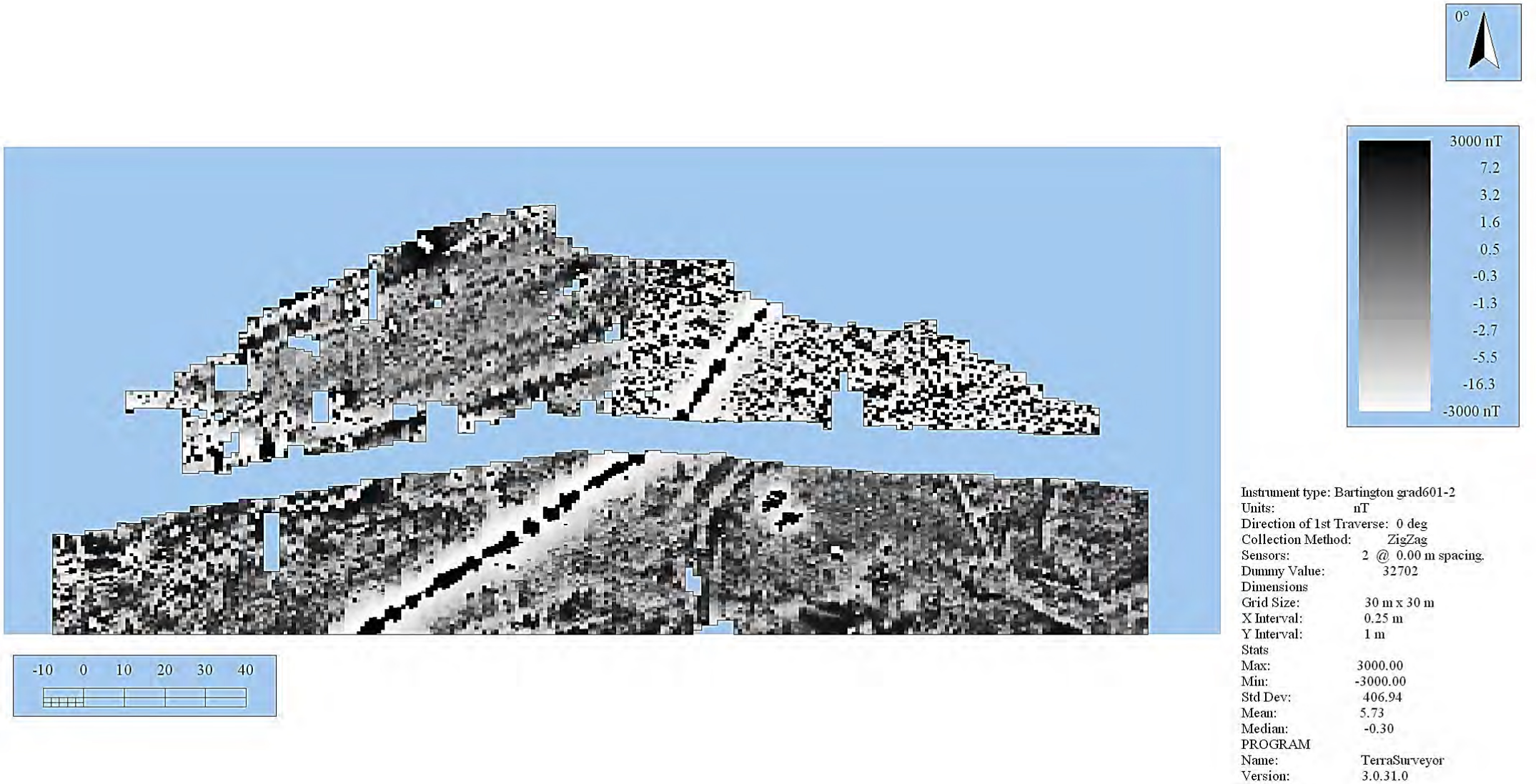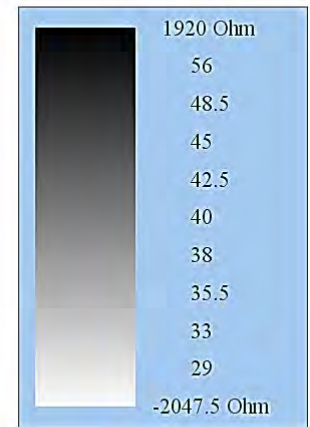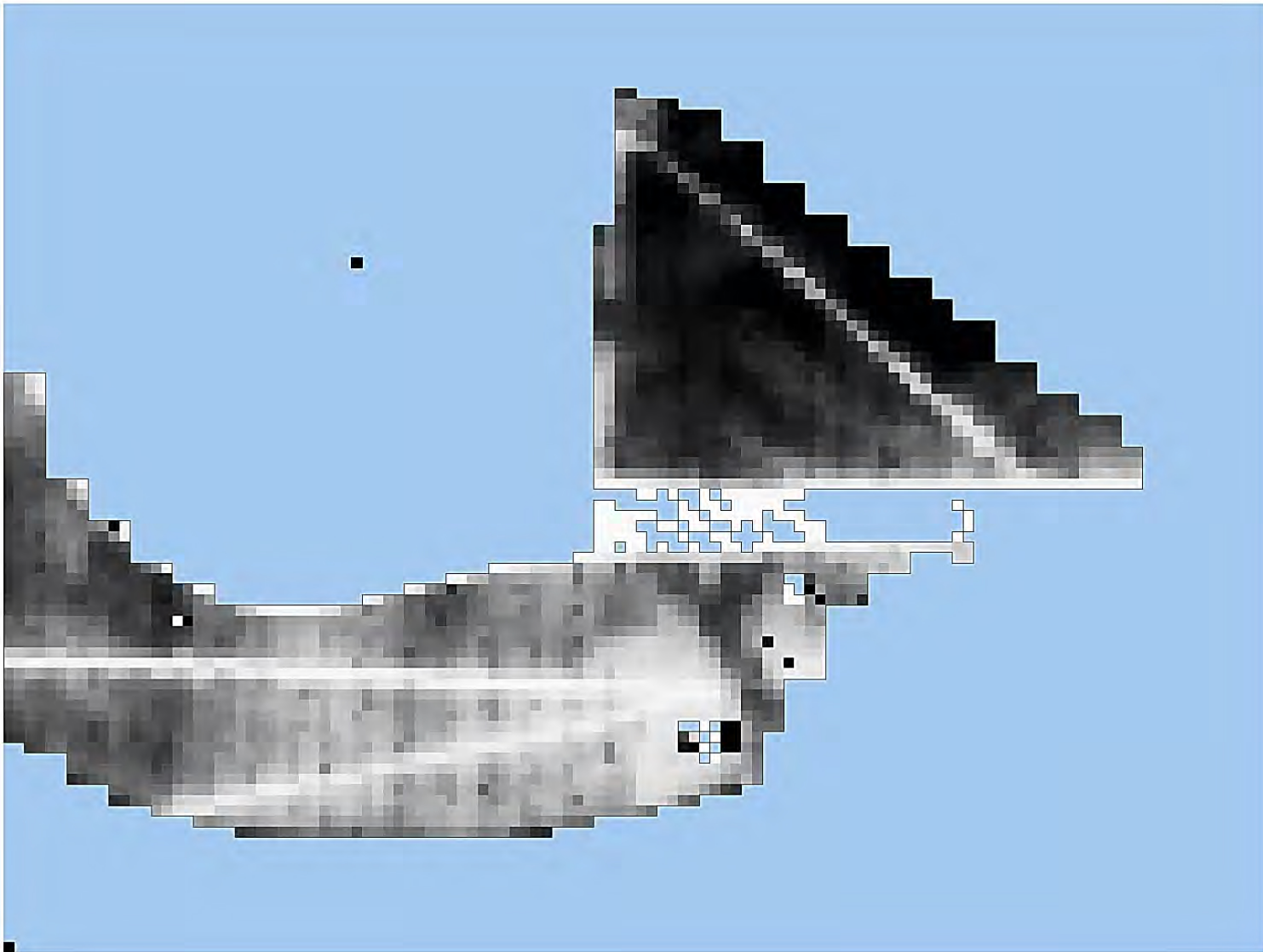-3000 nT

Instrument type: Bartington grad601-2
Units:                    nT
Direction of 1st Traverse:  0 deg
Collection Method:      ZigZag
Sensors:             2 @  0.00 m spacing.
Dummy Value:            32702
Dimensions
Grid Size:            30 m x 30 m
X Interval:            0.25 m
Y Interval:            1 m
Stats
Max:                 3000.00
Min:                 -3000.00
Std Dev:              406.94
Mean:                 5.73
Median:               -0.30
PROGRAM
Name:               TerraSurveyor
Version:             3.0.31.0

Processes:    1
   1   Base Layer

-10    0    10    20    30    40

Figure 19: shade plot of unprocessed magnetometer data, Pond area

Figure 20: shade plot of unprocessed resistance data, Mansion lawns

0°

1468.5 Ohm
78.5
72.5
67.5
61.5
58
55.5
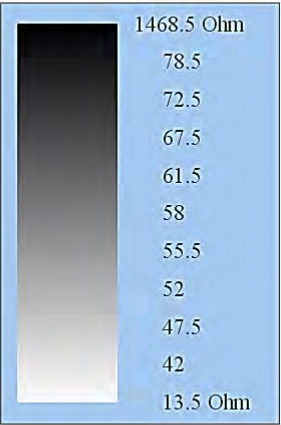52
47.5
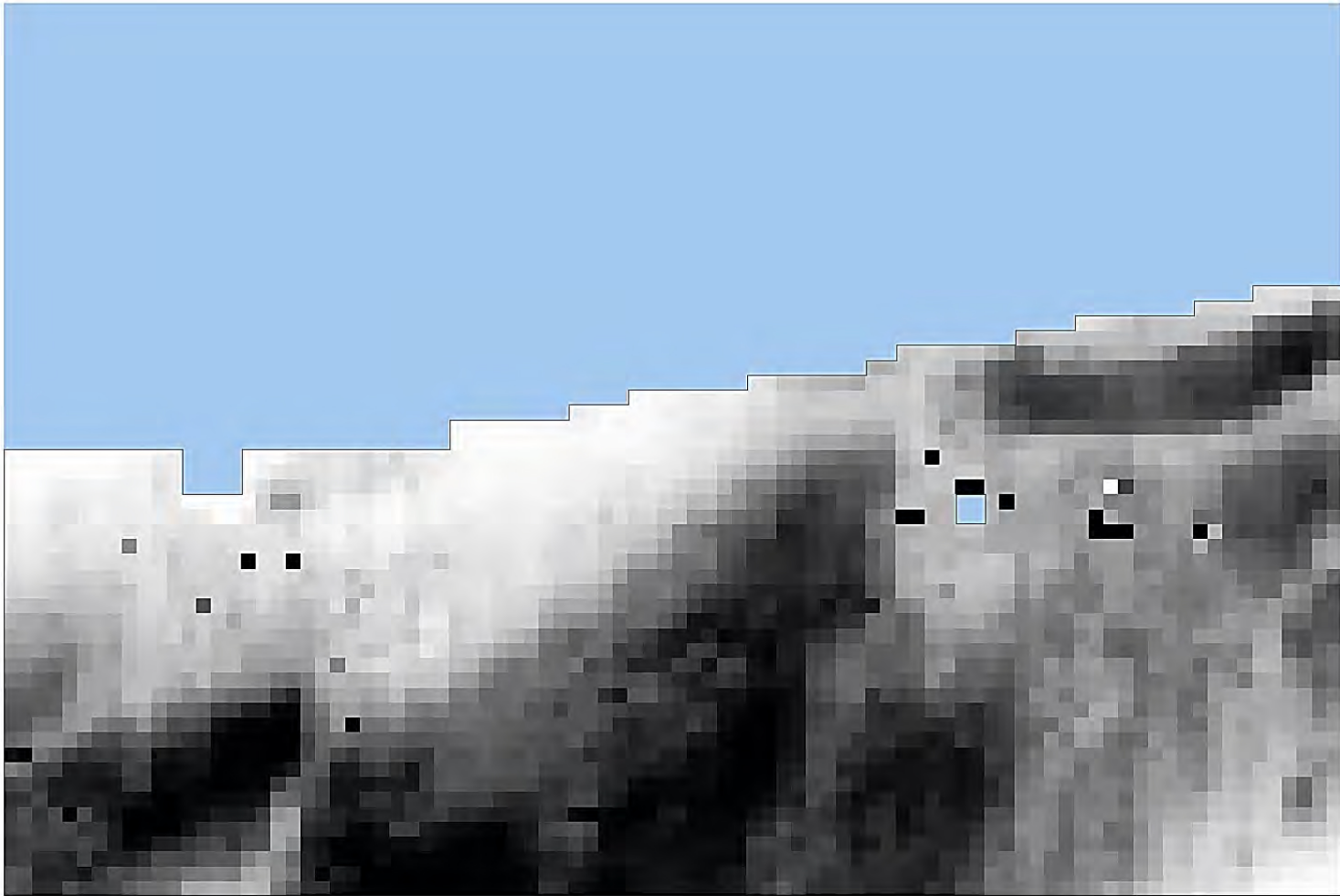42
13.5 Ohm

Instrument Type:    GeoScan (Resistance)
Units:              Ohm
Direction of 1st Traverse:  0 deg
Collection Method:  ZigZag
Sensors:            1
Dummy Value:        32702
Dimensions
Grid Size:          30 m x 30 m
X Interval:         1 m
Y Interval:         1 m
Stats
Max:                1468.50
Min:                13.50
Std Dev:            37.43
Mean:               61.94
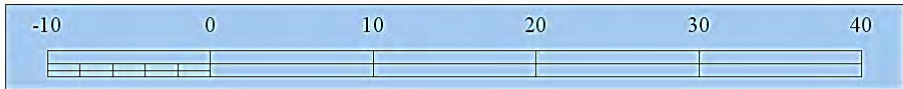Median:             58.50
PROGRAM
Name:               TerraSurveyor
Version:            3.0.31.0

Processes:   1
  1  Base Layer

-10        0        10        20        30        40

Figure 21: shade plot of unprocessed resistance data, Pond area west

60 Ohm
46.53
43.75
42.37
41.11
39.61
37.96
35.95
34.33
32.61
30 Ohm
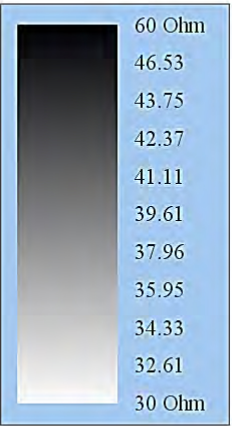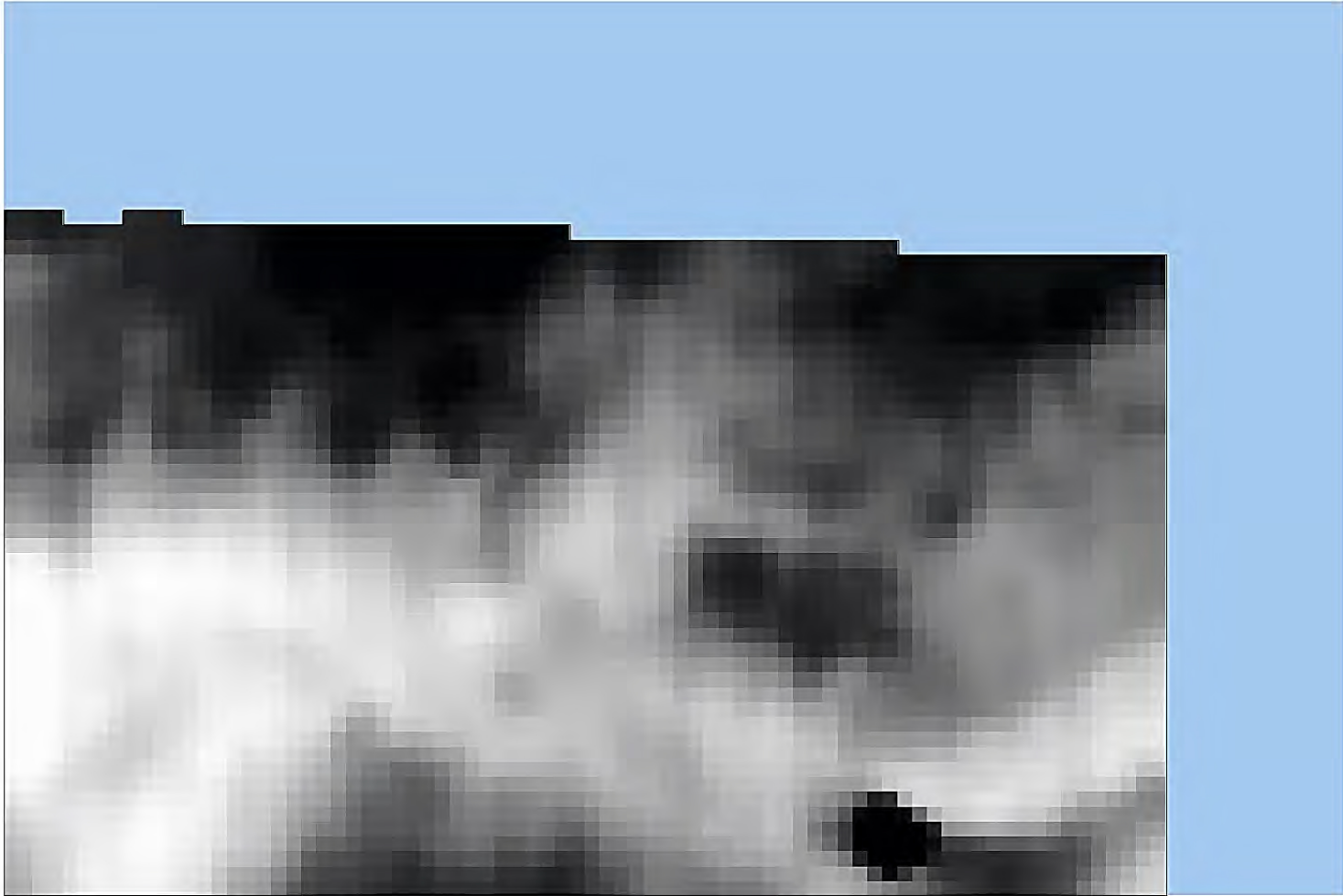
Instrument Type:        GeoScan (Resistance)
Units:                  Ohm
Direction of 1st Traverse:  0 deg
Collection Method:      ZigZag
Sensors:                1
Dummy Value:            32702
Dimensions
Grid Size:              30 m x 30 m
X Interval:             1 m
Y Interval:             1 m
Stats
Max:                    60.00
Min:                    30.00
Std Dev:                5.90
Mean:                   39.93
Median:                 39.73
PROGRAM
Name:                   TerraSurveyor
Version:                3.0.31.0

Processes:   1
 1   Base Layer

-10        0        10        20        30        40

Figure 22: shade plot of unprocessed resistance data, Pond area east

# Appendix 2    Tables

Site: An archaeological magnetometer and resistance survey
Land at Saltram House, Plympton, Plymouth, Devon
Centred on NGR (E/N): 252071,55573 and 252070,55348
Report: 1702SAL-R-1

| area | anomaly group | associated anomalies | anomaly characterisation certainty & class | anomaly form | additional archaeological characterisation | comments | supporting evidence |
|---|---|---|---|---|---|---|---|
| Mansion lawns | g1 | r1 | possible, negative | disrupted linear | | | |
| | g2 | r2 | possible, positive | disrupted linear | | | |
| | g3 | r3 r5? | possible, positive | disrupted linear | | | |
| | g301 | r301 | possible, high contrast linear | | ferrous cable, pipe or drain | | |
| | g302 | r302 | possible, high contrast linear | | ferrous cable, pipe or drain | | |
| Pond area | g4 | | possible, parallel linears | | informal tracks or natural deposits | anomaly group may represent informal human or animal tracks of unknown origin, alternatively some may represent natural soil creep | |
| | g5 | | possible, parallel linears | | informal tracks or natural deposits | anomaly group may represent informal human or animal tracks of unknown origin, alternatively some may represent natural soil creep | |
| | g6 | | possible, parallel linears | | informal tracks or natural deposits | anomaly group may represent informal human or animal tracks of unknown origin, alternatively some may represent natural soil creep | |
| | g7 | | possible, positive | disrupted linear | leat, track or possibly a ditch | | |
| | g8 | r12 | possible/negative/positive | curvilinear | archaeological deposit or palaeochannel | | |
| | g9 | | possible, parallel linears | | informal tracks or natural deposits | anomaly group may represent informal human or animal tracks of unknown origin, alternatively some may represent natural soil creep | |
| | g10 | g11 | possible, positive | disrupted linear | ditch or track | | |
| | g11 | g10 r16? r17? | possible, positive | disrupted linear | ditch or track | | |
| | g12 | | possible, parallel linears | | informal tracks or natural deposits | anomaly group may represent informal human or animal tracks of unknown origin, alternatively some may represent natural soil creep | |
| | g13 | | possible, parallel linears | | informal tracks or natural deposits | anomaly group may represent informal human or animal tracks of unknown origin, alternatively some may represent natural soil creep | |
| | g14 | | possible, positive | linear | ditch or natural palaeochannel edge | | |
| | g101 | | possible, repeated parallels | | cultivation traces - possible ridge-and-furrow | | |
| | g102 | | possible, repeated parallels | | cultivation traces - possible ridge-and-furrow | | |
| | g201 | | possible, negative sinuous | | palaeochannel | | |
| | g202 | | possible, positive sinuous | | palaeochannel edge | | |
| | g303 | | possible, high contrast linear | | ferrous wire or service | anomaly group lies along the line of old field boundary mapped at least until 1994 | OS 1868 1:10560 to 1989-1994 1:10000 |
| | g304 | g306 | possible, high contrast linear | | ferrous cable, pipe or drain | | |
| | g305 | | likely, mixed spread | | rubble and/or landfill | anomaly group probably relates to an area of hard standing recorded on a 1946 aerial photograph | National Monuments Record Centre 106G/UK1190/ 27FEB.46/F.20//541 SQDN |
| | g306 | g304 | possible, high contrast linear | | ferrous cable, pipe or drain | | |
| | g307 | | possible, regular narrow linears | | field drain | | |
| | g308 | | possible, regular narrow linears | | field drain | | |
| | g309 | | possible, regular narrow linears | | field drain | | |
| Mansion lawns | r1 | g1 | possible, high | disrupted linear | wall footings or gravel-filled service trench | | |
| | r2 | g2 | possible, low | linear | ditch or service trench | | |
| | r3 | r5? g3 | possible, high | linear | wall footings or gravel-filled service trench | | |
| | r4 | | possible, low | oval | pit or natural deposit | | |
| | r5 | r3? g3? | possible, high | return | wall footings or gravel-filled service trench | | |
| | r6 | | possible, low | linear | ditch or service trench | | |
| | r7 | | possible, high | linear | wall footings or gravel-filled service trench | | |
| | r8 | | possible, low | linear | ditch or service trench | | |
| | r9 | | possible, high | disrupted linear | wall footings or gravel-filled service trench | | |
| | r10 | | possible, low | linear | ditch or service trench | | |
| | r11 | | possible, high | return | wall footings or gravel-filled service trench | | |
| | r301 | g301 | possible, linear | | drain, pipe or cable | | |
| | r302 | g302 | possible, linear | | drain, pipe or cable | | |
| Pond area | r12 | g8 | possible, high | curvilinear | archaeological deposit or palaeochannel | | |
| | r12 | | possible, low | curvilinear | archaeological deposit or palaeochannel | | |
| | r13 | | possible, linear trends | disrupted linear | informal track or natural deposits | anomaly group may represent informal human or animal tracks of unknown origin | |
| | r14 | | possible, linear trends | | informal track or natural deposits | anomaly group may represent informal human or animal tracks of unknown origin | |
| | r15 | | possible, high | oval | Stoney deposit or concrete? | anomaly group has characteristics indicative of the base of a WW2 gun platform although this is not seen in the magnetometer data | |
| | r16 | g11? | possible, linear trends | | informal track or natural deposits | anomaly group may represent informal human or animal tracks of unknown origin | |
| | r17 | g11? | possible, linear trends | | informal track or natural deposits | anomaly group may represent informal human or animal tracks of unknown origin | |
| | r18 | | possible, linear trends | | informal track or natural deposits | anomaly group may represent informal human or animal tracks of unknown origin | |
| | r19 | | possible, linear trends | | informal track or natural deposits | anomaly group may represent informal human or animal tracks of unknown origin | |
| | r20 | | possible, high | oval | Stoney deposit or concrete? | anomaly group has characteristics indicative of the base of a WW2 gun platform although this is not seen in the magnetometer data | |
| | r101 | | possible, repeated parallels | | cultivation traces - possible ridge-and-furrow | | |
| | r102 | | possible, repeated parallels | | cultivation traces | | |
| | r201 | | possible, sinuous broad linear | | palaeochannel | | |

Table 1: data analysis

| Documents |
|---|
| Brief: National Trust South West Region (Cornwall) (2017) |
| WSI: Dean (2017) |

| Methodology |
|---|
| 1. The work was undertaken in accordance with the approved WSI. The geophysical magnetometer (gradiometer) and resistance survey was undertaken with reference to standard guidance provided by the Chartered Institute for Archaeologists (2014) and Archaeology Data Service/Digital Antiquity Guides (undated). |
| 2. The survey grid location information and grid plan was recorded as part of the project in a suitable GIS system. |
| 3. Data processing was undertaken using appropriate software, with all anomalies being digitised and geo-referenced. The final report included a graphical and textual account of the techniques undertaken, the data obtained and an archaeological interpretation of that data and conclusions about any likely archaeology. |

| Grid |
|---|
| *Method of Fixing:* DGPS set-out using pre-planned survey grids and Ordnance Survey coordinates. |
| *Composition:* 30m by 30m grids |
| *Recording:* Geo-referenced and recorded using digital map tiles. |
| *DGPS used:* Spectra Precision PM5V2 GPS with external antenna and survey pole and DigiTerra Explorer 7 as the survey control program. |

| Magnetometer Equipment | Magnetometer Data Capture |
|---|---|
| *Instrument:* Bartington Instruments grad601-2 | *Sample Interval:* 0.25-metres |
| *Firmware:* version 6.1 | *Traverse Interval:* 1 metre |
| | *Data capture:* automatic data logger |
| | *Traverse Method:* zigzag |
| | *Traverse Orientation:* GN |

| Magnetometer Equipment | Magnetometer Data Capture |
|---|---|
| *Instrument:* Geoscan Research RM15 multi-probe resistance meter | *Sample Interval:* 1 metre |
| *Configuration*: twin probe | *Traverse Interval:* 1 metre |
| *Mobile probe spacing*: 0.5-metres | *Data capture:* automatic data logger |
| | *Traverse Method:* zigzag |
| | *Traverse Orientation:* GN |

| Data Processing, Analysis and Presentation Software |
|---|
| IntelliCAD Technology Consortium IntelliCAD 7.2 |
| DW Consulting TerraSurveyor3 |
| Manifold System 8 GIS |
| Microsoft Corp. Office Excel 2013 |
| Microsoft Corp. Office Publisher 2013 |
| Adobe Systems Inc Adobe Acrobat 9 Pro Extended |

Table 2: methodology summary

| SITE | |
|---|---|
| Instrument Type: | Bartington Grad-601 gradiometer |
| Units: | nT |
| Direction of 1st Traverse: | GN |
| Collection Method: | ZigZag |
| Sensors: | 2 @ 1.00 m spacing. |
| Dummy Value: | 32702 |

| PROGRAM | |
|---|---|
| Name: | TerraSurveyor |
| Version: | 3.0.31.0 |

| Mansion Lawns | | Processes: 6 |
|---|---|---|
| Stats | | 1 Base Layer |
| Max: | 81.98 | 2 Clip at 1.00 SD |
| Min: | -75.94 | 3 Clip at 0.10 SD |
| Std Dev: | 16.45 | 4 De Stagger: Grids: All Mode: Both By: -2 intervals |
| Mean: | -2.55 | 5 DeStripe Median Traverse: Grids: All |
| Median: | -0.10 | 6 Interpolate: Match X & Y Doubled. |

| Pond area | | Processes: 10 |
|---|---|---|
| Stats | | 1 Base Layer |
| Max: | 911.63 | 2 Clip at 1.00 SD |
| Min: | -909.01 | 3 De Stagger: Grids: All Mode: Both By: -2 intervals |
| Std Dev: | 60.54 | 4 De Stagger: Grids: b22.xgd Mode: Both By: -1 intervals |
| Mean: | 0.63 | 5 De Stagger: Grids: b3.xgd Mode: Both By: -1 intervals |
| Median: | 0.04 | 6 De Stagger: Grids: b6.xgd b9.xgd b7.xgd b8.xgd Mode: Both By: -1 intervals |
| | | 7 DeStripe Median Sensors: Grids: All |
| | | 8 De Stagger: Grids: b9.xgd Mode: Both By: -1 intervals |
| | | 9 De Stagger: Grids: b3.xgd b6.xgd Mode: Both By: -1 intervals |
| | | 10 Interpolate: Match X & Y Doubled. |

Table 3: magnetometer survey processed data metadata

| | |
|---|---|
| SITE | |
| Instrument Type: | Geoscan Research RM15/MPX15 resistance meter |
| Units: | ohms |
| Direction of 1st Traverse: | GN |
| Collection Method: | ZigZag |
| Sensors: | 2 @ 1.00 m spacing. |
| Dummy Value: | 32702 |
| | |
| PROGRAM | |
| Name: | TerraSurveyor |
| Version: | 3.0.31.0 |

| | |
|---|---|
| **Mansion Lawns: Figure 12**<br>Stats<br>Max: 86.00<br>Min: 24.96<br>Std Dev: 10.42<br>Mean: 43.19<br>Median: 40.74 | Processes: 8<br>1 Base Layer<br>2 Search & Replace -2047.5 With: Dummy (Area: Top 0, Left 0, Bottom 119, Right 89)<br>3 Search & Replace 1920 With: Dummy (Area: Top 31, Left 64, Bottom 34, Right 66)<br>4 Search & Replace 1920 With: Dummy (Area: Top 0, Left 0, Bottom 2, Right 1)<br>5 Despike Threshold: 1 Window size: 3x3<br>6 Despike Threshold: 1 Window size: 3x3<br>7 Clip from 24.00 to 86.00 Ohm<br>8 Low pass Gaussian filter: Window: 3 x 3 |
| **Mansion Lawns: Figure 13**<br>Stats<br>Max: 11.90<br>Min: -12.16<br>Std Dev: 2.85<br>Mean: -0.22<br>Median: 0.25 | Processes: 9<br>1 Base Layer<br>2 Search & Replace -2047.5 With: Dummy (Area: Top 0, Left 0, Bottom 119, Right 89)<br>3 Search & Replace 1920 With: Dummy (Area: Top 31, Left 64, Bottom 34, Right 66)<br>4 Search & Replace 1920 With: Dummy (Area: Top 0, Left 0, Bottom 2, Right 1)<br>5 Despike Threshold: 1 Window size: 3x3<br>6 Despike Threshold: 1 Window size: 3x3<br>7 Low pass Gaussian filter: Window: 3 x 3<br>8 High pass Gaussian filter: Window: 10 x 10<br>9 Clip at 3.00 SD |
| **Pond area west**<br>**Figure 16**<br>Stats<br>Max: 120.00<br>Min: 34.10<br>Std Dev: 14.10<br>Mean: 60.44<br>Median: 58.50 | Processes: 5<br>1 Base Layer<br>2 Despike Threshold: 1 Window size: 3x3<br>3 Despike Threshold: 1 Window size: 3x3<br>4 Low pass Gaussian filter: Window: 3 x 3<br>5 Clip from 33.00 to 120.00 Ohm |
| **Pond area east**<br>**Figure 16**<br>Stats<br>Max: 139.99<br>Min: 28.69<br>Std Dev: 6.70<br>Mean: 40.04<br>Median: 39.73 | Processes: 4<br>1 Base Layer<br>2 Despike Threshold: 1 Window size: 3x3<br>3 Despike Threshold: 1 Window size: 3x3<br>4 Low pass Gaussian filter: Window: 3 x 3 |
| **Pond area west**<br>**Figure 17**<br>Stats<br>Max: 17.98<br>Min: -18.28<br>Std Dev: 3.50<br>Mean: -0.30<br>Median: -0.44 | Processes: 6<br>1 Base Layer<br>2 Despike Threshold: 1 Window size: 3x3<br>3 Despike Threshold: 1 Window size: 3x3<br>4 High pass Gaussian filter: Window: 10 x 10<br>5 Low pass Gaussian filter: Window: 3 x 3<br>6 Clip at 3.00 SD |
| **Pond area east**<br>**Figure 17**<br>Stats<br>Max: 8.30<br>Min: -8.27<br>Std Dev: 1.39<br>Mean: -0.05<br>Median: -0.11 | Processes: 6<br>1 Base Layer<br>2 Despike Threshold: 1 Window size: 3x3<br>3 Despike Threshold: 1 Window size: 3x3<br>4 High pass Gaussian filter: Window: 10 x 10<br>5 Low pass Gaussian filter: Window: 3 x 3<br>6 Clip at 3.00 SD |

Table 4: resistance survey processed data metadata