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SPECIALISTS IN ARCHAEOLOGICAL SURVEY

GEOPHYSICAL SURVEY REPORT

RESTENNETH PRIORY

RGC19342/RTP

Commissioned by: The Graham Hunter Foundation

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NON-TECHNICAL SUMMARY

Rose Geophysical Consultants LLP (RGC) was commissioned by The Graham Hunter Foundation to undertake a geophysical survey at Restenneth Priory, which is situated approximately 2km to the northeast of Forfar, Angus. This survey forms part of wider ongoing research into the site. For this phase of field work Resistance and Ground Penetrating Radar (GPR) surveys were undertaken within the guardianship area. The aim of the geophysical survey was to map any features associated with different phases of the Priory and potential earlier structures.

The resistance and GPR surveys have recorded a wealth of anomalies of archaeological interest with good correlation between the two data sets.

Both techniques have recorded anomalies within the cloister area which may be associated with the original cloister. However, the origin these anomalies is not clear. It is known that the existing 'cloister' walls are a later construction and one assumes the original cloister lies under or within the foot print of the extant 'cloister' walls on site. Assuming the existing walls overlie the original cloister walls then the responses could be associated with the internal walls of the cloister walk. However, it is entirely possible that these anomalies indicate the external corners of the original cloister suggesting a smaller area within the existing 'cloister' walls.

Both techniques have detected anomalies consistent with foundations of walls associated with the Sacristy and the Chapter House / East Range. Within the GPR data a very well defined anomaly has been recorded which may indicate the southern extension of the east range. Additional anomalies have been recorded to the east of the east range suggesting further structures.

Within the Nave and to the north of the Nave well-defined low resistance anomalies have been recorded in the resistance survey although the origin of these is unclear. A low response suggests a cut feature like an infilled ditch. It is possible that they are robber trenches associated with earlier phases of the priory. However, they could indicate drains. Additional discrete anomalies of possible archaeological interest have also been recorded by both techniques, although their origin is less clear.

Survey:	Restenneth Priory, Angus
Client:	Graham Hunter Foundation
Date of Fieldwork:	1st & 2nd June 2019
Survey Personnel:	Dr S M Ovenden and A S Wilson
Report Author:	Dr S M Ovenden
Report Illustrations:	Dr S M Ovenden
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1 INTRODUCTION

1.1 Rose Geophysical Consultants LLP (RGC) was commissioned by The Graham Hunter Foundation to undertake a geophysical survey at Restenneth Priory, Angus.

1.2 This survey forms part of wider research into the site. For this phase of field work Resistance and Ground Penetrating Radar (GPR) surveys were undertaken within the guardianship area. Further survey may be undertaken within the surrounding fields at a later date.

2 SITE LOCATION, GEOLOGY & DESCRIPTION

2.1 Restenneth Priory is situated approximately 2km to the northeast of Forfar, Angus. The site, which is under Historic Environment Scotland (HES) guardianship, is surrounded by farmland which is currently under rough pasture.

2.2 The geology of the area comprises Lower Old Red Sandstone which responds well to all geophysical techniques.

2.3 The survey covered all available areas within the HES Properties in Care (PIC) boundary, *circa* 0.2ha.

3 ARCHAEOLOGICAL BACKGROUND

3.1 Restenneth Priory is the remains of an Augustinian priory incorporating earlier features. Although the earliest datable masonry, comprising part of the surviving tower, dates to around AD 1100, historical records suggest that this may have been the site of an earlier Pictish church. Much of the surviving masonry is of 13th century date, although there has been considerable re-building, particularly around the original cloister.

3.2 The site is scheduled with the scheduled area extending beyond the PIC boundary. Section 42 Scheduled Monument Consent was obtained prior to survey.

4 SURVEY AIMS AND OBJECTIVES

4.1 The aim of the geophysical survey was to map any features associated with different phases of the Priory and potential earlier structures.

4.2 Specifically the objectives of the survey were:

- to determine the location, nature and extent of any potential anomalies associated with the priory and earlier structures.
- to produce a comprehensive report and data archive.

5 METHODOLOGY

5.1 SURVEY TECHNIQUES USED

5.1.1 Resistance and GPR surveys were carried out over all available areas within the PIC boundary as indicated on Figure 1, at scale of 1:500.

5.1.2 Resistance survey was carried out to map possible remnants of structural remains. One would normally expect walls, paths and areas of paving / cobbles etc. to produce high resistance anomalies. Occasionally they may show as a low resistance response if the feature is impeding the flow of groundwater resulting in the collection of water above the structure. Low resistance is usually indicative of a ditch type feature or a robber trench i.e. when stone foundations have been completely removed and the resulting trench has been infilled with soil. It should be stressed that the technique relies on sufficient contrast between a feature and the surrounding soil and as a result it is possible that some features may not be detected due to a lack of contrast. This could be due to a lack of sufficient material to generate a contrast or by similar materials, for example a sandstone wall in a very sandy soil. Generally resistance surveys detect features up to a depth of approximately 0.75m – 1m below the ground surface, but it does not provide any information of the depth of features detected.

5.1.3 GPR was also carried out to map possible remnants of structural remains. This technique compliments the resistance survey results, thereby aiding interpretation of both data sets. GPR also has the advantage of a greater depth of investigation, up to 2m, and the ability to provide information on the depth of features detected. This can be extremely useful on sites where there may be different phases of occupation.

5.1.4 It must be remembered that no geophysical technique can date features detected. However, a possible era can be suggested by the form of a response and it may be possible to distinguish different phases of settlement / features. However, this is not always possible and as a result the data can sometimes be ambiguous with responses from features of different dates being interpreted as a single feature.

5.1.5 All geophysical survey work was carried out in accordance with recommended good practice specified in guideline documents published by Historic England (David et al. 2008), European Archaeological Council (Schmidt et al. 2016) and the Chartered Institute for Archaeologists (CIfA, 2014).

5.1.6 Data processing, storage and documentation have been carried out in accordance with the good practice specifications detailed in the guidelines issued by the Archaeology Data Service (Schmidt, 2009).

5.2 Establishment of Survey Grid

5.2.1 Prior to data collection a series of 20m grids were set out and georeferenced using a Trimble R8 RTK GPS system using the VRS network with correction via mobile data connection. The grid was established to an accuracy of +/ - 5cm.

5.2.2 The data plots and interpretations have been positioned on a georeferenced digital map created by RGC using a Trimble R8 RTK GPS system using the VRS network with correction via mobile data connection.

5.2.3 Geo-referencing information is provided within Appendix I of this report and the accompanying CAD files.

5.3 Data Collection

5.3.1 Resistance Survey

5.3.1.1 The resistance survey was carried out using a Geoscan Research RM85 Resistance System.

5.3.1.2 The system was configured as a 0.5m Twin probe array. The system is a dual system which enables two transects of data to be collected simultaneously.

5.3.1.3 Data was collected on alignments appropriate to the orientation of the survey area using zig-zag traverses with a sample interval of 0.5m along traverses 0.5m apart.

5.3.1.4 The data were downloaded using Geoscan Research Geoplot 4.0 at lunchtime and at the end of the day to check data quality and to back-up the data.

5.3.2 GPR Survey

5.3.2.1 Survey was carried out using a MALA X3M GPR system with a 500MHz antenna.

5.3.2.2 Data was collected at 0.02m intervals along parallel traverses 0.5m apart using 'zig-zag' data collection.

5.3.2.3 The data were downloaded at lunchtime and at the end of the day to check data quality and to back-up the data.

5.4 Data Processing

5.4.1 Resistance Survey

5.4.1.1 Following data download, the survey grids were imported and assembled into composites using Geoscan Research Geoplot 4.0. The data was processed using a range of standard processing algorithms appropriate for resistance data. The data had the following processing steps applied:

- **Edited Data:** Despike & Edge Match/Deslope
  - *Despike:* Extremely high and / or low readings caused by poor contact, which are false readings, are replaced with the mean value of the immediate area.
  - *Edge Match/Deslope:* Occasionally there can be a variation in the mean value between grids which results in visible grid edges. This is corrected by simple addition/subtraction as required.
- **Interpolated Data:** As for edited data plus interpolation
  - *Interpolation.* Increases the resolution of a survey by interpolating new values between surveyed data points, creating a smoother overall effect. Data was interpolated once in the Y and X directions to create the effect of a square, 0.25m by 0.25m, data set.
- **Filtered Data:** As for Interpolated data plus High Pass Filter
  - *High Pass Filter.* Running a high pass filter on the data effectively removes background trends within the data thereby enhancing more discrete anomalies.

5.4.2 GPR Survey

5.4.2.1 Following data download, the traverses were imported and assembled into blocks in their correct relative location using Geophysical Archaeometry Laboratory GPR Slice. The data were processed using a range of standard processing algorithms appropriate for GPR data. The data had the following editing and processing steps applied:

- **Set Time Zero** - edit all radargrams to adjust for correct time zero (start point)
- **Gain & Wobble Correction** - application of a gain appropriate to the data set
- **Background Filter** - removes banding noise within the data
- **Bandpass** – Clips the data to remove high and low frequency noise

5.5 Data Presentation

5.5.1 A location plan showing the areas investigated by the different techniques is provided in Figure 1 at a scale of 1:500.

5.5.2 Resistance Survey

5.5.2.1 The data plots have been exported from Geoscan Research Geoplot 4.0 and have been attached to CAD base mapping provided by the client.

5.5.2.2 The data are displayed as greyscales and colour images with Black/Red indicating high resistance and White/Blue representing low resistance. Low resistance is generally typical of 'cut features' like ditches, pit-like features and flower beds. High resistance values are generally indicative of 'hard features' such as foundations, floors, rubble spreads and paths. The data are displayed at 1:500 in the following formats in Figures 2 - 6:

- **Edited Data** - Greyscale image plotted at 84Ω to 132Ω
- **Interpolated Data** - Greyscale image plotted at 75Ω to 142Ω
- **Interpolated Data** - Colour scale image plotted at 75Ω to 145Ω
- **High Pass Filtered Data** - Greyscale image plotted at -1SD to +1SD
- **Relief Plot** - Colour scale image plotted at 70Ω to 150Ω

5.5.2.3 Images showing the data with the site topography are displayed in Figure 7. An interpretation diagram is provided in Figure 8, also at a scale of 1:500.

5.5.3 GPR Survey

5.5.3.1 The data plots have been exported from Geophysical Archaeometry Laboratory GPR Slice and have been attached to CAD base mapping created by RGC.

5.5.3.2 The data are displayed as a series of depth slices, with accompanying digitised interpretation diagrams, in Figures 9 to 33, all at 1:500. Depth slices display the data as a series of successive plan views of the variation of reflector energy. The variation in amplitude is represented using a colour scale with red indicating high amplitude and blue indicating low amplitude responses. Low amplitude is generally typical of 'cut features' like ditches, pit-like features and flower beds while high amplitude are generally indicative of 'hard features' such as foundations, floors, rubble spreads and paths.

6 SITE CONDITIONS / GENERAL CONSIDERATIONS

6.1 The weather at the time of the survey was dry and generally sunny.

6.2 Conditions on site were good with the survey areas being under short grass.

6.3 There are significant topographic variations on site and as a result a coarse topographic survey was undertaken to aid interpretation of the resistance and GPR data.

7 RESISTANCE SURVEY: RESULTS AND INTERPRETATION (Figures 2 – 8)

The anomaly numbers referred to below are shown on the interpretation diagram, Figure 8.

7.1 A broad band of high resistance values has been recorded in the north of the cloister. The northern most band of high resistance responses (2) coincides with the top of bank. It is possible that this response (1) is simply due to preferential drainage in the area of the bank and is simple a topographic effect. However, there are suggestions of rectilinear responses (2) in the west and east which suggest these responses are not purely due to the current site topography.

7.2 If the anomalies (2) are archaeologically significant their exact origin is unclear. It is known that the existing 'cloister' walls are a later construction and one assumes the original cloister lies under or within the foot print of the extant 'cloister' walls on site. Assuming the existing walls overlie the original cloister walls then the responses (2) could be associated with the internal walls of the cloister walk. However, it is entirely possible that these anomalies (2) indicate the external corners of the original cloister suggesting a smaller area within the existing ''cloister' walls. The broad high resistance response (3) is at the bottom of the bank i.e. within the flat area of the cloister. This is particularly clear in Figure 7. These responses may be associated with the original cloister, possible indicating an inner walkway.

7.3 In the south of the cloister area several ephemeral trends (4) have been noted which may be archaeologically significant; they could indicate layouts of a formal garden within the cloister quadrangle although such an interpretation is tentative. The origin of the broad area of low resistance (5) is unclear. Although it could indicate the robbed out southern wall of the cloister, it could simply be due to natural variations in water content.

7.4 Several well-defined rectilinear low resistance anomalies have been recorded in the northwest of the survey area. Within the Nave a very clear rectilinear low resistance anomaly (6) has been detected. The origin of this is unclear. A low response suggests a cut feature like an infilled ditch, but that would be unlikely given the wider context. It is possible that it is a robber trench associated with the smaller earlier Nave. If this is the case it would suggest that the original Nave was completely robbed out prior to construction of the later structure, the foundations of which are visible on site. Another possible interpretation is that (6) is associated with a drain. However, one would normally expect a stone drain to show as a high resistance response. It is possible that if the stone capping on the drain has collapsed, or been removed, and the drain has silted up it may show as a low resistance anomaly. However, the response does not appear to extend beyond the foot print of the Nave which one would expect if it was a drain.

7.5 Even though anomaly (6) does not clearly extend beyond the footprint of the Nave, very similar responses have been recorded to the north of the Nave. In this case the rectilinear form of low resistance anomalies (7) are very suggestive of drains in terms of their geometry, although again the low response is perplexing as one would expect drains on such a site to be stone culverts which should show as a high resistance response. It is possible that, as stated above, the drains have silted up, or these responses may indicate robber trenches suggesting the location of former walls. However, it is not readily apparent how such walls would relate to the known wider priory complex.

7.6 A small low resistance response (8) has been recorded in the northeast of the Nave which appears to have some spatial association with anomalies (7) to the north.

7.7 In the northeast of the survey area a well-defined high resistance response (9) has been detected and is almost certainly the western wall of the Sacristy. The broad response (10) may simply be an associated rubble spread.

7.8 Similarly the high resistance responses (11) may be rubble spreads associated with the adjacent extant wall.

7.9 A discrete high resistance response (12) has been detected at the northeast corner of the Chancel and may be associated with the remnants of a buttress that is no longer apparent on the surface. It is likely that anomaly (13) to the east is simply due to a rubble spread or natural variations in the subsoil.

7.10 Several, more ephemeral, anomalies have been recorded in the Chancel. A broad area of high resistance (14) is apparent in the data. However this may partly be due to variations in water content. However, the well-defined western edge coincides with a narrow anomaly (15), which corresponds with a slight topographic change visible on the surface and may indicate the choir screen. A trend (16) can be seen to follow the line of the burial marker slabs on the surface, although its origin is unclear. It is possible that many of the responses within the Chancel are due to burials but they are not very well defined.

7.11 In the southeast of the area a high resistance response (17) has been recorded which is most likely associated with the chapter house. Additional smaller responses (18) suggest additional buried structural remains associated with the extant remains.

7.12 There is no clear evidence in the data for the eastern wall of the eastern range to the north or south of (17), although weak trends are just discernible in the data. It is interest that (17) and (19) coincide with a slight topographic change visible on the surface. While this topographic change may be archaeologically significant, rather than just natural, it does continue to the north running across the chancel.

7.13 A well-defined high resistance response (20) has been recorded just to the southeast of the tower and may indicate a wall or paved area, or perhaps a wall associated with the east range and or Chapter House.

7.14 To the south of the southern cloister wall several variations in response have been noted. Anomaly (21) suggests a possible wall or drain leading off the cloister. However, given that the exact date of construction the extant cloister walls is unknown, this response may be associated with a more recent path. However, a very rectilinear area of high resistance has been recorded immediately to the southwest of (21) which may be of archaeological interest. The origin of (22) at the south-eastern corner of the cloister is less clear but it does coincide with a doorway.

7.15 The origin of the broad area of high resistance (23) is unclear. It is most likely natural variations in the subsoil associated with the large tree immediately to the north. However, it may indicate a rubble spread associated with the structures to the east and northeast.

8 GPR SURVEY: RESULTS AND INTERPRETATION

The anomaly letters referred to below are shown on the interpretation diagrams.

8.1 The data from the GPR survey are displayed as a series of depth slice maps. These are 25cm thick spits through the ground which provide maps of buried features at different depths. The main depths slices have been constructed parallel to the modern ground surface with overlapping near surface depth slices. Four selected depth slices constructed on a horizontal plane, i.e. corrected for topography, are provided in Figure 34 for discussion.

8.2 0.00M – 0.25M DEPTH SLICE (FIGURES 9 & 10)

8.2.1 This near surface depth slice will be dominated by changes in the topsoil.

8.2.2 The most striking response within this depth slice is the rectangular response within the cloister. The strong response (A) in the north coincides with the bank / terrace and resistance anomaly (1) and may largely be a topographic affect. The responses to the west, south and east do not correspond with topographic changes or any clearly defined resistance anomalies, although the northwest and southeast 'corners' do correspond with resistance anomalies (2). The fact that the whole GPR anomaly does not have a corresponding resistance response is not surprising and would be expected if the feature is a very thin layer. However, the extremely shallow depth of the anomaly might suggest that the response (B) may be associated with a relatively modern path rather than part of the original cloister.

8.2.3 The origin of the amorphous response (C) to the south and west of the extant cloister walls is unclear. While they may be associated with the footings of the extant walls, the responses could be associated with the original cloister.

8.2.4 Numerous strong responses have been recorded within the Chancel. The strong anomalies (D) are due to changes in surface material e.g. the floor of the tower and recumbent grave markers.

8.2.5 The origin of the broad, but well-defined, high amplitude response in the northern half of the chancel (E) is unclear but corresponds with resistance anomaly 14. The response could indicate a rubble spread or an area of paving. It is possible that the response is partly due to additional burials, but if so, they are not well defined. The response (F) just to the north 0f the Nave is most likely an *in-situ* burial.

8.2.6 A broad area of high amplitude response (G) has been recorded in the north of the survey area and may simply indicate a rubble spread and shows some correlation with resistance anomaly (11).

8.2.7 The high amplitude response (H) in the west of the area corresponds with resistance anomaly (23) and is most likely associated with the tree and possibly rubble spreads.

8.3 0.13M – 0.38M DEPTH SLICE (FIGURES 11 & 12)

8.3.1 Within this overlapping depth slice many comparable anomalies have been recorded.

8.3.2 Although response (B) recorded in the previous depth slice is not as complete within this overlapping depth slice it is still evident as a high amplitude response in the west and south and low amplitude trends in the north and east.

8.3.3 At these depths the areas of high amplitude responses (E) and (G) are very well defined. There is also the suggestion of an associated anomaly (I) to the east of the Chancel. It is not clear how this may relate to the extant priory. These responses may simply indicate a 'contained' rubble spread associated with material from the priory. It is thought unlikely to be due to near surface bedrock given the wider context of the site and the nature of the responses. It is tempting, when viewing the data, to wonder if this rectangular area, offset from the footprint of the extant Priory, could be associated with an earlier structure, but such an interpretation is extremely tentative. It is more likely to be paving or a rubble spread associated with the extant priory combined with natural variations in moisture content.

8.3.4 A discrete area of high amplitude response (J) has been recorded just to the south of the tower. It is possible that this may suggest an intact floor or paved / cobble surface and corresponds with resistance anomaly (20).

8.3.5 Several anomalies have been recorded along the line of the eastern wall of the east range to the south of the Chancel. There is a slight topographic change in the area and it is not clear if anomaly (K) is due to an *in-situ* feature or simply just due to the microtopographic change. It is thought that the more amorphous area of high amplitude reflections (L) is associated with possible structural remains and associated rubble spreads.

8.4 0.25M – 0.50M DEPTH SLICE (FIGURES 13 & 14)

8.4.1 Comparable responses have been recorded within this overlapping depth slice.

8.4.2 Anomalies (K) and (L) which are most likely associated with the East Range are very defined at this depth.

8.4.3 In the north of the area a discrete anomaly (M) has been recorded and is associated with the western wall of the Sacristy and corresponds with resistance anomaly (9).

8.4.4 A discrete anomaly (N) has been detected in the southwest of the Chancel. This may be due to a wall but could be a burial.

8.4.5 Amorphous high amplitude responses (O) have been detected in the south of the cloister. The origin of these is unclear but it could be a rubble spread associated with the cloister walk / refectory (??). These responses broadly correspond with resistance trends (4).

8.5 0.38m – 0.64m & 0.50m – 0.75m Depth Slices (Figure 15 - 18)

8.5.1 These overlapping depth slices have recorded comparable responses. Anomalies associated with the Sacristy wall (M) and possible floor are clearly defined in the north of the area. Responses (L) and (J) to the south of the tower and the eastern wall of the east range, respectively, are still evident within these depth slices.

8.5.2 The amorphous responses in the south of the cloister are still evident, but they are poorly defined. However, relatively well-defined, but weak, rectangular anomalies (P) have been detected the south of the south cloister wall which may be of archaeological interest.

8.5.3 A very strong L-shaped anomalies (Q) has been recorded to the east of the cloister and is most likely associated the east range. However, the angle of the anomaly is not true to the extant wall immediately to the west. There are several possible reasons for this. It may be that the anomaly indicates an earlier phase of construction with the extant wall being later, or perhaps a more modern reconstruction which is not quite true to the original foundations. Another possibility is that anomaly (Q) indicates a stone drain. It should be noted that there is no comparable response in the resistance data which is because the depth of the anomaly detected by the GPR survey is close to the limits of the depth of detection of the resistance technique.

8.5.4 Strong anomalies (R) are being detected within the tower and are due to its foundations, which appear to be substantial.

8.6 0.64m – 0.89m & 0.75m – 1.00m Depth Slices (Figures 19 - 22)

8.6.1 The data from these overlapping depth slices are dominated by the strong responses (L) and (Q) in the southeast of the area which are believed to be associated with the east range. Within the 0.75m – 1.00m depth slice there are suggestions of further possible structural remains (S) leading off the east range which may be archaeologically significant. However, interpretation is cautious given the presence of an old tree immediately to the south and limited survey to the east due to the PIC boundary which marked the limit of this phase of field work.

8.6.2 Amorphous responses are still being recorded in the south of the cloister at these depths, but their origin is unclear.

8.7 0.89m – 1.14m Depth Slice (Figure 23 & 24)

8.7.1 By these depths elements of anomalies (L), (M), (Q) and (S) are still evident although mostly they are less well-defined and weaker.

8.7.2 Within the nave a linear anomaly (T) has been noted. While an archaeological origin for this cannot be dismissed, such an interpretation is tentative. It is possible that this response is an artefact in the data and not indicative of a real feature.

8.8 1.00m – 1.25m & 1.25m – 1.50m Depth Slices (FIGURE 25 - 28)

8.8.1 Within these depth slices the responses are not especially coherent and it is thought that most of the anomalies are due to natural variations and ringing of the signal. Elements of anomalies (M) and (T) are still evident.

8.8.2 A broad linear anomaly (U) has been detected just to the east of the tower. Some of this response follows the topographic change and the general alignment follows the line of recumbent burial slabs just to the east. Interpretation of this anomaly is tentative. While it is tempting to suggest that the response could perhaps be associated with foundations of an earlier structure such an interpretation is extremely cautious given the restricted survey area, known burials and topographic changes.

8.9 1.50m – 1.75m & 1.75m – 2.00m Depth Slices (Figures 29 - 32)

8.9.1 Although anomaly (U) is still clear within these depth slices, most of the other responses are thought to be due to natural variations and ringing of the signal

9 CONCLUSION (Figure 34)

9.1 The resistance and GPR surveys have recorded a wealth of anomalies of archaeological interest with good correlation between the two data sets, on the whole.

9.2 Both techniques have recorded anomalies within the cloister which may be associated with the original cloister (i). However, their exact origin is not clear. It is known that the existing ‘cloister’ walls are a later construction and one assumes the original cloister lies under or within the foot print of the extant ‘cloister’ walls on site. Assuming the existing walls overlie the original cloister walls then the responses could be associated with the internal walls of the cloister walk. However, it is entirely possible that these anomalies indicate the external corners of the original cloister suggesting a smaller area within the existing ‘cloister’ walls.

9.3 Both techniques have detected anomalies consistent with foundations of walls associated with the Sacristy (ii) and the Chapter House / East Range (iii). Within the GPR data a very well defined anomaly (iv) has been recorded which may indicate the southern extension of the east range. However, the angle of the anomaly is not true to the extant wall immediately to the west. It may be that the anomaly indicates an earlier phase of construction with the extant wall being later, or perhaps a more modern reconstruction which is not quite true to the original foundations. Additional anomalies (v) have been recorded to the east of the east range suggesting further structures.

9.4 Within the Nave and to the north of the Nave well-defined low resistance anomalies (vi) have been recorded in the resistance survey although their origin of this is unclear. A low response suggests a cut feature like an infilled ditch, but that would unlikely given the wider context. It is possible that they robber trenches associated with earlier phases of the priory. However, they could indicate drains. Although one would normally expect a stone drain to show as a high resistance response, it is possible that if the stone capping on the drain has collapsed, or been removed, and the drain has silted up it may show as a low resistance anomaly.

9.5 Additional discrete anomalies (vii) of possible archaeological interest have also been recorded by both techniques, although their origin is less clear.

9.6 Based on the results, additional survey beyond the PIC boundary is recommended. In particular, survey to the south of the cloister where there is a well-defined area of higher ground might help to map additional possible structures associated with the Priory.

10 STATEMENT OF INDEMNITY

10.1 Geophysical data can be ambiguous and while every effort has been made to ensure that the interpretations contained within this report represent an accurate record of potential surviving archaeological deposits, it is a subjective analysis of the data.

10.2 The success of a geophysical survey in identifying archaeological remains is dependent on several factors including geology and soils, time of year for some techniques, field conditions and the nature of the buried archaeological features / deposits. As a result a geophysical survey may only reveal certain archaeological features and not produce a complete plan of all of the archaeological remains within a survey area and can only confidently predict a presence of archaeology, not an absence.

ACKNOWLEDGEMENTS

Rose Geophysical Consultants wish to thank Norman Atkinson and The Graham Hunter Foundation for arranging the survey.

REFERENCES

CIfA, 2014, *Standards and Guidance for Archaeological Geophysical Survey*

David, A. Linford, N. Linford, P., 2008, English Heritage (Historic England): *Geophysical Survey in Archaeological Field Evaluation*, Swindon.

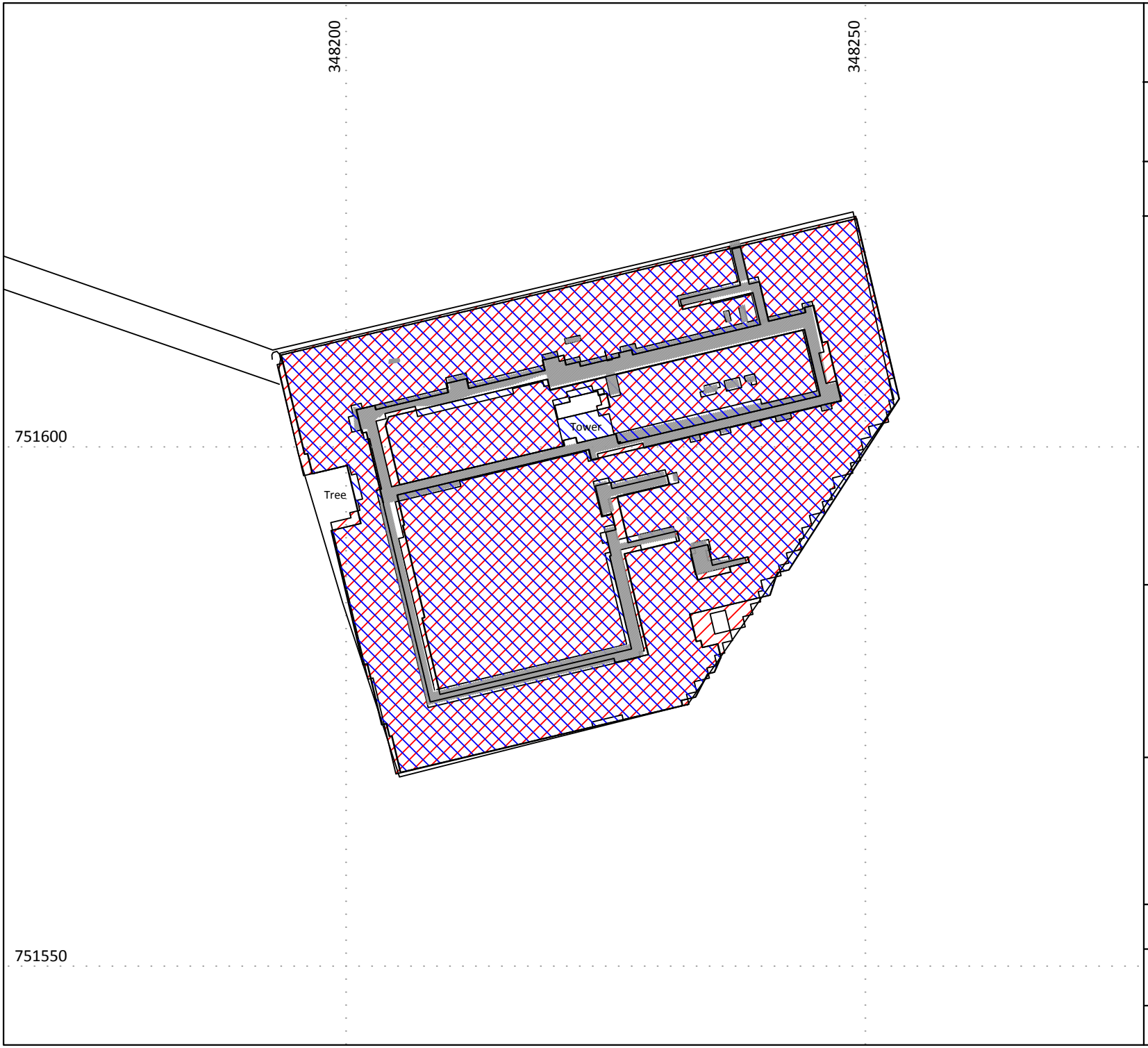
Schmidt, A. and Ernenwein, E., 2009, *Archaeology Data Service: Geophysical Data in Archaeology: A Guide to Good Practice*

Schmidt, A. Linford, P., Linford, N. David, A. Gaffeny, C. Sarris, A. Fassbinder, J., 2016, *EAC Guidelines for the use of Geophysics in Archaeology.* European Archaeological Council.

APPENDIX I: METADATA

RGC Project Name	Restenneth Priory		
RGC Project Number	RGC19342/RTP		
Client	The Graham Hunter Foundation		
Date of Survey	1st & 2nd June 2019		
Personnel	Susan Ovenden & Alistair Wilson		
Date OF Report	10th June 2019		
Report Author	Susan Ovenden		
Local Authority	Angus		
Parish	Forfar		
Site / Monument Type	Priory (Medieval)		
Site Number	NO45SE 10		
Canmore ID	33745		
SAM Index	SM90246		
Section 42 SMC	Case ID 300036733		
NGR	NO 48213 51588		
DES Entry	Yes		
Ground Cover	Short grass		
Weather Conditions	Dry		
Survey Techniques Area Data Interval	Resistance Survey 0.2ha; Data collected @ 0.5m by 0.5m 500MHz GPR survey 0.2ha; Data collected @ 0.02m by 0.5m		
Geo-reference details			
Resistance Survey	Data collected on Local Grid	BL 0m, 0m	TR 80m, 60m
	Survey grid georeferenced (OSTN15)	BL 348191.98 751546.95	TR 348255.98 751632.78
GPR Survey	Data collected on Local Grid	BL 16m, 18m	TR 73m, 60m
	Survey grid georeferenced (OSTN15)	BL 348203.38 751568.21	TR 348249.16 751622.23

ARCHIVE DETAILS			
Resistance Survey	Working Files (Geoplot 4)	Preservation Files (XYZ)	JPEG Images
Composites	Yes	Yes - CSV files	Yes
GPR Survey	Working Files (Mala X3M)	Preservation Files (SEGY)	JPEG Images
Radargrams	Yes	Yes	No



SITE: Restenneth Priory

SURVEY TYPE: Geophysical Survey

DATA TYPE: Location Diagram

Resistance Survey

GPR Survey

0m 20m

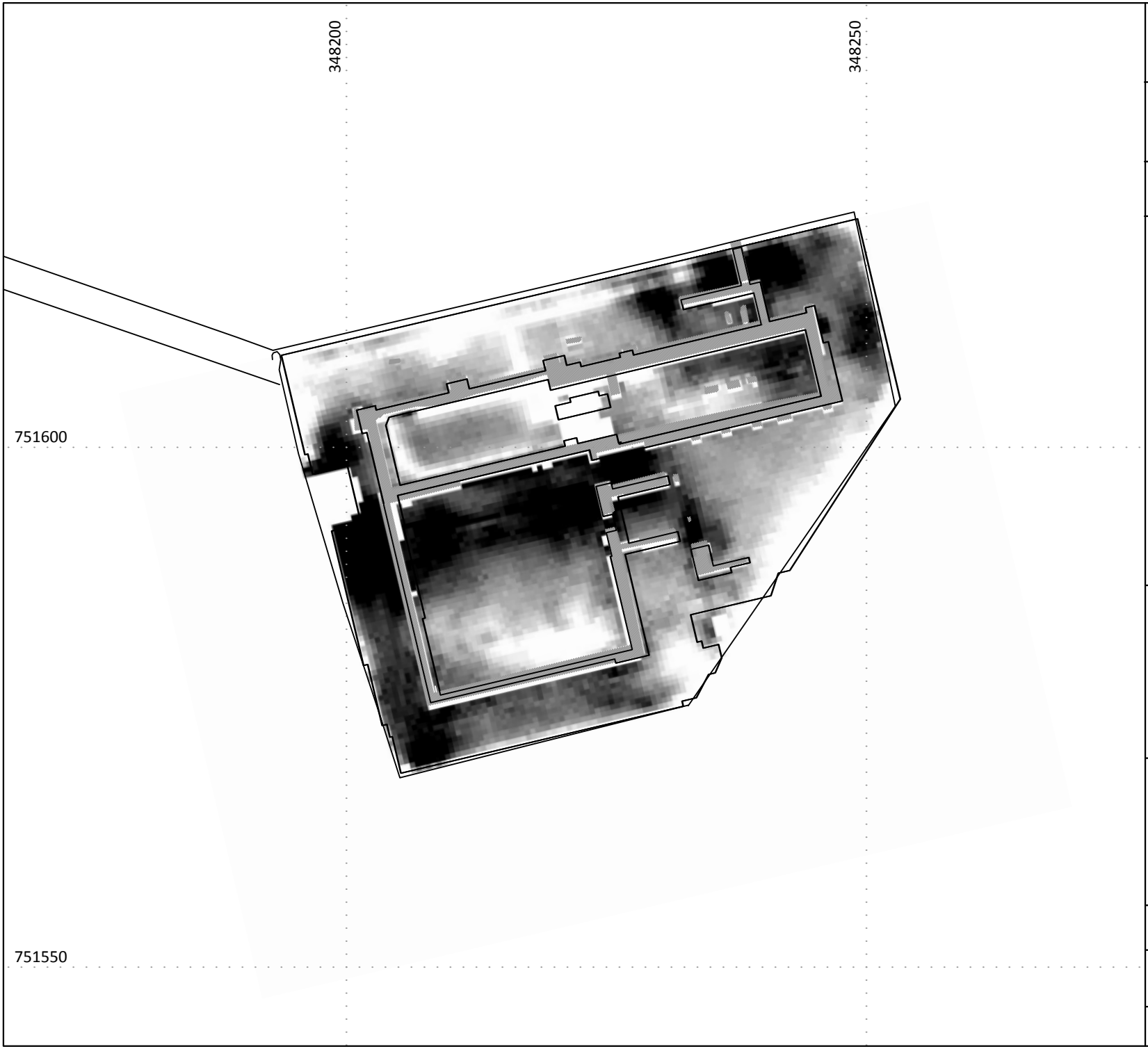
rose geophysics

CLIENT: Graham Funter Foundation

Scale: 1:500 @ A4
Date: 05/06/2019

Revision No: 0
Illustrator: SMO

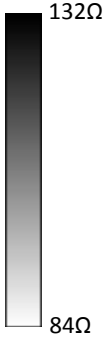
Figure 1

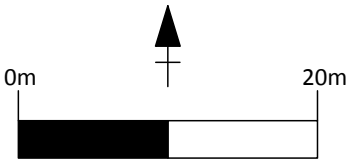


SITE: Restenneth Priory

SURVEY TYPE: Resistance Survey

DATA TYPE: Edited Data





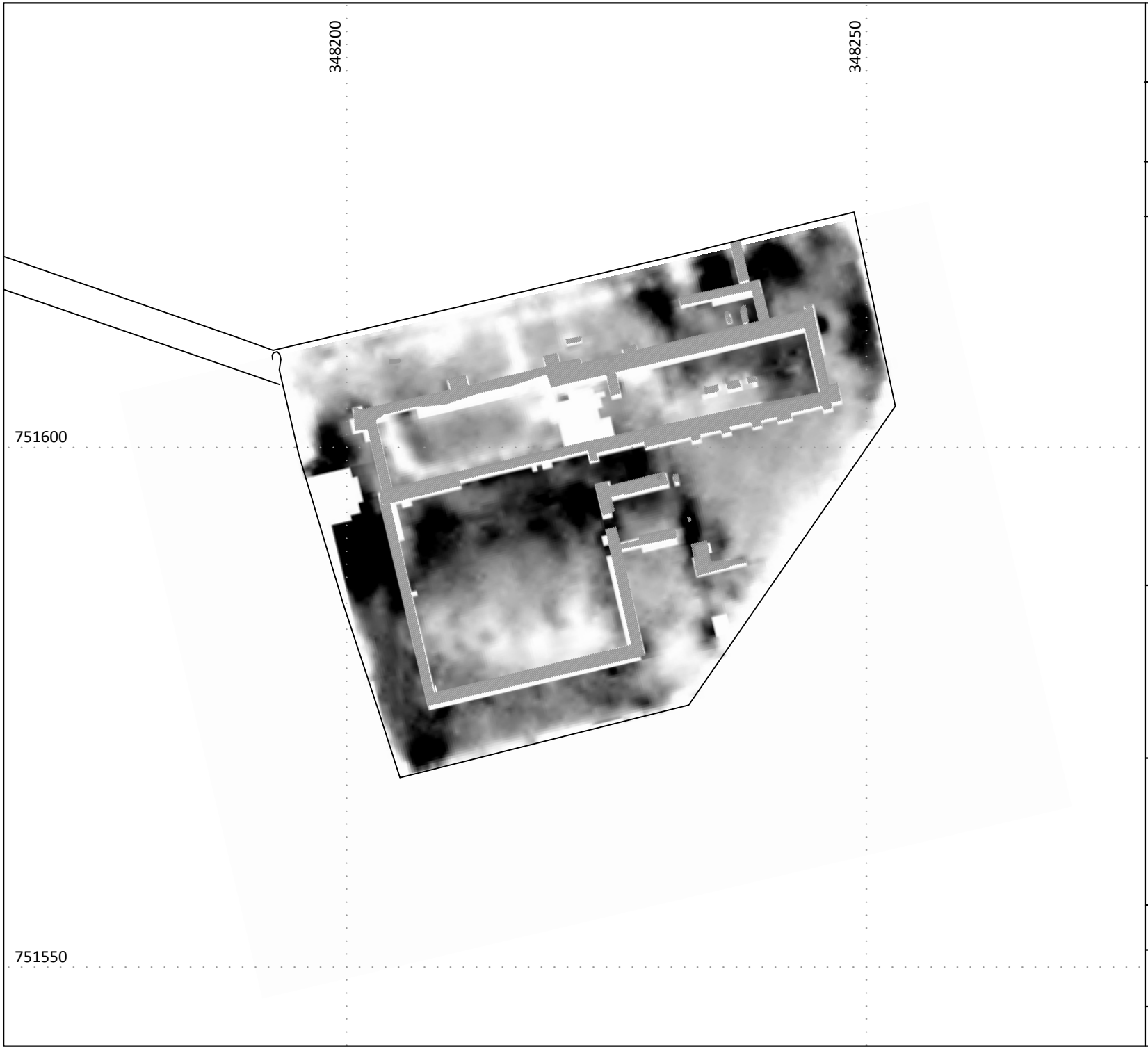
rose geophysics

CLIENT: Graham Funter Foundation

Scale: 1:500 @ A4
Date: 05/06/2019

Revision No: 0
Illustrator: SMO

Figure 2



SITE: Restenneth Priory

SURVEY TYPE: Resistance Survey

DATA TYPE: Interpolated Data

142Ω

75Ω

0m 20m

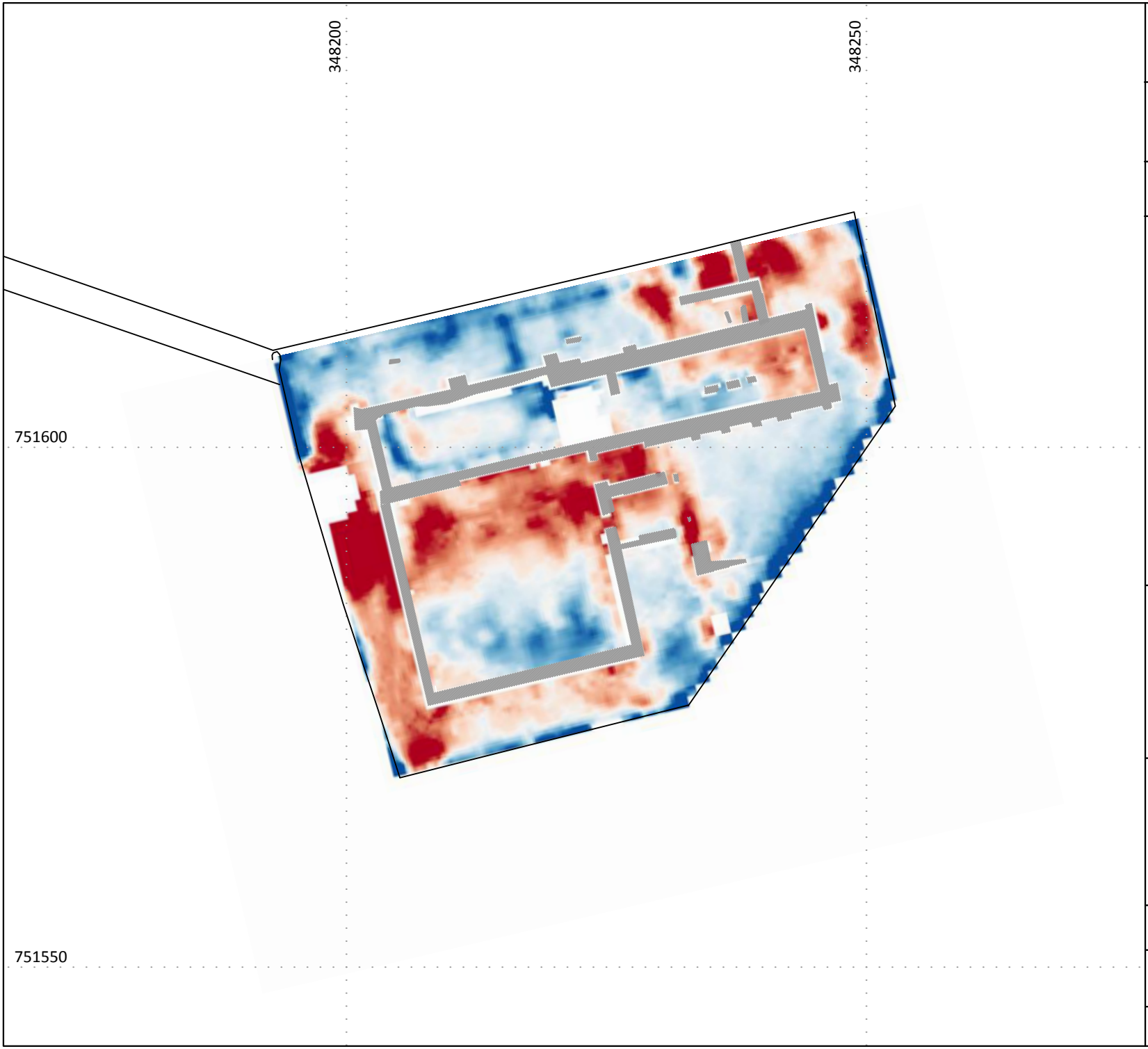
rose geophysics

CLIENT: Graham Funter Foundation

Scale: 1:500 @ A4
Date: 05/06/2019

Revision No: 0
Illustrator: SMO

Figure 3



SITE: Restenneth Priory

SURVEY TYPE: Resistance Survey

DATA TYPE: Interpolated Data

145Ω

75Ω

0m 20m

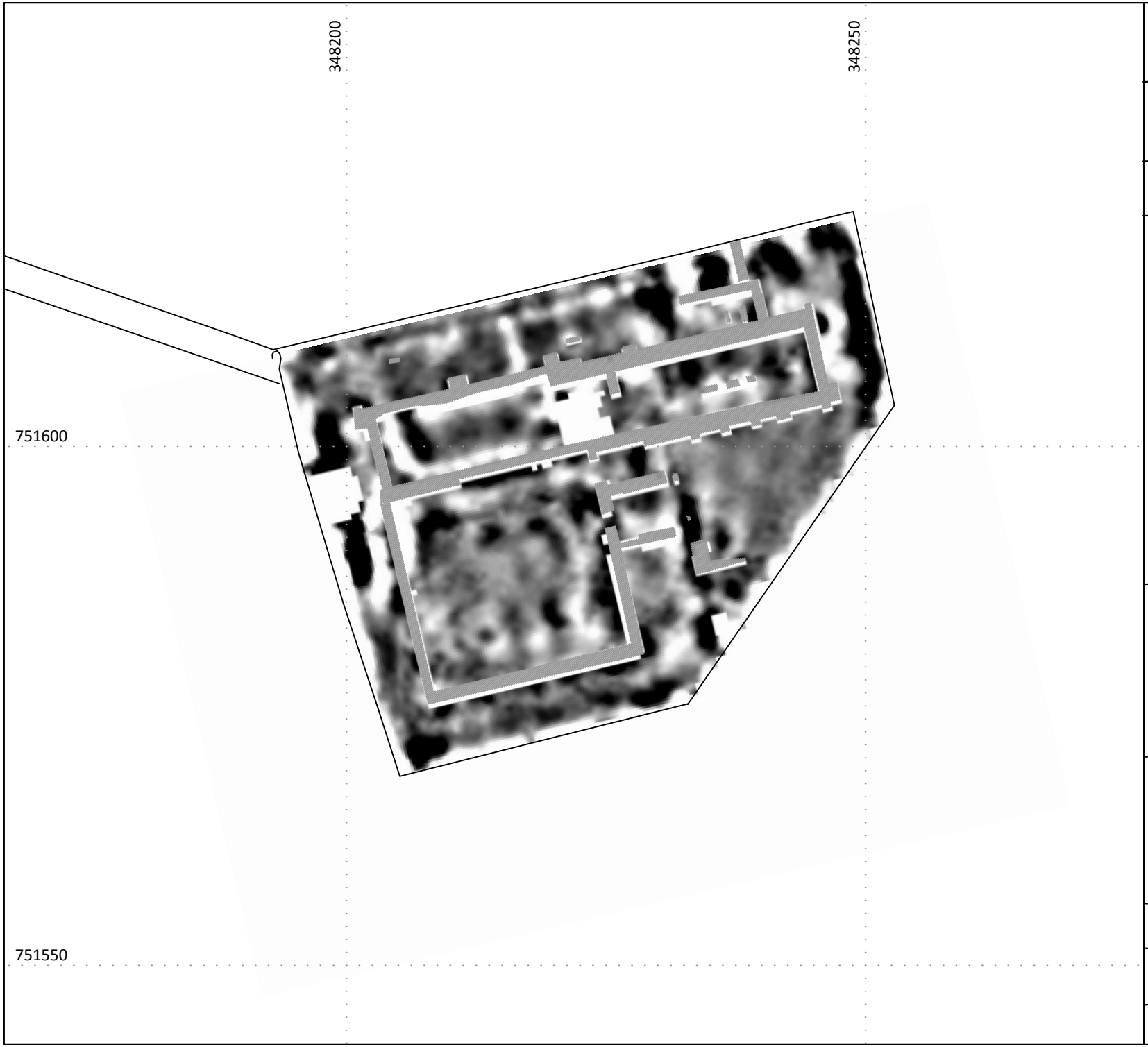
rose geophysics

CLIENT: Graham Funter Foundation

Scale: 1:500 @ A4
Date: 05/06/2019

Revision No: 0
Illustrator: SMO

Figure 4



SITE: Restenneth Priory

SURVEY TYPE: Resistance Survey

DATA TYPE: Filtered Data

1SD

-1SD

0m 20m

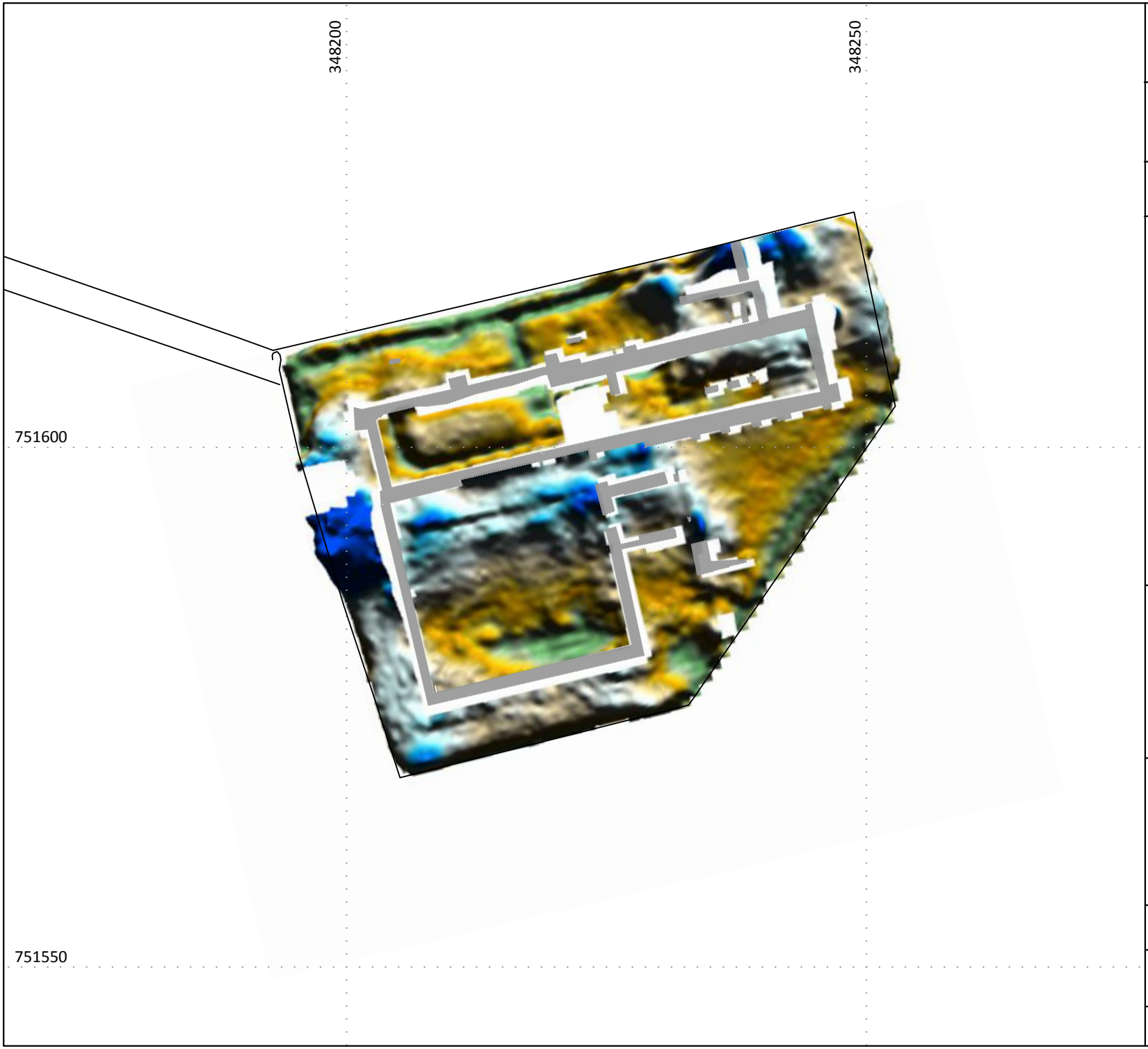
rose geophysics

CLIENT: Graham Funter Foundation

Scale: 1:500 @ A4
Date: 05/06/2019

Revision No: 0
Illustrator: SMO

Figure 5



SITE: Restenneth Priory

SURVEY TYPE: Resistance Survey

DATA TYPE: Shaded Relief Plot

150Ω

70Ω

0m 20m

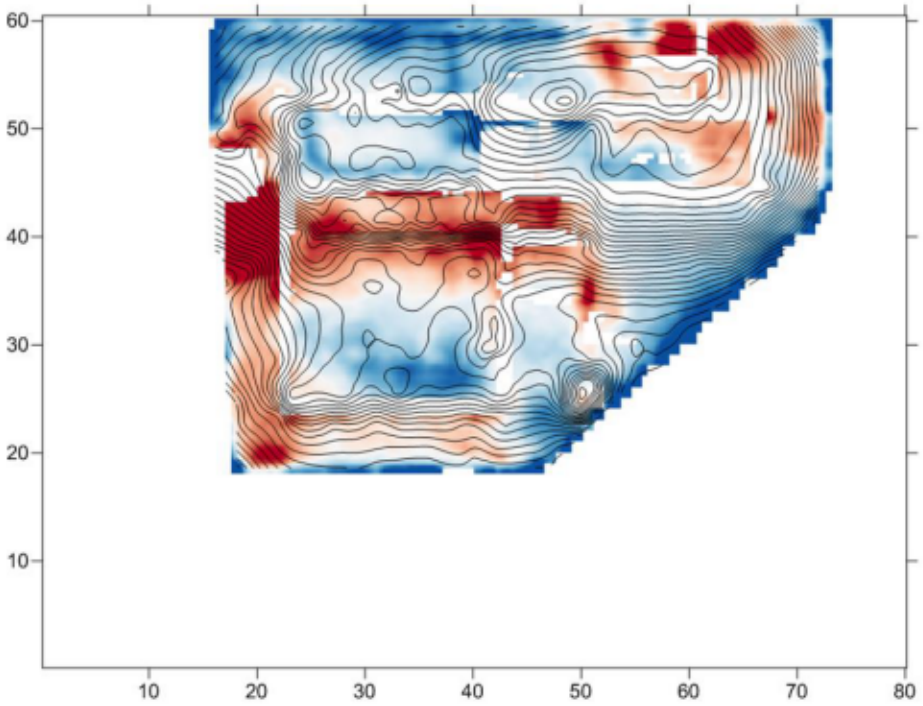
rose geophysics

CLIENT: Graham Funter Foundation

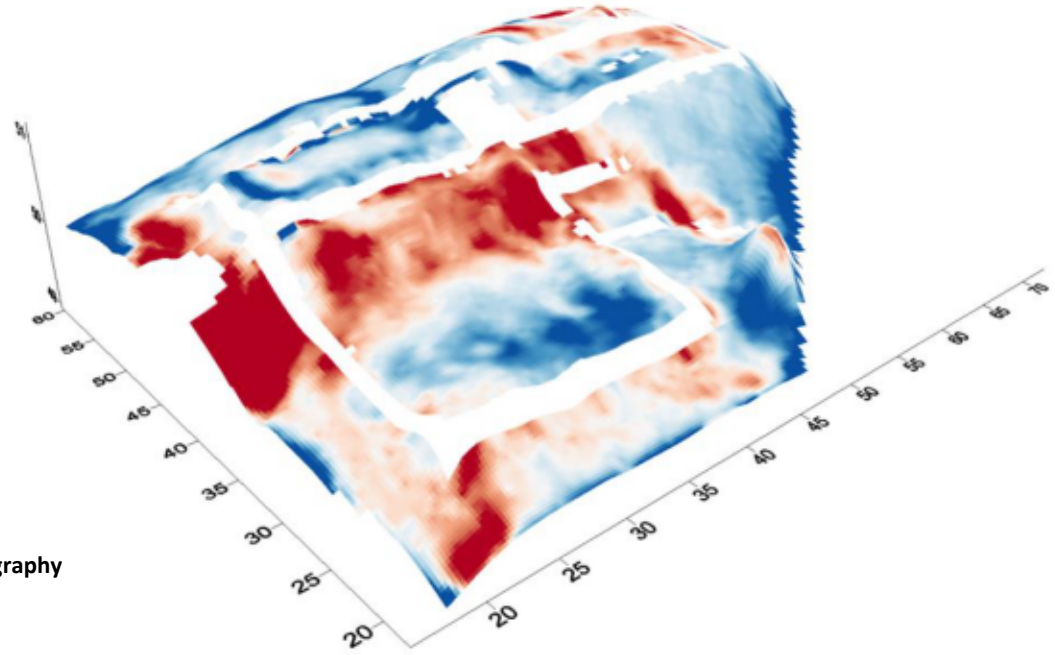
Scale: 1:500 @ A4
Date: 05/06/2019

Revision No: 0
Illustrator: SMO

Figure 6



Interpolated data with contours overlaid

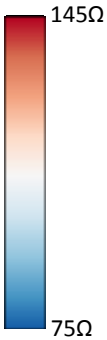


Interpolated data drapped over site topography

SITE: Restenneth Priory

SURVEY TYPE: Resistance Survey

DATA TYPE: Interpolated Data with Topography

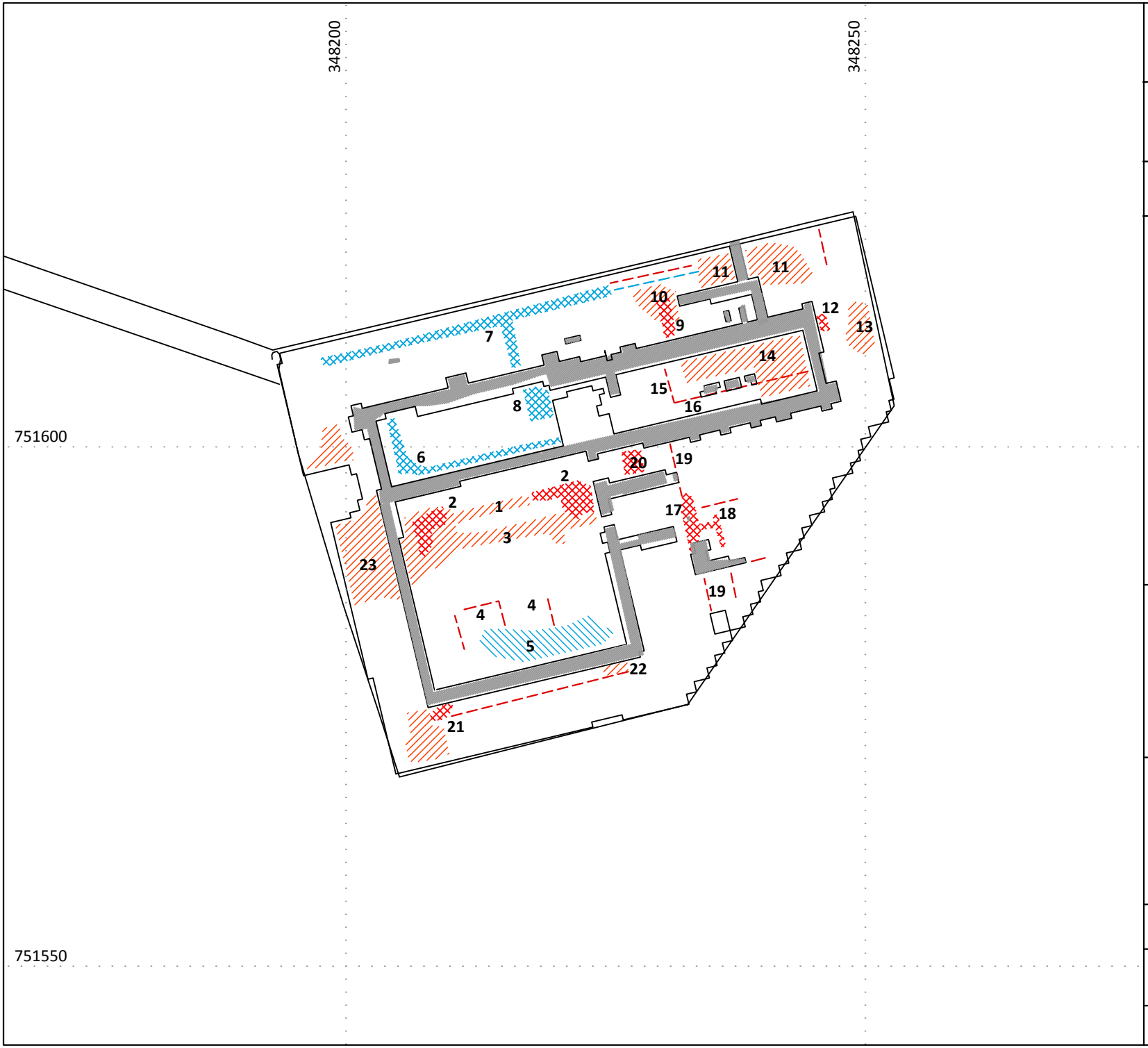


rose geophysics

CLIENT: Graham Funter Foundation

Scale: NTS	Revision No: 0
Date: 05/06/2019	Illustrator: SMO

Figure 7



SITE: Restenneth Priory

SURVEY TYPE: Resistance Survey

DATA TYPE: Interpretation

- High Resistance: Possible Structure
- High Resistance: Possible Archaeology
- High Resistance: Trend
- Low Resistance: Possible Archaeology
- Low Resistance: Unknown
- Low Resistance: Trend

0m 20m

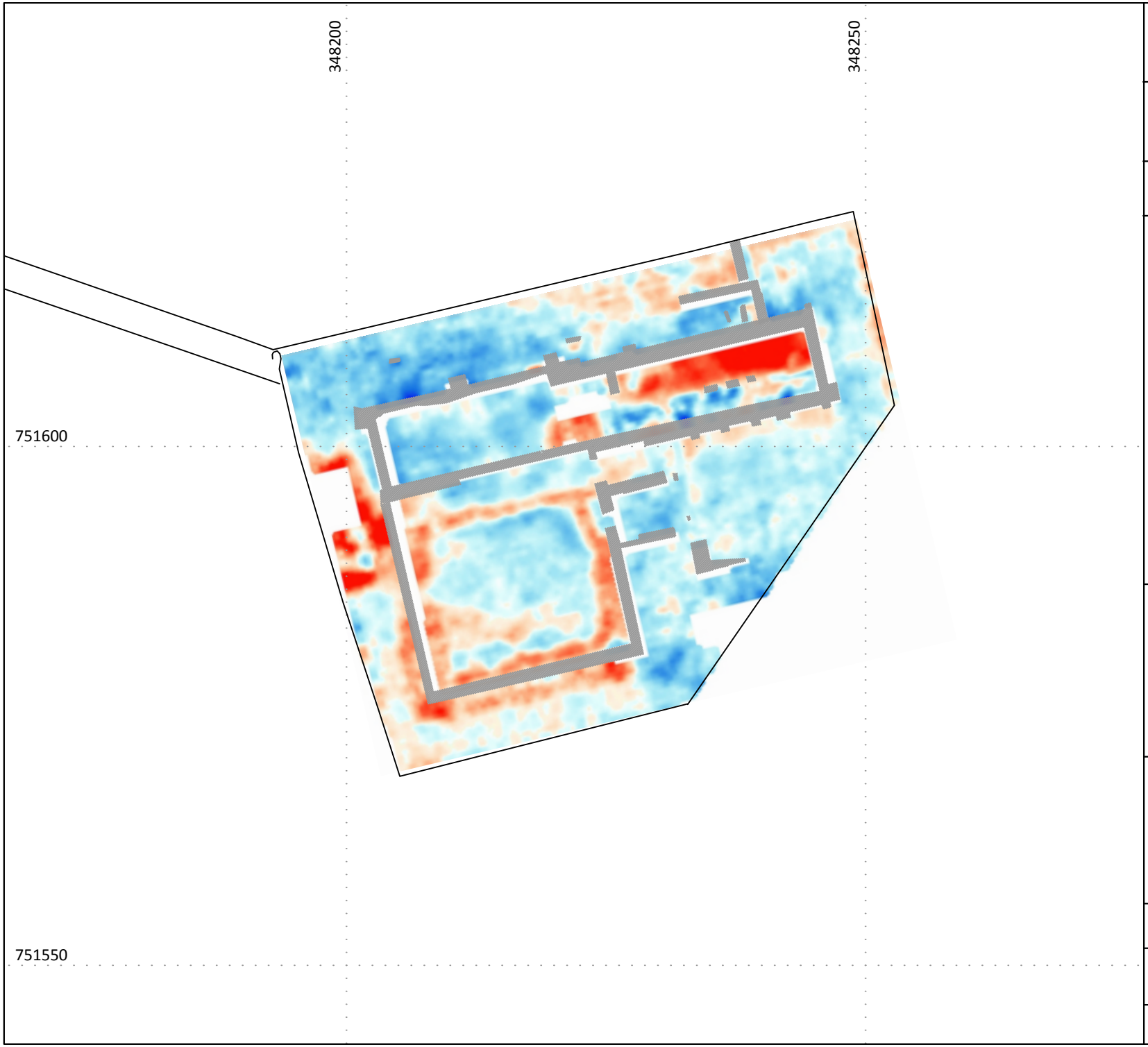
rose geophysics

CLIENT: Graham Funter Foundation

Scale: 1:500 @ A4
Date: 05/06/2019

Revision No: 0
Illustrator: SMO

Figure 8



SITE: Restenneth Priory

SURVEY TYPE: GPR Survey

DATA TYPE: Depth Slice 0.00m - 0.25m

High

Amplitude

Low

0m 20m

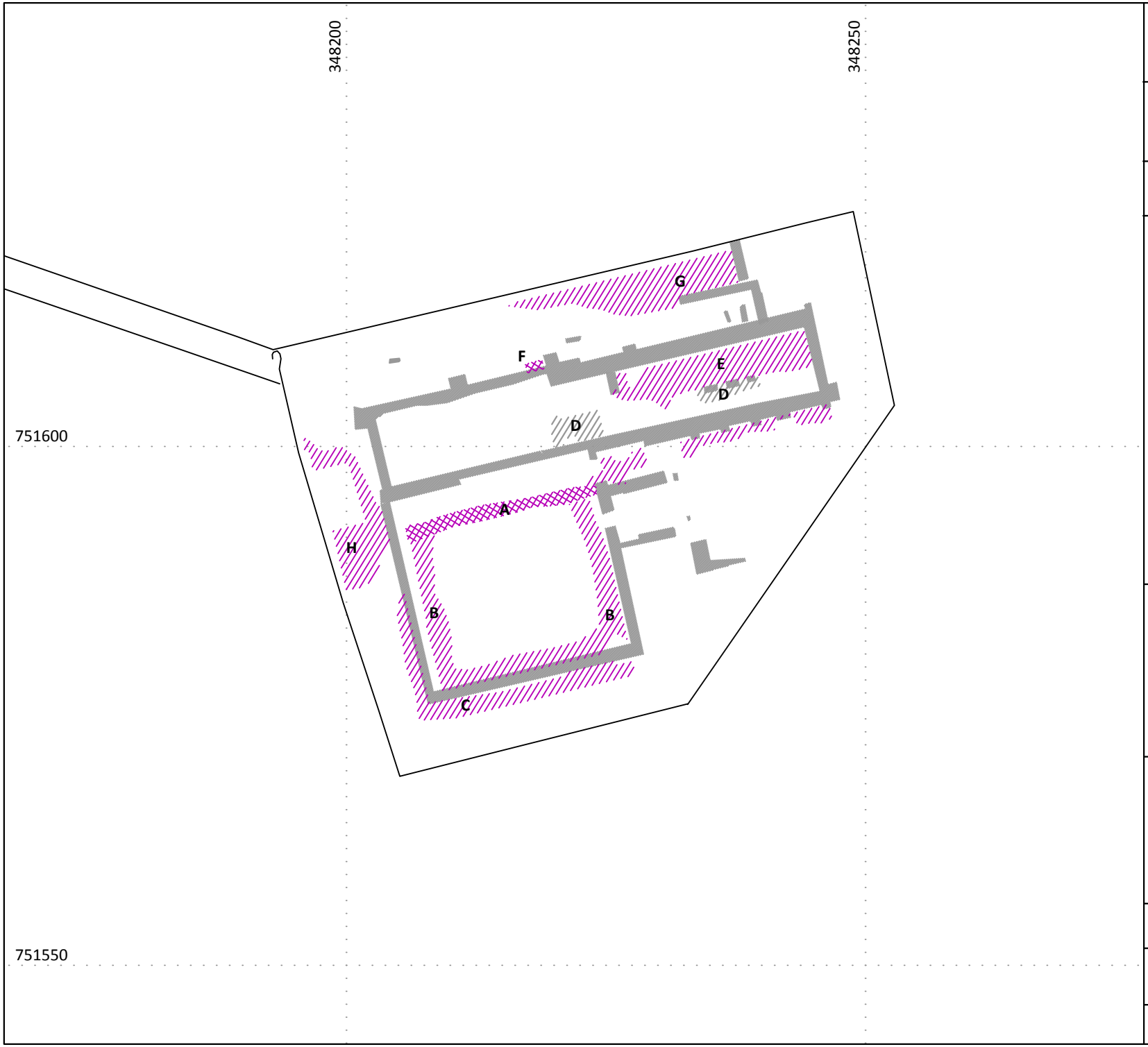
rose geophysics

CLIENT: Graham Funter Foundation

Scale: 1:500 @ A4
Date: 05/06/2019

Revision No: 0
Illustrator: SMO

Figure 9



SITE: Restenneth Priory

SURVEY TYPE: GPR Survey

DATA TYPE: Interpretation 0.00m - 0.25m

- Possible Archaeology
- High Amplitude Response
- High Amplitude Trend
- Low Amplitude Trend
- Surface Change
- Ringing of Signal

0m 20m

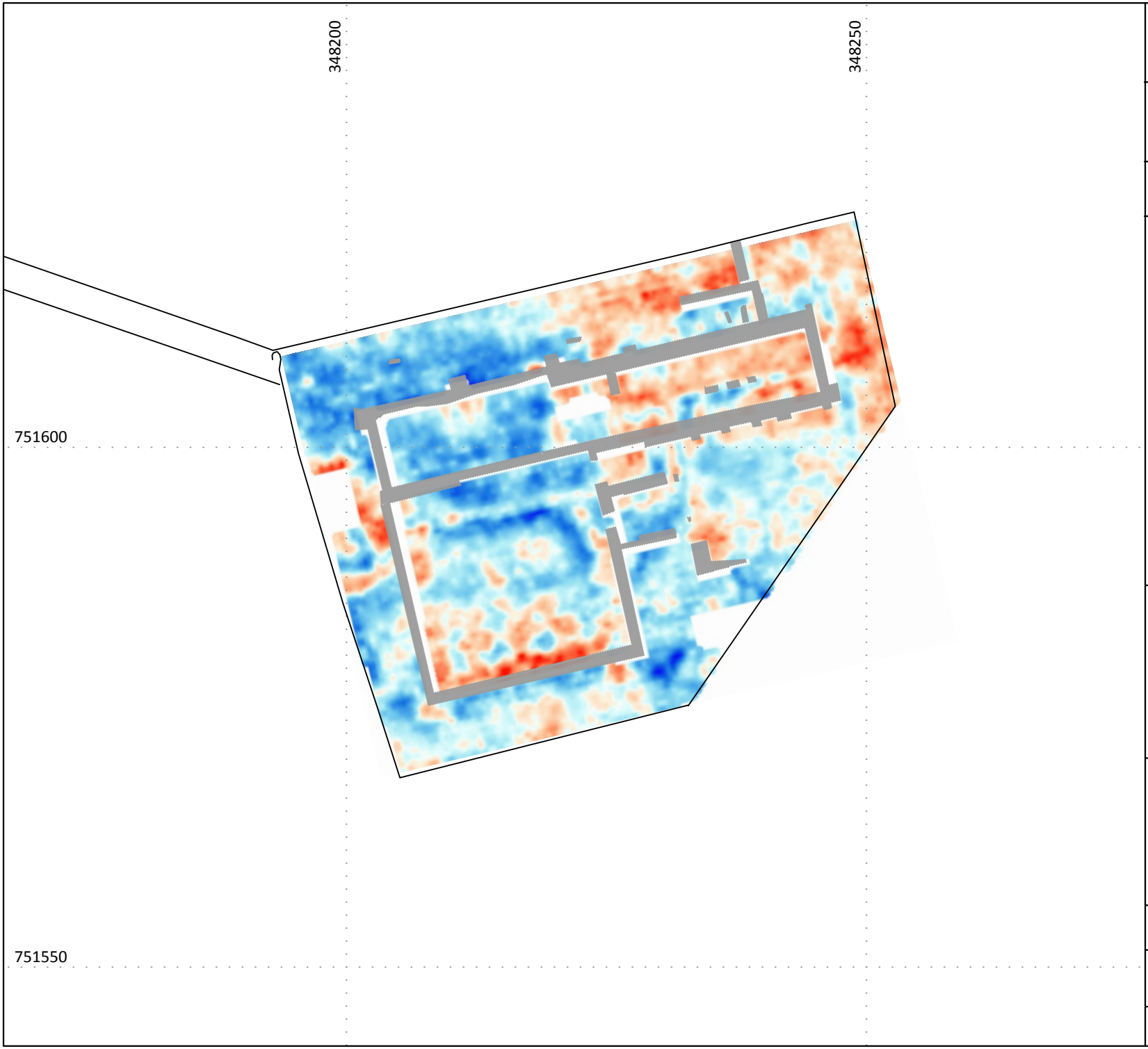
rose geophysics

CLIENT: Graham Funter Foundation

Scale: 1:500 @ A4
Date: 05/06/2019

Revision No: 0
Illustrator: SMO

Figure 10



SITE: Restenneth Priory

SURVEY TYPE: GPR Survey

DATA TYPE: Depth Slice 0.13m - 0.38m

High

Amplitude

Low

0m 20m

rose geophysics

CLIENT: Graham Funter Foundation

Scale: 1:500 @ A4
Date: 05/06/2019

Revision No: 0
Illustrator: SMO

Figure 11

SITE: Restenneth Priory

SURVEY TYPE: GPR Survey

DATA TYPE: Interpretation 0.13m - 0.38m

- Possible Archaeology
- High Amplitude Response
- High Amplitude Trend
- Low Amplitude Trend
- Surface Change
- Ringing of Signal

0m 20m

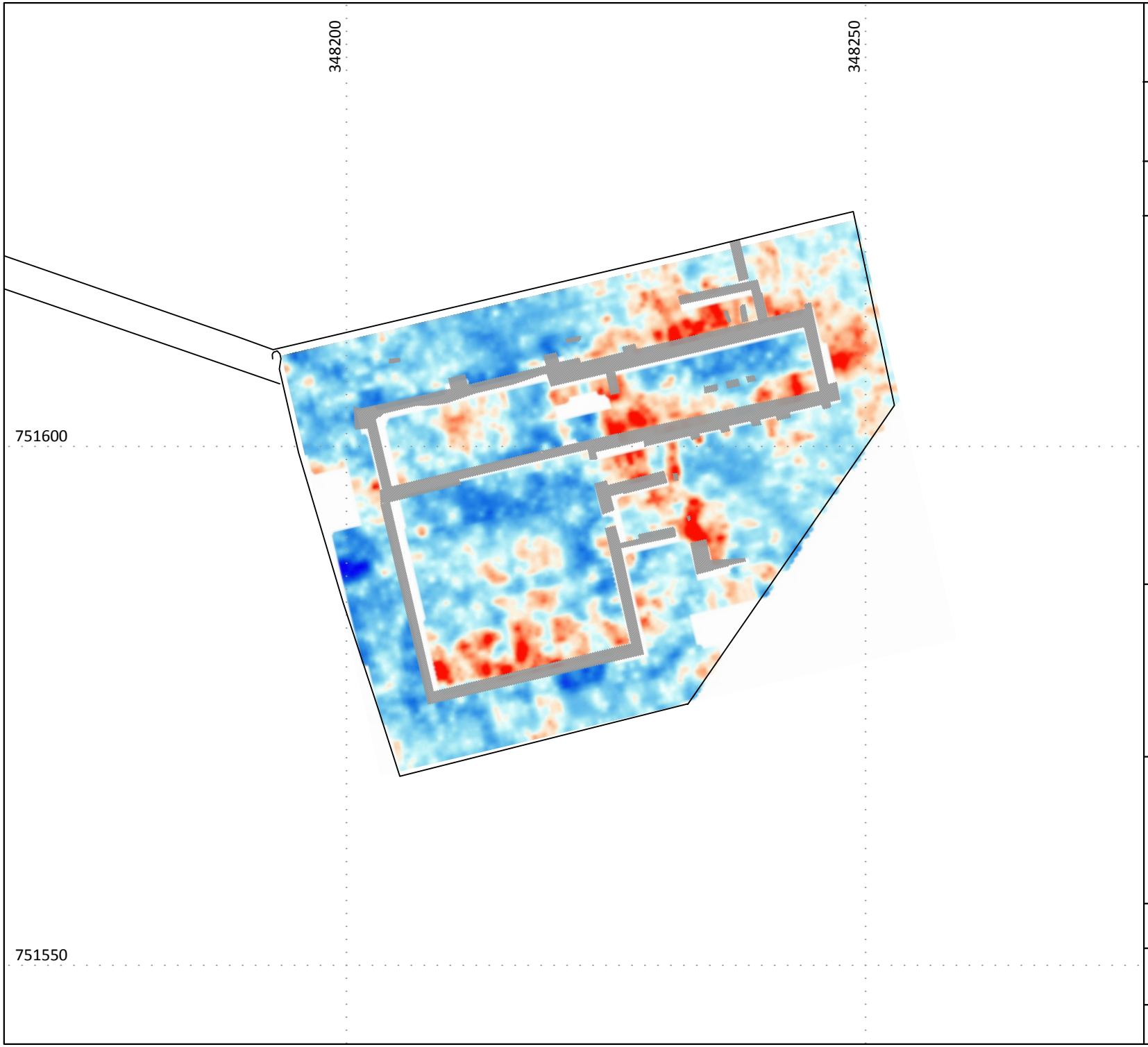
rose geophysics

CLIENT: Graham Funter Foundation

Scale: 1:500 @ A4
Date: 05/06/2019

Revision No: 0
Illustrator: SMO

Figure 12



SITE: Restenneth Priory

SURVEY TYPE: GPR Survey

DATA TYPE: Depth Slice 0.25m - 0.50m

High

Amplitude

Low

0m 20m

rose geophysics

CLIENT: Graham Funter Foundation

Scale: 1:500 @ A4
Date: 05/06/2019

Revision No: 0
Illustrator: SMO

Figure 13

SITE: Restenneth Priory

SURVEY TYPE: GPR Survey

DATA TYPE: Interpretation 0.25m - 0.50m

- Possible Archaeology
- High Amplitude Response
- High Amplitude Trend
- Low Amplitude Trend
- Surface Change
- Ringing of Signal

0m 20m

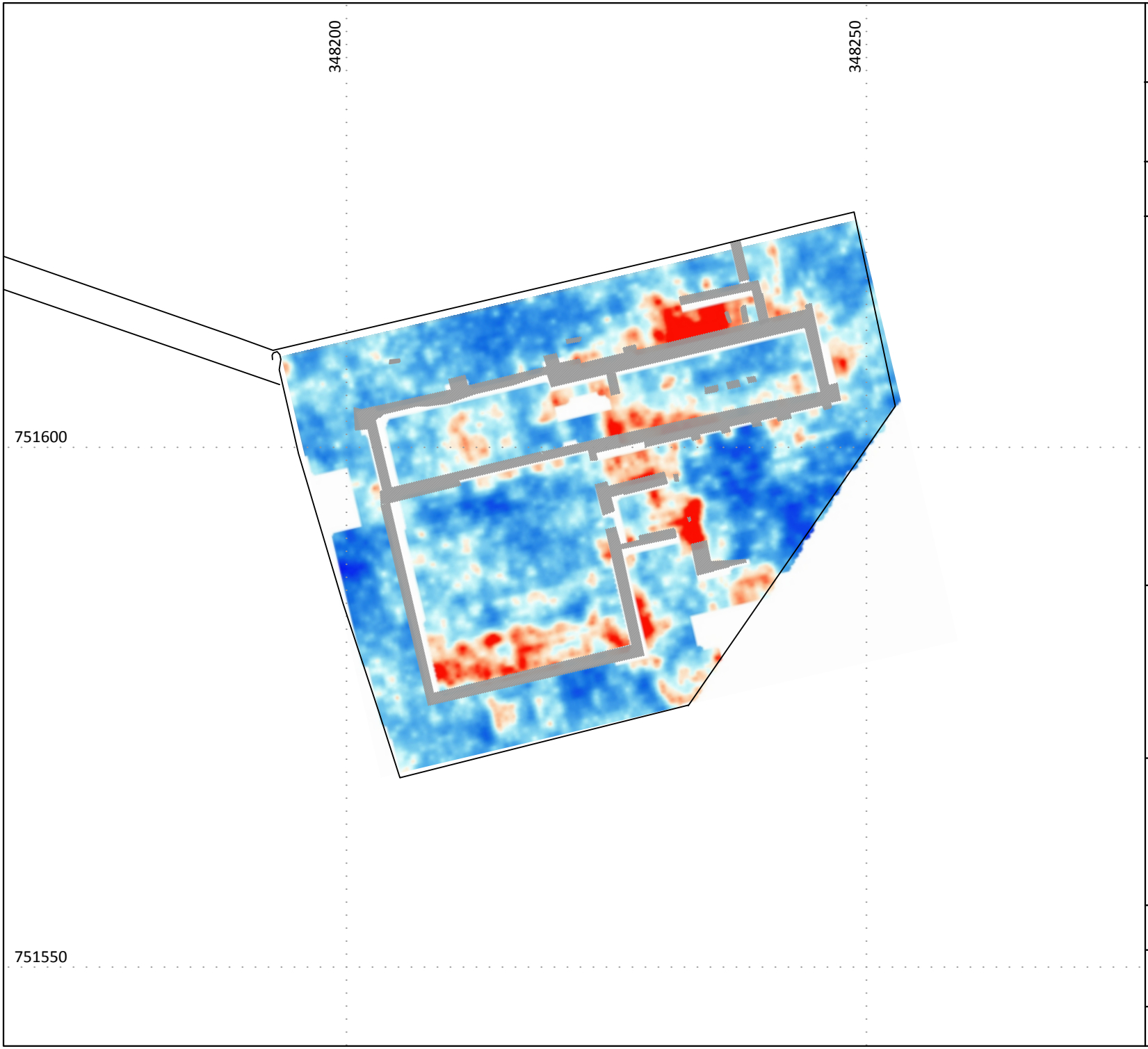
rose geophysics

CLIENT: Graham Funter Foundation

Scale: 1:500 @ A4
Date: 05/06/2019

Revision No: 0
Illustrator: SMO

Figure 14



SITE: Restenneth Priory

SURVEY TYPE: GPR Survey

DATA TYPE: Depth Slice 0.38m - 0.64m

High
Amplitude
Low

0m
20m

rose geophysics

CLIENT: Graham Funter Foundation

Scale: 1:500 @ A4
Date: 05/06/2019

Revision No: 0
Illustrator: SMO

Figure 15

SITE: Restenneth Priory

SURVEY TYPE: GPR Survey

DATA TYPE: Interpretation 0.38m - 0.64m

- Possible Archaeology
- High Amplitude Response
- High Amplitude Trend
- Low Amplitude Trend
- Surface Change
- Ringing of Signal

0m 20m

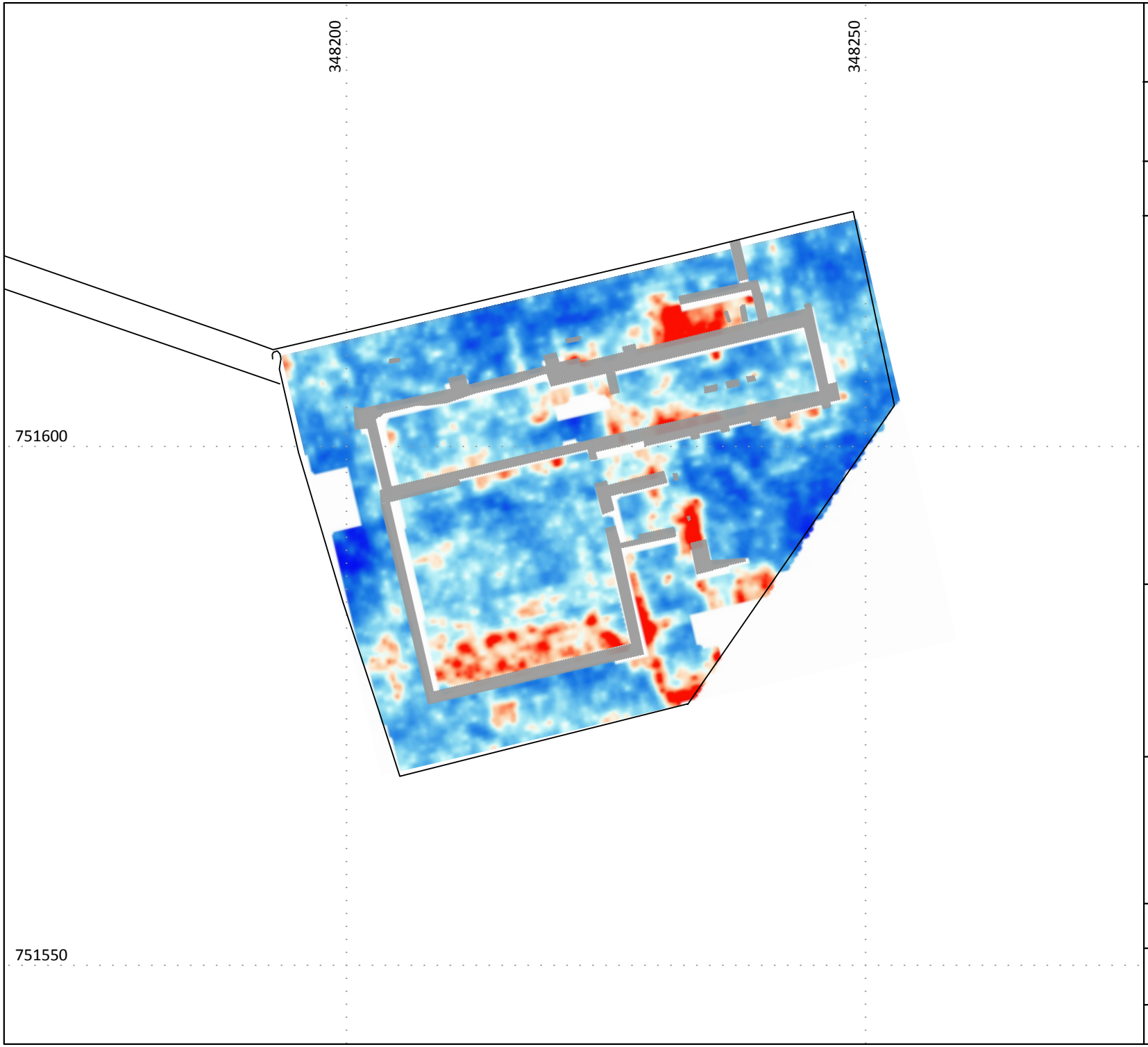
rose geophysics

CLIENT: Graham Funter Foundation

Scale: 1:500 @ A4
Date: 05/06/2019

Revision No: 0
Illustrator: SMO

Figure 16



SITE: Restenneth Priory

SURVEY TYPE: GPR Survey

DATA TYPE: Depth Slice 0.50m - 0.75m

High

Amplitude

Low

0m 20m

rose geophysics

CLIENT: Graham Funter Foundation

Scale: 1:500 @ A4
Date: 05/06/2019

Revision No: 0
Illustrator: SMO

Figure 17

SITE: Restenneth Priory

SURVEY TYPE: GPR Survey

DATA TYPE: Interpretation 0.50m - 0.75m

- Possible Archaeology
- High Amplitude Response
- High Amplitude Trend
- Low Amplitude Trend
- Surface Change
- Ringing of Signal

0m 20m

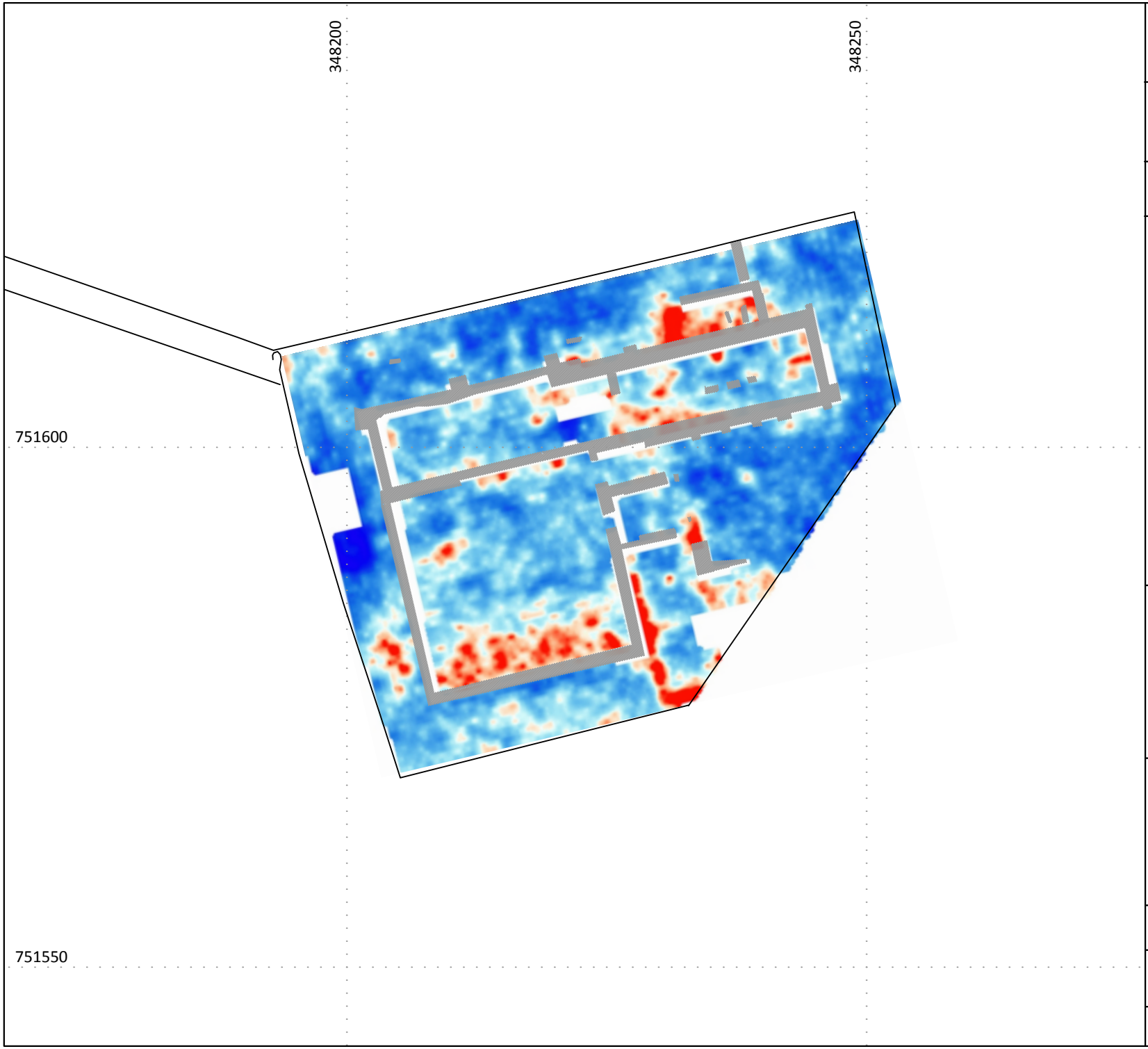
rose geophysics

CLIENT: Graham Funter Foundation

Scale: 1:500 @ A4
Date: 05/06/2019

Revision No: 0
Illustrator: SMO

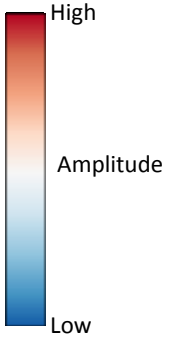
Figure 18

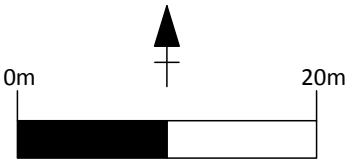


SITE: Restenneth Priory

SURVEY TYPE: GPR Survey

DATA TYPE: Depth Slice 0.64m - 0.89m





rose geophysics

CLIENT: Graham Funter Foundation

Scale: 1:500 @ A4
Date: 05/06/2019

Revision No: 0
Illustrator: SMO

Figure 19

SITE: Restenneth Priory

SURVEY TYPE: GPR Survey

DATA TYPE: Interpretation 0.64m - 0.89m

- Possible Archaeology
- High Amplitude Response
- High Amplitude Trend
- Low Amplitude Trend
- Surface Change
- Ringing of Signal

0m 20m

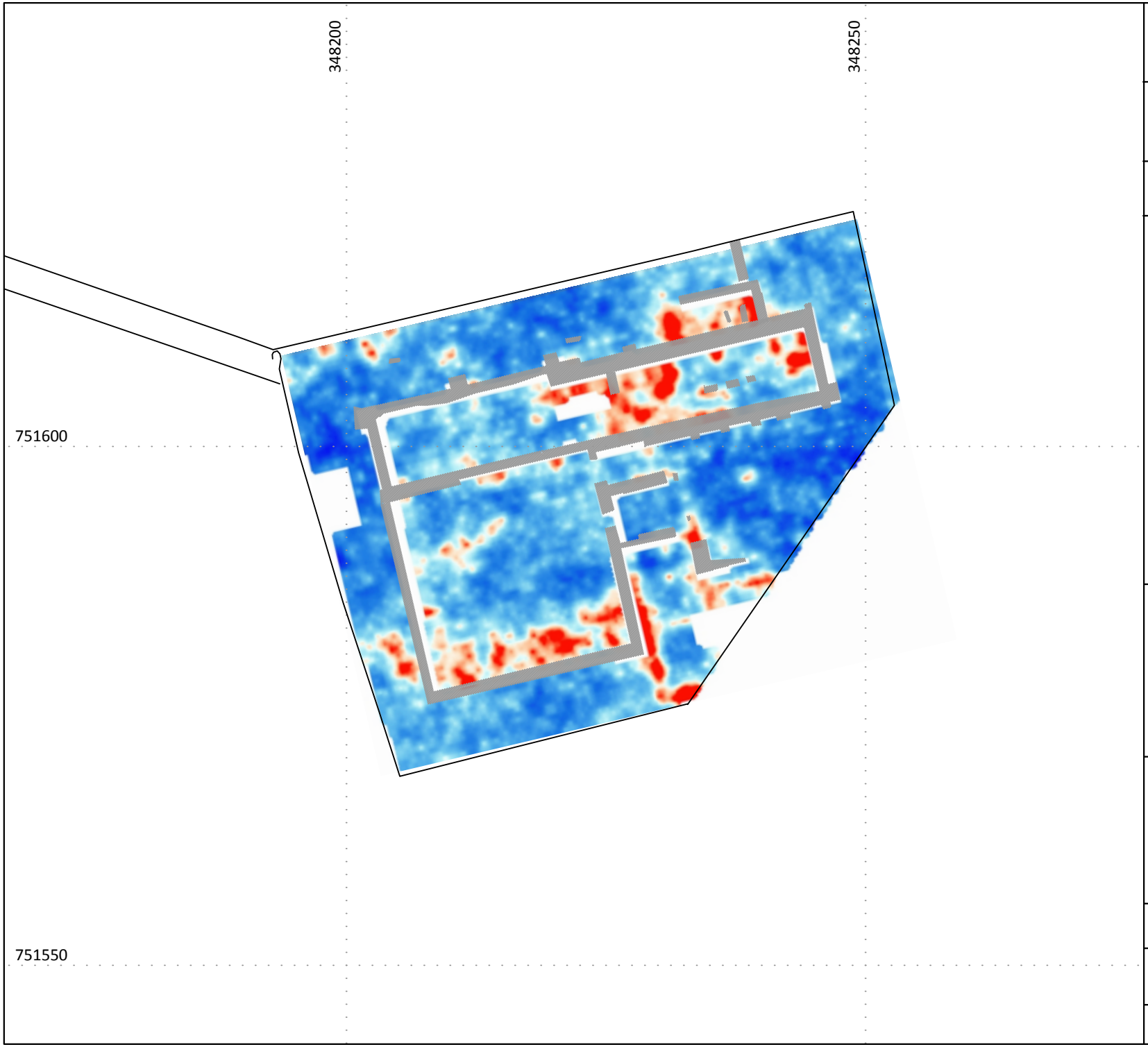
rose geophysics

CLIENT: Graham Funter Foundation

Scale: 1:500 @ A4
Date: 05/06/2019

Revision No: 0
Illustrator: SMO

Figure 20



SITE: Restenneth Priory

SURVEY TYPE: GPR Survey

DATA TYPE: Depth Slice 0.75m - 1.00m

High

Amplitude

Low

0m 20m

rose geophysics

CLIENT: Graham Funter Foundation

Scale: 1:500 @ A4
Date: 05/06/2019

Revision No: 0
Illustrator: SMO

Figure 21

SITE: Restenneth Priory

SURVEY TYPE: GPR Survey

DATA TYPE: Interpretation 0.75m - 1.00m

- Possible Archaeology
- High Amplitude Response
- High Amplitude Trend
- Low Amplitude Trend
- Surface Change
- Ringing of Signal

0m 20m

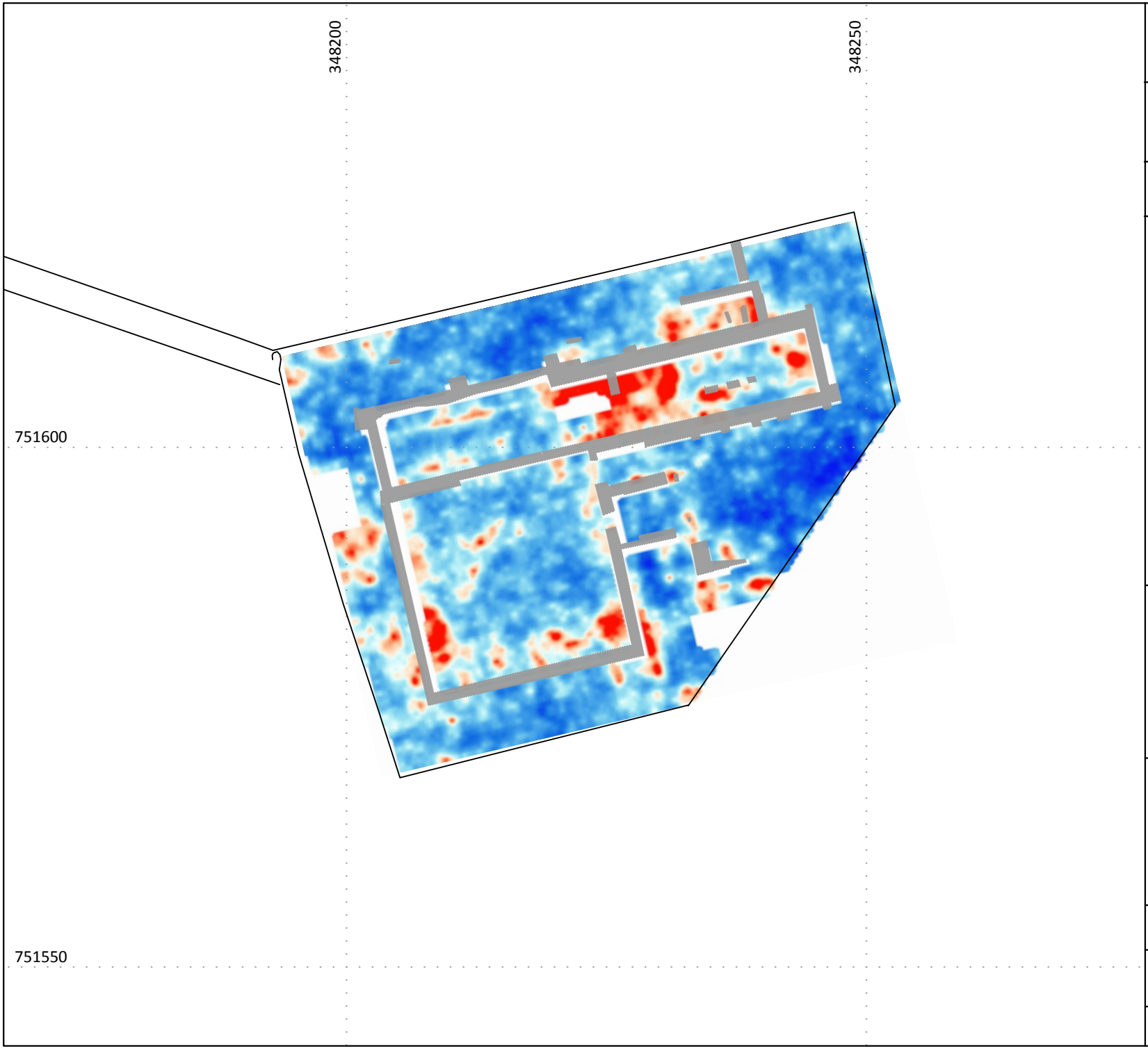
rose geophysics

CLIENT: Graham Funter Foundation

Scale: 1:500 @ A4
Date: 05/06/2019

Revision No: 0
Illustrator: SMO

Figure 22



SITE: Restenneth Priory

SURVEY TYPE: GPR Survey

DATA TYPE: Depth Slice 0.89m - 1.14m

High

Amplitude

Low

0m 20m

rose geophysics

CLIENT: Graham Funter Foundation

Scale: 1:500 @ A4
Date: 05/06/2019

Revision No: 0
Illustrator: SMO

Figure 23

SITE: Restenneth Priory

SURVEY TYPE: GPR Survey

DATA TYPE: Interpretation 0.89m - 1.14m

- Possible Archaeology
- High Amplitude Response
- High Amplitude Trend
- Low Amplitude Trend
- Surface Change
- Ringing of Signal

0m — 20m

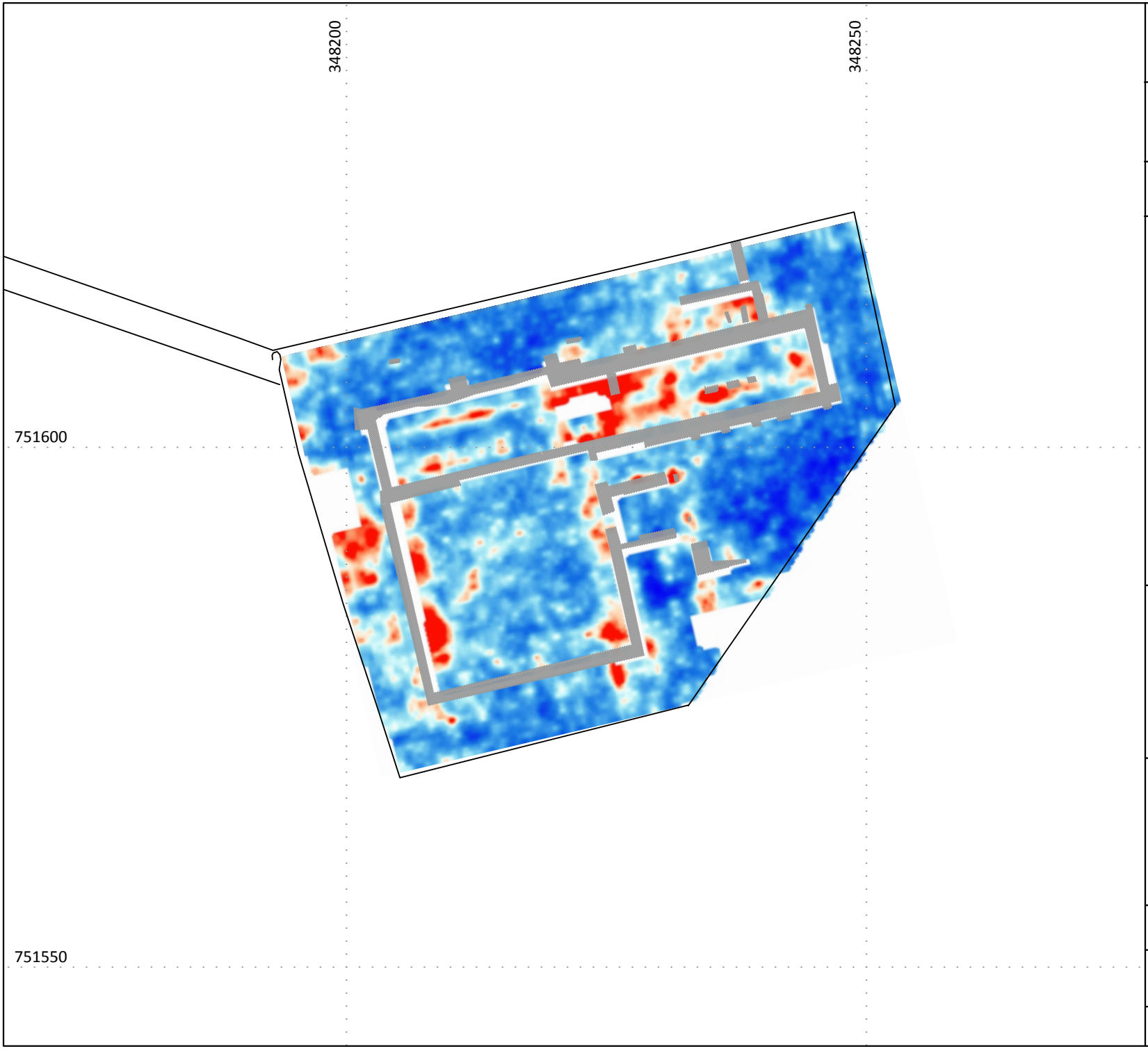
rose geophysics

CLIENT: Graham Funter Foundation

Scale: 1:500 @ A4
Date: 05/06/2019

Revision No: 0
Illustrator: SMO

Figure 24



SITE: Restenneth Priory

SURVEY TYPE: GPR Survey

DATA TYPE: Depth Slice 1.00m - 1.25m

High

Amplitude

Low

0m 20m

rose geophysics

CLIENT: Graham Funter Foundation

Scale: 1:500 @ A4
Date: 05/06/2019

Revision No: 0
Illustrator: SMO

Figure 25

SITE: Restenneth Priory

SURVEY TYPE: GPR Survey

DATA TYPE: Interpretation 1.00m - 1.25m

- Possible Archaeology
- High Amplitude Response
- High Amplitude Trend
- Low Amplitude Trend
- Surface Change
- Ringing of Signal

0m 20m

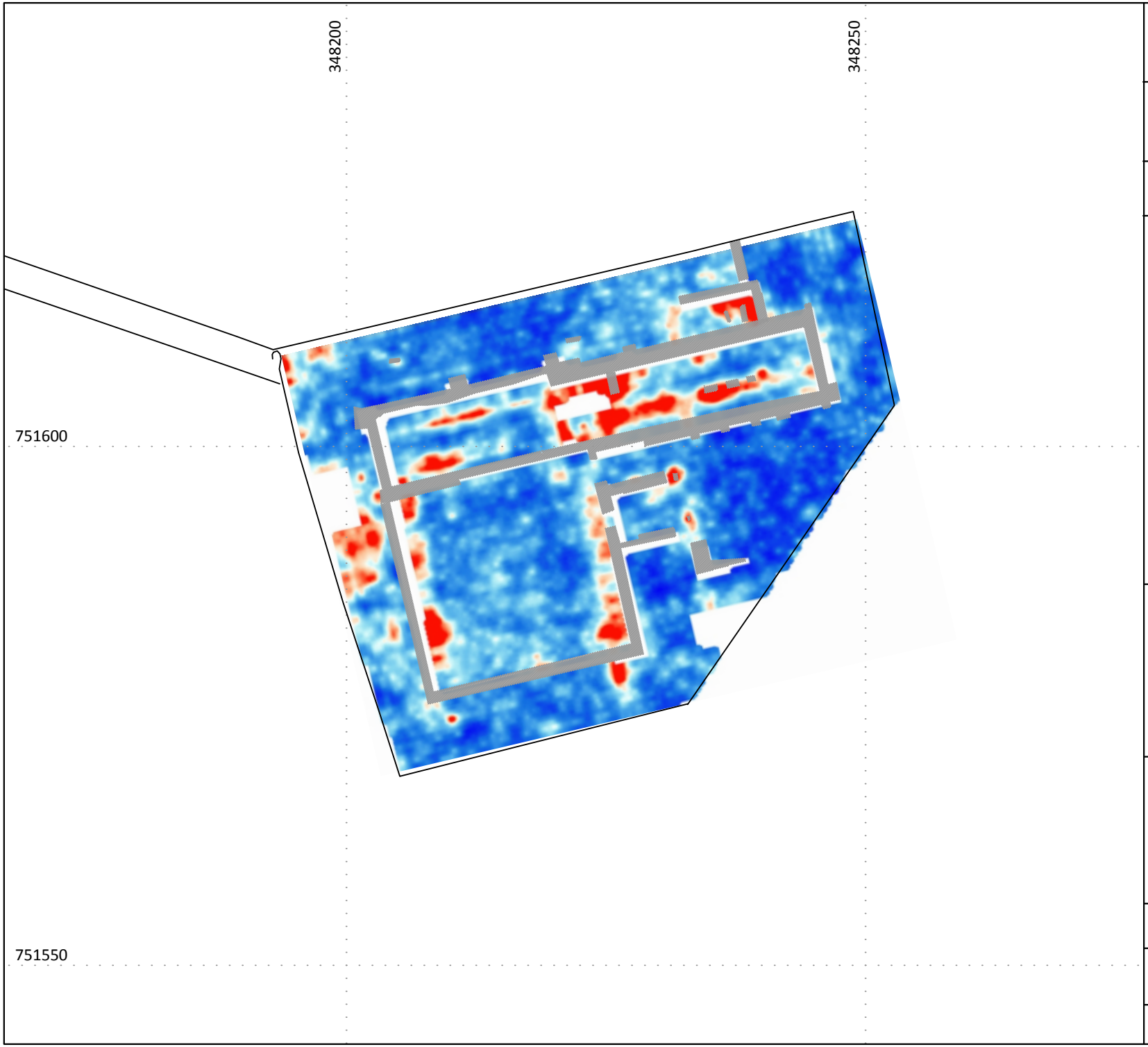
rose geophysics

CLIENT: Graham Funter Foundation

Scale: 1:500 @ A4
Date: 05/06/2019

Revision No: 0
Illustrator: SMO

Figure 26



SITE: Restenneth Priory

SURVEY TYPE: GPR Survey

DATA TYPE: Depth Slice 1.25m - 1.50m

High

Amplitude

Low

0m 20m

rose geophysics

CLIENT: Graham Funter Foundation

Scale: 1:500 @ A4
Date: 05/06/2019

Revision No: 0
Illustrator: SMO

Figure 27

SITE: Restenneth Priory

SURVEY TYPE: GPR Survey

DATA TYPE: Interpretation 1.25m - 1.50m

- Possible Archaeology
- High Amplitude Response
- High Amplitude Trend
- Low Amplitude Trend
- Surface Change
- Ringing of Signal

0m 20m

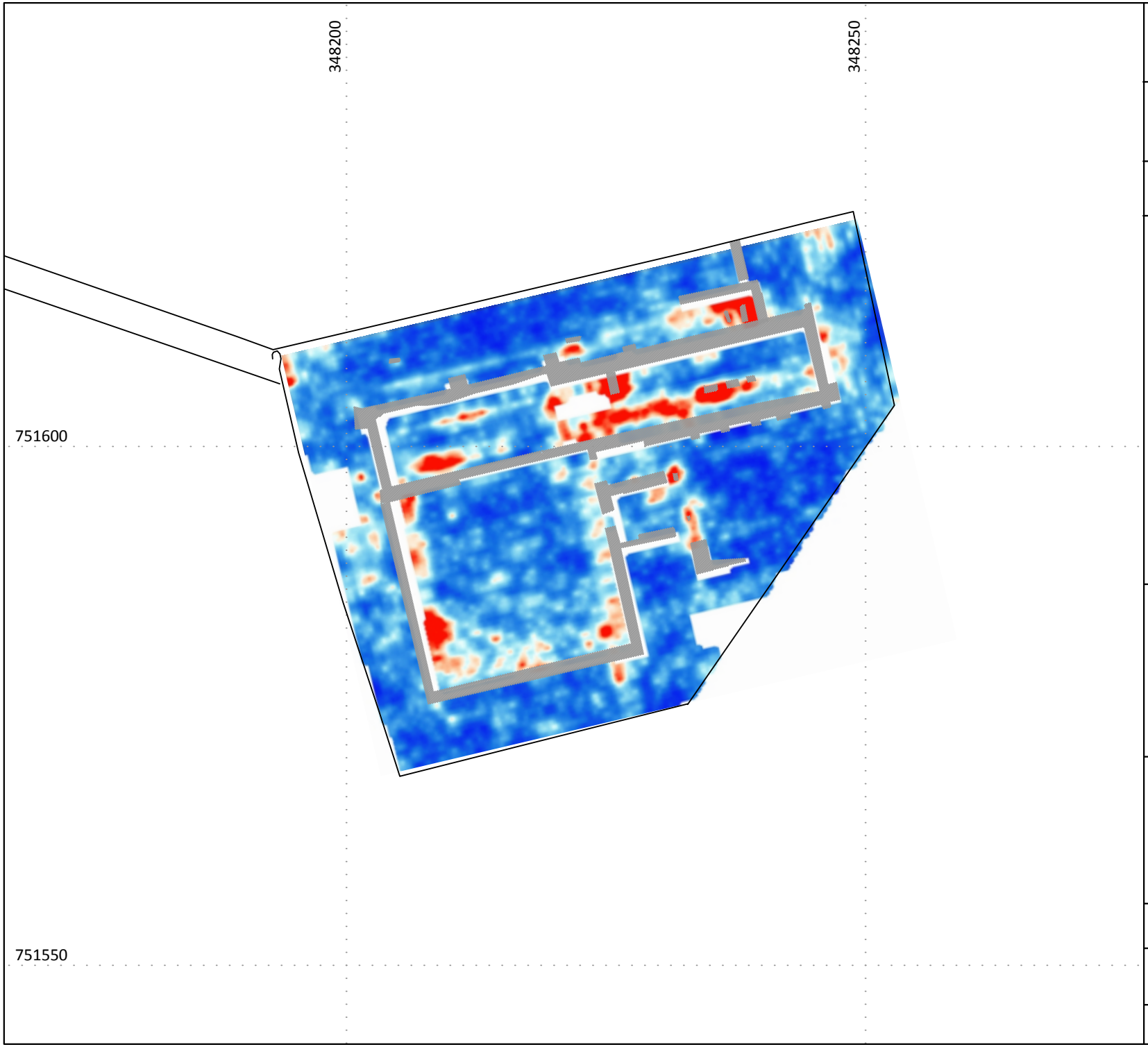
rose geophysics

CLIENT: Graham Funter Foundation

Scale: 1:500 @ A4
Date: 05/06/2019

Revision No: 0
Illustrator: SMO

Figure 28



SITE: Restenneth Priory

SURVEY TYPE: GPR Survey

DATA TYPE: Depth Slice 1.50m - 1.75m

High

Amplitude

Low

0m 20m

rose geophysics

CLIENT: Graham Funter Foundation

Scale: 1:500 @ A4
Date: 05/06/2019

Revision No: 0
Illustrator: SMO

Figure 29

SITE: Restenneth Priory

SURVEY TYPE: GPR Survey

DATA TYPE: Interpretation 1.50m - 1.75m

- Possible Archaeology
- High Amplitude Response
- High Amplitude Trend
- Low Amplitude Trend
- Surface Change
- Ringing of Signal

0m 20m

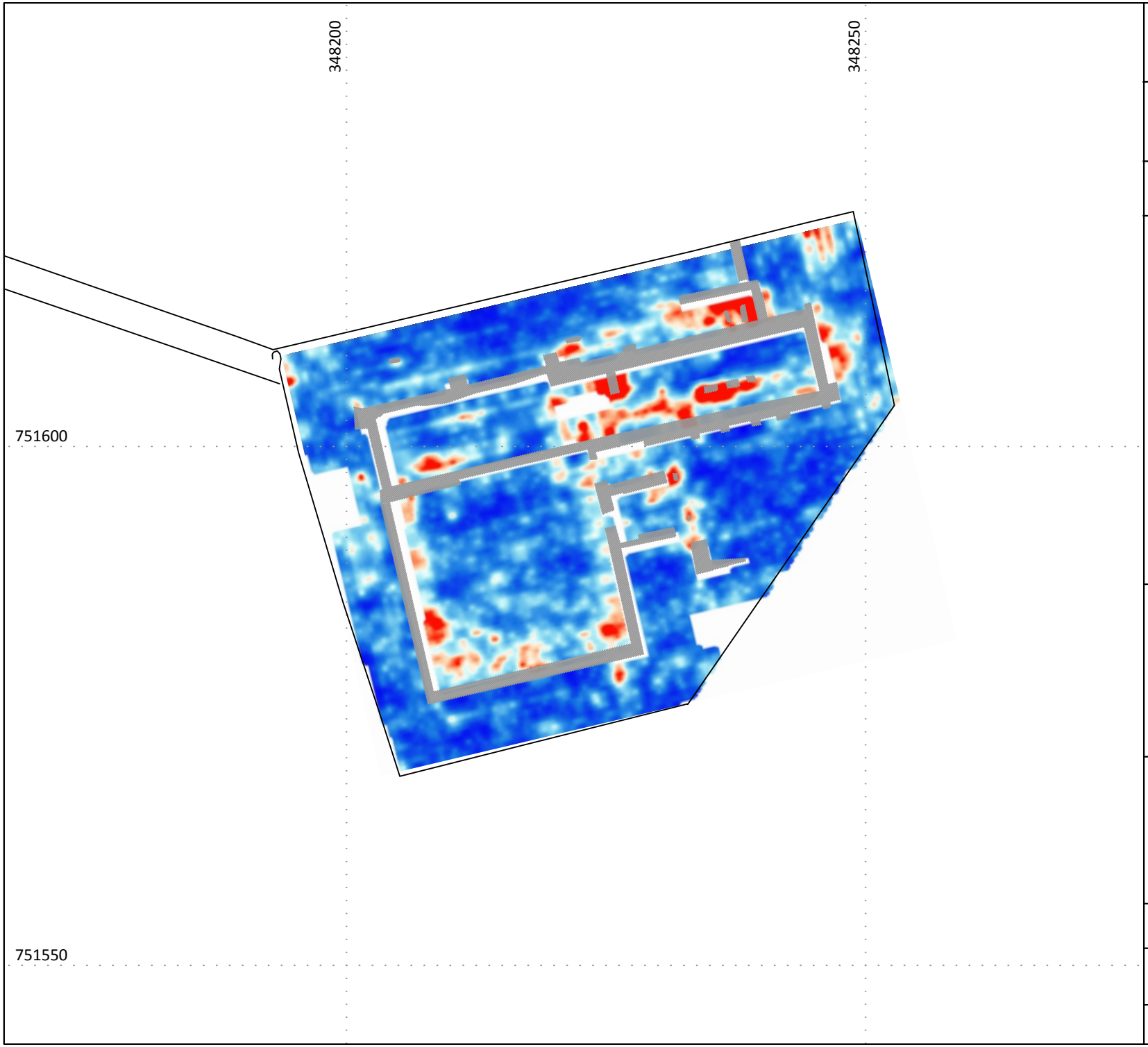
rose geophysics

CLIENT: Graham Funter Foundation

Scale: 1:500 @ A4
Date: 05/06/2019

Revision No: 0
Illustrator: SMO

Figure 30



SITE: Restenneth Priory

SURVEY TYPE: GPR Survey

DATA TYPE: Depth Slice 1.75m - 2.00m

High

Amplitude

Low

0m 20m

rose geophysics

CLIENT: Graham Funter Foundation

Scale: 1:500 @ A4
Date: 05/06/2019

Revision No: 0
Illustrator: SMO

Figure 31

SITE: Restenneth Priory

SURVEY TYPE: GPR Survey

DATA TYPE: Interpretation 1.75m - 2.00m

- Possible Archaeology
- High Amplitude Response
- High Amplitude Trend
- Low Amplitude Trend
- Surface Change
- Ringing of Signal

0m 20m

rose geophysics

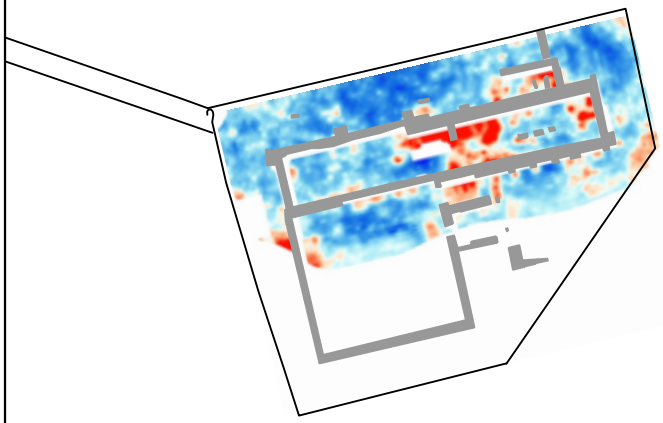
CLIENT: Graham Funter Foundation

Scale: 1:500 @ A4
Date: 05/06/2019

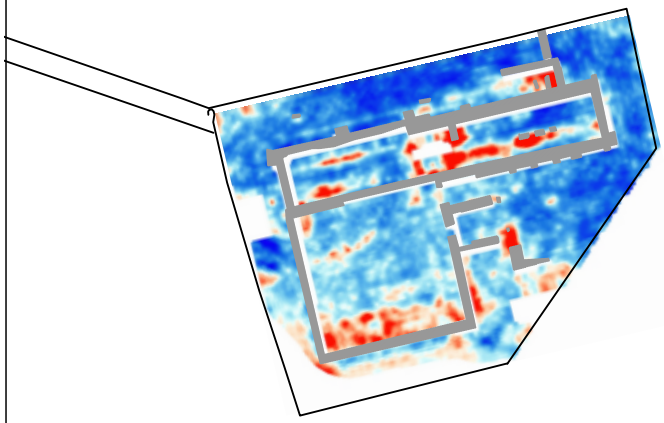
Revision No: 0
Illustrator: SMO

Figure 32

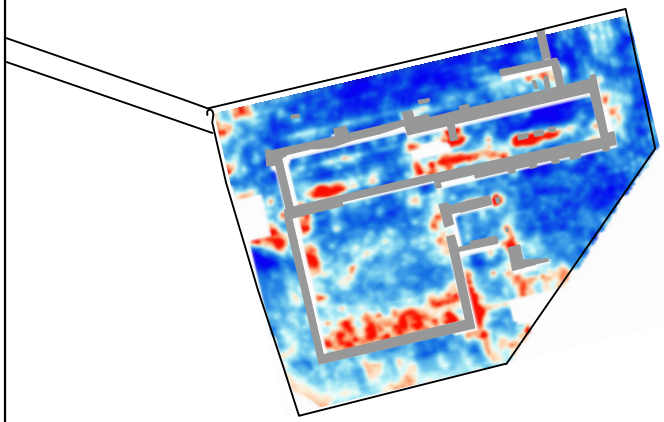
Horizontal Depth Slice: circa 0.9m below datum



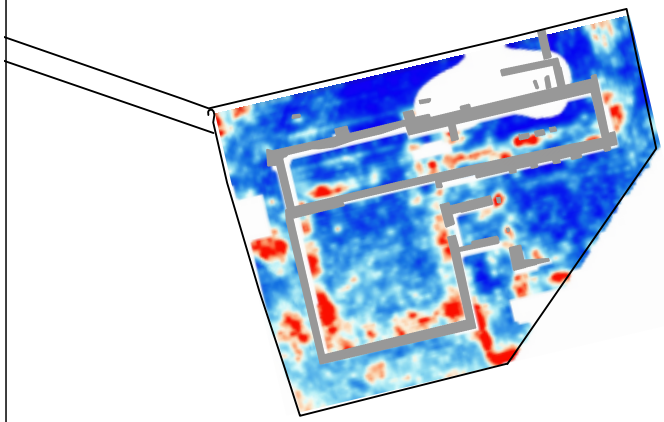
Horizontal Depth Slice: circa 1.5m below datum



Horizontal Depth Slice: circa 1.8m below datum



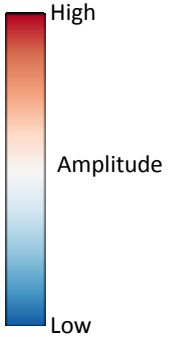
Horizontal Depth Slice: circa 2.0m below datum

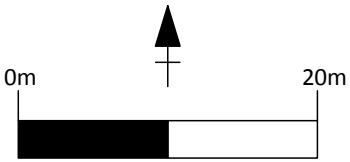


SITE: Restenneth Priory

SURVEY TYPE: GPR Survey

DATA TYPE: Horizontal Depth Slices





rose geophysics

CLIENT: Graham Funter Foundation

Scale: 1:1000 @ A4
Date: 05/06/2019

Revision No: 0
Illustrator: SMO

Figure 33

SITE: Restenneth Priory

SURVEY TYPE: Geophysical Survey

DATA TYPE:Summary Interpretation

- High Resistance: Possible Structure
- Low Resistance: Possible Archaeology
- GPR: Possible Archaeology
- High Amplitude Response
- High Amplitude Trend
- Low Amplitude Trend
- Surface Change

0m 20m

rose geophysics

CLIENT: Graham Funter Foundation

Scale: 1:500 @ A4
Date: 05/06/2019

Revision No: 0
Illustrator: SMO

Figure 34