

SURVEY RESULTS

2000 / 60 Holy Island, Northumberland

1. Survey Areas

- 1.1 Gradiometry, resistance survey and GPR were carried out at The Palace (Palace Field); resistance survey and GPR in the adjacent garden (Palace Garden) (Figures 1 and 6); and gradiometry to the east of the Lindisfarne Abbey (Abbey Field) (Figure 14).
- 1.2 The detailed survey areas were tied in by **Bernard Thomason** of **Time Team** using a Trimble GPS system. Excavation trenches shown on the location figures were also surveyed with the same system.

2. Display

- 2.1 The magnetic and resistance results are displayed as a variety of XY traces, dot density plots and greyscale images at differing scales shown on the individual figures. Interpretation diagrams for each area are also included. Details of the display options are described in the *Technical Information* section at the end of the report.
- 2.2 The GPR results are presented as radargrams and time slice maps. The latter provides a composite view of the data set and enables more subtle reflections to be studied while the individual radargrams provide detail as to the nature and form of individual responses. Figures 7, 10 and 12 shows the data as a series of *timeslices*. This form of display combines the data from all the traverses and provides plan views of the results at different times or depths. In Figures 8-9, 11 and 13 data from individual traverses are displayed as *radargrams*. These are vertical sections through the ground. One vertical axis is in nanoseconds (ns) and indicates the length of time required for the transmitted pulse to travel down to an interface and return to the receiver. This is referred to as a two-way-time. The other vertical axis displays the approximate depth of these reflectors below the surface.
- 2.3 All the GPR data collected are displayed as radargrams in Figures 20 - 24.

3. General Considerations - Complicating factors

- 3.1 Problems were encountered in Palace Field due to old sheds, former flower beds and other areas of concrete/stone that restricted the ground available for survey. They also produced anomalous readings in some of the data.
- 3.2 At Abbey Field electrical interference from buried cables precluded any resistance survey.
- 3.3 Strong electromagnetic contrast often leads to the GPR signal to be inter-reflected or reverberated which causes the reflected signal to be delayed in time. This results in a greater apparent depth than actually exists and as a result it is often not possible to detect the base of features, *i.e.* only the tops of buried features/deposits are detected.

- 3.4 The presence of large amounts of clay, especially where wet, results in a marked attenuation of the radar energy with depth. The conversion from time to depth depends on the velocity of the electromagnetic signal through the ground. This can vary markedly over a small distance and as a result any depth conversion is only an approximation.

4. Palace Field

Gradiometry

- 4.1 The magnetic data are very noisy due to modern ferrous disturbance in the field, for example, corrugated iron, metal posts and lengths of wire. As a consequence anomalies of archaeological interest are likely to have been swamped by the high background magnetic levels.
- 4.2 However, there are clear linear anomalies (1) along the eastern edge of the site that coincide with the line of building foundations. It is uncertain whether the responses are associated with the actual wall foundations or a build up of material outside (possibly a ditch, gully or drain).

Resistance Survey

- 4.3 The results of this survey are difficult to interpret because of the complications referred to above (Paragraph 3.1). It seems likely that the majority of the anomalies in the central area (2) of the survey are the result of modern disturbances; even if archaeological features are responsible, the lack of any clear shape or form in the responses makes archaeological interpretation impossible. Fortunately, the periphery of the site has produced slightly clearer results.
- 4.4 The southern limits of the so-called brewhouse are visible in the data (3). A raised floor level of brick, tile and stone is visible as a high resistance anomaly, but no further detail is discernible. The same is true for the building in the north-west corner of the site. Individual walls are 'lost' in the mass of rubble (4) that is present. It should be noted that the technique is unlikely to have detected any features below half a metre, whereas the GPR survey appears to have been more successful (see below, Area 2).
- 4.5 Along the eastern limits of the field, where a range of different buildings is known to lie, the survey has detected a few linear high resistance readings (5-9) that have been interpreted as walls. Areas of low resistance (10-13) are thought to reflect rooms within these buildings where the near surface deposits are either wetter or lacking in rubble. Other high resistance readings (14-16) probably reflect rubble deposits but again no clear wall lines are apparent.
- 4.6 Trench 2 was positioned in the south-eastern corner of the site; the aim was to investigate the apparent junction of two walls visible on the exterior boundary of the site. Surprisingly, the change between areas of low and high resistance (13 / 14) occurs south of this junction, though excavation confirmed that the geophysical results coincided with an internal wall in this location. However, once again, further archaeological detail is too complex to be interpreted from the resistance data.
- 4.7 Trenches 5 and 7 were not positioned on the basis of the resistance data though it has been beneficial to analyse the geophysical results in light of the excavation evidence. There is some correlation between stone slabs and a ditch found in Trench 5, but the resistance results are not particularly informative. Similarly in Trench 7 although the low resistance (17) clearly coincides with the natural clayey deposits, smaller archaeological features were beyond the resolution of the sampling interval employed (*i.e.* 1m intervals).

GPR Area 1

- 4.8 All the radargrams from this area show a wealth of reflections of possible archaeological interest. The most prominent responses and those which (when viewed in conjunction with the time slice maps) suggest possible substantial features are highlighted and discussed.
- 4.9 In the north-western corner of the shallow time slices, 0-10ns and 10-20ns, there is a suggestion of a linear feature (A). Such near surface features are difficult to see in individual radargrams which is why time slice maps are useful. However, in Radargram 41 a suggestion of the response (A) is visible in this area. Whatever the nature of this feature it is very near surface, and while it is on the same alignment as the anticipated features it does not extend to any depth.
- 4.10 Also apparent in the 10-20ns time slice map is a broad area of high amplitude responses (B). The lack of any clear form to these reflections suggest some sort of surface, as suggested in Radargram 27 (Figure 8). More discrete areas of high amplitude (C) are visible in the southern portions of this time slice which may be of interest.
- 4.11 Within the 20-30ns time slice the most apparent anomaly is a region of attenuation (D), *i.e.* a lack of any strong reflections. This is still visible in the 30-40ns time slice. Attenuation of the signal is caused by an increase in the moisture content of the material, such as a greater clay content. This zone indicates a change in the subsurface material, while its form suggests a possible ditch. Radargram 4 shows a generally quiet data set in the west with stronger reflection in the east. Immediately to the north and west of this low attenuation zone there is a coherent region of strong reflections (E) also visible in the 20-30ns and 30-40ns time slice maps. An example of these reflection can be seen in Radargram 6 (Figure 9). Substantial reflections (E) are apparent near the eastern limit of the radargram. It is possible that the feature at (D) is a foundation trench with the responses at (E) indicating an associated surface. It is possible that the postulated surface (E) could extend over much of the area, but is most clearly defined in this south-western corner.
- 4.12 Within the 20-30ns and 30-40ns time slice maps there is a suggestion of a linear feature in the data, indicated by arrows on Figure 7. This appears to correlate with the edge of the known buildings.
- 4.13 Within the 30-40ns and 40-50ns time slice there is a suggestion of a linear feature (F). The reflections suggest a substantial feature, possibly a wall, at about 1.5m below the ground possibly extending to a depth of 2.5m. There is still evidence for this feature in the 50-60ns time slice. The feature shows well in several of the radargrams especially 24 and 16 (Figure 9). The response in the former is shallower than that in radargram 16 which explains the changing lateral extent of the feature in the time slice maps.
- 4.14 It is interesting to note that the area of strong reflection (B) visible in the 10-20ns time slice maps changes to an area of weak reflections (G) in the 30-40ns map and starts to reappear as a discrete zone of higher amplitude responses in the 50-60ns time slice maps. Within radargram 24 two sets of reflections suggesting the two possible surfaces are apparent.

GPR Area 2

- 4.15 The individual radargrams from this area are dominated by a zone of strong reflections in the western half of the traverse extending to a possible depth of 2m, as indicated in radargram 7 (Figure 11). The concentration of these reflections is particularly apparent in the 40-50ns and 50-60ns maps. There is some evidence for structure within the zone of reflections in the west. For example, Radargram 2, suggests a possible structure (H) which can also be seen in the radargrams to the north and south. This feature is visible in the time slice maps for 20-30ns and 30-40ns (H) and suggests a possible wall line as indicated by the arrows on the time slice maps. Within the time slices there is evidence for other possible features but the lack of any form makes interpretation difficult.

5. Palace Garden

- 5.1 Apart from a few poorly defined resistance responses that are likely to reflect made-up ground below the lawn there are no suggestions of any obvious structures in the resistance data. However, the technique is unlikely to be seeing more than 1 metre below the surface.
- 5.2 The GPR data from this area is relatively quiet with few striking reflections being apparent within the radargrams. This is borne out by the time slice maps which do not suggest any coherent features (Figure 12).
- 5.3 Radargram 15 shows the uniform nature of the responses within this area (Figure 13). There are some near surface reflections but these are likely to be natural or the result of minor landscaping within the garden.

6. Abbey Field

- 6.1 On day 3 of the television programme, following consultations between Time Team, English Heritage and the County Archaeologist, it was decided to investigate the field that lies immediately east of Lindisfarne Abbey.
- 6.2 In the first instance resistance survey was attempted but constantly fluctuating readings showed that buried power cables were likely to be in the vicinity. Subsequent enquiries indicated that an electricity cable and telecommunications cable traversed across the survey area. No resistance work was possible, but fortunately the gradiometer was not affected by these services, so a sample block was investigated.
- 6.3 The results indicate two modern features: an existing hardcore footpath (18) and a ferrous pipeline / manhole cover (19). An area of disturbance (20) equates with a former boundary (S Ainsworth *pers. comm.*).
- 6.4 Bands of negative and positive anomalies (21) are thought to be natural in origin.
- 6.5 Elsewhere are numerous anomalies (*e.g.* 22 –24) including short ditch lengths, pit like responses and other presumed cut-features. These all have archaeological potential though there are suggestions that they may be aligned differently to the monastic remains.

7. Conclusions

- 7.1 The magnetic results from the Palace Field are very noisy, although there are linear anomalies along the eastern perimeter of the site that appear to equate with the surviving wall foundations. Similarly, despite problems associated with recent garden features, the resistance survey has identified several areas of interest that are associated with foundations and rubble spreads / paving.
- 7.2 The GPR surveys in the Palace Field have located many responses of possible archaeological interest. Within the main survey area, Area 1, there is evidence for possible walls, floors and other discrete reflections which may be of archaeological interest. The data from Area 2 suggest evidence for a possible wall which correlates well with the extant remains.

- 7.3 In the Palace Garden the resistance survey has identified areas of high readings but no clear anomalies indicative of structures within the top metre. The GPR survey has failed to identify any clearly defined reflections within the area surveyed. A few near surface reflections are apparent but these most likely relate to minor landscaping/garden features.
- 7.4 To the east of the Abbey, resistance survey proved impossible due to the presence of a high voltage electricity cable and telecommunications services. Magnetic survey was less affected by these and succeeded in identifying a complex of anomalies of archaeological interest.

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Project Assistants: Dr C Gaffney, Dr S Ovenden, F Robertson and A Shields
Date of Survey: 16th –18th June 2000
Date of Report: 8th August 2000

References:

- Fraser, R 2000. *Project Design for The Palace, Holy Island*. Unpublished
- Ryder, P 2000. *The Palace, Holy Island: A Provisional Archaeological Assessment*. Unpublished Report
- SSEW 1983. *Soils of England and Wales. Sheet 1, Northern England*. Soil Survey of England and Wales.

SITE SUMMARY SHEET

2000 / 60 Holy Island, Northumberland

Location, geology and topography

Three sites on Holy Island were investigated geophysically; one at The Palace and one in an adjacent garden, the third to the east of Lindisfarne Abbey. The first site was a partially overgrown field with a few former paths and stone-lined flower beds; the second site comprised a lawn and the third an area of level grassland on a promontory overlooking the harbour. The soils are slowly permeable, seasonally waterlogged reddish fine loamy over clayey, fine loamy and clayey soils of the Salop (711m) Association (SSEW, 1983).

Archaeology

Background information on The Palace is summarised in a number of articles and documents (Fraser *et al* 2000 and Ryder 2000). The site is a Scheduled Ancient Monument, as are the Abbey and grounds; permission to carry out the surveys was granted by Kate Wilson of English Heritage.

Aims of Survey

At The Palace it was hoped that a range of geophysical techniques would help with the identification of archaeological features and provide an indication of the depth of deposits. This information would assist with the location and planning of the excavation trenches. The area to the east of the Abbey was surveyed in an attempt to gain a better understanding of the archaeology surviving close to the monastic complex. The work formed part of a **Time Team** investigation into the sites on behalf of **Channel 4** television.

Summary of Results

Although the magnetic results from The Palace Field are very noisy, there are linear anomalies along the eastern perimeter of the site that appear to equate with the surviving wall foundations. Similarly, despite problems associated with recent garden features, the resistance survey has identified several areas of interest that are associated with foundations and rubble spreads / paving. The GPR survey has located many responses of possible archaeological interest within the main survey area, Area 1. There is evidence for possible walls, floors and other discrete reflections which may be of archaeological interest. Within Area 2 there is evidence for a possible wall which correlates with the extant remains.

In the garden adjacent to The Palace the resistance survey has identified areas of high readings but no clear anomalies indicative of structures within the top metre. Similarly, the GPR survey has failed to identify any clearly defined reflections within the area surveyed. A few near surface reflections are apparent but these most likely relate to minor landscaping/garden features.

To the east of the Abbey, resistance survey proved impossible due to the presence of a high voltage electricity cable and telecommunications services. Magnetic survey was less affected by these and succeeded in identifying a complex of anomalies of archaeological interest.

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Palace Field and Garden

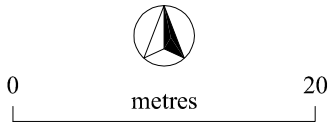
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Abbey Field

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Figure 24	Palace Garden: GPR Data	nts



GSB PROSPECTION
PROJECT: 2000/60 HOLY ISLAND
TITLE: Location Diagram
Based on a plan supplied by Time Team

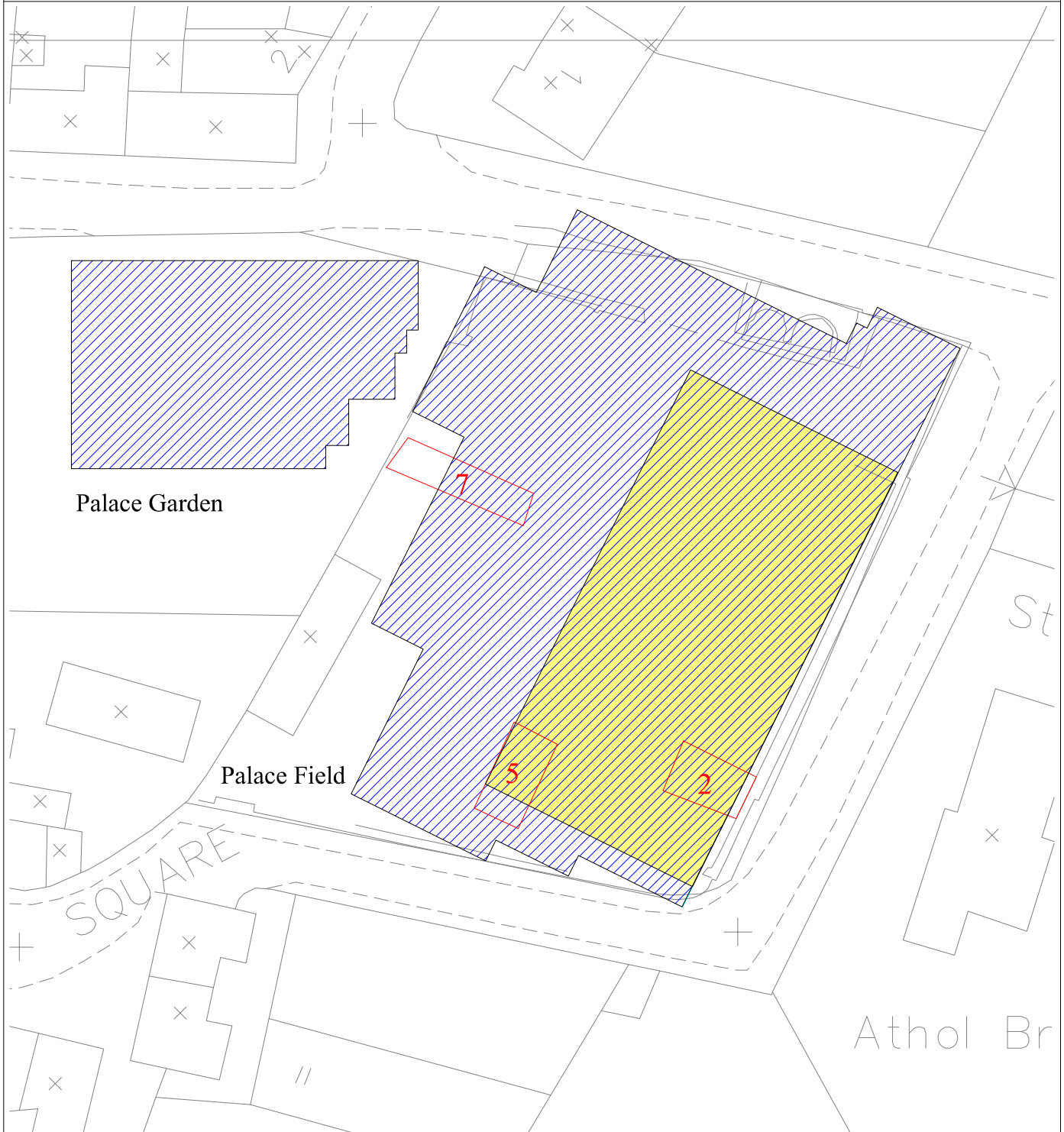


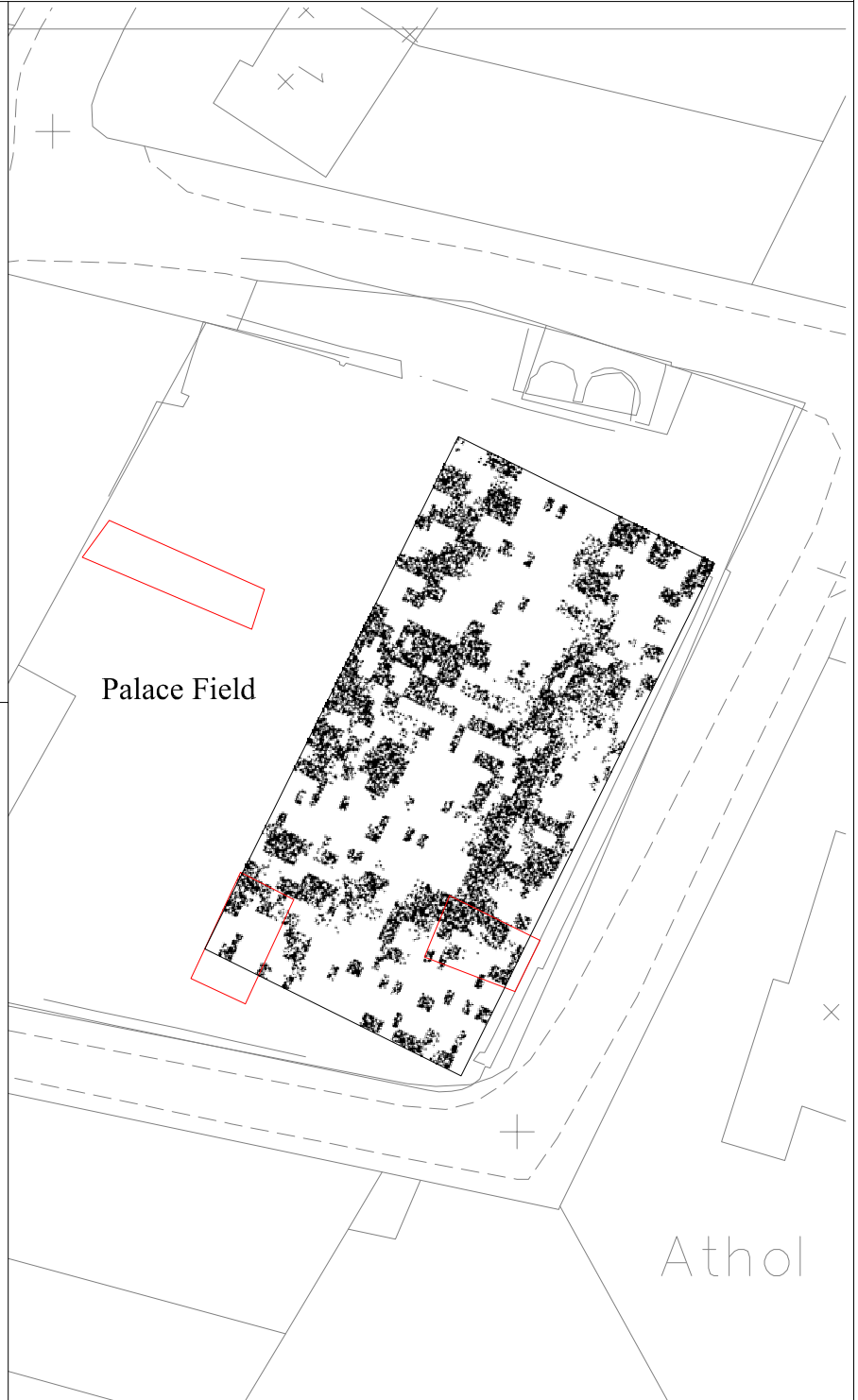
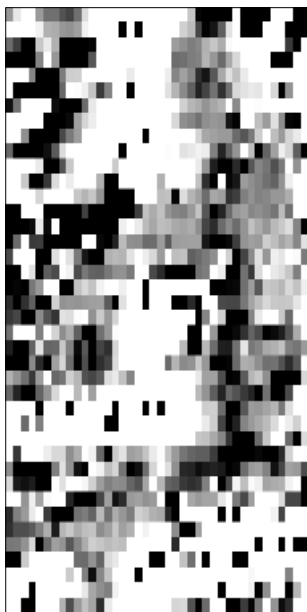
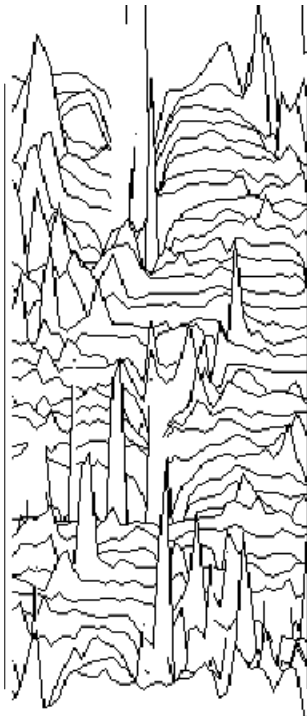
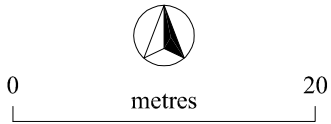
Figure 1

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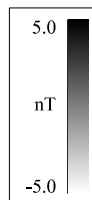
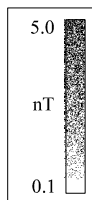
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TITLE: Magnetic Data

Based on a plan supplied by
Time Team



25 nT / cm



 Trenches

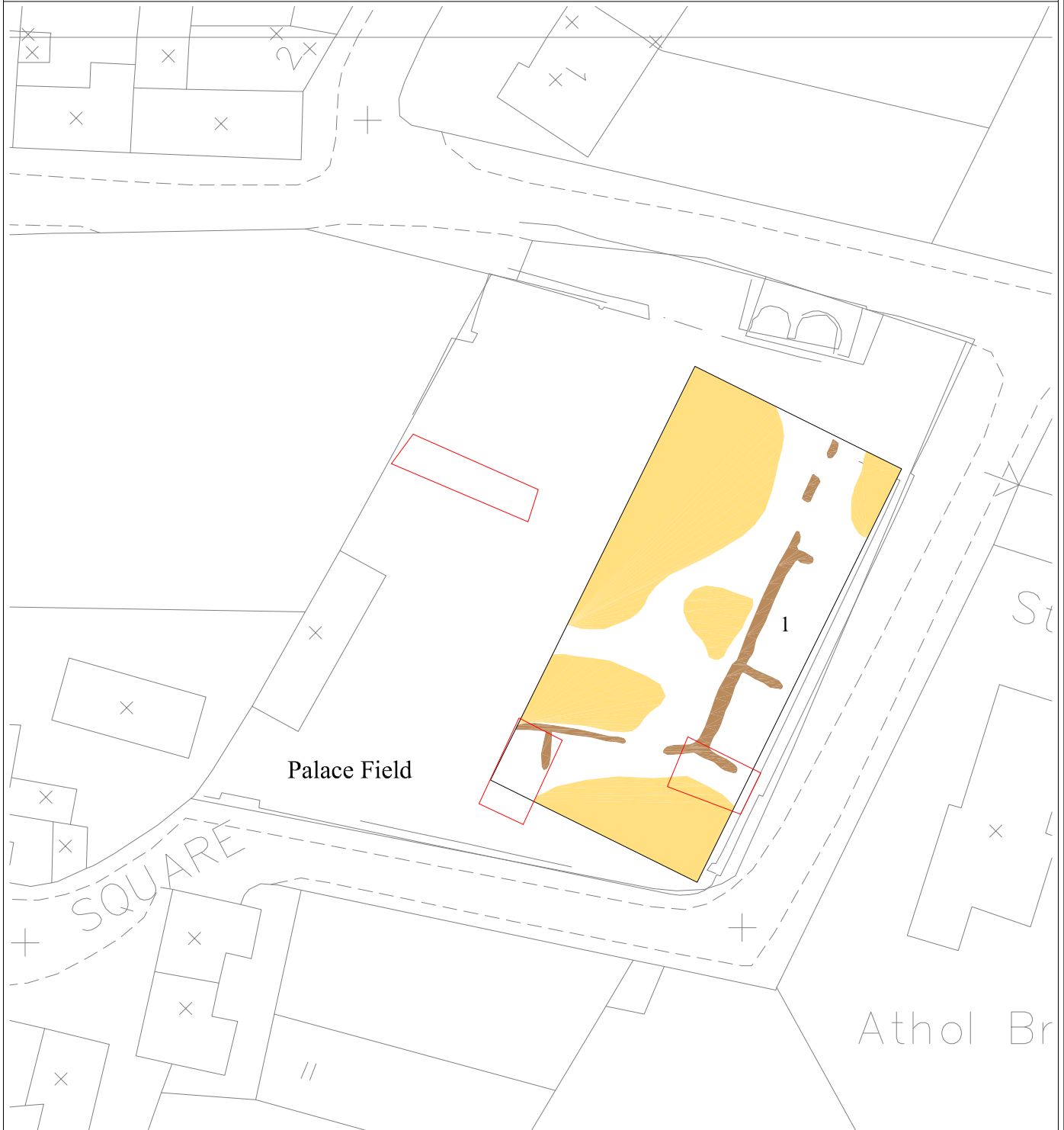
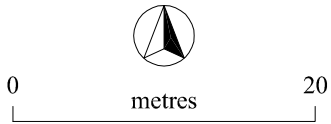
Figure 2

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TITLE: Magnetic Interpretation

Based on a plan supplied by
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Archaeology



Ferrous



Trenches

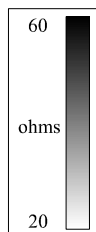
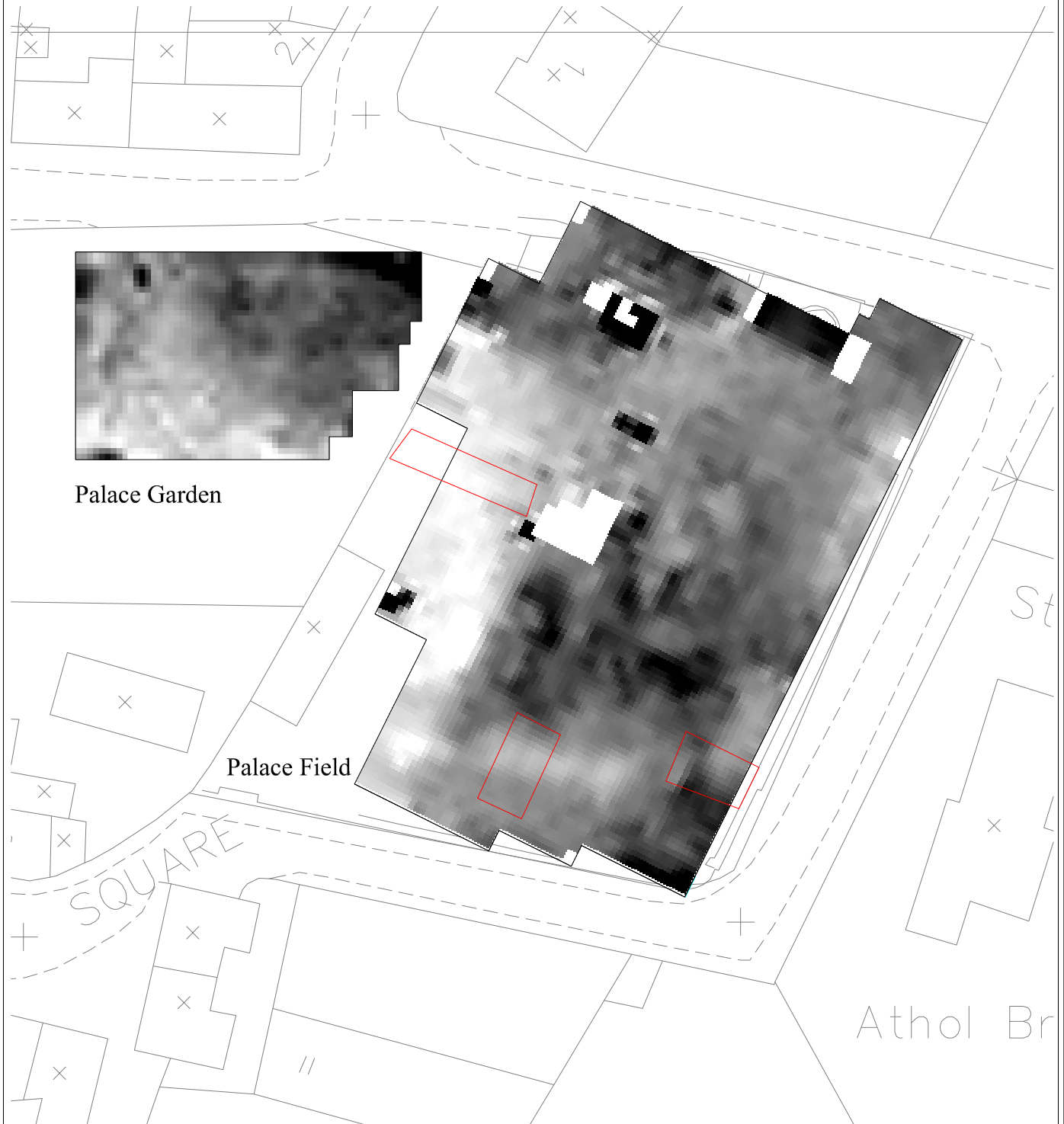
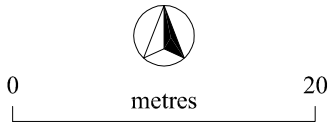
Figure 3

GSB PROSPECTION

PROJECT: 2000/60 HOLY ISLAND

TITLE: Resistance Data - Greyscale

Based on a plan supplied by
Time Team



 Trenches

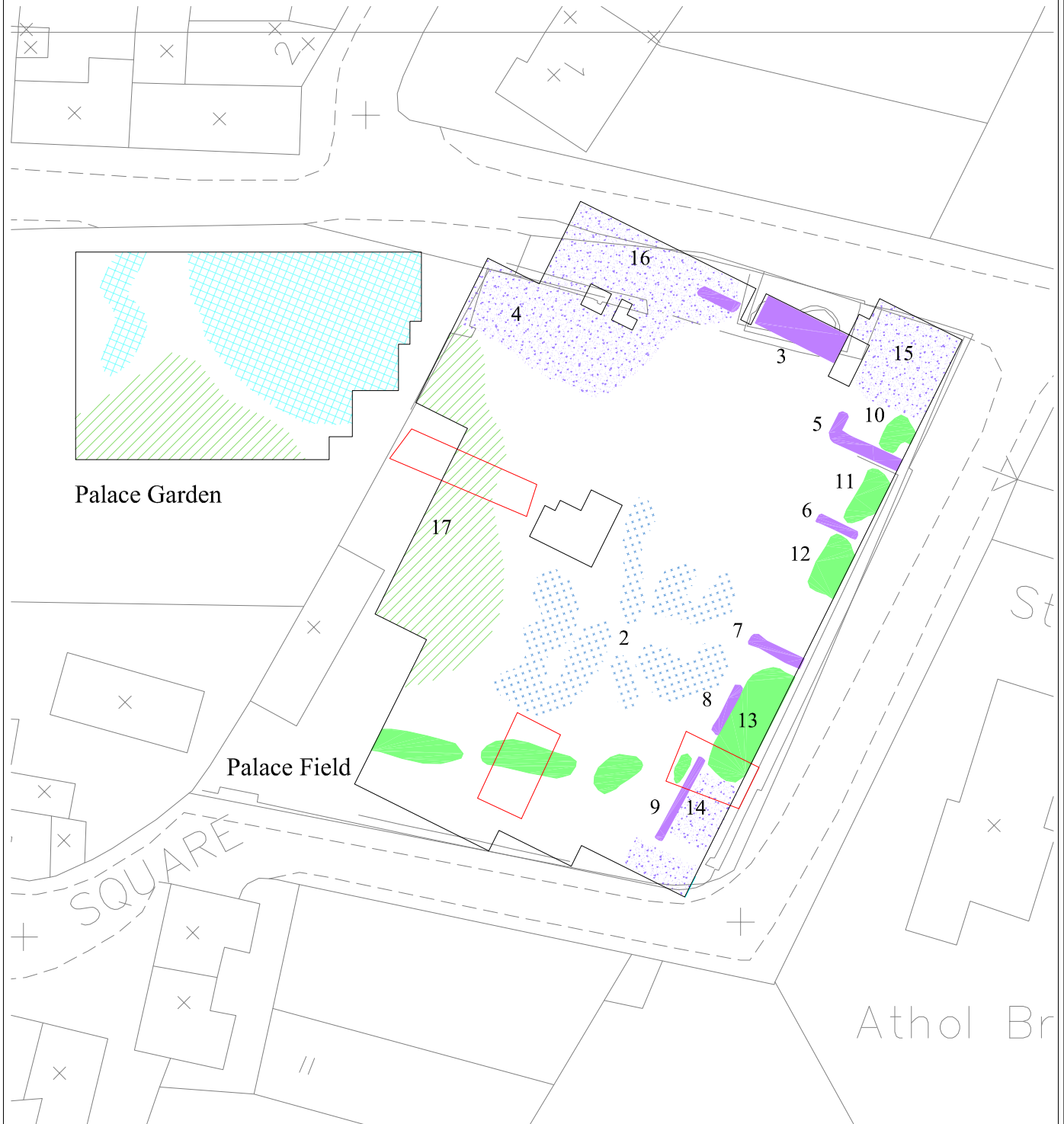
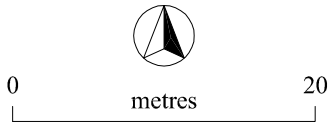
Figure 4

GSB PROSPECTION

PROJECT: 2000/60 HOLY ISLAND

TITLE: Resistance Data - Interpretation

Based on a plan supplied by
Time Team



High Resistance -
?Wall

High Resistance -
?Garden

Low Resistance -
?Archaeology

High Resistance -
?Rubble

High Resistance -
?Natural/Landscaping

Low Resistance -
?Natural/Landscaping

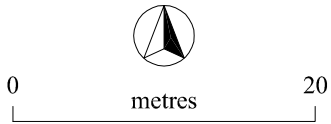
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GSB PROSPECTION

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TITLE: Location of Radar Traverses

Based on a plan supplied by
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Radar Traverses

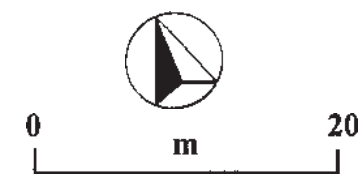
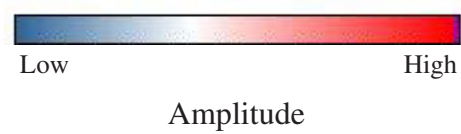
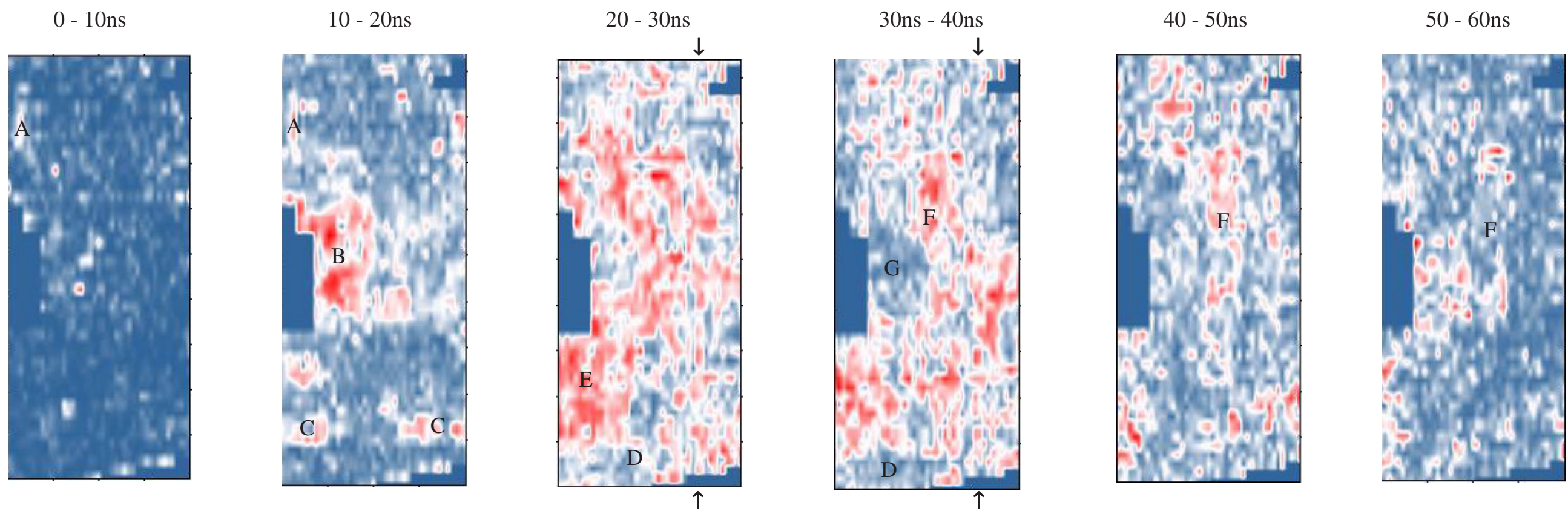


Trenches

Figure 6

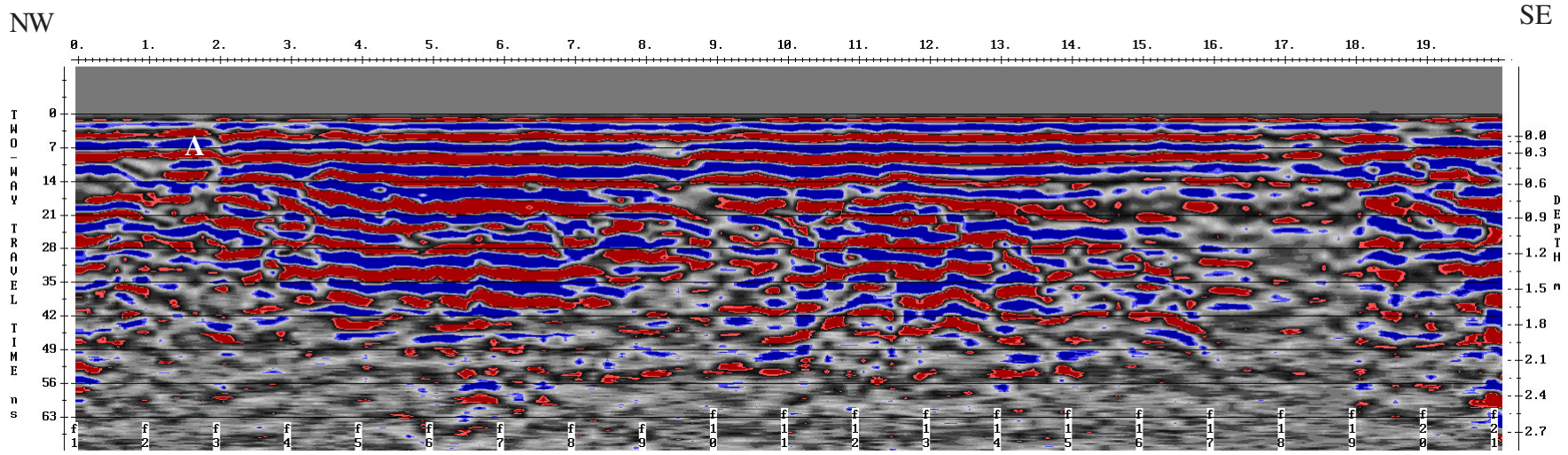
HOLY ISLAND Palace Field Area 1

Time Slice Maps

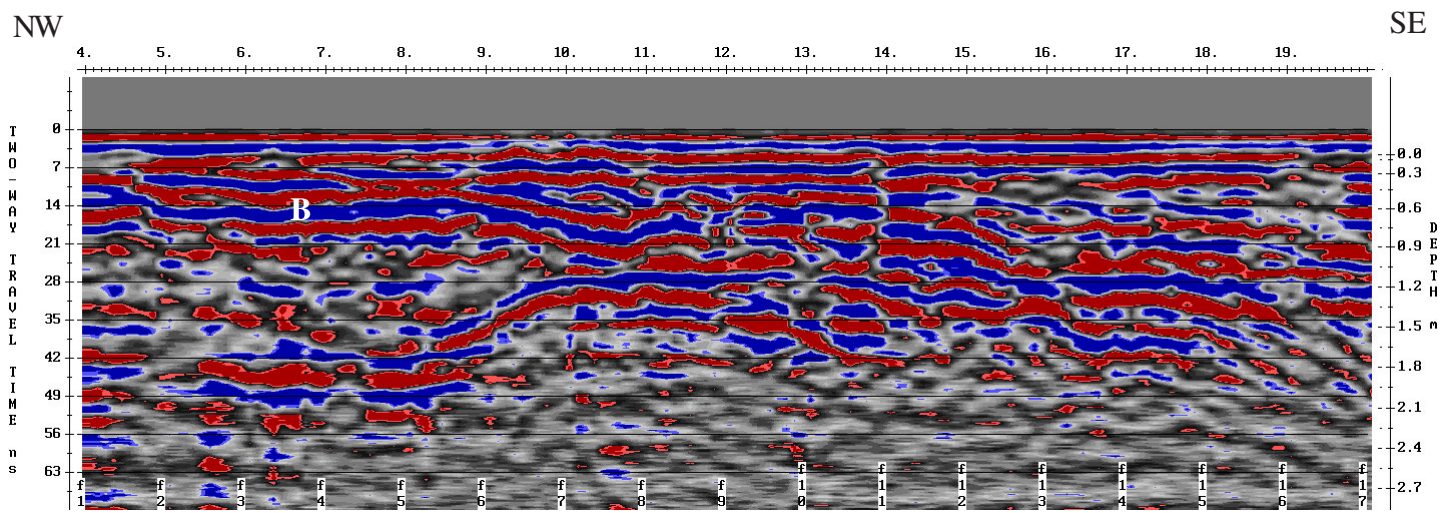


HOLY ISALND Palace Field Area 1

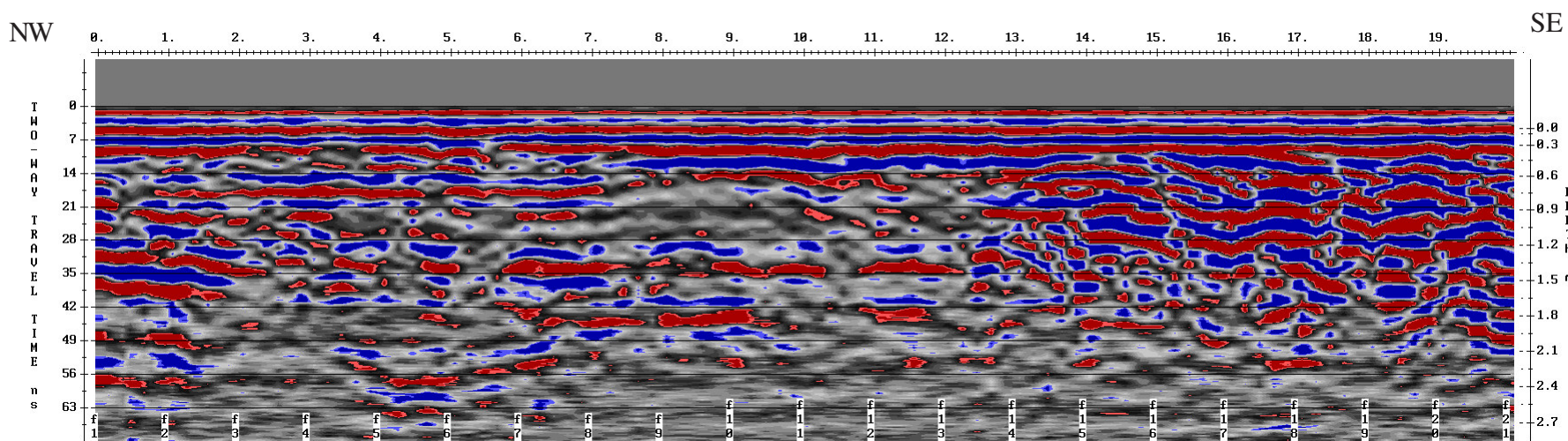
Radargram41



Radargram 27

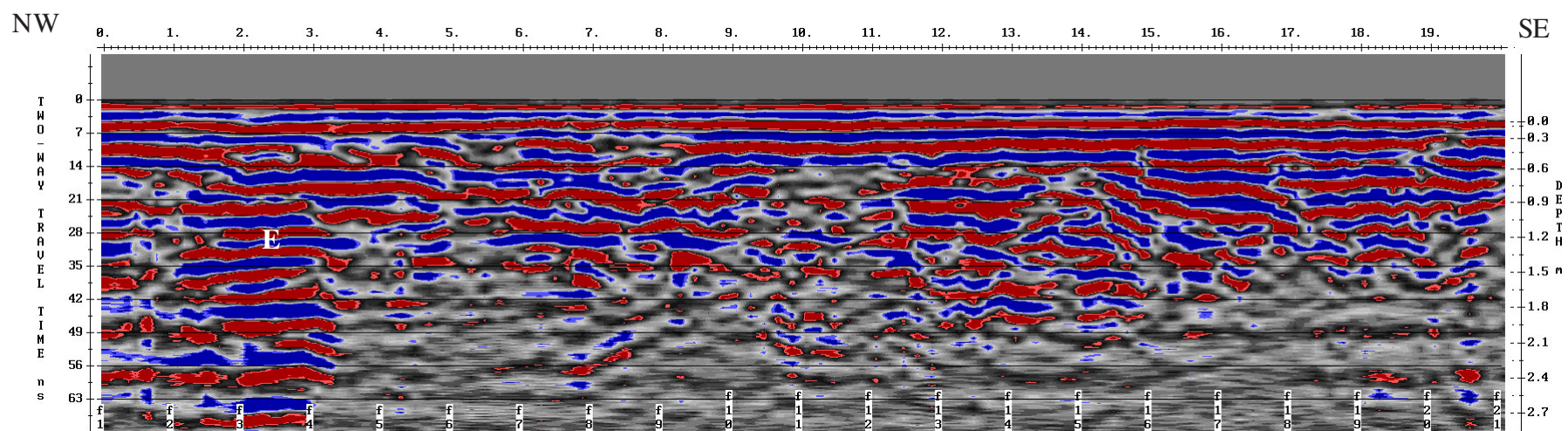


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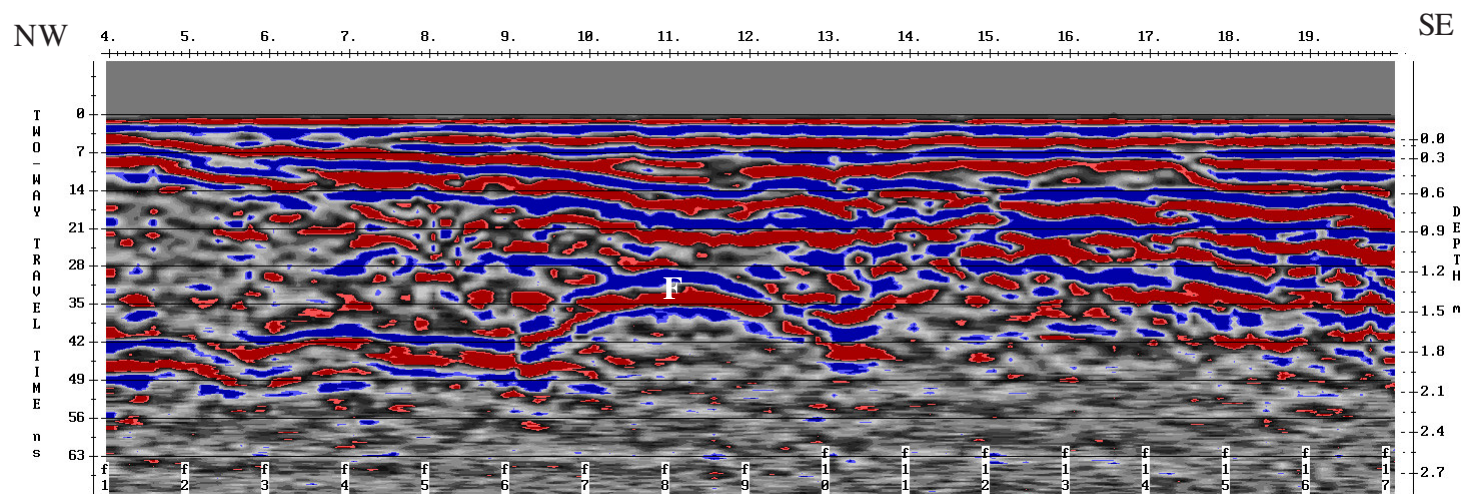


HOLY ISLAND Palace Field Area 1

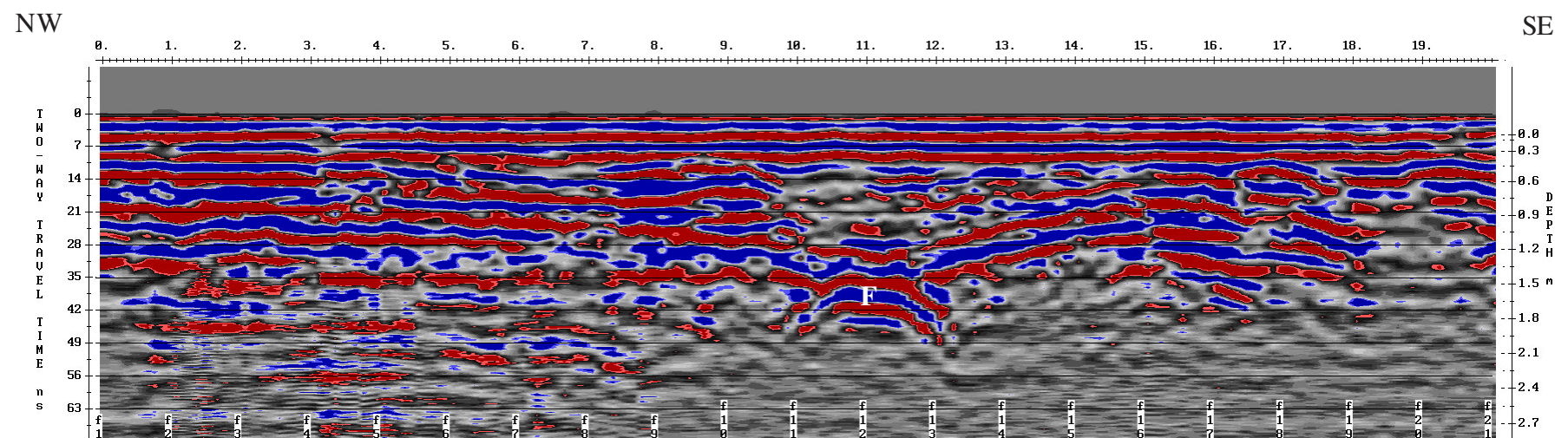
Radargram 6



Radargram 24



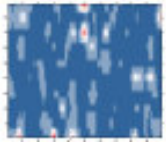
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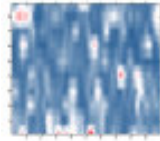
HOLY ISLAND Palace Field Area 2

Time Slice Maps

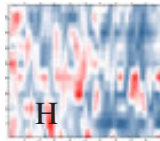
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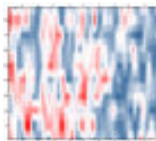
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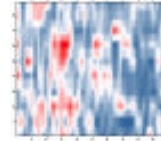
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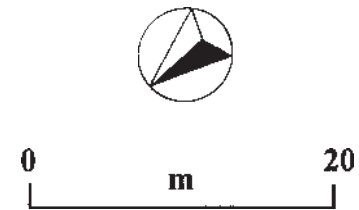
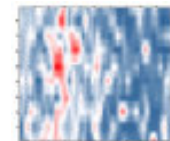
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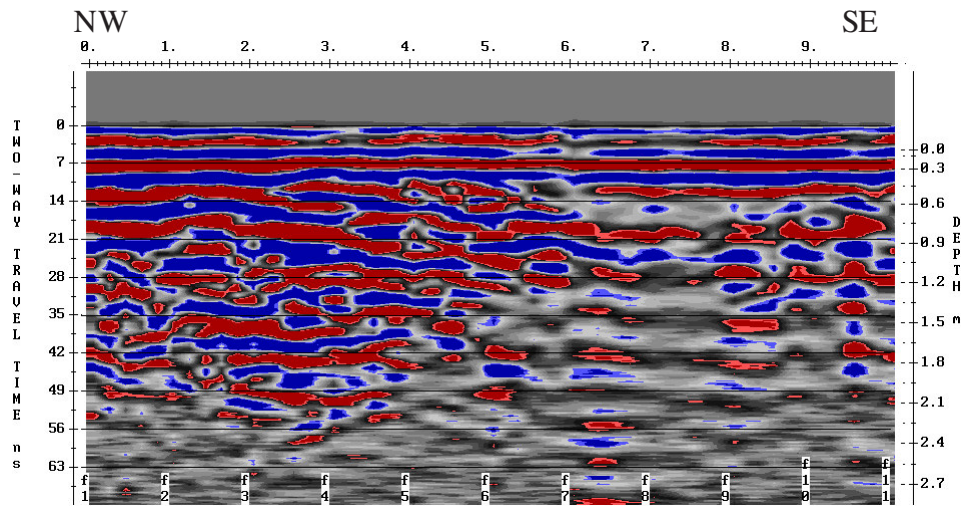


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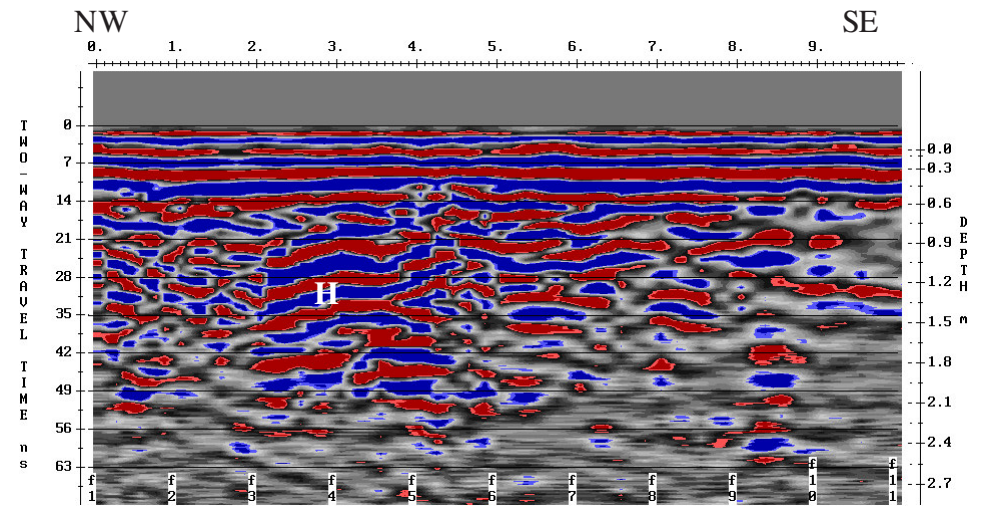


HOLY ISLAND Palace Field Area 2

Radargram 7

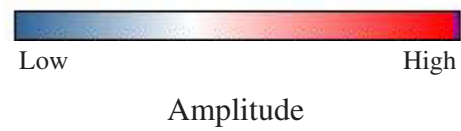
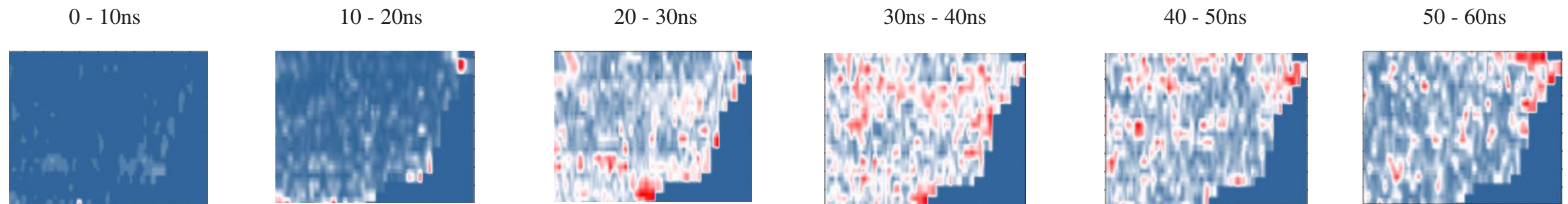


Radargram 2



HOLY ISLAND Palace Garden

Time Slice Maps

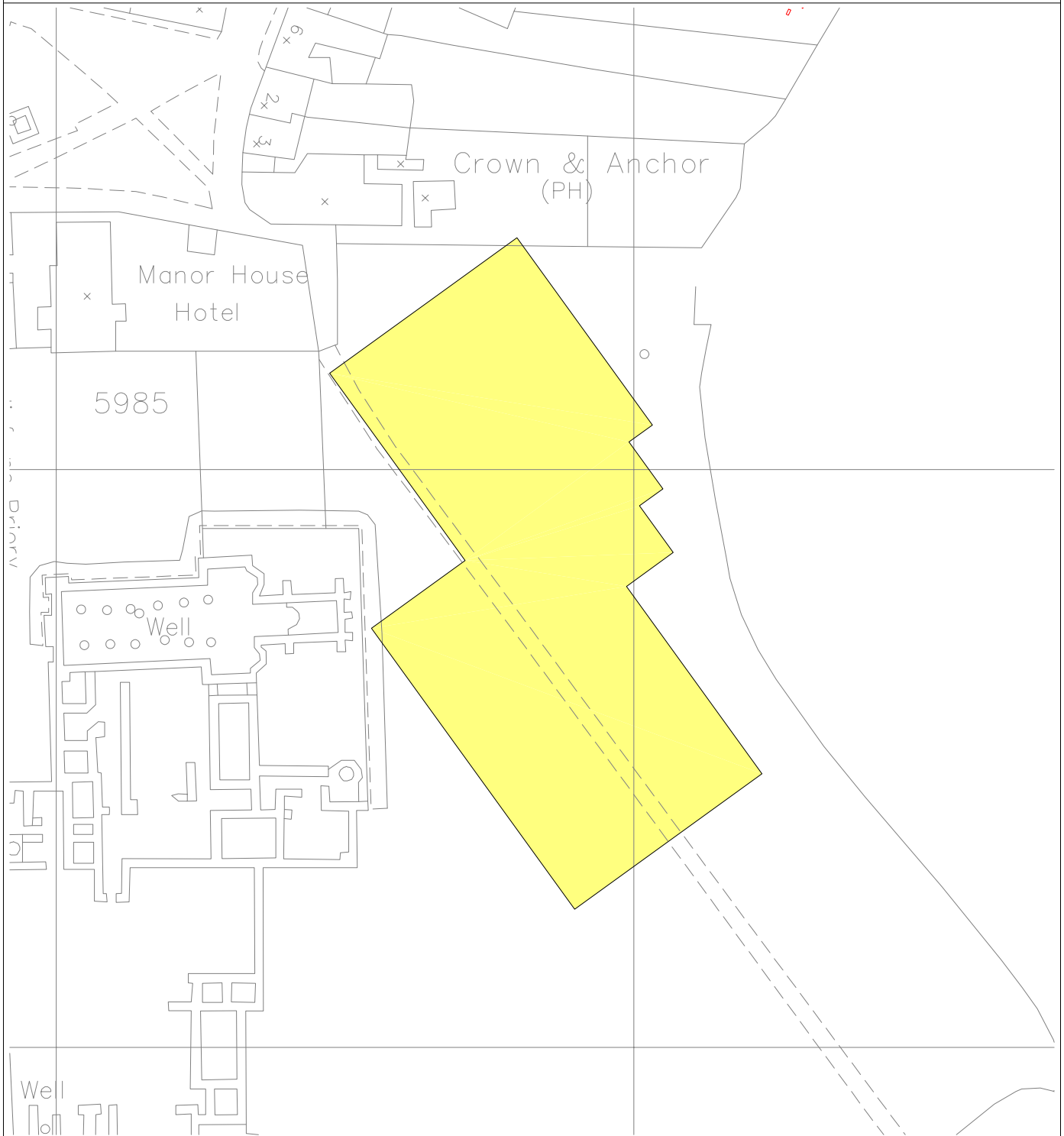
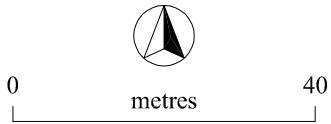


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TITLE: Abbey Field Location Diagram

Based on a plan supplied by
Time Team




 Gradiometer Survey

Figure 14

GSB PROSPECTION

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TITLE: Abbey Field Greyscale

Based on a plan supplied by
Time Team

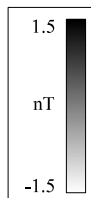
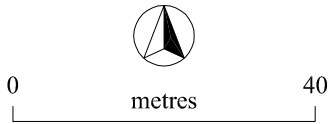


Figure 15

GSB PROSPECTION

PROJECT: 2000/60 HOLY ISLAND

TITLE: Abbey Field Interpretation

Based on a plan supplied by
Time Team

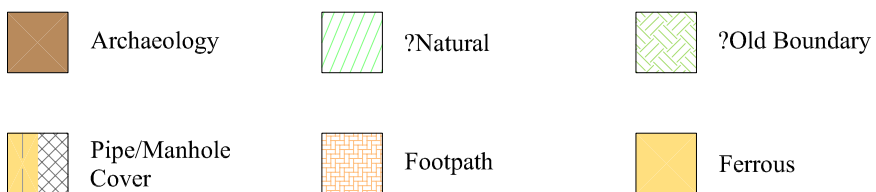
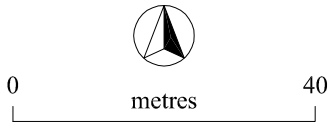


Figure 16