

SURVEY RESULTS**2002 / 64 Greenwich****1. Survey Areas**

- 1.1 A total of just over 1ha was surveyed using the resistance method, while individual transects and a small block were investigated using GPR. The location of the resistance survey areas are given in Figure 1 at a scale of 1:1250. The GPR transects and survey block are shown in Figure 2 at a scale of 1:250.
- 1.2 The survey grid was set out by **GSB Prospection** and tied in to the base map by Dr Henry Chapman using a Trimble GPS system.

2. Display

- 2.1 Figures 3 – 4 and 8 - 11 are greyscale images of the resistance surveys, with accompanying interpretation diagrams. All are at a scale of 1:500. Figures 5 - 7 display the GPR data from the Armoury site.
- 2.2 The display formats referred to above are discussed in the *Technical Information* section, and a complete list of figures precedes the diagrams. The data from the GPR survey are displayed in two formats. The individual traverses are displayed as *radargrams*. These represent vertical sections through the ground and the direction of the trace is shown on each diagram. The GPR data are also displayed as *time slice maps*. This form of display combines the data from all the traverses and provides plan views of the results at different times or depths.
- 2.3 Letters and numbers in parentheses in the text below refer to specific anomalies annotated on the resistance interpretations and GPR images, respectively.

3. General Considerations - Complicating factors***Resistance Survey***

- 3.1 Conditions on the main lawn in front of the Maritime Museum were ideal apart from the presence of a small number of trees and several paths.
- 3.2 Conditions were less favourable at the Music College. The old tennis courts were unsuitable for resistance survey however a small block of GPR survey was carried out in this area. The lawn to the north of the tennis courts presented no difficulties to carrying out resistance survey, however, the deep overburden hampered detection of any deeply buried features.

Ground Penetrating Radar Survey

- 3.3 The GPR investigations were carried out using a 225MHz antenna which will record data up to a depth of around 2m, depending on the nature of the soil/overburden.

- 3.4 While depths have been indicated on the diagrams, these have to be viewed with caution. The conversion from time to depth depends on the velocity of the electromagnetic signal through the ground. Given the nature of the site, this is likely to vary markedly over a small distance; as a result, any depth conversion is only an approximation. An average velocity of 0.08ns/m has been used for the time to depth conversions.
- 3.5 Where there is a strong electromagnetic contrast, the GPR signal can be inter-reflected or reverberated and this produces a delay in the reflection of the signal. This is termed 'ringing'. This happens, to some extent, with all reflections and results in a greater apparent depth than actually exists. As a result, it is often not possible to detect the base of features; only the tops of buried features/deposits are detected with certainty.

4. Results of Survey of 'Armoury Site'

Resistance Survey

- 4.1 The clearest response in the data is a broad high resistance anomaly (A) that bisects the survey area from north to south. It is thought to correspond to a path shown on earlier maps of the gardens.
- 4.2 In the eastern portion of the survey area there are two high resistance anomalies of archaeological potential (B) and (C). Both responses are poorly defined but it was felt they might indicate buried foundations. Subsequent excavation proved them to be masonry structures: (B) formed part of a brick lined cess pit and a deeply buried wall while (C) revealed itself as part of a culvert.
- 4.3 In the western portion of the survey area an ill-defined mass of high resistance readings (D) is present. While an archaeological origin cannot be ignored, the presence of numerous mature trees along this edge of the survey area suggests that the anomalies are likely to be due to tree roots rather than archaeological features.
- 4.4 Areas of low resistance may be associated with former garden beds or they could equally reflect past landscaping / consolidation of the ground.

Ground Penetrating Radar

Pilot Radargrams

- 4.4 Initially individual transects, 5m apart, were collected over the area of a former tennis court in an attempt to accurately locate known culverts and cess tanks to facilitate location of excavation trenches. The data from these transects, displayed in Figure 5, show great variation with zones of severe ringing of the data. The GPR data from these was not very informative with much of the variation along the transects appearing to be due to variations in the made/landscaped surface associated with the former tennis courts.

Area Survey

- 4.5 An area of approximately 18m by 14m was investigated in detail with data being collected at 5cm intervals along parallel transects 0.5m apart.
- 4.6 As can be seen from the time slice data, Figure 6, the first 50cm appears to be dominated by strong reflections from the made ground/landscaping of the tennis courts. By the 0.6m – 0.8m time slice map there are suggestions of a linear anomaly (1) in the south of the area and a second response (2) in the north of the area. It is not clear if these indicate one continuous linear feature. Studying the radargrams from Line 10 and 32, Figure 7, the nature of the reflections from (1) and (2) differ, suggesting different features or at least different materials.

- 4.7 At about 0.8m – 1.0m below the modern ground surface a linear anomaly (3) is apparent in the data. This appears to coincide with a brick vaulted cess tank found in the excavation. The response at the eastern edge (4) visible in the deeper time slice maps is due to ringing in the individual radargrams, for example Lines 14 and 16, Figure 7.
- 4.8 A curving low amplitude anomaly (5) starts to appear in the 1.2m – 1.4m time slice map and is clearly defined by the 1.8m – 2m map.
- 4.9 Anomalies (3) and (5) need to be viewed with some caution. The reflections corresponding to the anomalies visible in the time slice maps are not especially clear in the individual radargrams, Line 14 and Line 16 respectively. It is possible that these anomalies represent differing levels of ringing of the signal. Clearly this is due to subsurface differences, but whether these are the product of archaeological structures beneath the ground or variations in the landscaping material is unclear.

5. Results of Survey of 'Tilting Yard'

Resistance Survey

- 5.1 The data from this area are dominated by a swathe of responses (E) extending across the north western portion of the survey block. This has been caused by a Victorian railway, which goes through a tunnel. There are several responses (F) visible in the data within the swathe (E) that appear of potential archaeological interest. However, as the tunnel was of a 'cut and cover' construction, they must be of a later date than this event. Their position relative to the A206 road suggests the possibility of garden features, however, such an interpretation is tentative.
- 5.2 Linear and rectilinear high and low resistance anomalies (see (G) and (H)) were thought to be associated with possible wall foundations, paths, garden features or service trenches. Excavation confirmed this interpretation, and while it was possible to follow such features across the site once their origin had been determined by excavation, it was impossible to provide an interpretation based on the geophysics alone.
- 5.3 Two areas of very high resistance (I) are thought to be modern. However, given the context, they may have an archaeological significance.

6. Conclusion

- 6.1 In the area of the armoury, excavation showed that a considerable reuse of the ground had taken place, involving a large quantity of made-up ground, and this accounts for the lack of clear resistance anomalies in the data. However, two short lengths of wall were identified in the resistance data and these were found to be part of a drainage and cess system. The majority of anomalies visible in the data are attributed to garden features and the effects of landscaping.
- 6.2 On the lawn to the north of the Maritime Museum the data showed clear rectilinear responses of both high and low resistance. While some of these were shown to be service trenches, others were confirmed by excavation to be Tudor walls represented as both standing courses of masonry and robbed-out foundation trenches.
- 6.3 GPR was carried out over the former tennis courts in the grounds of the Music College. Initial pilot radar transects were undertaken with the aim of defining the precise location of known or suspected

cess tanks under the ground to aid the placement of trenches. The trials were inconclusive because of severe ringing of the signal from the made ground associated with the tennis court. However, a detailed block of GPR survey over the same area did identify substantial reflections between circa 1m and 1.5m from the surface, which correlated with features recorded in the trenches.

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References:

SSEW 1983. *Soils of England and Wales. Sheet 6, South East England.* Soil Survey of England and Wales.

SITE SUMMARY SHEET

2002 / 64 Greenwich

NGR: TQ 385 779 (Armoury Site) & TQ 387 777 (Tilting Yard)

Location, topography and geology

Two sites were investigated in Greenwich, one either side of the A206 on the south bank of the River Thames in East London. The first site lay on old tennis courts in the grounds of the Music College (the former Old Royal Naval College) and the second site, directly in front of the Maritime Museum. Both areas are generally level though both have been subjected to landscaping and consolidation. The soils will have been heavily modified throughout their history but can be broadly grouped as typical stagnogleys comprising fine loams formed from a parent of recent alluvium and quaternary drift (SSEW, 1983).

Archaeology

Both sites have been occupied continuously for over five hundred years. In the early 16th century Henry VIII maintained a palace at Greenwich, for which pictorial evidence exists. However, many of the ancillary buildings were demolished in the following century to make way for monastic constructions and other buildings. The first site is thought to contain elements of the 'armoury' while the second site covers part of the 'tilting' yard used for jousting events.

Aims of Survey

The main aim was to locate and identify any archaeological anomalies, with specific reference to the armoury and tilting yard of Henry VIII. This report forms part of a wider archaeological assessment undertaken by Channel 4's **Time Team**.

Summary of Results *

Due to the depth of overburden at the first site, it proved difficult to locate anomalies that might relate to foundations connected with the armoury, however, 19th Century garden features have been clearly mapped. Resistance survey was slightly more successful at the tiltyard site, though interpretation of the results is still perplexing. Some of the linear anomalies were found by excavation to be associated with walls while others were connected with service pipes. As a consequence the archaeological significance, if any, of many of the anomalies remains unclear.

GPR was carried out over the former tennis courts in the grounds of the Music College. Initial pilot radar transects were undertaken with the aim of defining the precise location of known or suspected cess tanks as an aid to the placement of archaeological trenches. The trials were not conclusive because of severe 'ringing' of the signal from the made ground associated with the tennis court. However, a detailed block of GPR survey over the same area did identify substantial reflections between circa 1m and 1.5m, which correlated with features recorded in the trenches.

*** It is essential that this summary is read in conjunction with the detailed results of the survey.**

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