Rendlesham Survey 2008-2014: Methodological Review

Historic England project reference 6471

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Summary

The Naunton Hall estate in Rendlesham, Suffolk, has between 2008 and 2014 been the subject of systematic metal detecting and geophysics, and targeted small scale excavation. This has identified a complex sequence of settlement and activity from late Prehistory to the present day, including a rich and extensive settlement complex of the 5th–8th centuries AD (the early–middle Anglo-Saxon period) which is of national and international significance. This report assesses the methodologies used in the survey phase of the project, with particular emphasis on the use of metal detecting and the integration of data and analytical results from a range of sources.

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Background
This review assesses the methodologies used between mid-2008 and July 2014 in archaeological surveys on the Naunton Hall estate in the parishes of Rendlesham and Eyke in south-east Suffolk. The archaeological results of the surveys are fully assessed in Minter et al 2016a, and a consideration of the condition and potential future management of the archaeology has also been drafted (Minter et al 2016b).

The project was initiated because of landowner concerns about illicit metal detecting on fields near Naunton Hall and St Gregory's Church, Rendlesham which were passed to Suffolk County Council Archaeological Service (SCCAS) in 2007. This area has long been identified as potentially the site of an Anglo-Saxon royal settlement, mentioned as at Rendlesham by Bede (*H.E.* iii. 22; Colgrave & Mynors 1969). Some support for the Naunton Hall location was provided in 1982 when fieldwalking and a small excavation identified surface early, middle and late Anglo-Saxon pottery (Martin et al 1983, 235; Newman 1992, 36-8) but little to suggest that this site was of particularly high status. The combination of landowner concern and the potential loss of significant evidence for the status and extent of the site led Suffolk County Council Archaeology Service (SCCAS) to design a small project involving systematic metal detecting, magnetometry, air photo plotting and digital mapping of the 1982 fieldwork results; this was funded by the Sutton Hoo Society and SCCAS. In 2009 the basis and extent of the metal detecting survey was changed and further magnetometry commissioned. In 2011 a project design was submitted to English Heritage (now Historic England) for funding support to continue the survey within their priority topic around ploughzone archaeology (National Heritage Protection Plan (NHPP) Measure 4, Understanding: assessment of character and significance, Activity 4G2, Ploughzone Archaeology, English Heritage 2011). Continued financial support from the Sutton Hoo Society and from SCCAS was also essential for ongoing magnetometry and finds recording.

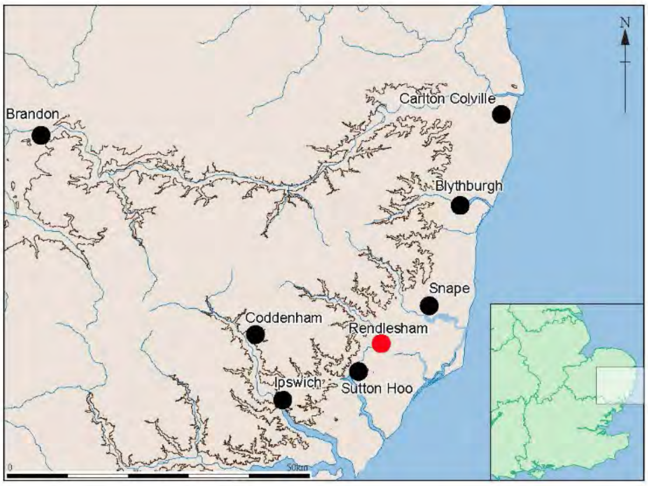

Figure 1 Rendlesham and other major early-middle Anglo-Saxon places in Suffolk

From the outset it was apparent that there was indeed evidence for high status 6th and 7th-century activity in the ploughsoil and that the area of significance was larger than the 1982 fieldwork and assessment of the Historic Environment Record (HER) had suggested. The various survey methods and their contribution are considered below. This assessment also takes account of the 2013-14 programme of small scale excavation in two fields within the core area of Anglo-Saxon activity as identified by the survey, which was designed to test the survey results. This was funded by grant-aid from national and local research bodies. The excavation assessment report is available (Caruth et al 2014) and full archive and publication reports are in preparation.

The project aims and objectives

The research objectives set out in the survey project design for English Heritage (Plouviez and Scull 2011, 5-6) are listed below. They prioritised characterising the archaeology in order to define long term sustainable management of the historic environment within the Naunton Hall estate, and to contribute to our understanding of Anglo-Saxon settlement, society and landscape.

Management and Protection

- what is the significance of the ploughzone archaeology?
- how vulnerable / resilient is the ploughzone archaeology?
- what are the best ways of protecting the physical resource here and its significance?
- what lessons can be learned that are more generally applicable to assessing the significance of, and protecting, ploughzone archaeologies?

Anglo-Saxon Studies

- what is the date, character and extent of the early medieval activity?
- does the early medieval use of the site change?
- what is the spatial development of activity?
- what is the social and economic character of the settlement/s represented here?
- how does the early medieval activity relate (spatially and in character) to earlier (Roman) and later (high medieval) activity?
- what are the contexts (local, regional, national and international) of the early medieval activity here?

Assessment of the individual survey methods

Systematic metal detecting

Background

Methodologies for designing and implementing systematic metal detecting surveys have been developed and refined in Suffolk since the 1980s. Nationally, because of specific issues relating to metal detecting and tensions between archaeological ethics and the use of metal-detectors for treasure hunting, there are few studies of best practice. Recently, however, the use of metal-detectors in battlefield archaeology has begun to redress this (eg Foard and Morris 2012, 22-30; Foard and Curry 2013, 99-118) and there has been considerable work since the start of the Portable Antiquities Scheme (PAS) on the biases within metal detected datasets and their use for landscape as well as artefact-specific studies (eg Brindle 2014, Chester-Kadwell 2009). Many of the potential issues with surface collection by detecting are similar to those identified in many studies for fieldwalking (see recently Gerrard and Aston 2007), such as operator skill and experience, field conditions, under-representation of specific materials and the tension between speed/costs and representative sampling. Machine quality is an issue specific to detecting, though inter-related to operator ability.

An earlier attempt in Suffolk to neutralise the impact of illicit detecting by carrying out an archaeological survey at the scheduled Roman settlement at Icklingham in 1987 was less extensive than planned and remains unpublished because of a lack of resources. In that case a group of metal detector users, selected because they regularly reported finds to SCCAS, detected the field within a 20m grid under archaeological supervision. Each non-ferrous object was recorded by measuring from the grid corners; the process was therefore slow and expensive but did produce a valuable assemblage of ploughsoil data for comparison with excavated and other finds from this productive site. It was also probably less effective in deterring further looting than the uniquely persistent prosecution of criminal activity by the landowner, John Browning.

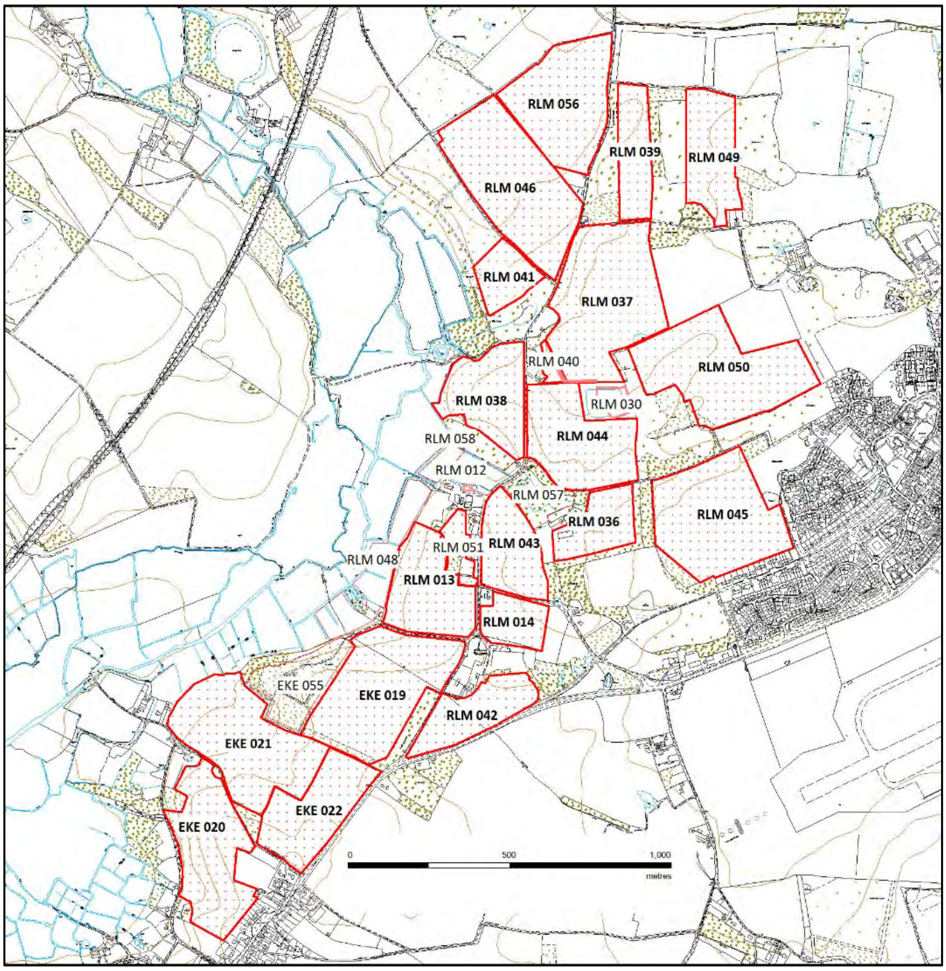

Figure 2 Map of survey extent with field HER numbers

<u>Employed metal detecting</u>

The initial phase of work at Rendlesham employed two metal detector users (for 15.5 person days), who were joined by two volunteers with expenses paid (for c. 8.5 person days), to carry out the survey in autumn 2008 and spring 2009 on fields RLM 036 and RLM 013 (in addition two person days were done voluntarily on RLM 014). All the individuals were regularly employed by the SCCAS Field Team (now Suffolk Archaeology CIC) to metal detect on development-led projects but also had a background of many years of experience in ‘hobby’ detecting and of recording and reporting finds locations.

The process of detecting and recording was not significantly different in this phase to subsequently and is described below. It was carried out with minimal supervision consisting of occasional SCCAS Archaeological Officer visits.

A total 137 objects were recorded (an average of just under 4 per person day, slightly higher than the 3 per day recoded in the survey overall), just 3.5% of the total finds assemblage of 3,946. The range of material recovered would be sufficient in a development context to indicate significant and potentially high status Anglo-Saxon activity but provided no indication of the full chronological potential, the extent of the site and the range of artefact-related research data that is now available from Rendlesham.

Illicit activity was noticed on both fields before the metal detecting, and was clearly taking place immediately after ploughing and rolling of the soil. This provoked the detecting team into dedicating a voluntary day on RLM 014 to forestall the looting there when it was ploughed.

<u>Volunteer metal detecting (under a detectorist/landowner agreement)</u>
The remainder of the survey was carried out by the four detectorists in their own time with a standard private agreement between them and the landowners, which included ensuring that finds continued to be handed to SCCAS for recording. Permission was extended to the entire estate (see Fig 2).

The major advantage of this was that the ploughzone finds collection part of the survey could be continued without cost to SCCAS in the field, allowing the limited resources to be focussed on other aspects (mainly recording and magnetometry survey).

The change did remove some archaeological control, although there were no significant differences in field methodology and any archaeological suggestions were generally followed by the detecting team.

Another advantage to this system was that finders and estate workers could negotiate directly to identify when land was available for detecting, ensuring minimum delay when there was a risk of looting on freshly turned soil.

The change highlighted the issue of the long-term fate of the finds archive. The potential financial value of certain types of archaeological material means that it is difficult to persuade landowners to promise free deposition in an appropriate museum, even in commercial development contexts. When the archive is the product of metal detecting this becomes even less likely. The legal requirements under the Treasure Act 1996 and the general practice in the PAS acknowledge the likelihood that most objects will either be retained by finder or landowner or sold. In the case of Treasure the process gives museums the chance to pay the market value as a reward; the value is determined by the Treasure Valuation Committee, and this is usually divided equally between finder and landowner. Where Treasure is found on an archaeologically run project, such as the initial phase at Rendlesham, only the landowner share is paid. The Rendlesham assemblage includes items of relatively high market value, both Treasure and non-Treasure, the latter in particular comprising Anglo-Saxon coinage. All parties acknowledged from the outset that the finds archive should ideally remain together in a public institution, but the landowner was very clear about his and the finders' rights to Treasure rewards and appropriate payment for other material. Various museums were approached and regarded the collection as worth investment; Ipswich Museum was agreed on as the closest appropriate repository and has successfully raised grant support in stages for acquisition of the material.

A total 1,206 man days were spent on the metal detecting under the detectorist/landowner agreement. This size of field commitment, representing over five years full-time employment, could not have been contemplated any other way. The basic cost (ie salaries and employer on-costs) of the fieldwork would have been in the region of £200,000.

The regular presence of the detectorists led to a rapid decrease in the amount of looting activity from the middle of 2009 onwards. In 2012 signs were noted on three occasions in the summer (on RLM 013, 037 and 038), once in the winter (RLM 014) and in 2013 on three days (RLM 013 and EKE 019). The 2013 record of illicit activity was after the evaluation trenching on RLM 013, which also saw one overnight episode during the excavation.

<u>Field collection and recording systems</u>

Detecting was carried out by linear walking aligned as most convenient in arbitrary blocks, the individuals walking a few metres apart to enable 100% ground coverage in the detector sweeps. Aerial photographs taken by English Heritage show this coverage underway in their footprint trails in the sandy soil on RLM 044 in 2012 (Fig 3).

Figure 3 The four detectorists can be seen near the completion of a second block on field RLM 044. Photo by Damien Grady, ©Historic England

Detectors were set to discriminate against ferrous objects. Control samples from sieved and detected ploughsoil in the evaluation demonstrate the large quantity of modern and undated iron fragments that would otherwise have been collected; these would have added massively to the resources required both in the field and subsequently for very little useful additional information. All objects found were retained initially, but any obviously recent material and undiagnostic iron were not recorded to a precise location and were later discarded. Occasionally such items were re-considered and added to the catalogued material with a field reference only. Non-metal items (pottery, flint, stone and glass) were recovered and fully recorded when visually identified.

Locations were recorded by the finder using a handheld GPS (Garmin e-Trex models); the NGR was copied from the GPS and written onto the individual plastic bag for the object. Also recorded on the bag were the field name and the finder's initials. This method has the advantage that locational data and artefact are securely related from the start. An alternative system, whereby GPS temporary numbers are allocated and the data downloaded to a computer at a later stage, was not favoured by the finders and carries risks of total loss or confusion of batches of finds if numbers become muddled or data is accidentally lost from the GPS. The main disadvantage of the system used is that occasionally numbers are mis-copied from the GPS. About 80 entries (2% of the total) were subsequently identified as definitely incorrectly located in the database (due to both mis-copying in the field and later typing errors) but the majority could be corrected.

There is also a potential error of 5m to15m integral to the Garmin handheld machines (on the more recent models around 5m or less). This was not considered significant given that ploughsoil finds might be moved by as much as 5m in a single year of ploughing (evidence for object movement is discussed in detail in Minter et al 2016b).

In addition to the find record on the individual bag one detectorist (RA) kept a daily log of who was present, on which field(s), soil and crop conditions, evidence of looting and any non-metal or significant finds. He also had a set of 1:2500 paper maps which could be annotated, for example where areas of dark soil were noted.

All arable fields within the Naunton Hall estate were fully detected at least once, and most of the wooded and grass areas were also visited. Within fields there were often subdivisions such as game cover belts planted with maize which were accessible at different times to the rest. There is some variability in how intensively areas were covered due to different agricultural availability and weather (particularly wet conditions could prevent access). Variability was also caused by the natural tendency to prioritise those areas that had already been productive when there was only a limited window of opportunity for several fields.

A significant omission in the system was that there is no record of exactly which objects were found on each day, because identifying the individual finds from the daily record sheet was laborious and not always possible. In future we would recommend that the date of discovery be recorded on each the plastic bag for each find along with NGR, field name and finder's initials. Following from this, although it is possible to calibrate retrieval rates from different collection units (fields) by the expedient of dividing the number of artefacts recovered by the number of days spent detecting, it is not possible to drill down in more detail to address how conditions at any one time may have affected recovery.

Figure 4.Left: Density of finds by field (finds per ha). Centre: Intensity of search by field (person days per ha). Right: Finds productivity by field (number of finds per person day). All shaded high/medium/low.

Finds were assembled in batches by one finder (AS) for delivery to SCCAS when work was completed on a field or group of fields every few months (the date of deposition was recorded for each batch of finds). Potential Treasure finds were notified to SCCAS by telephone within the requisite 14 days and deposited there with the general finds batches.

Finds recording: database

Finds were individually recorded on a project specific MS Access database. Each field surveyed was allocated an HER event/monument number (as on Fig 2) and finds numbered from 1001 onwards for each HER number (except in RLM 013 where numbers run from 0001 onwards), corresponding to standard SCCAS practice.

The decision was made not to use the PAS national database for various reasons:

- at the start of the project the landowner was very anxious about the need to minimise publicity, largely because of the risk of intensified criminal activity around his property
- SCCAS experience had shown that the PAS numbering system is far from ideal when handling a substantial collection such as this, as it consists of non-sequential 6-digit hexadecimal strings with an “SF-“ prefix
- the records would have to be downloaded into MS Excel every time anything other than single records were to be consulted
- PAS database locational data does not readily allow grouping by HER reference
- input to PAS is relatively slow, partly due to network/internet issues, but also because of the complexity and the online nature of the database
- a project-specific GIS environment allows the speedy and effective integration of all relevant data-sets held by the project and SCCAS

There would have been advantages to using the PAS database for input, for example the range of fields and drop down terms would ensure cleaner data. It would also have been useful to have a better defined right to call on PAS expertise, although this was actually done in practice (for example see the contribution by Sam Moorhead in Minter et al 2016a).

For administrative reasons the Treasure team at the British Museum have added the Rendlesham survey Treasure items to the PAS database. All finds after June 2014 from the area are also being processed through PAS.

The database also contains supplementary tables such as the correlation between field names and HER numbers, and a version of the daily record of activity made by the detectorists. The latter is not complete in all fields (particularly condition and finds information) but could be revisited and upgraded from the paper record.

Although some data fields required cleaning and some needed adding or amending during the project the database tables proved reasonably useful for assessment of the finds by material, period and functional category and for examining the intensity of search on the different fields (Minter et al 2016a).

Finds recording: visual

During recording on the database it was also noted whether finds should be photographed or drawn, based on the principles used in Suffolk PAS recording.

The photographic record has proved particularly valuable for sharing data with specialists.

The drawn record is incomplete, due to other project pressures on the SCCAS illustrator, but is less urgent because the material will remain accessible at Ipswich Museum. Treasure items were prioritised for drawing.

Figure 5 Photograph and drawing of a gold, type D, 6th-century bracteate, 22mm in diameter, RLM 036 1242, Treasure case 2014 T404. Drawing by Donna Wreathall, both © Suffolk County Council

Finds recording: GIS mapping

At intervals during the project the finds data table was copied and used as a layer within the SCCAS MapInfo system, including key fields such as period, object type, functional category to allow the separation of subsets of the data. This facilitated interim analysis (Plouviez 2009, Plouviez and Scull 2012) and informed the other survey techniques. It has also provided useful, indeed essential, analytical results and visual material for academic and public dissemination.

Data on the paper maps used by the detectorists was also copied to a separate MapInfo layer at the end of the survey.

Geophysical survey

Field methodology

All the work was carried out under the supervision of Woodhouse Consultancy (except for grass areas around Naunton Hall in 2014), and the data from 2014 were also passed to

Woodhouse Consultancy for integration with the rest. The survey was undertaken using a Bartington Grad 601-2 dual sensor vertical component fluxgate gradiometer except in the 2014 grass areas where a single sensor Bartington Grad 601 was used. Readings were taken at 0.25m intervals along traverses of 1m spacing. This enabled a reasonably high density of data to be collected whilst not impairing the speed of the survey. The survey grid was a consistent 30m grid (based on grid north) throughout. The methodology was established in the initial phase of the survey in 2008, and discussed and agreed as appropriate with English Heritage in 2011.

The initial areas (RLM 013, 012) were selected on the basis of the 1982 survey. Further areas were selected to supplement the results of the metal detecting where there were significant assemblages of Anglo-Saxon finds and to form a reasonably cohesive geographic area. In total 46ha was covered by magnetometry.

Any doubts that magnetometry would show results on the local Crag and glaciofluvial sandy soils were resolved by the initial results. There is good correlation between the magnetometry results and finds of all periods.

Practical issues around the fieldwork related to planning ahead with the potential for alterations in the agricultural calendar, but in practice all sessions went ahead as planned. There were some years in which there was insufficient time in the turnaround period between crops for access, so survey within a more limited timeframe would have been constrained.

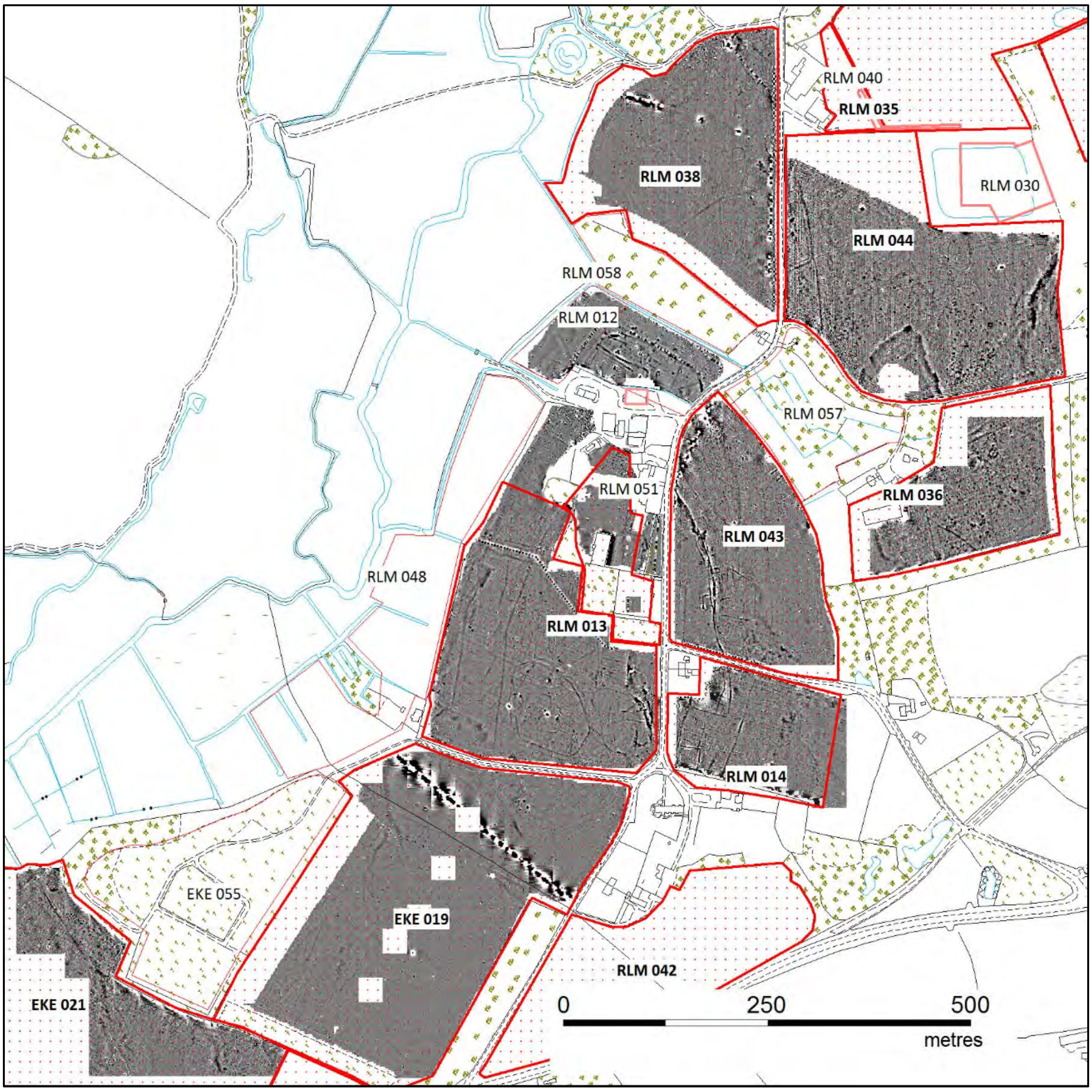

Figure 6 The complete magnetometry cover

<u>Interpretation</u>

Full interpretation by a specialist geophysicist was carried out for the early stages of the survey (Woodhouse 2008, also included in Plouviez 2009 as Appendix 3) and Woodhouse 2010). Subsequent phases have not been analysed in such detail. Comparison of the early reports with subsequent information, particularly the excavation results, suggest that a minimal investment in interpretation in the early stages of a complex survey is probably adequate if the data is as good as here.

Air photo plotting

The initial project involved plotting of the available photographs, particularly those known to exist in the Cambridge University collection, for a very limited area around the church and Naunton Hall (Palmer 2008 and included as Appendix 2 in Plouviez 2009). Later, access was given to view English Heritage digital photographs and flying by EH continued across the area during the survey (see for example Fig 4). As these showed further cropmarks the opportunity was taken to include the Rendlesham survey area within an NMP project (HE project 7085, Suffolk Coast and Heaths AONB NMP) and the results have proved very useful in interpretation of the survey results, both alongside the magnetometry and in the other fields in the survey area.

Geochemical ploughsoil survey

In 2011 a geochemical survey was carried out by English Heritage over part of the survey area, including RLM 013 where evidence of metalworking was suggested from the metal detected finds. The results were published in Dunster et al 2012 and concluded that there was no apparent correlation between the concentrations of the selected metal elements and other archaeological evidence. The technique is still experimental but has been shown to be effective on ploughsoil where intensive industrial activity has occurred (Dungworth et al 2013).

Effectiveness of the combined approaches

The key product for integrated examination of the survey results is the GIS mapping, which includes the results of all the key survey elements alongside other available datasets including LIDAR (from which 50cm interval contour data has been derived), early maps and the 1982 fieldwork results. Using this it has been possible to suggest correlations between these varied types of information.

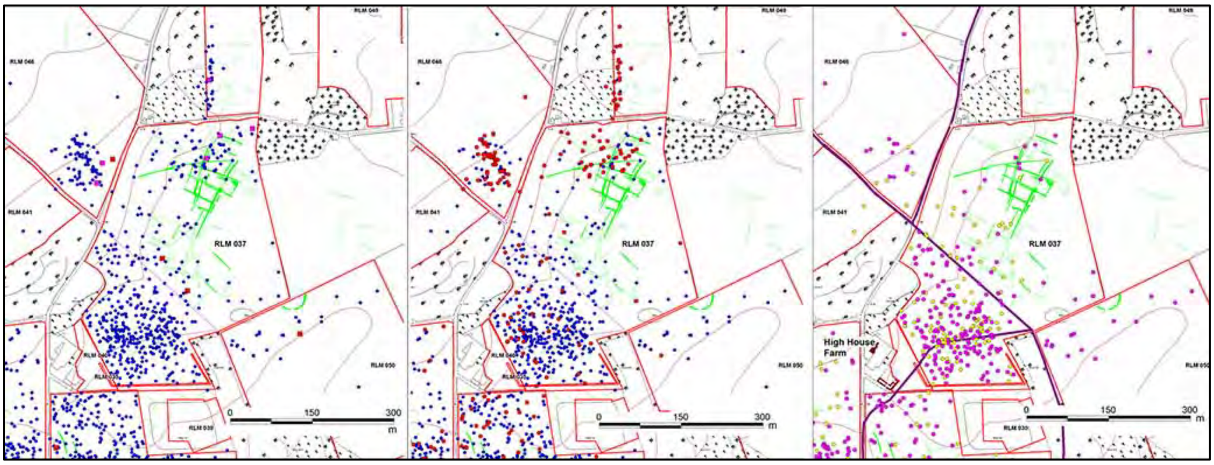

Figure 7 Field RLM 037 Left Bronze Age (red squares) and Iron Age (pink squares) against all finds (blue) and cropmarks (green). Centre Roman (red spots) against the same. Right medieval (pink spots) and later finds with 18th-century road lines in purple.

For example, outside the core Anglo-Saxon area, in field RLM 037, Colletts, we can trace a very tentative association between indistinct cropmarks and Bronze Age finds in the middle of the field but a much more definite association between later Iron Age and Roman finds and the cropmark enclosure system in the north of the field. In the medieval and early post-medieval period the cropmark evidence is irrelevant, but an 18th century estate map suggests that the dense scatter of finds in the south of the field is flanking a road that was also fronted by the High House Farm complex at the SW edge of the area.

There is potential to improve analysis and presentation of the GIS data. For example the mapping of the finds to show concentrations could probably be displayed more effectively as kernel density distributions. The project has access to the program Vertical Mapper in order to test this in the future.

The combination of finds and magnetometry information in the core Anglo-Saxon area allowed various interpretations that were tested in 2013-4 by excavation trenches in RLM 013 and RLM 044. Features identified on the magnetometry were mostly accurately identified and all proved to be archaeological features. Trial trenches in RLM 044 indicate that burials remain largely invisible in the magnetometry; a group of surface finds of hand-made pottery accurately pinpointed early Anglo-Saxon cremation burials, but a possible row of graves proved to be sunken-featured buildings and other pits. The presence of 5th- to 7th-century inhumations in this field is strongly suggested by the metal finds, but may only be locatable within it by pinpointing concentrations of artefacts such as copper-alloy brooches, wrist clasps and girdle hangers that are particularly common in 5th- and 6th-century grave groups. The evidence is also that early-middle Anglo-Saxon ground level timber buildings with foundations in postholes or narrow trenches are very unlikely to show in the magnetometry.

Another key archaeological deposit that could not be predicted before excavation was a "midden" layer surviving below the ploughsoil over cut features in RLM 013; this had probably originally accumulated as a substantial midden mounded against a palisade. This exceptional preservation was visible on the surface as darker soil with animal bone and noted in both the metal detecting survey and in the 1982 fieldwalking; in both cases, however, it was assumed to be the result of plough damage to a cut feature or features such as sunken-featured buildings.

Potential gaps in the survey methods

Fieldwalking

Only a small proportion of the total survey area was archaeologically fieldwalked in 1982 but because this included much of the area selected for the initial survey work in 2008 it was seen as an adequate sample. Further gridded fieldwalking was not seen as economically justifiable, or essential to achieve the research aims, as the survey project was developed and implemented, especially as the detectorists were retrieving and spatially recording visually-identified pottery, flint, stone and glass.

	RLM 013	**RLM 014**	**Total sherds**
Roman	158	146	304
Hand made	17	1	18
Ipswich ware	7	4	11
Thetford ware	12	9	21
Total	*194*	*160*	*354*

Table 1 Pottery from the 1982 fieldwalking

	RLM 013	RLM 014	Total sherds
Roman	36	13	49
Hand made	4	0	4
Ipswich ware	2	2	4
Thetford ware	6	4	10
Total	*48*	*19*	*67*

Table 2 Pottery from 2008-2014 survey

Tables 1 and 2 compare the amounts of specific wares from the two surveys. Given that the 1982 project surveyed the fields once compared to the numerous visits by the metal detectorists there is no doubt that retrieval in a systematic fieldwalking survey by professionals will retrieve a larger sample of ceramic material (and even more of worked flint as only reworked tools were collected by the detectorists). However this is mainly an issue for identifying good samples of material of Roman and medieval date: it is noticeable that the Anglo-Saxon pottery (hand-made, Ipswich and Thetford type wares) is represented in small amounts in both assemblages, and is proportionally more evident in the 2008-14 group. These do not contribute significantly to the pattern of finds distribution, although they are useful in assessing the chronological spread present. It seems that additional fieldwalking would have been useful in better defining the Roman and medieval areas of activity (for example in RLM 037 and RLM 045) but would not have been so valuable in the core area of the survey. It should also be stressed that the comparison is with experienced professional rather than sometimes less experienced volunteer fieldwalking. In the latter situation the results might well have provided less information and generated more follow-up work to record and select the collected finds.

Having said this, it must be emphasised that systematic metal-detecting has identified evidence for past activity of a wealth, extent and complexity that the results of conventional fieldwalking barely hinted at, and by making visible the non-ferrous metal element of the ploughsoil assemblage has revealed a much more representative sample of past material culture and a database of vastly greater potential that has both national and international significance. By comparison, the fieldwalking data is of limited significance and potential, and it is possible to argue that at the very least systematic detecting should always be undertaken as an element of survey or prospection by surface collection for periods from late prehistory onwards when non-ferrous metal finds were in common circulation, and that for periods such as the early Anglo-Saxon, where the ceramic tradition poses problems of survival, retrieval and chronological precision, priority should be given to metal-detecting.

Strengths and weaknesses of the project methodologies

The project objectives were to study a potentially very important, and very specific, site within a heavily arable landscape where agricultural damage was being exacerbated by targeted looting. The agricultural calendar, and additional activities such as game shooting, constrained the time that fields or parts of fields were available to carry out the various survey techniques. Despite this, partly because the survey extended over a span of years, there are relatively few significant gaps in the coverage as planned.

Metal detecting is now regarded as an essential tool for identifying domestic and most particularly funerary sites of early Anglo-Saxon date in eastern England (see for example

Chester Kadwell 2009). In development-led evaluations the standard 5% trial trenching can fail to identify these sites, particularly if the excavation trenches are not also metal detected; for example a 7th-century cemetery was not identified in evaluation trenching at Coddenham (Penn 2011, 1-2) and defining the extents of early Anglo-Saxon settlements by trenching has proved difficult in recent cases. At Rendlesham it is the metalwork assemblage, retrieved from the ploughzone by detecting, that has established the exceptionally high status of the later 6th- to early 8th-century activity, and provided such a rich sample bearing on changing patterns of settlement and activity in a local landscape context and across a period of more than two millennia to the present day. For example, excluding hoard finds and the Sutton Hoo purse, Rendlesham now has the highest concentration of gold coins of this period in England. Within the core area of Anglo-Saxon activity the artefactual evidence also shows a continuum from the 5th century with an exceptional late Roman coin profile that suggests some official links in the Theodosian period. The precision with which the finds have been recorded also allowed the identification of a potential late Roman coin hoard within the field scatter (Fig 8), demonstrating the benefits of the systematic approach to detecting on complex sites.

Beyond the core Anglo-Saxon area the artefact scatters provide a range of late Iron Age, Roman and later medieval evidence that illustrate activity within the Deben valley over the longer time frame. As noted above the addition of intensive fieldwalking could, for these periods when pottery is common, add useful data for defining domestic site extents. The metalwork evidence does however provide a good chronological definition for the sites, using relative proportions of coins and brooch types for the Roman period. The medieval

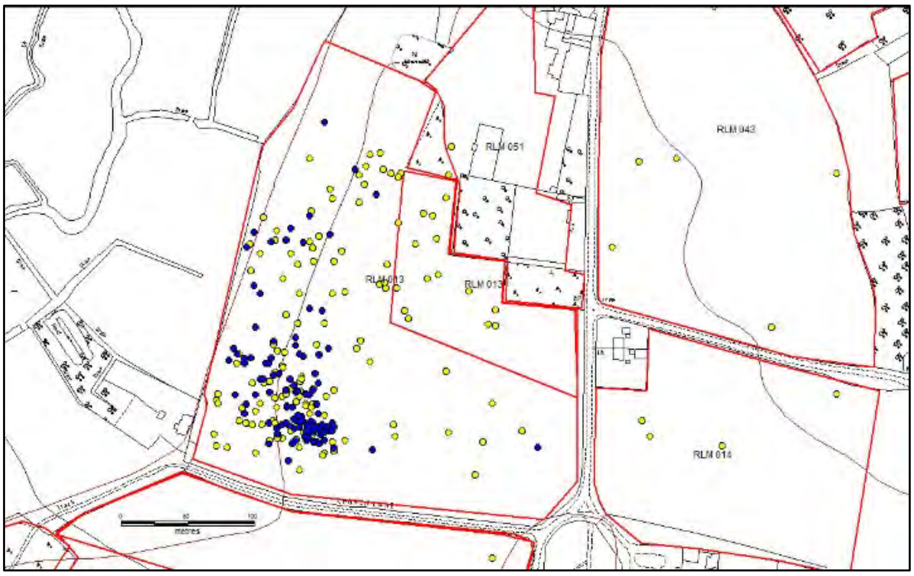

Figure 8 Roman coins (yellow spots) in field RLM 013, with Theodosian (383-402) nummi (blue spots) showing a probable hoard concentration in the south-west of the field

assemblage is exceptional in providing a large and well-recorded group that can be compared with urban assemblages and with the very few other rural groups of substance as well as the generally less systematically-collected material in the national PAS database.

The prehistoric landscape is not well defined by the survey methods used although some features were noted in both the cropmark and magnetometry surveys and occasional

Bronze Age and later copper-alloy artefacts were found. Intense fieldwalking or shovel test-pitting would give better data for the distribution of worked flints. However only evaluation and monitoring of an irrigation reservoir exposed small pits containing late Neolithic Grooved Ware in the NE corner of field RLM 044 (Meredith and Damant 2008).

The survey data have already contributed to our understanding of ploughzone research questions both specific to Rendlesham and more generally, and have considerable potential for further analysis (Minter et al 2016a). It does, for example, seem possible to suggest the taphonomic processes resulting in specific assemblages in some areas. In RLM 044 relatively large fragments of 5th- and 6th-century brooches are likely to derive from disturbed graves or sunken-featured buildings, the latter also visible in the magnetometry. A wide scatter of late 7th- and 8th-century silver coins in this field seems more likely to reflect surface losses during use as an area for assembly and exchange. Similarly the wide scatter of lower value Roman and medieval coins may represent manuring on arable fields close to contemporary settlement sites as well as stray loss. One future avenue for research would be to more closely examine variation in fragmentation in the different assemblages. There is also a current project examining the vulnerability of ploughsoil metalwork assemblages to modern agricultural chemicals at Huddersfield University that will make use of Roman coins from the survey in comparison to groups elsewhere.

The positive results in terms of identifying extent, significance and survival of the archaeology through the combination of survey techniques has allowed an assessment of the level of risk and various suggestions about future management (Minter et al 2016b) which will be followed up with the estate.

It must be emphasised that the small-scale evaluation excavations in two key fields (RLM 013 and RLM 044) that did not form part of the survey process, and which were separately funded, were extremely useful in clarifying and confirming interpretations based on the survey data. Identification of specific groups of maculae on the magnetometry as sunken-featured buildings could have been disputed, and determining the date of features such as a D-shaped enclosure and various linear systems in RLM 013 was highly speculative and often wrong before the evaluation. The information gained about soils and depths of cultivation and subsoiling were also extremely useful in assessing the agricultural risk.

The various survey methods, and their integration, have either fulfilled the original research aims or provided scope for future study to do so. The results will certainly add usefully to our understanding of the various ‘productive’ sites of the early medieval period. Certain less-well recorded sites in Suffolk that are also mainly identified by finds scatters, such as Coddenham (Newman 2003) may prove to be comparable to Rendlesham. The retention of the full archive also means that there is scope to redefine and revisit research questions in the future.

Conclusions and Recommendations

The survey methodology adopted for Rendlesham was intended to address specific management and academic issues, and had to be tailored to resource, the constraints of the agricultural regime, and the need for discretion so as not to offer further opportunities for criminal activity. We take the following key points from the experience of planning and implementing the survey:

- survey must be systematic and geared towards specific goals
- the skills and experience, archaeological as well as in the handling of metal-detecting equipment, of those undertaking the survey on the ground are of critical importance
- specialist academic, technical and managerial support and infrastructure (finds identification and analysis, project co-ordination and management, IT and GIS capability) is essential
- where circumstances permit, small teams working long-term within the agricultural cycle are likely to provide more comprehensive coverage, be cost-effective, and deter illegal detecting
- the need in future to build in data-recording protocols that will facilitate the calibration of survey results across collection units and conditions
- the importance of complementary survey methods and data-sources, and the capacity to integrate these data-sets in a GIS environment
- the importance of securing the long-term integrity of the archive through donation to or acquisition by the local museums service
- the full support and engagement of landowner and farmer is essential
- this approach is scalable, and has potential to build projects that deliver very significant research and conservation benefits through a range of partnerships between voluntary, professional and academic sectors both locally and nationally
- good and timely communication between partners and stakeholders is key
- systematic metal-detecting is highly effective as a field survey method: it should be undertaken as a matter of course in all survey and prospection where there is a reasonable chance of encountering activity of the late iron Age or later, and may for some periods and circumstances be considered a more effective approach than conventional fieldwalking

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Appendix 1

Quantification of metal detecting results: rates of discovery, erosion of the resource and optimum survey levels

The data collected by the detectorists (see Appendix 2 for an overall summary of all survey areas) can be used to examine questions such as whether the numbers of finds decreases over time (ultimately leading to the 'worked-out site' sometimes referred to by detector users) and the optimum and essential levels of detecting required for site characterisation (after which the law of diminishing returns sets in). These are complex questions which depend on a range of factors including weather and ground conditions at the time of survey, and both current and past cropping regimes. This information is held by, or is available to, the project, and will be analysed in detail. In what follows, we consider some preliminary indications based on recorded retrieval rates alone.

Rendlesham is mostly on light soils under heavy arable use which is leading to constant erosion of archaeological deposits (as described in Minter, Plouviez and Scull, 2016b), and the quantity of objects in the ploughsoil is probably being constantly replenished, although movement of objects within the ploughsoil also affects their availability for retrieval over the years. Under current conditions a rapid decline to a low level of finds might suggest total archaeological destruction.

Two sites are tabulated below (Table 3), selected because both are within the Anglo-Saxon area with similar ranges of find types. RLM 036 was targeted in the initial SCC survey because of information from the landowner that this field had been consistently looted, whereas RLM 044 (a much larger field to the north) had apparently not been previously recognised as producing significant material, and was only identified as an Anglo-Saxon area in the autumn of 2010 during the general survey. Game cover areas are listed separately because of the separate cropping cycle.

	RLM 036 Finds	**RLM 036** Proportion of finds	**RLM 036** Days	**RLM 044** Finds	**RLM 044** Proportion of finds	**RLM 044** Days
2008 (SCC survey)	34	11.85%	10.5			
Autumn/winter 2009	12	4.18%	7			
Spring 2010	31	10.80%	8	3	0.47%	2
Autumn 2010	85	29.62%	29	89	13.84%	26
Spring 2011				97	15.09%	33.5
Autumn/winter 2011	15	5.23%	9.5	143	22.24%	51.8
Spring 2012	52	18.12%	10			
Autumn 2012/Spring2013	6	2.09%	2	68	10.58%	24.5
Autumn 2013				117	18.20%	38.6
Spring 2014	52	18.12%	17.5	126	19.60%	46.8
Totals	*287*	*100.00*	*93.5*	*643*	*100*	*223.2*
Game Cover areas						
Spring 2011	2		3	53		11.5
Spring 2012	2		1.5	13		5.5
Spring 2013	2		1			
Spring 2014				17		4
Totals	*6*		*5.5*	*83*		*21*

Table 3 Sites RLM 036 and RLM 044 Numbers of finds over the survey period

There is no indication of substantial decreases in numbers of finds over time and variations are more likely due to local conditions at the time of each survey episode and the length of time available for access. A study of variable artefact size and fragmentation could perhaps also usefully compare these two sites; a subjective impression is that there are larger fragments of, for example, early Anglo-Saxon brooches from RLM 044.

RLM 013 Coins of Anglo-Saxon date

Year	Coin numbers
SCC Survey 2009	5
2009	10
2010	21
2011	6
2012	20
2013	9
2014	9
Total	*80*

Table 4 Numbers of Anglo-Saxon period coins found at RLM 013 each year

The most intensely metal detected and the most productive area is RLM 013. Table 4 shows the number of coins of Anglo-Saxon date found in each calendar year, which shows a fairly constant pattern of recovery. The numbers from this site are now exceptional and so it is hard to define where an acceptable cut-off point might be. The copper-alloy Byzantine *folles* are one of the significant groups of material from Rendlesham, confirming that these are indeed contemporary (and not modern) losses and that they occur in Anglo-Saxon as well as Western British contexts. The first of these from RLM 013 was not found until 2010, the second in 2012 and the third in 2013; arguably the evidence was sufficient by the end of 2012. By this time the detectorists has spent 162 person days (of the total 250 to July 2014) on RLM 013. Similarly in RLM 036 the first Byzantine coin was found in late 2010 (55 person days of the total 93) and the second in late May 2012 (71 person days).

For comparison the finds over time from a field outside the Anglo-Saxon core area is shown in Table 5 below. Here a discrete Roman site was identified, but not until 2013, the third year that it was detected, and it has only been briefly visited once since then. The assemblage is sufficient to show that there is a Roman scatter in one area of the field. The number of coins identifiable to Reece period is, at 39, below a reliable sample for the comparative graph – 50 is acceptable and 100 generally reliable. A few of the Roman finds suggest a religious function, but again this is very tentative. Ideally this field should be detected again when conditions are favourable to fully characterise it, perhaps increasing the number of person days from 41 to around 70.

RLM 045	Finds	Days
2010	4	5
2011	2	4
2012	0	0
2013	144	31.25
2014	1	1
Totals	*151*	*41.25*

Table 5 Numbers of finds per year from site RLM 045

It is notable that all these figures for investment of time on sites are much higher than the rather cursory metal detecting surveys sometimes carried out in advance of development, as well as demonstrating that sites may not be defined for several years until ground conditions are optimal.

Appendix 2 Table of all Rendlesham survey areas

Site	Name	Area - sq m	Objects	Mapped	Man Days	Finds per day	Finds per ha	Days per ha	Magnetometry Ha
Arable fields									
EKE 019	Steeple Tye	*117,600*	182	179	76.22	2.388	15.476	6.481	10.18
EKE 020	Sutton Barn	*91,290*	46	46	7.50	6.133	5.039	0.822	
EKE 021	Clapett	*113,300*	125	123	33.50	3.731	11.033	2.957	3.65
EKE 022	Eyke Road	*69,030*	105	103	57.50	1.826	15.211	8.330	
RLM 013	Park	*65680*	1020	1008	249.55	4.087	155.298	37.995	7.13
RLM 014	Kitchen piece	*27840*	120	110	46.41	2.586	43.103	16.670	2.62
RLM 036	Dog Kennel	*37260*	293	283	99.10	2.957	78.637	26.597	2.75
RLM 037	Collets	*132100*	473	471	132.40	3.573	35.806	10.023	
RLM 038	Dock Hill	*64380*	294	286	91.75	3.204	45.666	14.251	5.37
RLM 039	Duffals	*41230*	31	29	7.50	4.133	7.519	1.819	
RLM 040	High House Farm = adj 037	*5164*	2	2	0.50	4.000	3.873	0.968	
RLM 041	Spring Hill	*28600*	3	3	1.00	3.000	1.049	0.350	
RLM 042	Three Corner Tye	*49270*	120	120	38.80	3.093	24.356	7.875	
RLM 043	Blackcroft	*50820*	109	109	46.00	2.370	21.448	9.052	4.92
RLM 044	Sand Walk	*83970*	742	734	251.90	2.946	88.365	29.999	6.89
RLM 045	Hut	*117500*	151	151	41.25	3.661	12.851	3.511	
RLM 046	Foxburgh South	*126100*	84	84	27.00	3.111	6.661	2.141	
RLM 049	Gravel Pit field	*58020*	1	1	1.00	1.000	0.172	0.172	
RLM 050	Rearing ground	*121400*	26	26	9.50	2.737	2.142	0.783	
RLM 056	Foxburgh North	*97200*	3	3	1.50	2.000	0.309	0.154	
	TOTAL (arable)	1,497,754	3,930	3,871	1,220				43.51
Non-arable areas									
EKE 055	Broom Hill Wood	*41620*	1	1	1.75	0.571			
RLM 012	Meadow	*21171*							2.10
RLM 048	Water meadows - extent approx	*48300*	7	7	2.70	2.593			
RLM 051	Garden + Park wood	15,500	5	5	2.75	1.455			0.80
RLM 057	Sand Walk Wood	38670	2	2	3.50	0.571			
RLM 058	Wood SW of RLM 038	14600	1	1					
	TOTAL (grass & woods)	179861	16	16	12	1.368	0.890	0.651	2.90
	Overall total	1,677,615	3,946	3,887					46.41