EVALUATION AT NORTH END FARM, MADRESFIELD

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HWCM 4072

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1 Summary

An archaeological evaluation was undertaken at North End Farm, Madresfield on behalf of the Trustees of the Madresfield Estate to assess the archaeological potential of an area proposed for large-scale development. This area included a site of archaeological interest and lay within an area associated with the archaeologically important Malvernian pottery industry.

The evaluation identified the presence of Romano-British deposits relating to a settlement. These deposits were well preserved in the southern part of a core area defined to indicate the area of intensive settlement and included structural and boundary features along with occupation deposits. To the north truncation due to ploughing had damaged archaeological deposits and survival was poor. Survival of pottery was good and the recovered assemblage represented domestic debris dating from the second to fourth centuries AD. Some environmental evidence was preserved. The site has potential for the study of domestic and economic activities, especially in relation to the Malvernian pottery industry in the Roman period and some potential for the study of the surrounding environment.

These remains are of considerable significance to our understanding of settlement relating to the nationally important Malvernian pottery industry, especially in terms of its local economy and organisation.

2 Introduction

An archaeological evaluation was undertaken in an area with outline planning permission for retail, industrial and housing development. The development application (Application MH91/0026) had been submitted to Malvern Hills District Council by the Trustees of the Madresfield Estate. No archaeological objection was made to the submission in principle, on the condition that an evaluation was undertaken to assess the archaeological potential of the development area, and that its results be integrated into the final development design.

The proposed development area, covering approximately 50ha, is centred at NGR SO 792 477 (Fig 2) and is currently agricultural land. The soil is of the Whimple 3 Association with a small area of the Brockhurst 1 Association in the north (Soil Survey of England and Wales 1:250,000). These are reddish fine loamy or fine silty clay soils. The solid geology is of Mercian Mudstone (Keuper Marl) and drift of Silurian-derived Head exists in the southern part of the development area.

One site (Fig 2; HWCM 4072) within the area is registered on the County Sites and Monuments Record as a site of archaeological interest. This was identified as the location of two Romano-British kiln sites in Newland hopfields (Fig 3; Fields 1 and 2), and was identified by C I Walker FSA in the 1960's. The site comprised two scatters of Romano-British pottery on either side of the path which runs across the northern end of the proposal area (Fig 2). This pottery has recently been examined by J D Hurst and a local group of volunteers. The pottery dating from the 2nd to 4th centuries AD was largely of the type known as Severn Valley ware (Hereford and Worcester County Pottery fabric series, fabric 12) and included a little overfired pottery and a single fragment of waster (pot broken or misshapen during firing and subsequently discarded). Beyond this, the proposed development area was of

unknown archaeological significance and no survey had been undertaken.

The evaluation area lies within an area containing the Malvernian prehistoric, Roman and medieval ceramic industries which supplied pottery and tile throughout the Midlands. These industries are of great archaeological significance due to their longevity and large-scale. Despite this significance and the fact that it was first identified over twenty years ago (Peacock 1968) the industry has received very little research attention. The importance of major regional production sites, such as the Malvernian ones, has recently been highlighted, "clearly priority should be given to those kilns whose products are known to have firstly, a provincial and secondly, a regional distribution" (Fulford and Huddleston 1991, 52).

The area of the proposed development is within area of pottery production during the Roman period and a number of sites dated to that period are listed on the County Sites and Monuments Record (Fig 2; HWCM 1315, HWCM 1510, HWCM 4073, HWCM 4585, HWCM 6004, HWCM 7061, HWCM 9317 and HWCM 11392). Two of these (HWCM 4073 and HWCM 7061) are surface scatters of pottery including overfired pottery and wasters. The remainder have been subject to salvage recording of disturbed buried remains or limited excavation. The quality and quantity of these varies, with recent excavation of only two of them (HWCM 1315; Waters 1976; and HWCM 4585; Waters 1969). No kiln structures were located but excavated features contained very large quantities of locally produced pottery, charcoal, burnt clay and some wasters. Kiln structures were reported at one site (HWCM 6004) but these were excavated in 1887 and although the finds have been kept and recorded (Peacock 1969) no record of the excavation survives. At the remaining three, salvage recording and observation noted large quantities of pottery and possible kiln structures at two sites (HWCM 1510 and HWCM 9317) and a dump of wasters at the third (HWCM 11392; Waters 1970). Dating of the pottery from these sites and others in the Midlands indicates that large-scale production in the Malvern area in the Roman period dated from the 1st through to the 4th century AD.

Thus the information available indicates a large-scale, long lived, significant, but probably scattered, pottery industry. Little detail is known of the production sites, associated settlements, the extents of these or the social and economic organisation of the industry at any given period. In contrast the pottery, fabrics and forms produced are widely recognised and recorded, though little synthesis has been undertaken. As a whole the industry and its products have considerable national importance. This importance is increased by the presence within the same part of the Midlands of two other major industries during the Roman period, the iron industry in Worcester and Ariconium and the salt industry of Droitwich. Together these three industries must have had considerable significance to the regional and national economies.

3 Aims

The aims of the evaluation were to locate archaeological deposits and determine, if present, their extent, state of preservation, date, type, vulnerability, documentation, quality of setting and amenity value. The purpose of this was to establish their significance, since this would make it possible to recommend an appropriate treatment which could then be integrated with any proposed development programme.

4 Method

The evaluation covered a large area (50ha), of largely unknown archaeological potential, with only one known site included towards the north end of the development area (Fig 2; HWCM 4072). In order to locate any unknown sites that might have been in the

development area and to more precisely locate the known site two non-destructive survey methods were initially employed, magnetometer survey and fieldwalking. The results of these surveys could then be used to locate trenches for excavation to assess the survival and significance of any archaeological deposits encountered.

A magnetometer survey was undertaken first, by Geophysical Surveys of Bradford whose full report is included as an appendix (Appendix 4). This type of survey identifies magnetic anomalies in the soil and can be used to detect features including archaeological deposits up to one meter in depth. Such a survey was considered particularly suitable for locating any kiln sites present in the evaluation area, since kilns should produce characteristic magnetic anomalies. A scanning strategy was employed across much of the area with the gradiometer (device for detecting magnetic anomalies) carried systematically across open fields, along traverses approximately 10m apart. Where anomalies were detected further investigation was undertaken and those with archaeological potential noted and marked (Appendix 4, Fig A1). In Field 1 which contained the recorded site (HWCM 4072), three areas of anomalies were identified and these were gridded out into 20m squares for more detailed survey with the specific aim of locating any kilns which might be present (Appendix 4, Fig A2).

This survey was hampered by the presence of numerous services and quantities of modern ferrous material in the ploughsoil. Consequently a fieldwalking survey was undertaken across much of the evaluation area where crop cover was not present (Fig 3). In the central and southern parts of the evaluation four fields were walked (Fields 4, 5, 6 and 7) along transects approximately 20m apart. Finds were collected at 20m intervals along these transects and located with a unique reference number. The aim was to collect finds disturbed from underlying archaeological deposits by modern ploughing and to plot the varying densities of distribution encountered.

This method is particularly good for locating unknown sites. In the north part of the evaluation around the known site (HWCM 4072), in two fields (Fig 3; Fields 1 and 2), a more intensive fieldwalking survey was undertaken to help identify the extents of the deposits. One area was gridded out in squares (10x10m) and five north to south traverses of each square were walked collecting finds. To the south and east of this area strips, 20m apart were gridded on a 10m square basis and three traverses undertaken in each square. All finds collected were located to their 10m square by unique reference number.

The results of the fieldwalking and magnetometer survey were used to locate three trenches for detailed excavation (Fig 4; Trenches 1, 2 and 3) and subsequent to the excavation of these a further trench was excavated (Fig 4; Trench 4). In these trenches modern ploughsoil was removed by mechanical excavator to the interface with archaeological or natural deposits. Selected deposits were then excavated by hand according to standard Archaeology Section recording practice (Archaeology Section Recording System, 1988 as amended). In addition, three small trenches (Fig 4; Trenches 122, 128 and 311) were excavated entirely by hand. In total approximately 156m of trench was opened, mostly 1.5m in width but in one trench (3) a 20m strip, 4.5m in width, was excavated.

Artefacts recovered from the evaluation were washed, marked, identified and an assessment of the nature and potential of the assemblage made. A detailed analysis was not undertaken. Less common pottery forms were selected for illustration (Fig 9).

5 Analysis

Magnetometer survey

The magnetometer survey based on the detailed grid in Field 1 (Appendix 4, Fig A2)

identified two anomalies of potential archaeological interest (Appendix 4, Area 1, Fig 1.1). These were used in conjunction with the fieldwalking results to position Trenches 3 and 311 (Appendix 4, Fig 1.1). The remaining gridded areas (Appendix 4, Areas 2 and 3, Fig A2) only produced anomalies suggesting modern features (Appendix 4, Fig 2.1 and 3.1). The less intensively surveyed area scanned to the south revealed a number of strong magnetic anomalies but the results were somewhat inconclusive and none of the anomalies were singled out for further investigation. However, Field 2 to the south of the gridded area was an area in which a considerable number of strong anomalies were noted (Appendix 4, Fig A1 and paragraph 4.6). This field produced the greatest density of pottery during fieldwalking and was archaeologically the best preserved (see below). Some of these anomalies may represent archaeological deposits though no direct correlation was identified between anomalies and deposits in the trenches.

Fieldwalking

Fieldwalking identified no new areas of potential early settlement but clearly confirmed the presence of archaeological activity in the northern area of the evaluation in the vicinity of the known site (HWCM 4072). Dense concentrations of Romano-British pottery were recovered from north and south of the path which crossed the north part of the evaluation area (Fig 5) and established the location and extents of archaeological deposits far more clearly than the previous observations had done. From the fields to the south (Fig 3; Fields 4, 5, 6 and 7) only eight sherds of Romano-British pottery were recovered. In contrast the two fields to the north (Fig 3; Fields 1 and 2) produced 1,949 sherds of Romano-British pottery. Two pieces of worked flint were also recovered, one a scraper the other a waste flake.

Excavated deposits

Three phases were identified in the excavated trenches.

Phase 1 Natural deposits

Natural deposits varied but mainly were a reddish brown silt clay (205, 303, 401 and "natural") or a pale greenish grey clay silt with decayed mudstone (402\404). The former deposit was the dominant one and was present in all trenches. Bands of the other deposit were present in three trenches (2, 4 and 311), both overlying and underlying the reddish brown deposit. Archaeological deposits lay above and were cut into the natural.

Phase 2 Roman deposits

Roman deposits were present in five of the seven trenches (1, 2, 3, 4 and 128).

Roman deposits were encountered along the length of Trench 1. These comprised two ditches (103 and 110, fills 102 and 111), a group of four postholes (109, 113, 115 and 117, fills 108, 112, 114, 116 and 121), a post-pad (106, fill 105), a shallow feature (127, fill 126) and a layer (134\135) in a shallow depression (136). There was also an extensive layer (120) in the central and southern part of the trench.

The ditches ran approximately north to south on slightly differing alignments, one (110) cutting the other (103) and possibly a recut of it. These were very poorly defined with their fills being virtually identical to the layer they cut (120). They were only clearly visible in section and where quantities of finds were present in their fills. Their definition was further complicated by a modern land drain which ran on almost exactly the same alignment centrally to the ditches.

The later ditch (110) cut a shallow (0.10m) scoop (127), probably a setting for a post with sandstone slab and pottery in its fill (126). Of the four postholes three were very

similar, (113, 115 and 117) being shallow (0.08-0.32m) with charcoal rich fills (112, 121 and 116). One (115) had an upper fill (114) which contained charcoal and burnt clay fragments. The fourth posthole (109) was more substantial (0.50m deep). In the same part of the trench was a post-pad (107) comprising two limestone slabs (106). These features all cut layer 120. To the north end of the trench a charcoal flecked layer of silty clay loam (134\135) occupied a shallow hollow (136, 0.35m deep) in the natural. This layer contained a large quantity of pottery (280 sherds) and mixed rubble (pebbles, Malvernian metamorphic stone and greenish grey mudstone).

An extensive layer (120) overlay the reddish brown natural and was cut by Roman dated features and contained a small quantity of Roman pottery. This was a loamy clay silt, pale greenish grey in colour containing mudstone and a small quantity of charcoal. Excavation through it showed that it varied in depth, thickening towards the south end of Trench 1 (maximum depth 0.15m). This deposit was also present in Trench 128 to the south where it was shallower (0.08m). In Trench 128 it was cut by a slot (131), a posthole (130) and a shallow, possibly linear feature (132).

To the north in Trench 2 (Fig 6), a ditch (203) with a stakehole in its base (202) and a shallow cut, possibly a truncated posthole (207) were excavated and are dated to this period on the basis of the nature of their fills and on the absence of modern material in their fills. Two unexcavated features are also considered Roman due to the similarity of their fills to those of the two features above. The ditch was U-shaped in profile and ran approximately north to south. It was 1.40m wide and was 0.46m deep. Its fill (202) was a charcoal flecked very fine sandy loam. This also filled the stakehole in its base. The possible posthole (207) was shallow (0.10m) with a burnt clay and charcoal flecked fill (206).

Trench 3 (Fig 7) contained only a shallow irregular feature possibly linear and running east to west (315, 0.30m deep) and a posthole (305, 0.15m deep) which can be dated to this period on the basis of their fills and the absence of later material in them. The linear feature (315) may be the feature detected by magnetometer survey and shown as "?drain" in the magnetometer survey report (Appendix 4, Fig 1.1).

In Trench 4 a number of intercutting features are considered Roman (Fig 7; 407, 408, 409 and 410). Of these only one (407), a posthole was partially excavated. Its fill (406) contained Roman pottery and was similar to the unexcavated fill of 410. These two were stratigraphically later than the other two deposits in this trench (408 and 409).

Phase 3 Post-medieval deposits

The main deposit from this period was the modern ploughsoil (100/101, 123, 129, 201, 300/301 and 400) which contained large quantities of Roman pottery and quantities of post-medieval artefacts. This varied in depth (0.10-0.20m) and was not well defined due to the effects of subsoiling, mole-ploughing, root action and weathering. This deposit reflected the natural topography, with a high point to the north of the path (OD 50.26m) falling 2.80m to a low point by Trench 122 (OD 47.46m).

A large number of post-medieval features were identified and are shown as areas of tone on the plans of the trenches (Figs 6 and 7). The majority of these were drainage features and contained land drains. A number of postholes were also noted which still contained elements of rotted posts. In Trench 122 a post-medieval metalled deposit (Fig 6; 125) comprising stone and brick rubble was revealed approximately 0.50m below the top of the ploughsoil and overlying the natural marl. The deposition of this would have removed any archaeological deposits in the area. In Trench 2 a number of pits were observed along the line of the path.

6 Discussion

Natural deposits

The reddish brown natural deposits represent Mercian Mudstone (Keuper Marl) with the variations (402 and 404) possibly resulting from periglacial weathering and redeposition of material from the surrounding hills. The natural at the interface with the ploughsoil above was not well defined due to disturbance by various activities including ground improvement, root action and weathering. The latter probably has had considerable effect especially resulting from cracking of the ground during dry weather.

Roman deposits

In Trench 1 (Fig 6) the group of postholes (109, 113, 115, 117 and 127) and the post-pad (107) clearly relate to one or more timber structures, but within the excavated area insufficient elements were present to attempt an interpretation of the form of this structure. Burnt clay in the fill of one may indicate a wattle and daub construction. An abundance of charcoal in the fills of three of them may represent debris from a hearth. In Trench 122 (Fig 6) a large posthole (130), a slot (131) for a horizontally laid timber and a further linear feature (132) indicate another timber structure or structures. Again the form of this could not be ascertained. In Trench 4 (Fig 7) the partially excavated posthole (407) and the unexcavated features (408, 409 and 410; probably representing postholes) suggest a further timber structure but again the function is uncertain. Here the fact that features cut each other indicates at least two phases of activity. Both forms of construction (post-built and post and timber cill beam slot) are common methods of construction encountered on Romano-British settlement sites. The function of the postholes in Trenches 2 (Fig 6; 207) and 3 (Fig 7; 308) cannot be established.

Ditches in Trenches 1 and 2 (Fig 6; 103, 110 and 203) and the linear feature in Trench 3 (Fig 7; 315), which probably represents a ditch or gully, are interpreted as boundary features with a possible secondary function as drainage features. They may divide properties or plots of land. In Trench 1, one ditch (110) cut the other (103) and represents a recut of it on a slightly differing alignment. This indicates a fairly long period of occupation. In addition the recut truncated a shallow posthole (127). The line of the ditch and recut in Trench 1, if continued, would approximately lead to the ditch in Trench 2 and they may be all part of one ditch alignment. The ditches in Trench 1 had been backfilled in part with domestic rubbish.

A layer (Fig 6; 134\135) in Trench 1 represents an element of surviving horizontal stratigraphy. This deposit clearly extended east and west of the trench and probably had been more extensive to the north and south prior to truncation by ploughing. The hollow in which the surviving element lay had protected it from truncation. This layer contained a large assemblage of fragmented domestic pottery as well as rubble and charcoal. A sample from this produced a charred fragment of Romano-British grain and several other fragments of charred seeds (see Appendix 3). This layer is interpreted as being occupation debris.

The layer which covered much of Trench 1 (Fig 6; 120) is interpreted as a layer with natural origins that has then formed a ground surface. Its varying deposition down the slope of the hill, its nature and its absence from the brow of the hill suggest that its origins lie in the erosion and redeposition of material down a hillslope. Such processes usually occur on exposed land such as a ploughed field and suggest that this area was under cultivation prior to the Romano-British occupation. Subsequently it formed the Roman ground surface being cut by Roman features and having Roman finds incorporated into it as a result of its use as a ground surface. Since hillwash had clearly contributed to the backfilling of the Roman features especially the ditches the definition of features within this layer was extremely poor. Some horizontal truncation of this has

occurred due to ploughing in recent times.

The finds assemblage mainly comprised pottery, the majority of which was Severn Valley ware (fabric 12) and could only be dated to the 2nd to 4th centuries AD. As a whole, the assemblage indicated a probable 3rd century date for the settlement. The fabrics and vessel types present were typical of a Romano-British domestic assemblage in this area (Peacock 1968 and Webster 1976). The only notable exception was the relatively low percentage of grey wares compared to the percentages at the Roman towns of Worcester and Droitwich. This is probably due to the location of the settlement close to Malvernian and Severn Valley ware pottery production sites and localised variations in short distance trade. The high percentage of large storage vessels as opposed to "tablewares" and the tiny quantity of Samian and *mortaria* indicate a population still largely following a native lifestyle. This is particularly significant since the Roman pottery industry in the area, though using Roman technology, developed out of the major, local, prehistoric industry to form a significant part of the regional Roman economy.

Environmental sampling produced few charred plant remains but this probably relates to the function of the sampled features rather than to poor conditions of survival. Features such as the ditches and postholes present in the evaluation trenches rarely produce good quality environmental remains. However those features which do produce good evidence, such as pits and corn drying ovens are liable to be present within the settlement as a whole.

Together these deposits, the finds associated with them and the environmental remains indicate the presence of a Romano-British settlement dating to the third century AD. The extents of this settlement beyond the evaluation area and its relationship to the Romano-British pottery industry cannot be established on the basis of this evaluation, and can only be established through a specific research design. However, several observations can be made about the nature and possible relationship of the settlement and the industry.

The excavated evidence did not suggest that kilns were in the immediate vicinity since few wasters, overfired sherds or the general charcoal and fired clay debris to be expected in association with kilns were recovered. However, the Malvern-based industry was producing large quantities of pottery at the time of this settlement and although few of the kilns have been located they cannot have been at any great distance from it. Consequently it can be assumed that the settlement and the industry were linked in some way. This idea is strengthened by the unusually low proportion of Grey wares present suggesting that a Severn Valley ware kiln nearby was able to supply the majority of pottery necessary. It is unlikely that the potters would have lived in immediate proximity to the kilns due to the smoke and fumes and the considerable risk of fire. Unlike a modern industry, production would have been seasonal, probably coinciding with a lull in the agricultural year and the availability of the large quantities of timber required to provide fuel for the kilns. The industry is unlikely to have been concentrated in one place but would have been scattered perhaps among several small rural settlements. For much of the time these would have functioned as any rural community, largely engaged in agricultural work, with a period of pottery production occurring at a convenient time within the year. If this were the case then the associated settlements would not stand out from the average Romano-British rural settlement unless the actual kiln sites or rubbish pits were located. This site would fit such a model as would the sites so far noted in the area on the County Sites and Monuments Record.

In a wider context this industry is of even greater interest when considered along with the prehistoric, Roman and medieval salt production industry at Droitwich and the

Roman iron industry in Worcester and Ariconium, which were large-scale industries. Together, the three suggest that this part of the Midlands formed a highly important industrial area which would have had a considerable impact on the national and regional economy and resources. As a group they are highly significant to our understanding of the industrial economy of Roman Britain.

Post-medieval deposits

The presence of numerous finds in the ploughsoil, the shallow nature of features especially in Trenches 2 and 3 and the lack of horizontal archaeological deposits with the important exception of those in Trenches 1 and 128 suggest that ploughing has severely truncated archaeological deposits over much of the area. This appears to be most severe to the north of the path at the highest point of the land but reduces in severity to the south, down the hill towards the stream. Here hillwash has deepened the overlying soils and protected the archaeological deposits.

Other post-medieval features represented land drainage, rubbish disposal and a yard area (124) probably part of earlier agricultural activity replaced by the more modern buildings and yards at Newland hopbarns. Recent use of the fields for hops accounts for the postholes which represent the settings for hop-poles.

7 Assessment of significance

The evaluation produced evidence of an area of greater archaeological significance (Fig 8). This area contained deposits which represent the remains of a Romano-British settlement probably relating to the Malvernian pottery industry. To establish the significance of these deposits an assessment of the site has been made using the *Secretary of State's criteria for scheduling ancient monuments*(DoE 1990, Annex 4; Appendix 2).

Rarity

Sites relating to a major Roman pottery industry which forms part of a pottery production tradition dating from prehistoric times through to the medieval period are rare. The organisation and economy of early industries such as the Malvernian pottery industry are poorly understood at a national and local level. Research to date has largely concentrated on the actual kilns and the wider distribution of their wares. The status of potters, their way of life and the functions of supply and demand at a local level are poorly understood since very few associated settlements have been identified or excavated. In addition such sites have the potential to provide dating for local kilns which "seldom have independent internal evidence of date" (Fulford and Huddleston 1991, 43).

Documentation

The evaluation site (HWCM 4072) is documented in this report. Other sites in the area associated with the industry are documented (HWCM 1315; Waters 1976; HWCM 4585; Waters 1969 and HWCM 11392; Waters 1970). Additionally the pottery produced has been widely reported in excavation reports since the industry was first recognised in the 1960's (Peacock 1969).

Group Value

The group value of the site is high. It forms part of a group of sites which together represent the nationally important Malvernian pottery industry dating to the prehistoric, Roman and medieval periods. The products of this industry are found on sites throughout the Midlands.

Known sites in the Malvern area dating to the Roman period include this site (HWCM 4072), three possible kiln sites (HWCM 1510, HWCM 6004 and HWCM 9317), a waster dump (HWCM 11392), and two occupation sites (HWCM 1315 and HWCM 4585) with assemblages of pottery and dumps of charcoal suggesting nearby kilns. Finds

scatters at two sites (HWCM 4073 and HWCM 7061) are of an indeterminate nature. This pottery industry is clearly of considerable national importance due to its scale and longevity however at present little is known of the production sites or any associated settlement sites.

As one of the few identified Romano-British settlements in the area this site has considerable significance within this important group of sites. This importance lies not only in terms of understanding the relationships of the sites associated with the industry at this period, but in terms of the changing relationships between the sites through time. Distribution of local wares is poorly understood. Towns such as Worcester tend to draw products from too wide an area to disentangle the patterns of local production and marketing. The answer to these problems can only be found in small rural settlements, particularly those occupied for a relatively short period of time such as this one, and the pattern across a group of them within an identified area of production and distribution.

The importance of this settlement and the associated group of pottery production sites is increased by their relationship to the iron industry in Worcester and the salt industry in Droitwich. As a group these three industries and the sites related to them form a regional industrial framework which is of national importance to our understanding of the economy in the Roman period.

Survival\Condition

The area of the settlement as identified within the evaluation area (Fig 8), can be divided broadly in half along the line of the path crossing it. To the south of this postholes, ditches, ground surfaces and layers of occupation debris survived below the modern ploughsoil. Though some truncation had occurred through ploughing the survival of these deposits was good as evidenced by the survival of two areas of horizontal stratigraphy.

To the north of the path the quality of survival deteriorated especially on the brow of the hill. In trenches 2 and 3 few features had survived, those remaining being relatively shallow. Few smaller features such as postholes, and no areas of horizontal stratigraphy had survived. The presence of concentrations of pottery in the ploughsoil sealing these indicated that they had been present but had been either largely or wholly truncated across this part of the settlement.

Artefactual remains were numerous with large quantities of pottery recovered. Preservation of this was good with many sherds surviving in largely undisturbed deposits to the south of the path. Where the pottery had been disturbed from deposits through ploughing, it had become fragmented and abraded. The assemblage included locally produced pottery as well as a small quantity imported from elsewhere in England and one foreign import. Fragments of tile and fired clay debris were also recovered, some iron slag and a whetstone. The pottery and other finds indicate that good evidence of the economy of the site is preserved. The study of Roman finds in this region suffers from a lack of rural assemblages to compare with the relatively well represented urban assemblages. No metal objects or bone survived in the stratified deposits. Environmental remains were sparse probably due to the nature of the sampled features rather than adverse preservation conditions. Those that were present demonstrate that some evidence of the environment of the site is preserved.

Fragility\Vulnerability

The surviving deposits on the site are preserved below 0.15-0.20m of modern ploughsoil. Any activity involving wholesale stripping of the soil, levelling down of the area or causing disturbance below the depth of the ploughsoil would damage or destroy archaeological deposits.

In addition the significance of these sites has been highlighted by the Society for the

Promotion of Roman Studies (1985, 8-9), who identify as an area for general priority, sites "associated with the manufacture and distribution of ceramics, such as pottery, tile and brick". They also state that "it is desirable to strip adjacent areas (to kilns) to find potters' houses, workshops etc and gain a better understanding of the industry as a whole."

In summary the importance of the site lies in the survival of an area of deposits relating to Romano-British settlement and in the relationship of that settlement to the Malvernian pottery industry. This site has the potential to considerably further our knowledge of the economy and settlement pattern relating to that nationally important industry and as such has considerable significance.

8 Conclusions

The evaluation identified the presence of a Romano-British settlement with deposits representing an occupation layer, a ground surface, timber built structures and boundary ditches. The survival of these deposits was good in the southern part of the settlement area falling within the evaluation but horizontal truncation through ploughing meant that survival was poor to the north of a modern path which crossed the site.

The assemblage of Romano-British pottery recovered largely comprised locally produced domestic wares, especially Severn Valley ware but also included wares from elsewhere in England and a fragment of imported Samian ware from Gaul. Environmental evidence was limited.

The pottery suggests that the site dated broadly to the third century AD and was contemporary with that period of the Malvernian pottery industry. The relationship of the settlement to that industry and other settlement associated with that industry is not possible to determine from existing knowledge but clearly there must have been some social and economic link. It is those relationships, and the importance of understanding the pottery industry as part of a wider nationally significant regional industrial economy, that makes the site of considerable importance.

9 Acknowledgements

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11 Bibliography

Bergren, G, 1981 *Atlas of Seeds and Small Fruits of Northwest-European Plant Species with Morphological Descriptions, Part 3, Salicaceae - Cruciferae,* Swedish Museum of Natural History, Stockholm

Colledge, S and Moffett, L C, Sampling and human activities: a study of the charred plant remains from the Beckford roundhouse (unpub)

de Rouffignac, C, 1991 The plant remains, in *Evaluation at Carrant Brook Farm, Ashton-under-Hill*, R Jackson, HWCC Archaeology Section Internal Report **85**, 22-27

Ede, J, 1990 Carbonised seeds, in Dinn, J, and Evans, J, *Aston Mill Farm, Kemerton: Excavation of a ring-ditch, Middle Iron Age enclosures and a* Grubenhaus,in Trans Worc Arch Soc **3 Ser 12**, 54-59

Fulford, M G and Huddleston, K 1991, *The current state of Romano-British pottery studies, A review for English Heritage*, English Heritage Occasional Paper No 1

Greig, J R, and Colledge, S, 1988 *The prehistoric and early medieval waterlogged remains from multiperiod Beckford sites 5006 and 5007 (Worcestershire), and what they show of the surroundings then,* English Heritage, Ancient Monuments Laboratory Report 54/88

Griffin, K, 1988 Plant Remains in *De Arkeologiske Utgravninger I Gamlebyen, Oslo, Volume 5, Mindets Tomt - Sondre Felt, Animal Bones, Moss, Plant, Insect, and Parasite Remains*, E Schia ed, Alvheim and Eide, Ovre Ervik, 15-108

Hinton, P, 1982 Carbonised seeds, in *Later Bronze Age downland economy and excavations at Black Patch, East Sussex, P Drewett,* Proc Prehist Soc **48,** 321-400

Jacomet, S, 1987 *Praehistoriche Getreidefunde*, Botaniches Institut der Universitat Abteilung Pflanzensystematik und Geobotanik, Basel

Peacock, D P S, 1968 *Romano-British Pottery Production in the Malvern District of Worcestershire*, in Trans Worc Arch Soc **3 Ser 1,** 15-28

Society for the Promotion of Roman Studies, Advisory Committee for the Roman Period to the English Heritage Commission, 1985 *Priorities for the Preservation and Excavation of Romano-British Sites.*

Waters, P, 1969 *Grit Farm, Malvern Link*, in Worc Arch News Letter, **No 4**, 4

Waters, P, 1970 *Grit Farm, Malvern Link*, in Worc Arch News Letter, **No 6**, 6

Waters, P, 1976 *A Romano-British Pottery site at Great Buckmans Farm*, in Trans Worc Arch Soc **3 Ser 5,** 63-72

12 Abbreviations

Numbers prefixed with 'HWCM' are the primary reference numbers used by the Hereford and Worcester County Sites and Monuments Record.

HWCC - Hereford and Worcester County Council

Appendix 1 The archive

The archive consists of:

64	Context records AS1
10	Fieldwork progress records AS2
4	Photographic records AS3
3	Context number catalogue records
23	Context finds sheets AS8
15	Sample records AS17
1	Levels record AS 19
17	Scale drawings
4	Boxes of finds
7	Field walking record sheets
7	Field survey sheets
45	Fieldwalking finds record sheets
9	Context finds summary sheets
2	Finds by phase assessment sheets

All primary records and finds are kept at:

Archaeology Section
Hereford and Worcester County Council
Tetbury Drive
Warndon
Worcester WR4 9LS

Tel Worcester (0905) 58608

A security copy of the archive has been placed at:

Hereford and Worcester County Museum
Hartlebury Castle
Hartlebury
Near Kidderminster
Worcestershire DY11 7XZ

Tel Hartlebury (0299) 250416

Appendix 2

Secretary of State's criteria for scheduling Ancient Monuments - Extract from *Archaeology and Planning* DoE Planning policy guidance 16, November 1990

The following criteria (which are not in any order of ranking), are used for assessing the national importance of an ancient monument and considering whether scheduling is appropriate. The criteria should not however be regarded as definitive; rather they are indicators which contribute to a wider judgement based on the individual circumstances of a case.

i *Period*: all types of monuments that characterise a category or period should be considered for preservation.

ii *Rarity*: there are some monument categories which in certain periods are so scarce that all surviving examples which still retain some archaeological potential should be preserved. In general, however, a selection must be made which portrays the typical and commonplace as well as the rare. This process should take account of all aspects of the distribution of a particular class of monument, both in a national and a regional context.

iii *Documentation*: the significance of a monument may be enhanced by the existence of records of previous investigation or, in the case of more recent monuments, by the supporting evidence of contemporary written records.

iv *Group value*: the value of a single monument (such as a field system) may be greatly enhanced by its association with related contemporary monuments (such as a settlement and cemetery) or with monuments of different periods. In some cases, it is preferable to protect the complete group of monuments, including associated and adjacent land, rather than to protect isolated monuments within the group.

v *Survival/Condition*: the survival of a monument's archaeological potential both above and below ground is a particularly important consideration and should be assessed in relation to its present condition and surviving features.

vi *Fragility/Vulnerability*: highly important archaeological evidence from some field monuments can be destroyed by a single ploughing or unsympathetic treatment; vulnerable monuments of this nature would particularly benefit from the statutory protection which scheduling confers. There are also existing standing structures of particular form or complexity whose value can again be severely reduced by neglect or careless treatment and which are similarly well suited by scheduled monument protection, even if these structures are already listed buildings.

vii *Diversity*: some monuments may be selected for scheduling because they possess a combination of high quality features, others because of a single important attribute.

viii *Potential*: on occasion, the nature of the evidence cannot be specified precisely but it may still be possible to document reasons anticipating its existence and importance and so to demonstrate the justification for scheduling. This is usually confined to sites rather than upstanding monuments.

Appendix 3

The plant remains from North End Farm, Madresfield, Clare de Rouffignac, MA GIBiol AIFA, Environmental Archaeologist

1 Summary

The environmental samples from the evaluation at Madresfield produced some charcoal but few charred seeds or chaff. Some cereal and weed seeds were noted from the samples, but the evidence points to crop processing taking place away from the evaluation area.

2 Introduction

The evaluation at Madresfield produced evidence of a Romano-British settlement probably associated with the Malverian pottery industry.

Previous work on environmental remains from rural Roman sites in the county has been scanty. The evaluation at Ashton-under-Hill (HWCM 5503) produced some charred cereal remains (de Rouffignac 1991), whilst the more extensive excavations at Beckford and Aston Mill produced charred and waterlogged plant remains (Greig and Colledge 1988).

Preservation of charred remains at Aston Mill was very variable, and it appeared that processing of crops was not taking place in the area of the excavations (Ede 1990, 54). The excavations at Beckford produced cultivated cereal crops from Iron Age and Romano-British features, including *Triticum dicoccum* (emmer) and *Triticum spelta* (spelt) (College and Moffett unpub).

3 Aims

It was hoped that plant remains would be recovered in sufficient quantity to enable identification of:

a) Charred cereal grains from Roman features;

b) The stages of crop processing from which the charred remains came.

4 Method

The samples which were collected were between half a litre and five litres in size. The samples were sieved, floated and sorted. Many of the samples consisted mainly of clay. These were soaked for two days in water with the addition of a proprietary water softener to enable breakdown of the clay. The remaining samples did not require preliminary treatment.

The mesh size used was 500μm for the flots from all the samples. The residues were sorted at 5mm to enable recovery of artefactual remains before being discarded.

All the flots were then sorted to recover seeds and other plant remains. The sorted plant remains were then examined under a low power EMT-1 light microscope to enable identification.

The seeds were identified as far as possible using the Archaeology Section comparative collection, a seed identification manual (Bergren 1981) and an illustrated site report (Griffin 1988). Comparative descriptions of charred cereal seeds and chaff were obtained from Jacomet (1987).

5 Results

Fifteen samples were recovered from the excavations, all of which were examined for charred plant remains. A full list of the samples examined is given in Table 1. Of the

samples examined, only four were found to contain charred seeds and chaff. The numbers of seeds are listed in Table 2, whilst Table 3 gives the habitats of the species recovered.

6 Discussion

As so few charred plant remains recovered from the samples, it is very difficult to interpret the results. A single *Triticum spelta* glume base from [134] (occupation layer) indicates a Roman/Romano-British date which has already been observed using the pottery from the evaluation.

The weed species recovered are all commonly found on waste and disturbed ground. The presence of *Corylus avellana* (hazel) nut fragments is indicative of autumn collection of nuts, probably for winter food.

The presence of spores of *Cenococcum* sp, a species of soil fungus commonly found from archaeological sites (Hinton 1982), could be contemporary with the Roman deposits, or intrusive from more recent episodes of burning in the vicinity of the evaluation.

The lack of charred remains is in some cases related to function. Previous experience of sampling ditches has proved to be rather unproductive and the residual nature of ditch fills means that little useful information can be gained from the results (Lisa Moffett pers comm). Sampling of certain features such as pits and corn drying ovens is more productive and can produce good information relating to the environment of a site. Unfortunately such features were not encountered within the limited area of settlement excavated for the purposes of this evaluation.

7 Conclusions

The presence of some charcoal and charred plant remains suggests that human activity was taking place nearby, but not directly in the area of the evaluation. This is a similar situation to that encountered at Aston Mill, where the plant remains suggested that the settlement area was not where the excavation took place (Ede 1990).

Table 1 Results from examination of samples

[102] Fill of boundary ditch [103]

No charcoal or seeds

[108] Fill of posthole [109]

Little charcoal and no seeds

[112] Fill of posthole [113]

No seeds, some charcoal

[114] Fill of posthole [115]

8 seeds, including 7 *cf* cerealae and 1 *Chenopodium* sp

[116] Fill of posthole [117]

No seeds, some charcoal

[118] Fill of ditch [103]

4 seeds, comprising 1 cereal indet, 2 *Chenopodium album*, and 1 other seed, probably a legume

[121] Fill of posthole [115]

No charred seeds, some charcoal

[126] Fill of posthole/pit [127]

Some charcoal and a charred seed of *C album* and 12 charred *Cenococcum* sp spores

[130] Fill of posthole [130]

Very little charcoal and no seeds

[131] Fill of slot [131]

No charcoal or charred seeds present

[134] Occupation layer

7 charred seeds, including 2 *C album*, 1 Caryophyllaceae, 2 *Corylus avellana*, 2 *Rumex* sp and a *Triticum spelta* glume base

[202] Silting up of ditch [203]

No seeds and only a little charcoal

[206] Fill of irregular feature [207]

No seeds or charcoal

[314] Fill of pit [314]

No charcoal or charred seeds

[Fill of pit [407]

No charred seeds or charcoal

Table 2 Plant remains recovered from samples

	114	118	126	134
Cerealae				
Triticum spelta glume base				1
Cereal indet		1		
cf Cerealae	7			
Caryophyllaceae				
Caryophyllaceae				1
Chenopodiaceae				
Chenopodium album		2	1	2
Chenopodium sp	1			
Corylaceae				
Corylus avellana				2
Leguminosae				
Leguminosae	1			
Polygonaceae				
Rumex sp				2
Other seeds				
Fungal spores				
Cenococcum sp		12		

Table 3 Habitats of plant remains recovered from samples

Chenopodiaceae

Chenopodium album - fat hen - nitrophilous weed of waste and cultivated ground

Chenopodium sp - goosefoot type - nitrophilous weed

Coryllaceae

Corylus avellana - hazel - shrub of woodlands, edible nuts

Polygonaceae

Rumex sp - dock - weed of waste and cultivated ground

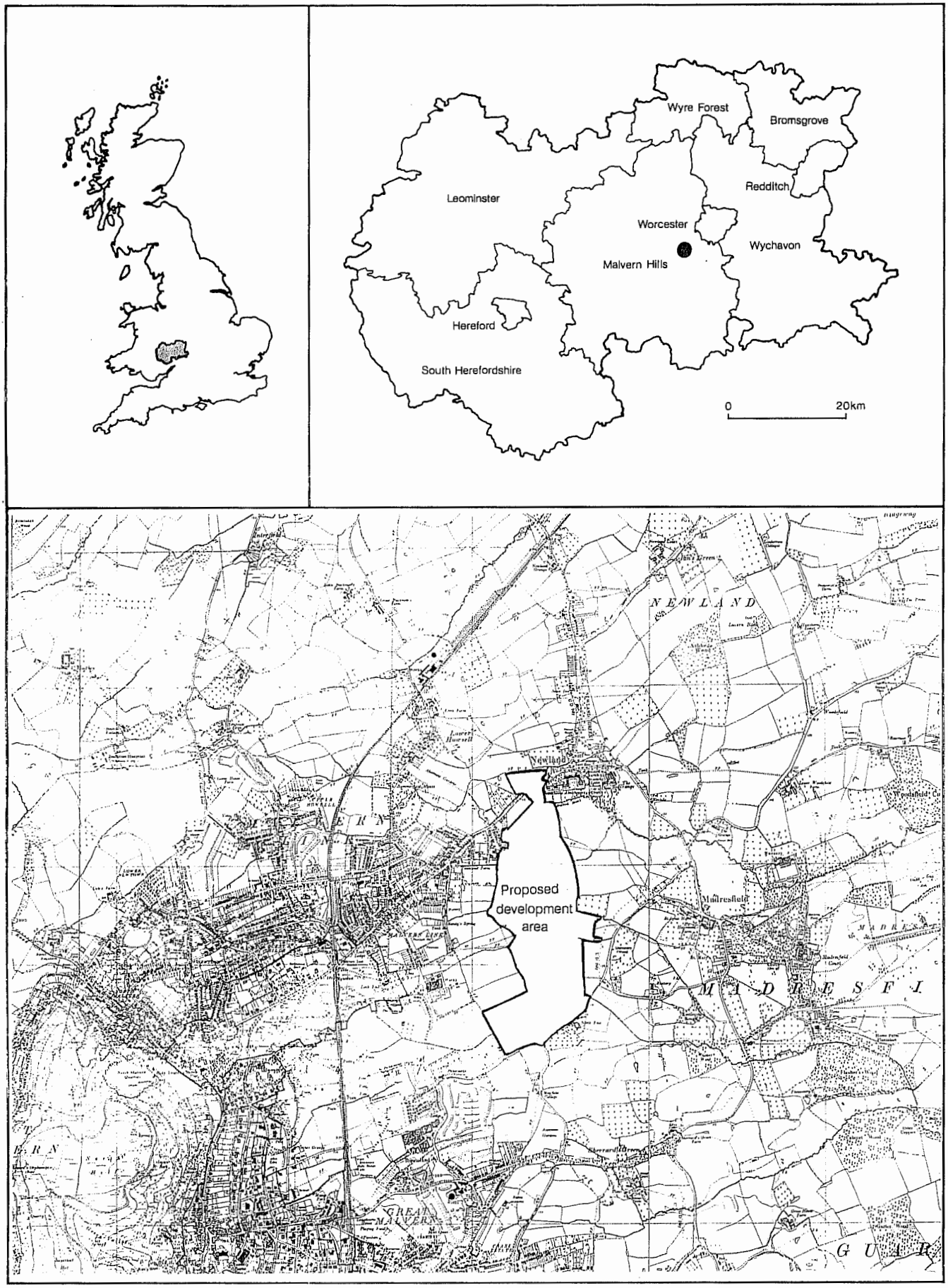

Wyre Forest
Bromsgrove
Leominster
Redditch
Worcester
Wychavon
Malvern Hills
Hereford
South Herefordshire
0
20km
Proposed development area
NEWLAND
Newland
Mathresfield
GREAT MALVERN

Fig. 1


HWCM 1315
HWCM 11392
HWCM 4585
HWCM 4073
HWCM 7061
HWCM 9317
HWCM 4072
HWCM 6004
Area of evaluation
NEWLAND
Newland
Madresfield
MADRE
MALVERN LINK
WEST MALVERN
GREAT MALVERN
Lower Howell
Sherrard Green
0
1 km

Fig. 2

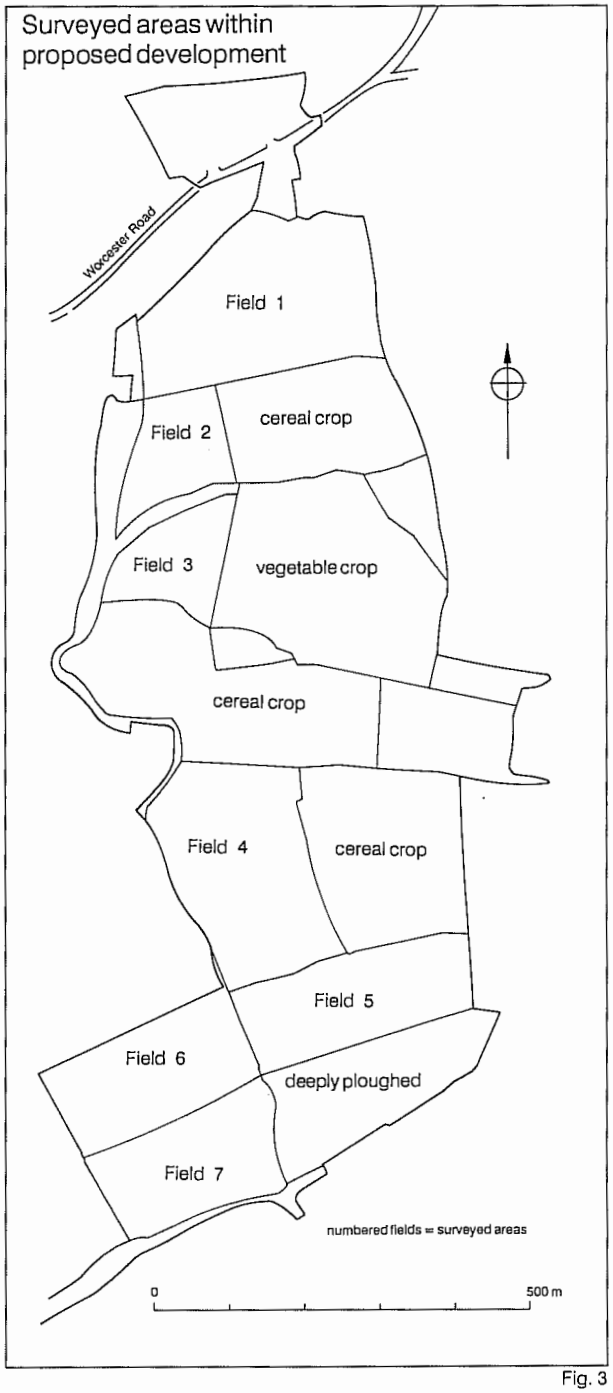

Surveyed areas within
proposed development
Worcester Road
Field 1
Field 2
cereal crop
Field 3
vegetable crop
cereal crop
Field 4
cereal crop
Field 5
Field 6
deeply ploughed
Field 7
numbered fields = surveyed areas
0
500 m

Fig. 3

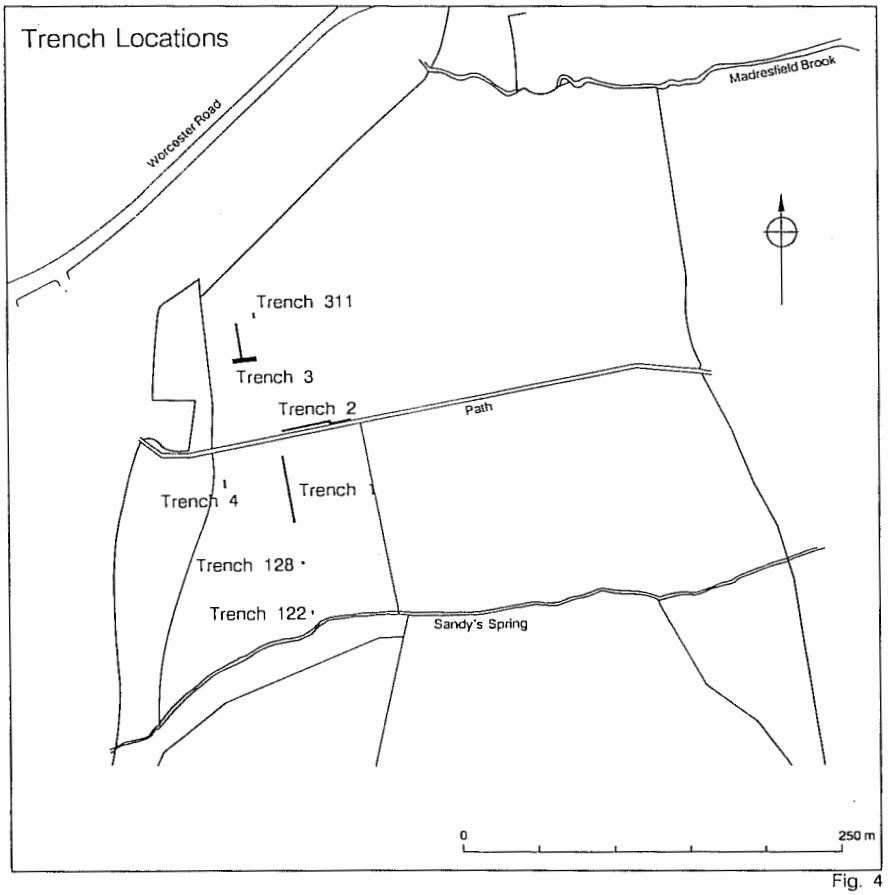

Trench Locations
Worcester Road
Madresfield Brook
Trench 311
Trench 3
Trench 2
Path
Trench 4
Trench 1
Trench 128
Trench 122
Sandy's Spring
0
250 m

Fig. 4

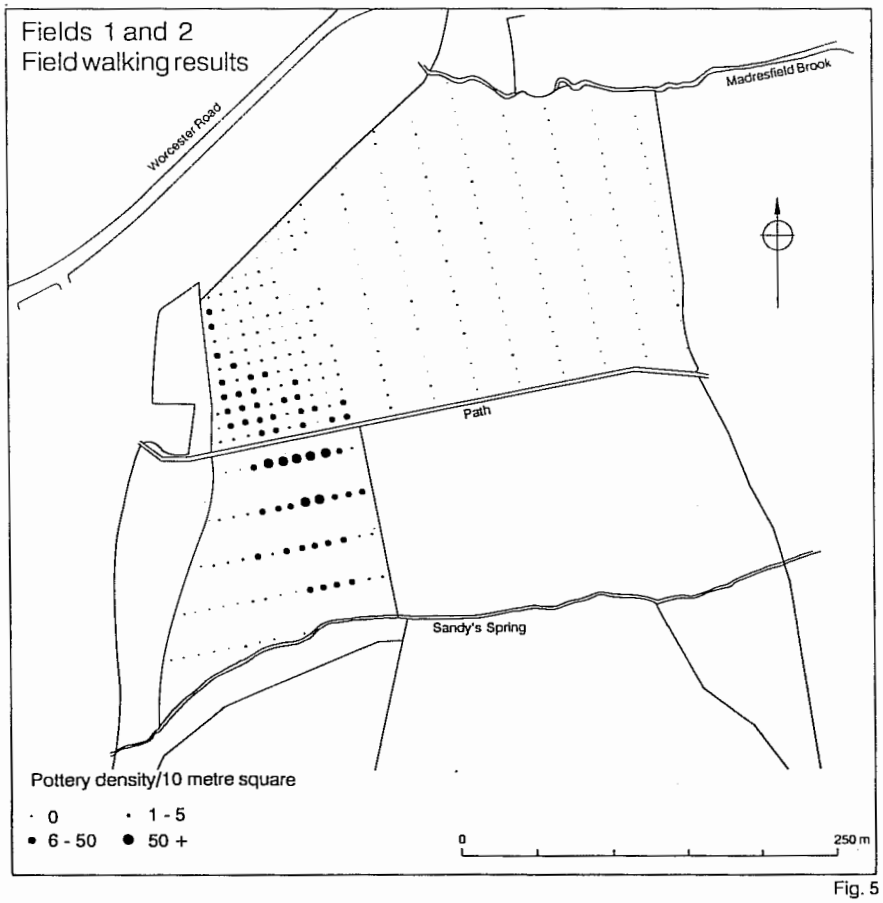

Fields 1 and 2
Field walking results
Worcester Road
Madresfield Brook
Path
Sandy's Spring
Pottery density/10 metre square
0
1 - 5
6 - 50
50 +
0
250 m

Fig. 5

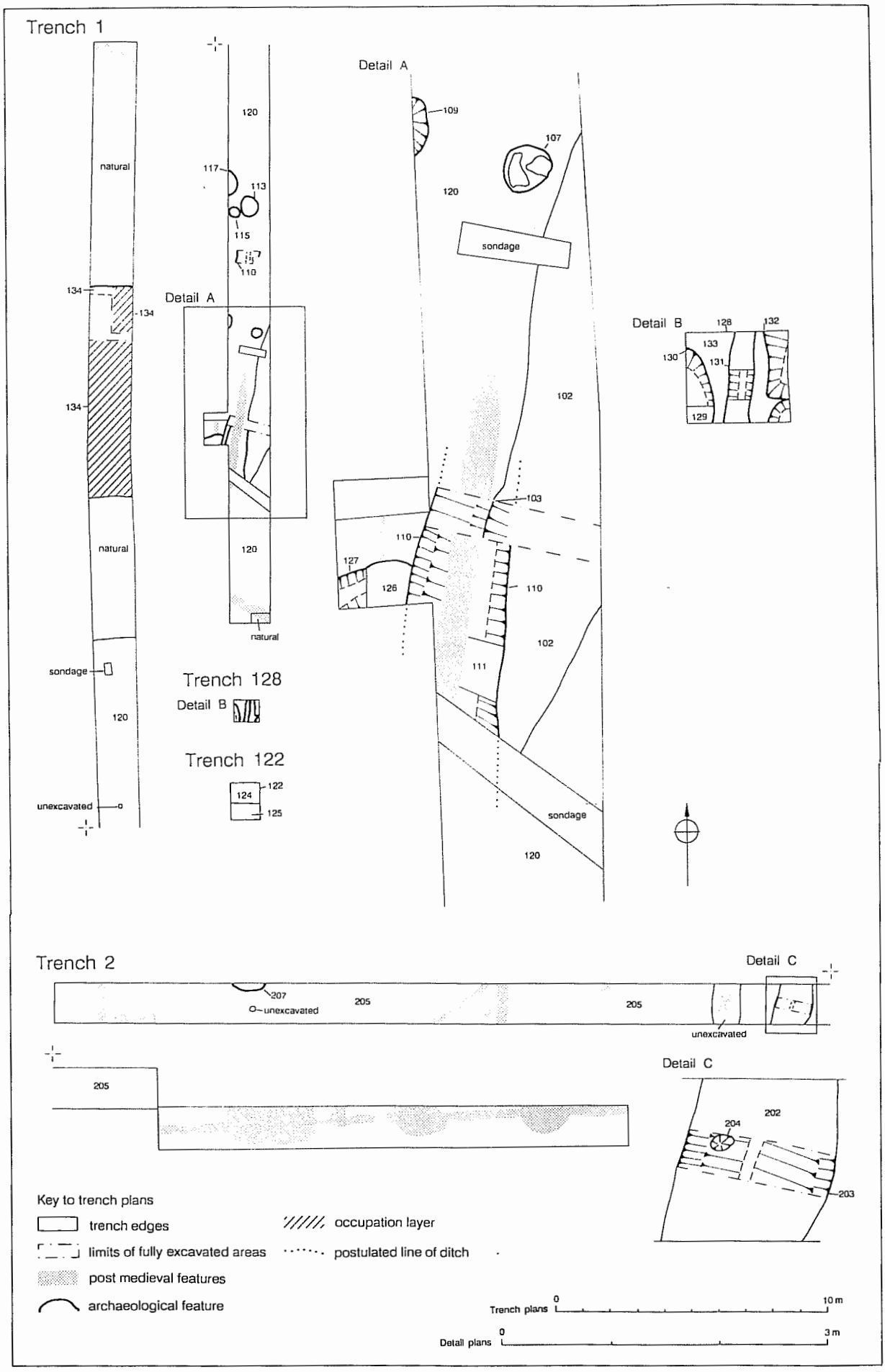

Trench 1
natural
134
134
134
natural
sondage
120
unexcavated
120
117
113
115
110
Detail A
natural
Trench 128
Detail B
Trench 122
124
122
125
Detail A
109
107
120
sondage
102
103
110
127
126
110
102
111
sondage
120
Detail B
128
132
133
130
131
129
Trench 2
207
unexcavated
205
205
unexcavated
Detail C
205
Detail C
202
204
203
Key to trench plans
trench edges
limits of fully excavated areas
post medieval features
archaeological feature
occupation layer
postulated line of ditch
Trench plans
0
10 m
Detail plans
0
3 m

Fig. 6

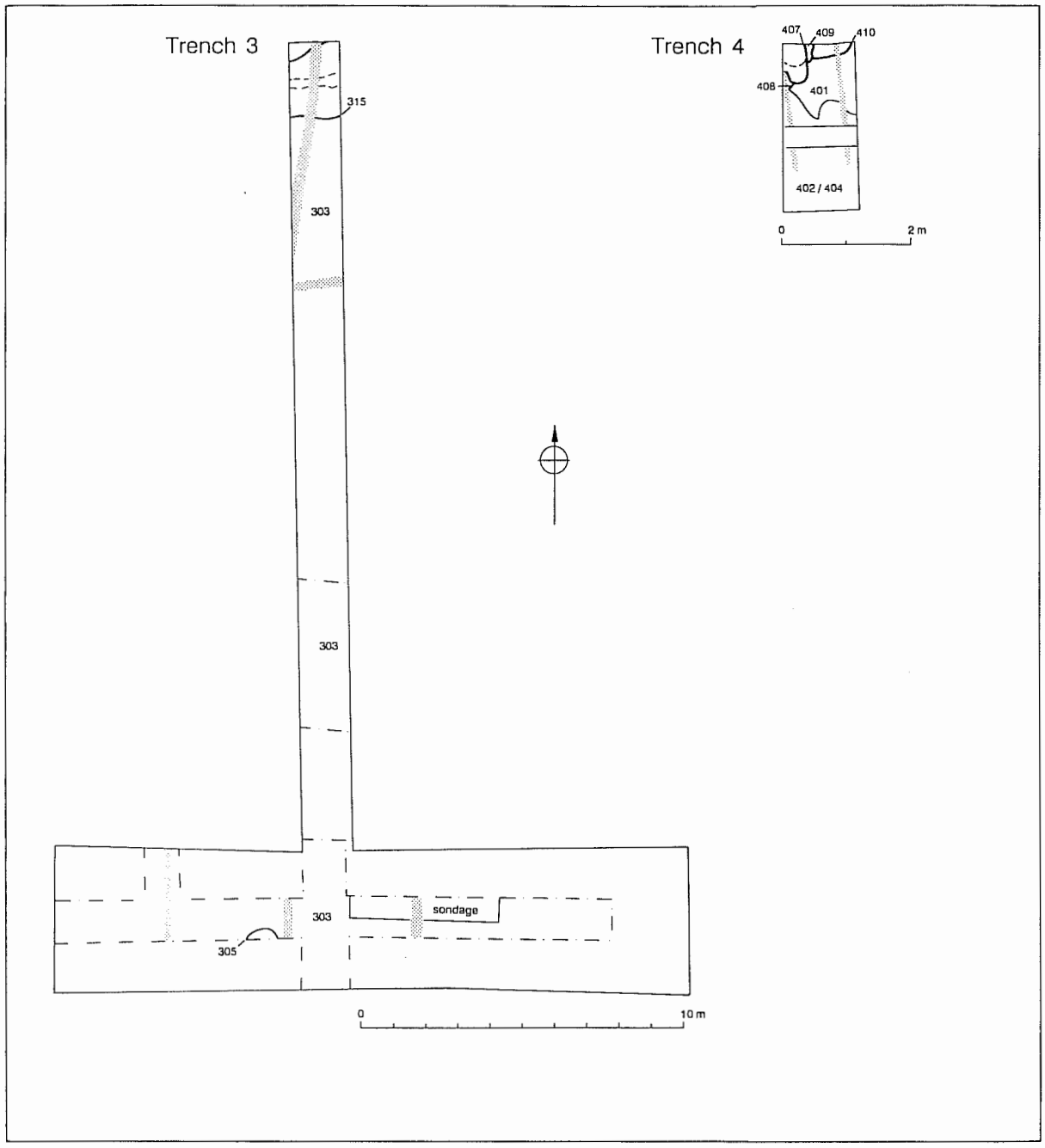

Trench 3
315
303
303
303
305
sondage
0
10 m
Trench 4
407
409
410
408
401
402 / 404
0
2 m

Fig. 7

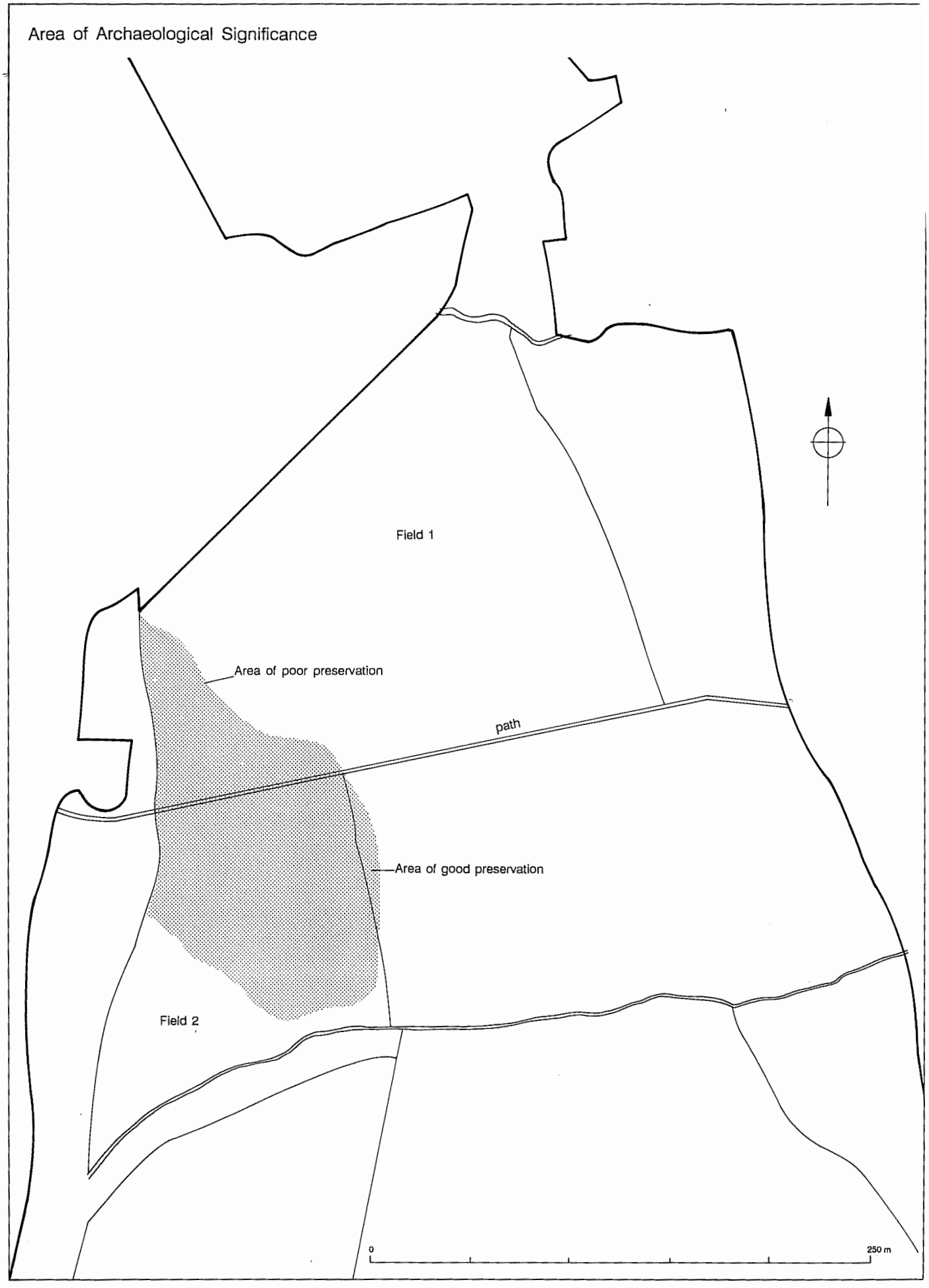

Area of Archaeological Significance
Field 1
Area of poor preservation
path
Area of good preservation
Field 2
0
250 m

Fig. 8

Appendix 4

REPORT ON GEOPHYSICAL SURVEY

MADRESFIELD, MALVERN

Report Number 91/64

Client : Hereford & Worcester County Council

Work Commissioned by

Hereford and Worcester County Council

Sites and Monuments Record	
Monument No	WSM 4072
Activitiy No	WSM 30130
	WR8514

GEOPHYSICAL SURVEYS
of Bradford

The Old Sunday School. Kipping Lane. Thornton. Bradford BD13 3EL
Telephone (0274) 835016
Fax (0274) 830212

SITE SUMMARY SHEET

91 / 64 Madresfield, Malvern

NGR: SO 792 477

Location, topography and geology

The site under investigation lies north-east of Malvern. It extends from the A449 road in the north, over an area of some 50 hectares towards the village of Madresfield in the south. The soils are loam and silts over clays, with a solid geology of Mercian Mudstone and drift deposits of Silurian-derived Head in the south. The fields are generally flat and the land-usuage at the time of the survey is detailed below (Figure A1).

Archaeology

SMR No 04072: "Possible RB kiln sites in Newland hopfields...pottery collected during fieldwalking, including kiln waste material, mostly severn valley ware...".

Aim of Survey

To attempt to locate any pottery kilns prior to trial excavations at the site.

Summary of Results *

Unfortunately the results from Madresfield have been severely hampered by the presence of service mains, land drains and general ferrous debris in the topsoil. As a consequence, although scanning has identified numerous magnetic anomalies which could be associated with pottery kilns, subsequent detailed work showed the geophysical evidence to be far from convincing.

Two possible areas of interest have been identified and the results of any trial excavation work should confirm whether or not archaeological kilns are surviving at the site.

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

SURVEY RESULTS

91/64 Madresfield, Malvern

1. Sampling Strategy

1.1 The area under investigation at Madresfield is in the order of 50 hectares in size. The proposed development covers several fields, which were under differing stages of cultivation. Figure A1 shows the land use during the course of the geophysical evaluation.

1.2 Given the nature of the archaeological targets (suspected Roman pottery kilns), a scanning strategy was adopted whereby the gradiometer was carried systemetically back and forth across the open fields, along traverses aproximately 10 metres apart. Areas of magnetic interest, viewed on the display of the instrument, were investigated more intensively, and where the anomalies were considered to be of potential archaeological significance, marker canes were left in the field. These points were subsequently tied-in, and where appropriate detailed grids were surveyed (Figure A2).

1.3 It should be noted that this strategy does not aim to offer a totally comprehensive cover of the area. The only way to provide such a survey would be a detailed (logged) investigation of the entire area. Such and exercise would be extremely time consuming and expensive, and hence difficult to justify. The sampling strategy adopted has been used successfully at numerous sites in the past, by both ourselves and the Ancient Monuments Laboratory (English Heritage). It follows a standard procedure for investigating large survey areas where pottery kilns are the subject of investigation.

2. Complicating Factors

2.1 Service mains and other pipelines were found to be present in many of the fields. Major pipelines have been marked on the plan (Figure A1), but only where they cross through the 'open' fields. Pipelines at the edges of fields, close to buildings, and under tracks have not been plotted. It should also be noted that the course of one particular sewage mains could only be traced where it lies close to the surface. As a consequence, more deeply buried mains could easily have been missed.

2.2 Land drains, some made of fired-clay, are known to criss-cross the area under investigation. At least two phases are suspected, on slightly differing alignments. A local foreman reported that some of the drains are buried in ditches/channels which contain a clinker/ash fill. Both the drains and the fills will have affected the magnetometer, particularly where material has been brought to the surface by ploughing.

2.3 Fields with vegetable crops or barley could only be investigated along tractor lines, because of potential crop damage. In addition, from the survey point of view, these were the only areas where the gradiometer could be kept in a vertical axis. However, given the problems of the pipelines, the drains and stray ferrous material, it was decided that such restricted scanning was of little use in this instance. Effort was concentrated, therefore, on the open areas.

---

3. Display (Figures 1.1 to 3.3)

3.1 A variety of display formats, including dot density plots, grey-scale images and X-Y traces, are used to represent the data from the detailed survey areas. These are discussed in more detail in the *Technical Section.*

---

4. Results

4.1 Scanning was initially concentrated in the field (A2) where artefact scatters suggested the presence of pottery kilns.

4.2 Numerous anomalies of potential interest were identified, but it was difficult to be certain of their exact nature by scanning alone. Detailed grids (20m x 20m) were investigated, therefore, over some of the 'suspect' anomalies.

4.3 The detailed work confirmed the presence of pipelines and land drains, which produced large magnetic anomalies and confused interpretation when scanning. Unfortunately, therefore, subsequent scanning had to be carried out without any 'clear' kilns having been identified. This lack of a control, or known response, naturally made scanning more difficult.

4.4 The results of the scanning, summarised in Figure A1, show some of the major pipelines, plus other areas of uncertain interest.

4.5 Points marked on the plan indicate apparent isolated anomalies greater than 20 nanoTesla in strength, and covering an area at least 5 metres across. In known archaeological contexts, such anomalies might reasonably be expected to be associated with kilns or kiln debris, but in this instance could be caused by numerous modern ferrous objects. An intact kiln should produce characteristic magnetic anomalies, but once the kilns are plough-damaged, the associated anomalies naturally become distorted and more difficult to interpret. This is partly because the anomalies can be similar to those associated with stray ferrous material, say from agricultural machinery or old field boundaries.

4.6 There is a definite increase in magnetic noise in the field immediately south of the area (A2) investigated in detail. However, ferrous debris was noted throughout the topsoil and this was thought to account for the majority of the anomalies.

4.7 A second area of increased magnetic noise is visible south of a small pond (?) and shown as an area of small squares in Figure A2. The origin of these anomalies is uncertain. Detailed work would be necessary to clarify the results.

4.8 Following the scanning of the open fields, which proved to be somewhat inconclusive, more intensive work was attempted in Field 1.

4.9 The results indicate one or two anomalies which could be associated with kilns or kiln debris / wasters. It is recommended that any trial excavation work should concentrate initially on these two areas. The results of any such work should help with any re-analysis of the geophysical results, if appropriate.

---

5. Conclusions

5.1 While scanning has identified numerous magnetic anomalies which could be associated with pottery kilns, the evidence is not particularly convincing. Similarly the results from the detailed survey areas are confusing, but they do serve to demonstrate graphically the effects of modern pipelines and drains. Two possible areas of interest have been identified and the results of any trial excavation work should confirm whether or not archaeological kilns are surviving *in situ*.

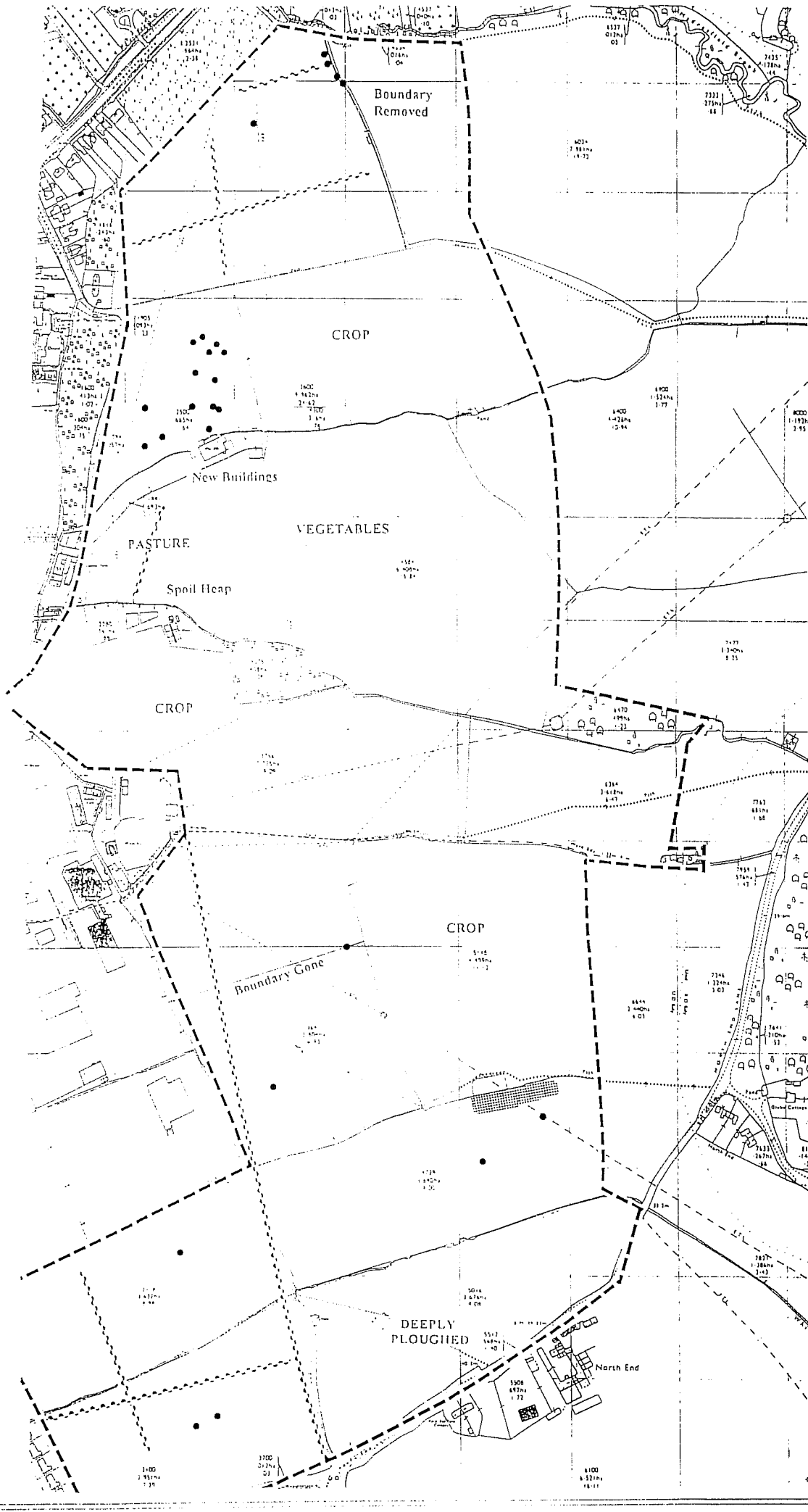
Project Co-ordinator: J Gater

Project Assistants: S Manifold, Y Minvielle-Debat

Geophysical Surveys of Bradford
6th September 1991

MADRESFIELD

Geophysical Evaluation



Strong Magnetic Anomaly

Area of Anomalies

Pipeline

Limit of Evaluation

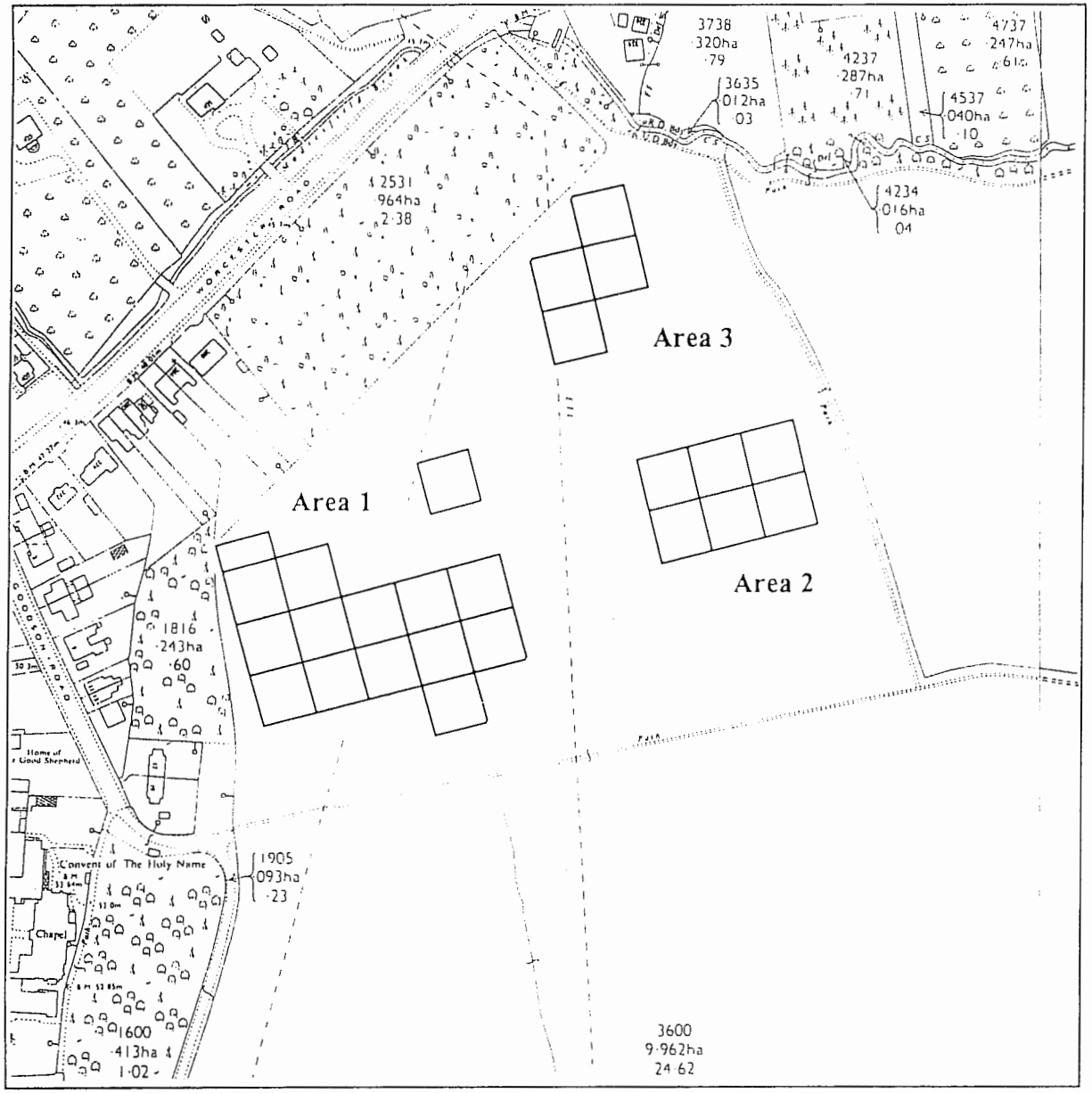
Fields marked with :

Crop
Vegetables
Deeply Ploughed

= Minimal Evaluation

0 100
m

Figure A1



MADRESFIELD

Grid Location Diagram

1:2500

Figure A2

MADRESFIELD

Area 1

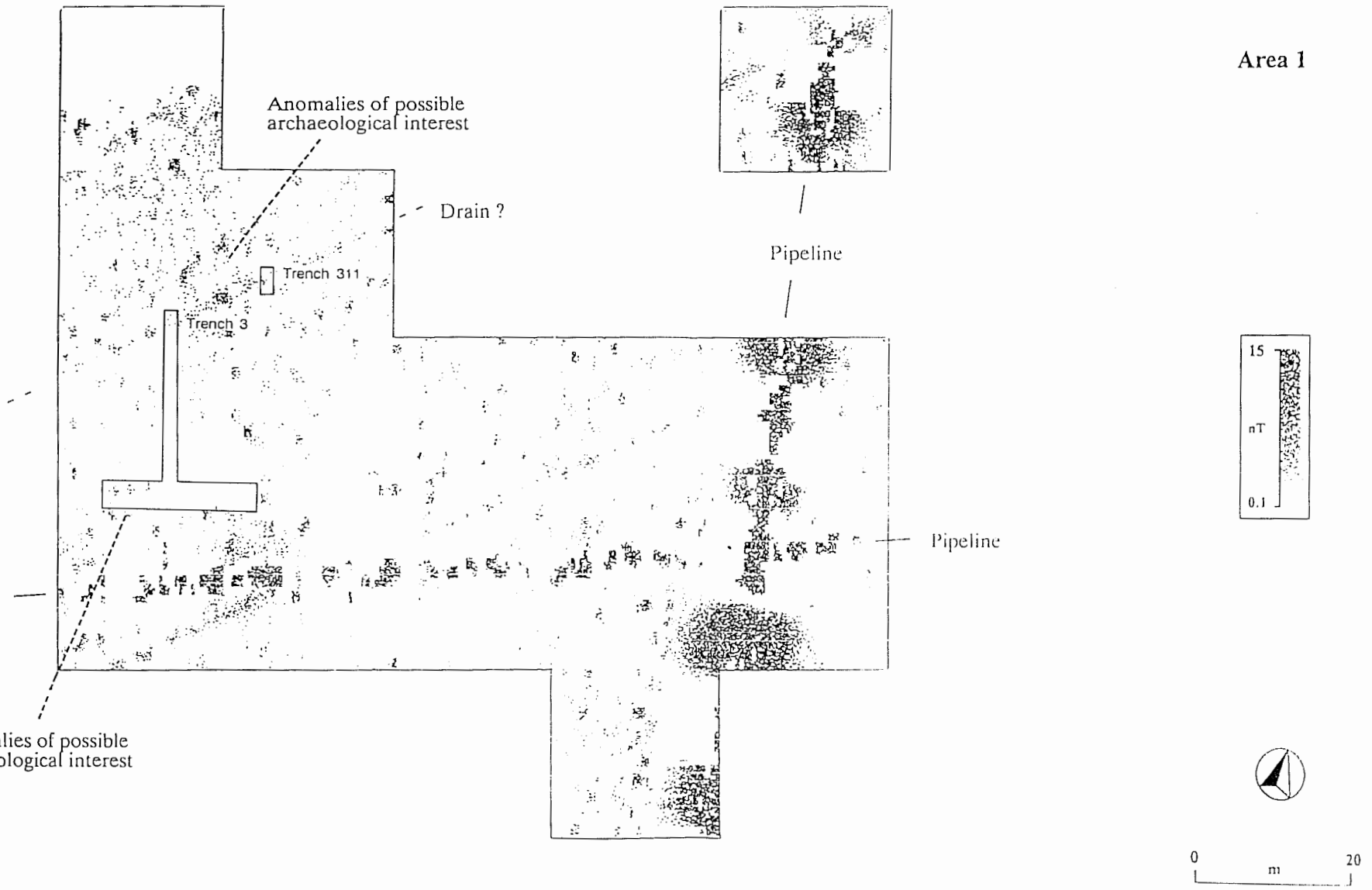
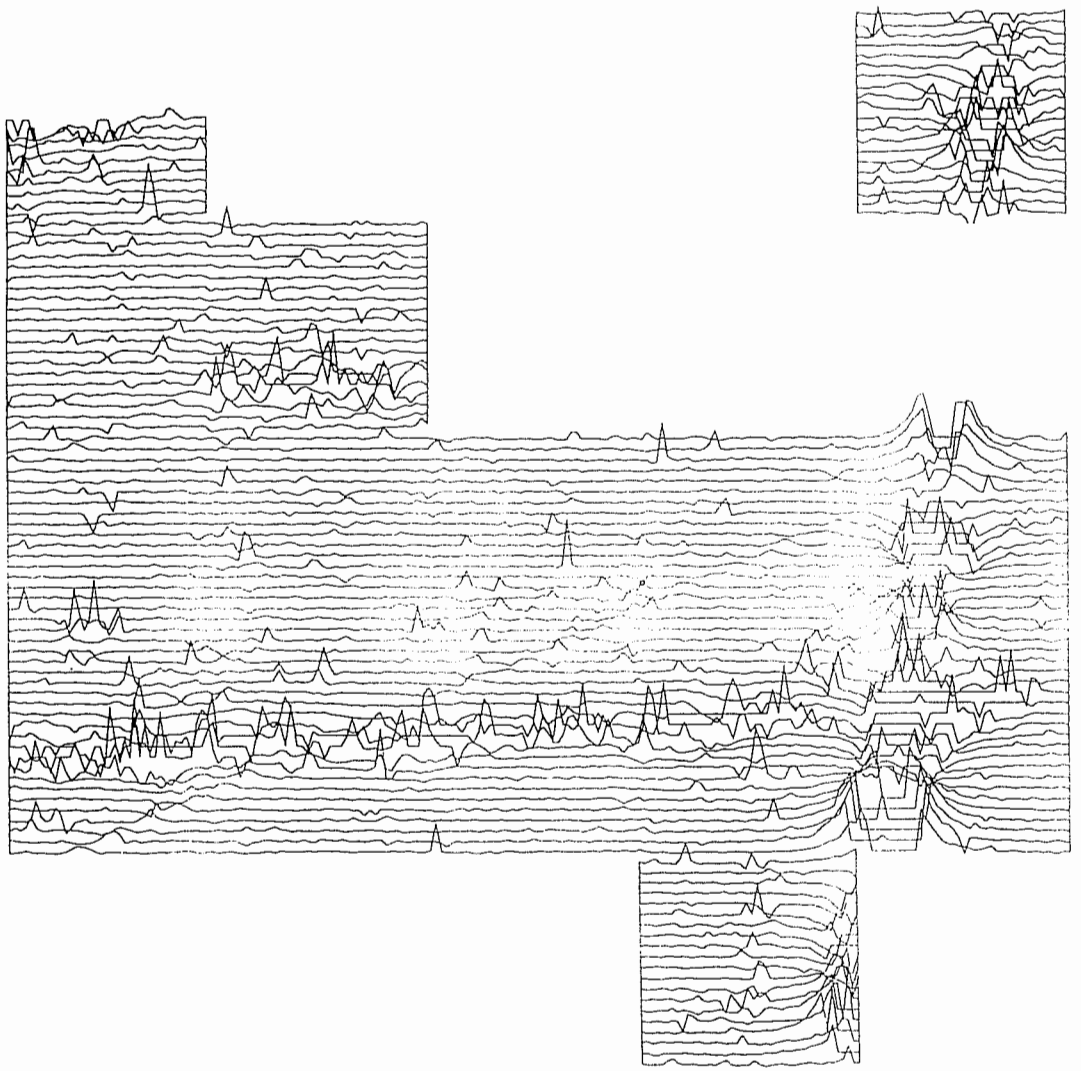


Figure 1.1

MADRESFIELD

Area 1



50 nT

0 m 20

Figure 1.2

MADRESFIELD

Area 1

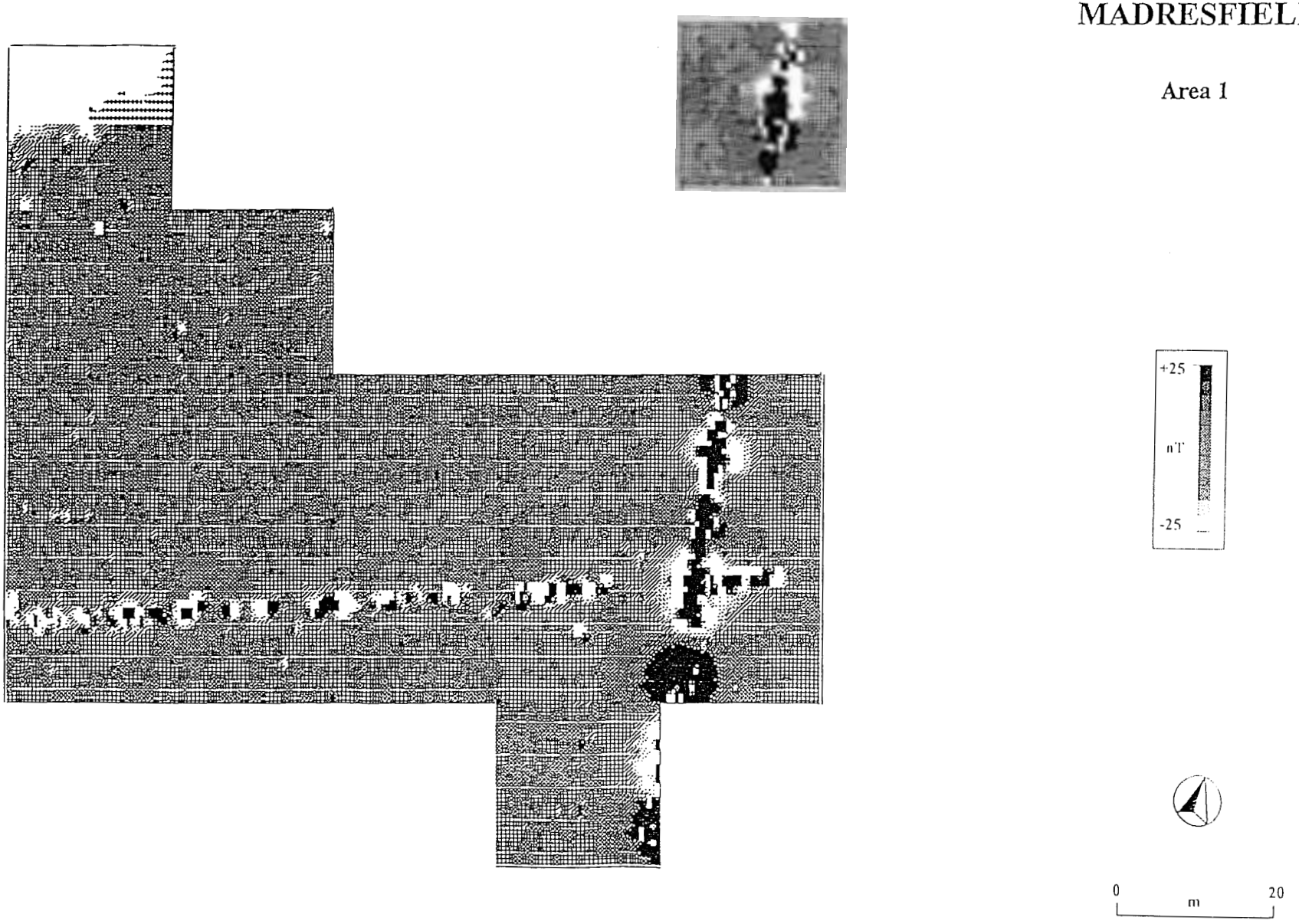
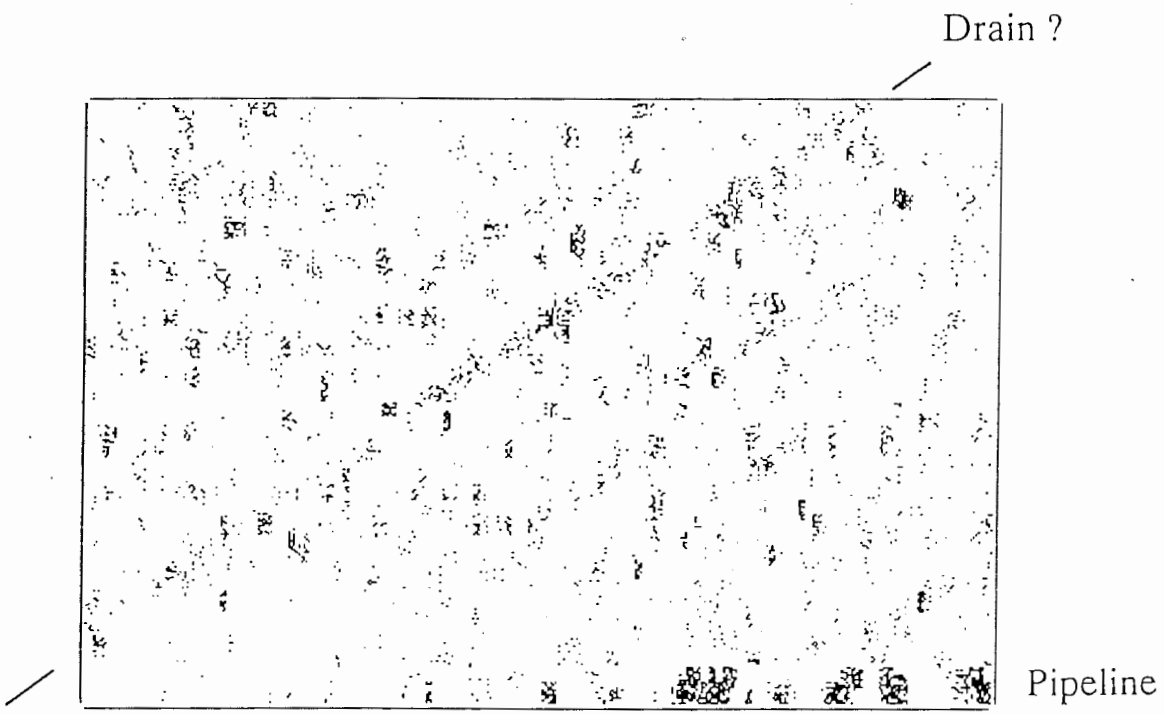
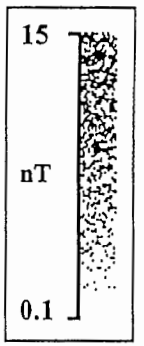


Figure 1.3

MADRESFIELD

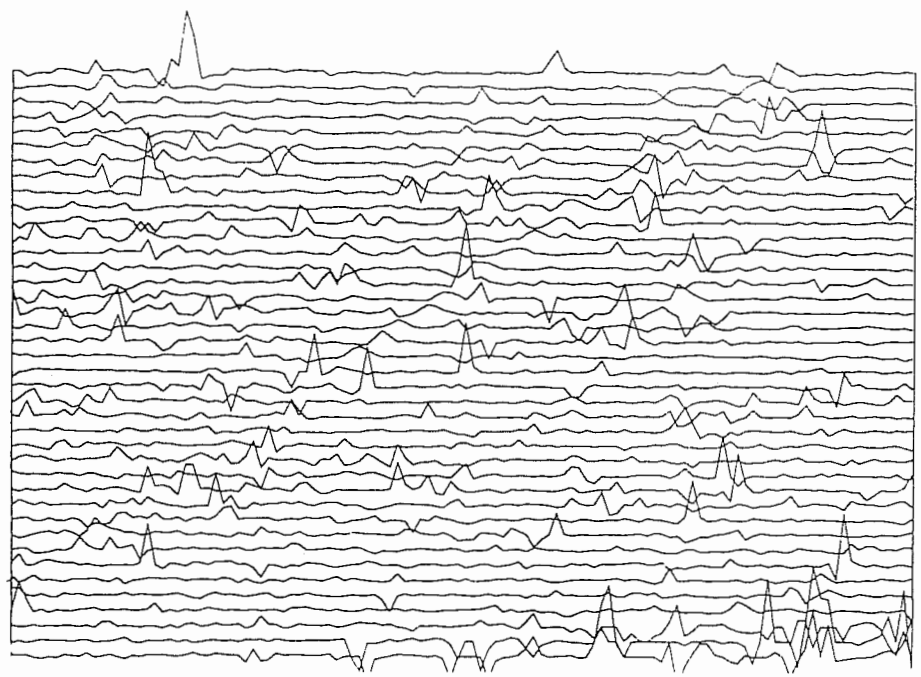
Area 2





0 m 20

Figure 2.1



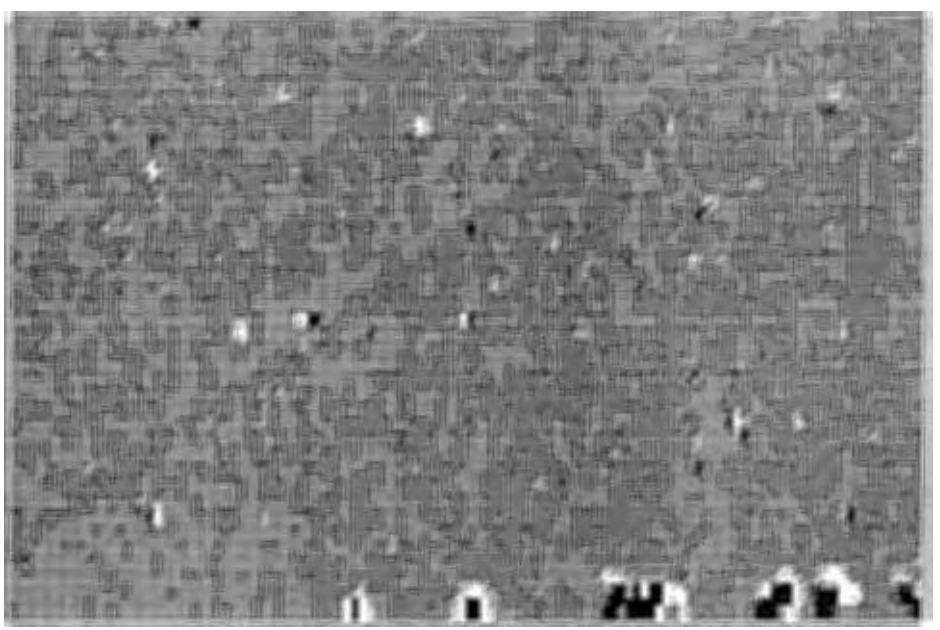
MADRESFIELD

Area 2

50 nT

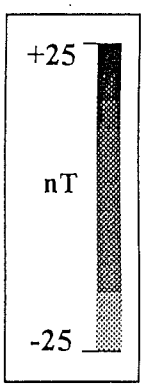
0 m 20

Figure 2.2



MADRESFIELD

Area 2



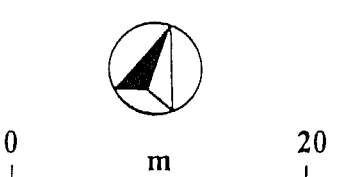
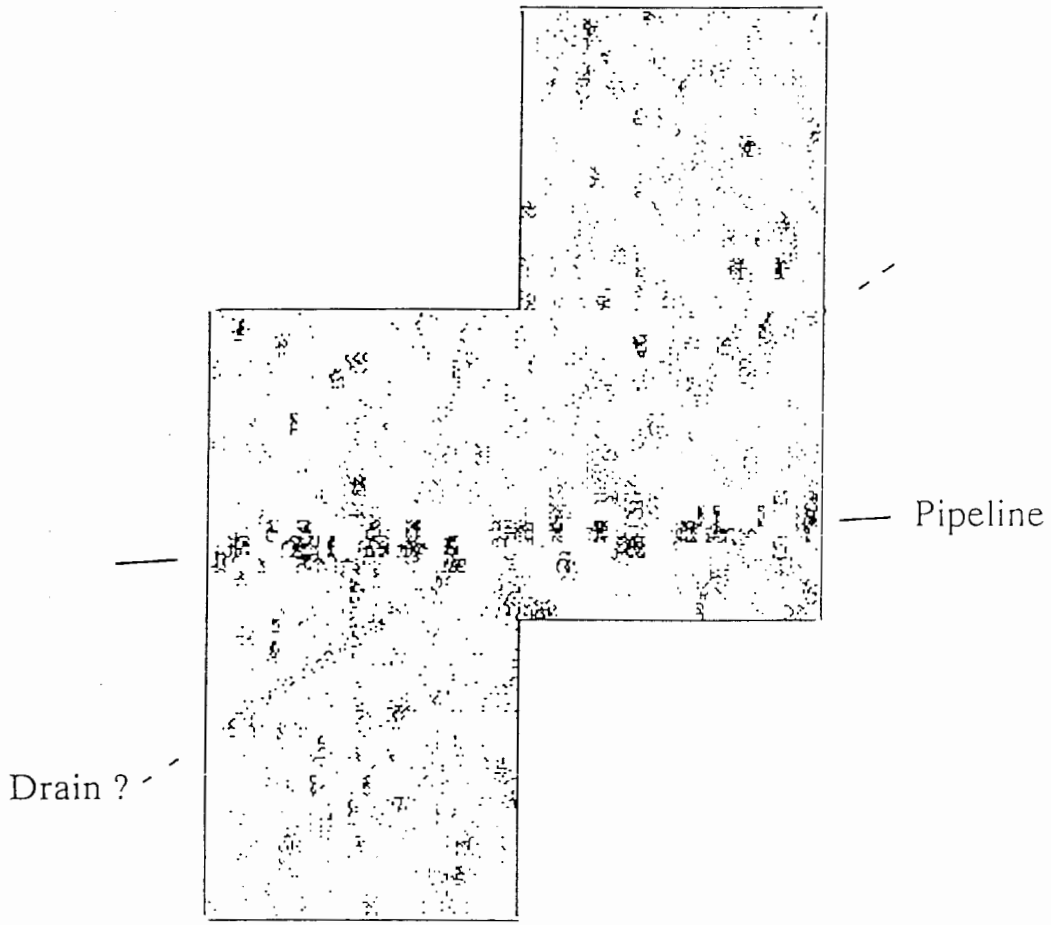
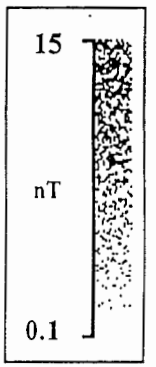


Figure 2.3

MADRESFIELD

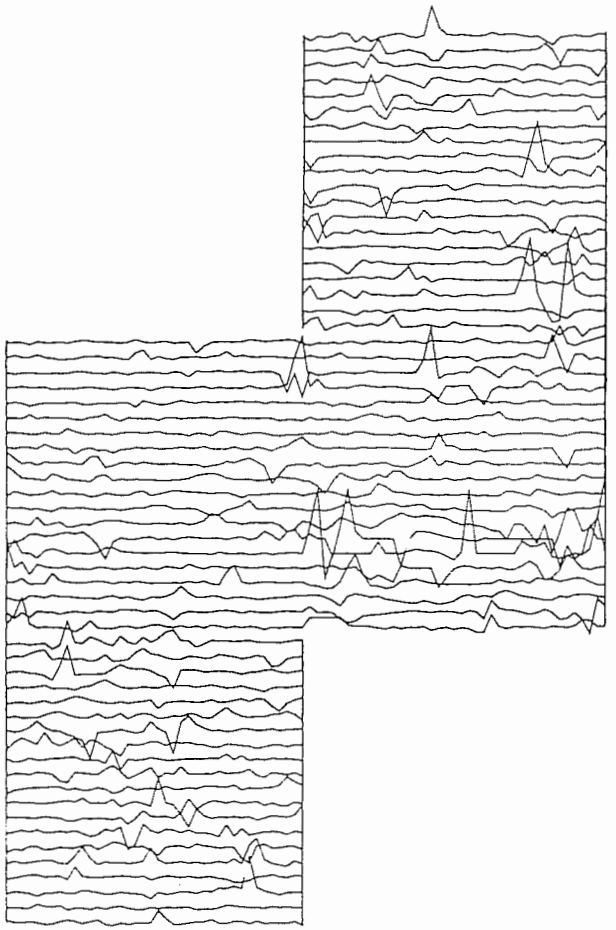
Area 3





0 m 20

Figure 3.1



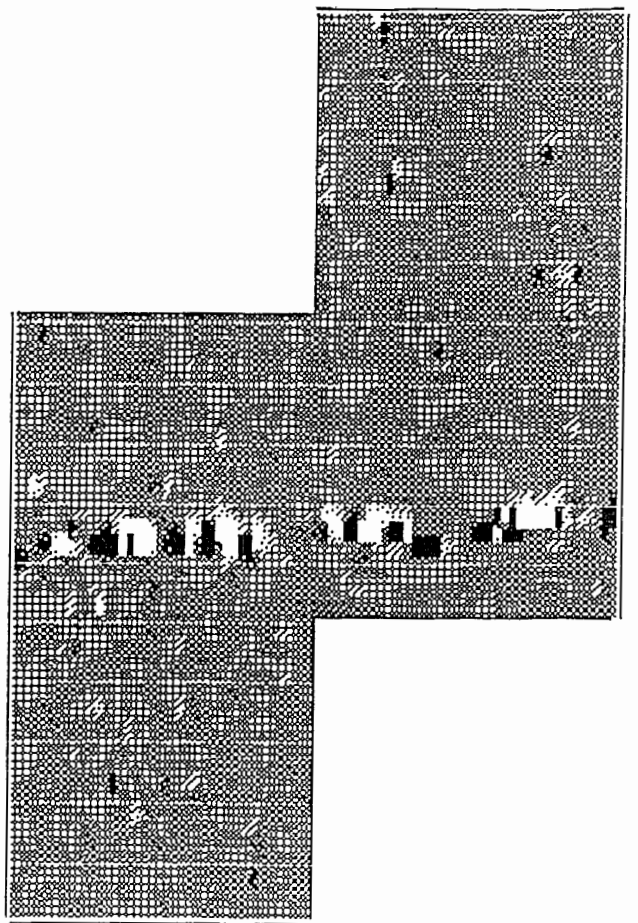
MADRESFIELD

Area 3

50 nT

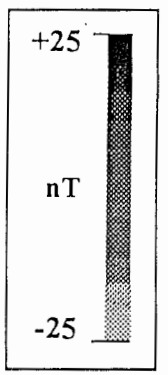
0 m 20

Figure 3.2



MADRESFIELD

Area 3



0 m 20

Figure 3.3

TECHNICAL INFORMATION

The following is a description of the equipment and display formats used in **GEOPHYSICAL SURVEYS OF BRADFORD** reports. It should be emphasised that whilst all of the display options are regularly used, the diagrams produced in the final reports are the most suitable to illustrate the data from each site. The choice of diagrams results from the experience and knowledge of the staff of **GEOPHYSICAL SURVEYS OF BRADFORD.**

All survey reports are prepared and submitted on the basis that whilst they are based on a thorough survey of the site, no responsibility is accepted for any errors or omissions

Magnetic readings are logged at 0.5m intervals along one axis in 1m traverses giving 800 readings per 20m x 20m grid, unless otherwise stated. Resistance readings are logged at one metre intervals giving 400 readings per 20m x 20m grid. The data are then transferred to a Compaq SLT/286 and stored on 3.5" floppy discs. Field plots are produced on a portable Hewlett Packard Thinkjet. Further processing is carried out back at base on a Mission or Dell 386 computer linked to appropriate printers and plotters.

Instrumentation

(a) Fluxgate Gradiometer - Geoscan FM36

This instrument comprises two fluxgates mounted vertically apart, at a distance of 500mm. The gradiometer is carried by hand, with the bottom sensor approximately 100-300mm from the ground surface. At each survey station, the difference in the magnetic field between the two fluxgates is conventionally measured in nanoTesla (nT) or gamma. The fluxgate gradiometer suppresses any diurnal or regional effects. Generally features up to one metre deep may be detected by this method.

(b) Resistance Meter - Geoscan RM4 or RM15

This measures the electrical resistance of the earth, using a system of four electrodes (two current and two potential). Depending on the arrangement of these electrodes, an exact measurement of a similar volume of earth may be acquired. In such a case the amount measured may be used to calculate the earth resistivity. Using a 'Twin Probe' arrangement the terms 'resistance' and 'resistivity' may be interchanged. This arrangement involves the pairing of electrodes (one current and one potential), with one pair remaining in a fixed position whilst the other measures the resistivity variations across a fixed grid. Resistance in measured in ohms, while resistivity is measured in ohm-metres. The resistance method has a depth resolution of approximately 0.75m, although the nature of the overburden and underlying geology will cause variations in this generality.

(c) Magnetic Susceptibility

Variations in the magnetic susceptibility of subsoils and topsoils can provide valuable information about the 'level of archaeological activity' associated with a site. This phenomenon can also be used in a predictive manner to ascertain the suitability of a site for a magnetic survey. The instrument employed for measuring this culturally enhanced phenomenon is a laboratory based susceptibility bridge. Standard 50g soil samples are collected in the field.

Display Options

The following is a description of the display options used. Unless specifically mentioned in the text, it may be assumed that no filtering or smoothing has been used to enhance the data. For any particular report a limited number of display modes may be used.

(a) X-Y Plot

This involves a line representation of the data. Each successive row of data is equally incremented in the Y axis, to produce a 'stacked' profile effect. This display may incorporate a 'hidden-line' removal algorithm, which blocks out lines behind the major peaks and can aid interpretation. Advantages of this type of display are that it allows the full range of the data to be viewed and shows the shape of the individual anomalies. Results are normally produced on a flatbed plotter.

(b) Dot-Density

In this display, minimum and maximum cut-off levels are chosen. Any value that is below the minimum cut-off value will appear 'white', whilst any value above the maximum cut-off value will appear 'black'. Any value that lies between these two cut-off levels will have a specified number of dots depending on the relative position between the two levels. The focus of the display may be changed using different levels and a contrast factor (C.F.). When the contrast is equal to 1, then the scale between the two cut-off levels is linear. A C.F.>1 helps to enhance the higher readings, although a C.F. greater than 2 is rarely required. To assess lower than normal readings involves the use of an inverse plot. This plot simply reverses the minimum and maximum values, resulting in the lower values being represented by more dots. In either representation, each reading is allocated a unique area dependant on its position on the survey grid, within which numbers of dots are randomly placed. The main limitation of this display method is that multiple plots have to be produced in order to view the whole range of the data. It is also difficult to gauge the true strength of any anomaly without looking at the raw data values. This display is much favoured for producing plans of sites, where positioning of the anomalies and features is important.

(c) Contour

This display joins data points of an equal value by a contour line. Displays are generated on the computer screen or plotted directly on a flat bed plotter / inkjet printer. The former will generate either colour or black and white copies depending on the printer used.

(d) 3-D Mesh

This display joins the data values in both the X and Y axis. The display may be changed by altering the horizontal viewing angle and the angle above the plane. Again, the output may be either colour or black and white. A hidden line option is occasionally used (see (a) above).

(e) Grey-Scale

This format divides a given range of readings into a set number of classes. These classes have a predefined arrangement of dots, the intensity increasing with value. This gives an appearance of a toned or grey scale.

Similar plots can be produced in colour, either using a wide range of colours or by selecting two or three colours to represent positive and negative values. While colour plots can look impressive and can be used to highlight certain anomalies, grey-scales tend to be more informative.