- a review of *documentary evidence* for land-use and ownership in Sutton parish was undertaken (Warner 1984, 1985).

- a *data base management system* was designed, and all data recovered from the site was entered in it. The Sutton Hoo archive now contains records of some 15,000 finds recovered before April 1985.

- the *archaeological, anthropological and historical implications* of the existing records were studied using published material (Bruce-Mitford 1974 etc; Longworth and Kinnes 1980) and discussed in special seminars held for the purpose at Ipswich and Cambridge (Carver 1985, 27).

- an intensive fieldwalking programme by the Suffolk Archaeological Unit in the Deben valley laid the foundations for their long term *regional survey*.

A brief account of the results of the site evaluation follows. It will be seen that in addition to the stated objectives, some progress was made in the study of the efficacy of remote sensing itself. A further bonus was the range of archaeological features captured in the exploratory cuttings, which have provoked a reassessment of the character of the whole site, in both its prehistoric and historic phases.

4. RESULTS FROM FIELDWORK, 1983-5

A. *REMOTE MAPPING* (C. Royle) (Figs. 9–19; Table 2)

1. Before any surface inspection could be carried out, an intensive programme of *site clearance* was undertaken to remove the bracken, brambles and long grass which obscured many of the lower mounds. Two more possible burial mounds (Nos. 17, 18) were discovered as a result of this site preparation. Once the surface of the site could be seen in its entirety, the first stage of the survey work could begin.

2. Following the contour surveys carried out nearly twenty years previously, a new *contour survey* was undertaken in the summer of 1983, using an electronic distance measurer (EDM), and the contours were computer-plotted at 10cm vertical intervals. This gave a statement of the topography of the site as it stood at the beginning of the new campaign.

3. The winter and spring of 1983/4 provided the optimum period for the *surface feature survey* (INT. 18, Fig. 12). This was a study of the surface features and grass-marks which appeared as the vegetation began to reassert itself after the removal of the bracken. This exercise proved worthwhile, as the scars left by holes previously dug in the site were located. Tank-tracks were identified and plotted and some slit-trenches and fox-holes were still visible. Other holes which had been back-filled may be the cause of small sub-square or sub-rectangular patches of thicker green grass which appeared in large numbers all over the site. A study of the flora at Sutton Hoo was undertaken by Dr. S. Rothera, formerly of the University of East Anglia. Although it is unlikely that any disturbance to the site could be dated by its vegetation, it may be possible to suggest that an abundance of annual herbs and grasses on a feature means recent (less that 15 years) rather than ancient disturbance and a dense sward of perennial grasses may indicate a longer period (e.g. 40 years +) since last disturbance. Further computer-analysis of the species diversity is required to refine these interpretations.

4. In order to help to find the extent of the Sutton Hoo site, particularly the prehistoric settlement, a five-month programme of *fieldwalking* (INT. 19, Fig. 13) was undertaken, spanning two winters. A 100m wide strip was intensively fieldwalked in the ploughed fields around the perimeter, (Zones D & F) and further transects

SUTTON HOO 1984

INTERVENTION 30

CONTOUR SURVEY

ZONE A

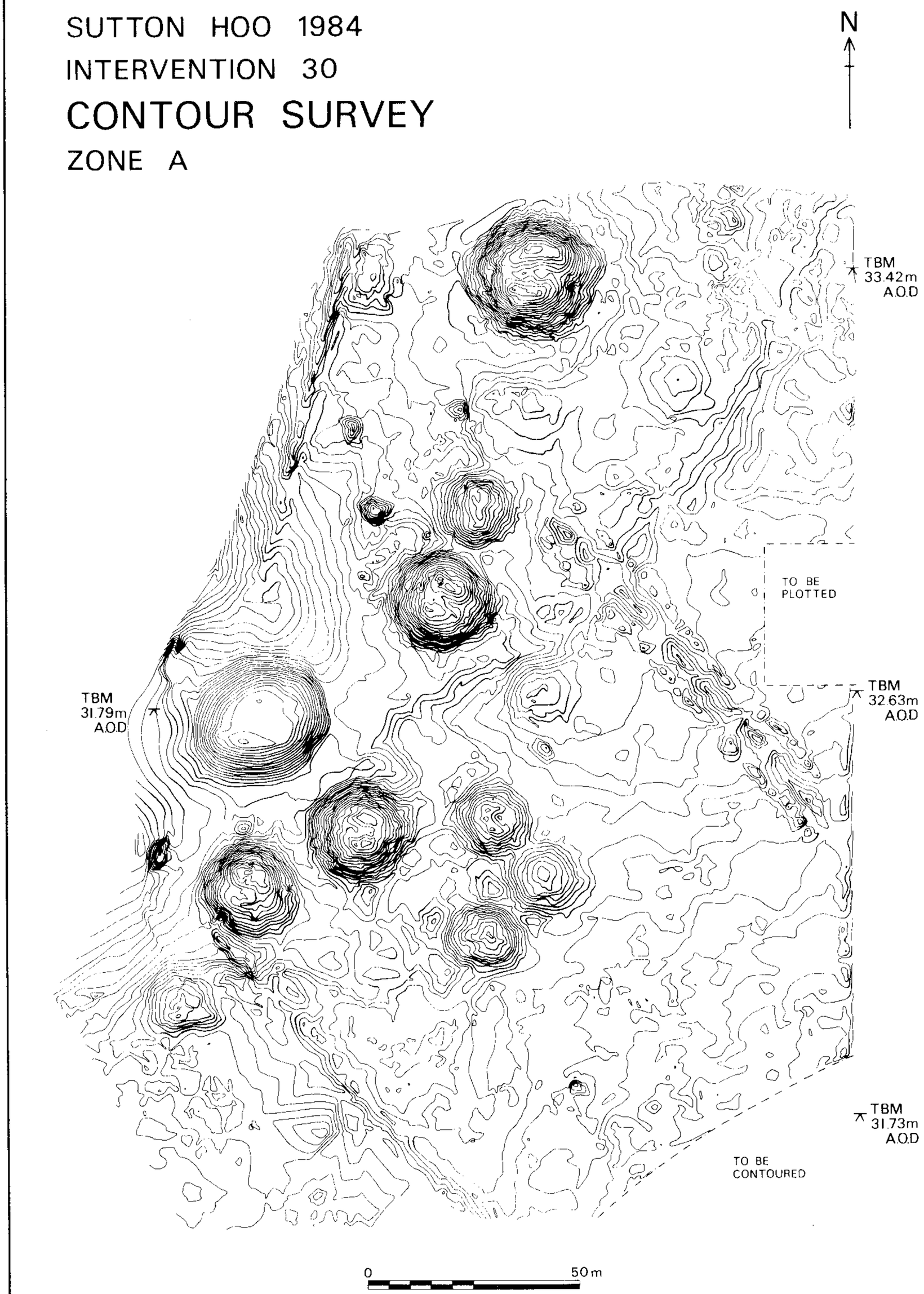


Fig. 11: Contour Survey in Zone A (Bruce/Ingrams/Cooper/Royle)

SUTTON HOO 1984 ZONE A INT. 18
VEGETATION SURVEY

YORKSHIRE FOG *(Holcus lanatus)*

MOSS *(Polytrichum sp.)*

BRACKEN *(Pteridium aquilinum)* and GORSE *(Ulex sp.)*

YORKSHIRE FOG *and* SPRING BEAUTY

SHEEP'S FESCUE *(Festuca ovina)*

SPRING BEAUTY *(Montia perfoliata)*

EXPOSED SANDY SOIL

OUTLINE OF BURIAL MOUND

N

Fig. 12: Surface Feature Survey of Zone A (Copp)

SUTTON HOO 1984/5 INT. 19

FIELDWALKING

PREHISTORIC MATERIAL

ZONES D&F

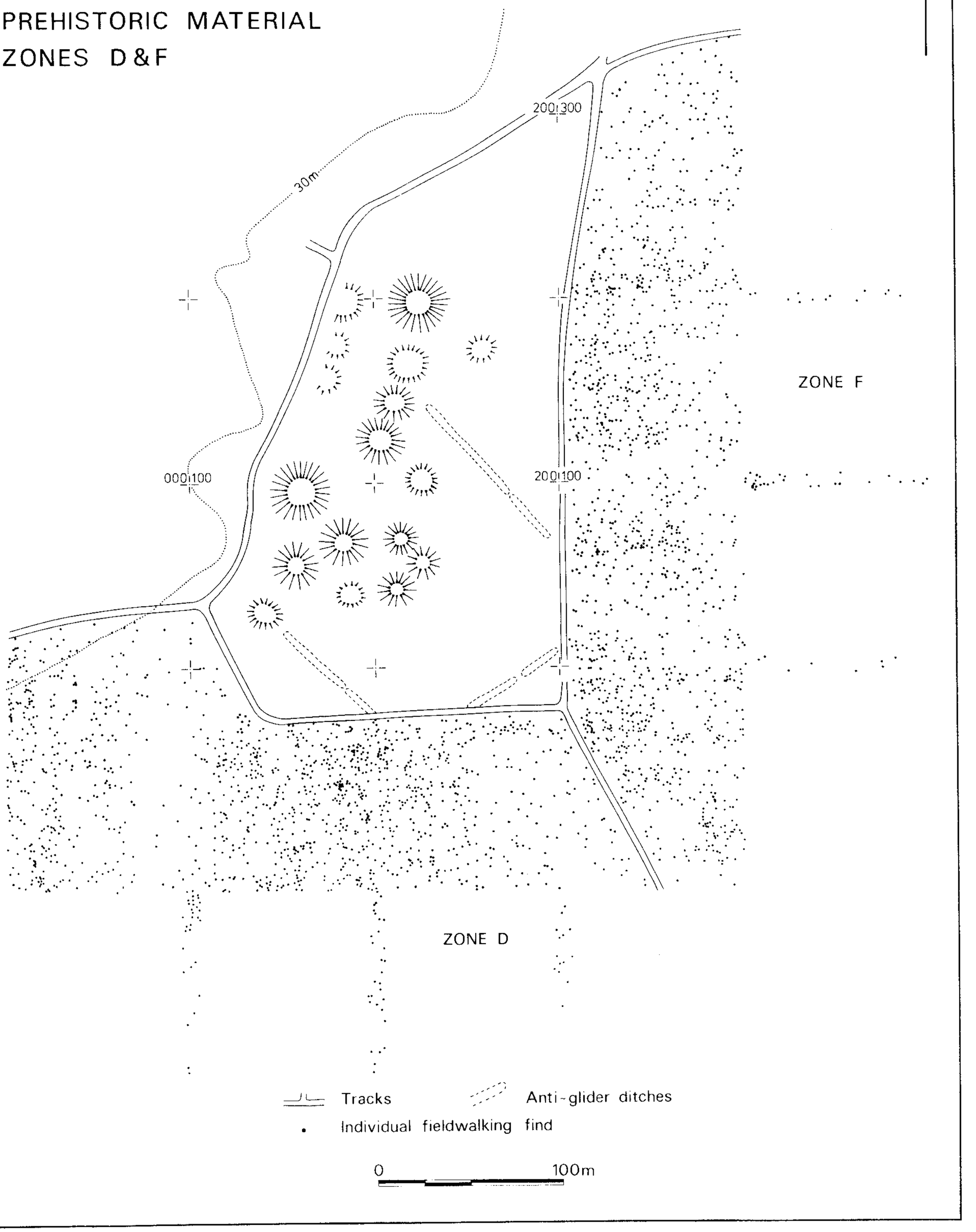


Fig. 13: Fieldwalking in Zone D and F (Copp/Royle)

radiating out from this area were also fieldwalked to confirm the conclusions drawn. Fieldwalking samples would undoubtedly not have given such a clear view of the prehistoric settlement as was obtained from the individual plotting of finds over the whole area. The distribution of prehistoric material is shown in Fig. 13. Pottery does not survive well in the ploughsoil, and little was collected, but the flint assemblage was much more informative. The flintwork belongs to the Neolithic and Bronze Age, the bulk of it consisting of waste flakes. A proportion of implements (scrapers, knives, arrowheads etc.) was also recovered. All finds have been entered on the computer file, and it is hoped to produce accurate plots of specific tool-types. So far no Anglo-Saxon material has been recognised on the surface. A shallow, urned cremation cemetery would have left traces, but excavation in the field (Zone F) has so far only revealed inhumations which would not. As can be seen in Fig. 13, the prehistoric finds in Zone F appear to fade out 70m to the E of Zone A and in Zone D a particularly clear cluster of occupation debris is apparent. Excavation results show that fieldwalking does here reflect the archaeological features which are, or have been, present. In Zone D a cluster of burnt flint proved on excavation to be material from a prehistoric hearth and a similar cluster in Zone F came from a palisade trench packed in one sector with burnt fragments of flint.

5. To further substantiate fieldwalking results, and give coverage to an even larger area, a *phosphate survey* (INT. 37, Fig. 14) was carried out (Gurney, archive report). Soil samples for phosphate analysis were taken in Zone F, the ploughed field to the E of the site, and the results showed a concentration to the west and north west of the Zone, endorsing the results from fieldwalking.

6. Using a deep-seeking metal detector the whole of Zone A was covered by a *metal detector survey* (INT. 27, Fig. 15), and all targets plotted. Discrimination could be made between ferrous and non-ferrous metals and deep and shallow targets. These results, when plotted and compared with the results from the surface feature survey, indicate that some of the slit-trenches noted, in particular those on the western side of Mound 2, were used as rifle-emplacements, and still contain the empty shells of brass-cased bullets. Although little metal debris was visible on the surface of the site, the metal detector survey showed the existence of old wire fences, hut-stances and metal fence-posts, as well as several thousand readings probably due to shrapnel and other missiles. In the ploughed field the metal-detector targets from one area were dug up and all proved to be shell cases or modern farm debris. These results were all however to be of vital significance to the interpretation of the proton magnetometer survey results. It was also demonstrated that the metal detector gave a positive signal from sherds of pottery, particularly Neolithic.

7. A magnetometer survey carried out at Snape, another ship burial site on similar terrain a few miles away, had not been a success, but since new, highly sensitive equipment was now available it was decided to test it at Sutton Hoo, and a *proton magnetometer survey* (INT. 28, Fig. 16) was carried out on selected areas of the site. Proton magnetometers are extremely sensitive to ferrous deposits: the results of the metal detector survey showed which responses were due to iron objects and which were likely to indicate real archaeological anomalies. However the results of the magnetometer survey, in the forms of a contour plot, a shaded 'grey' plot and a 3-D plot, were not particularly informative. The only easily recognisable anomaly was that of a large ditch, which on excavation proved to be approximately 2m wide and 1m deep. Background noise from geological deposits made any further interpretation difficult, although other anomalies were visible and clarification of their status as probable archaeological anomalies only came after comparison with the fluxgate survey. Such poor results were to some extent to be anticipated, as the soils of the Sandlings seem to only respond to the magnetometer to a limited extent.

8. A test-area overlapping that covered by the proton magnetometer was

ZONE F PLOUGHSOIL PHOSPHATES INT.37

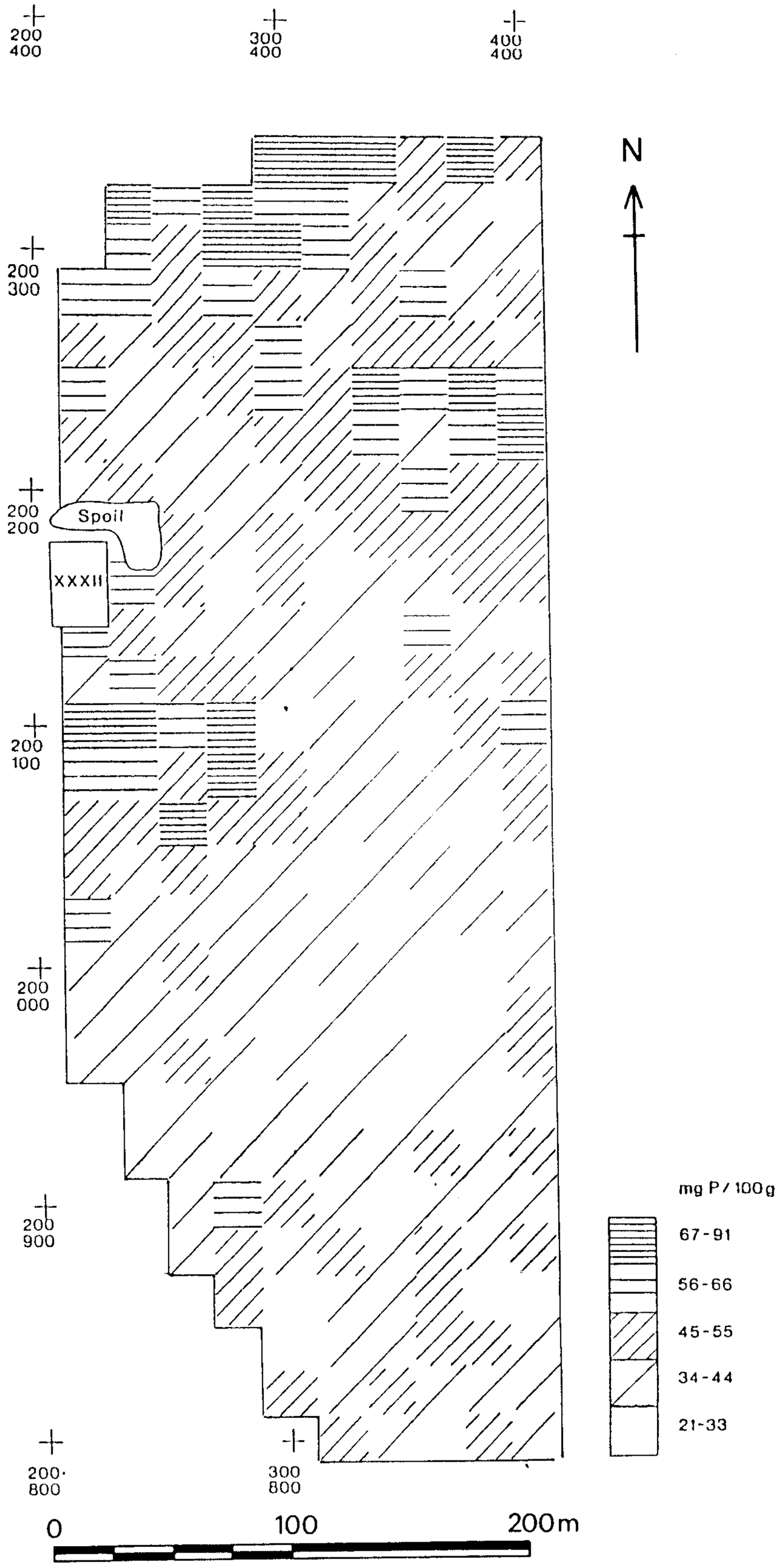


Fig. 14: Phosphate Survey in Zone F (Gurney)

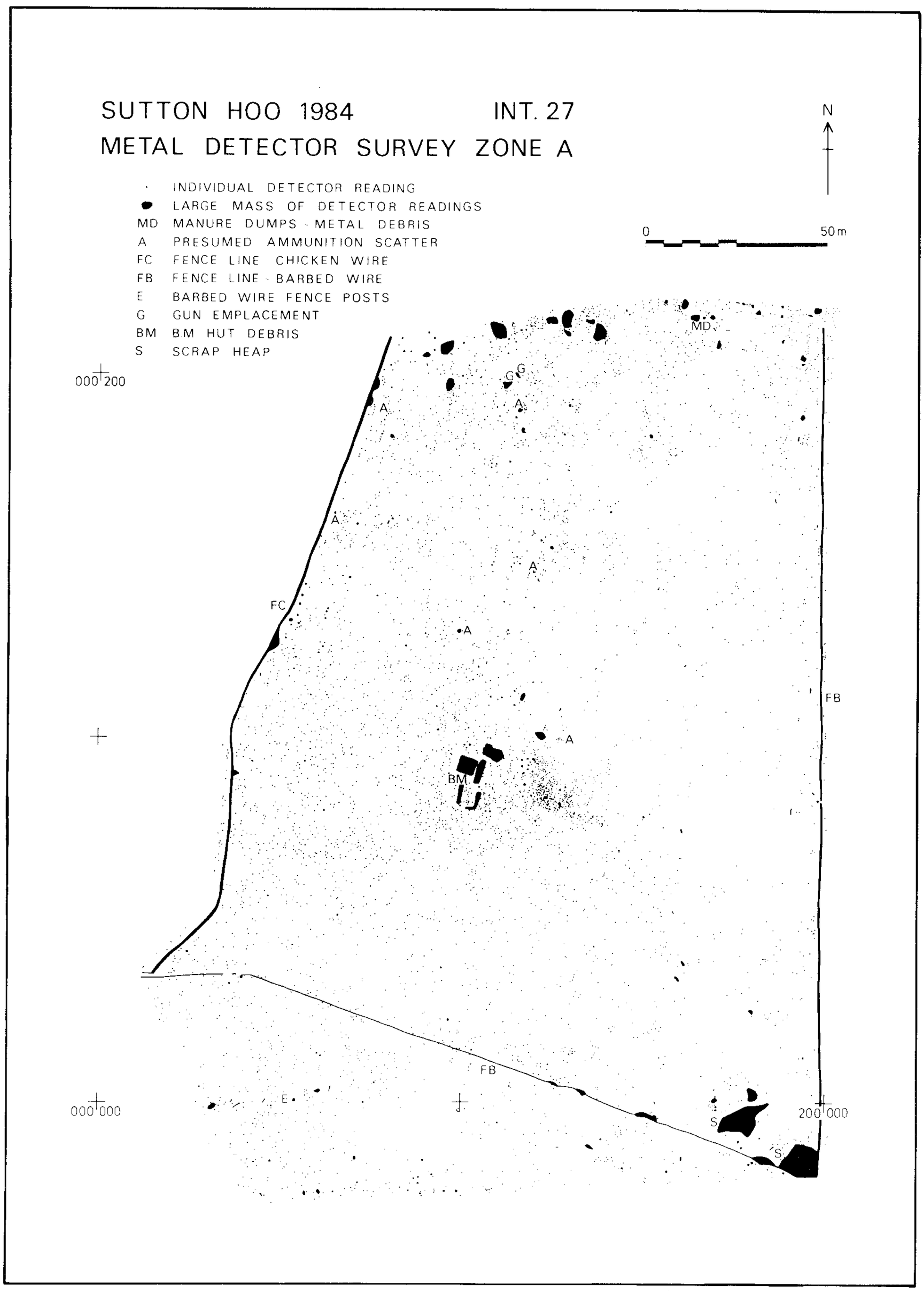


Fig. 15: Metal Detector Survey in Zone A (Royle)

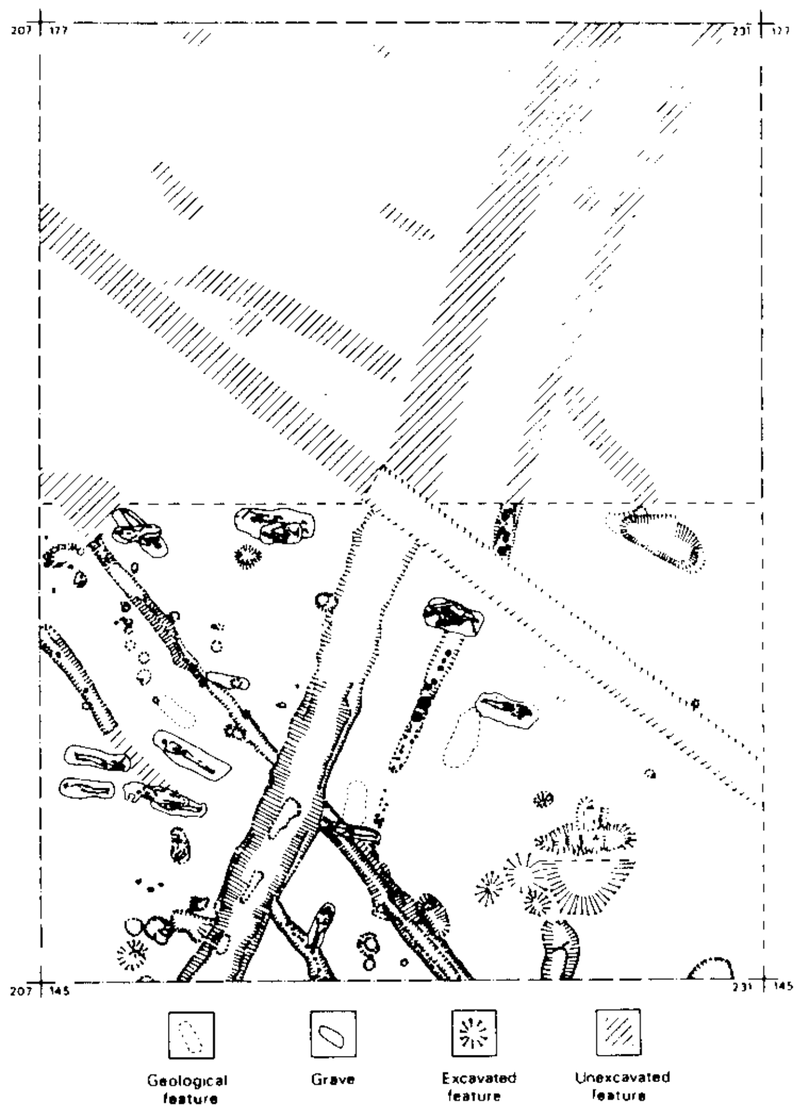
SUTTON HOO 1985

GEOPHYSICAL SURVEYS

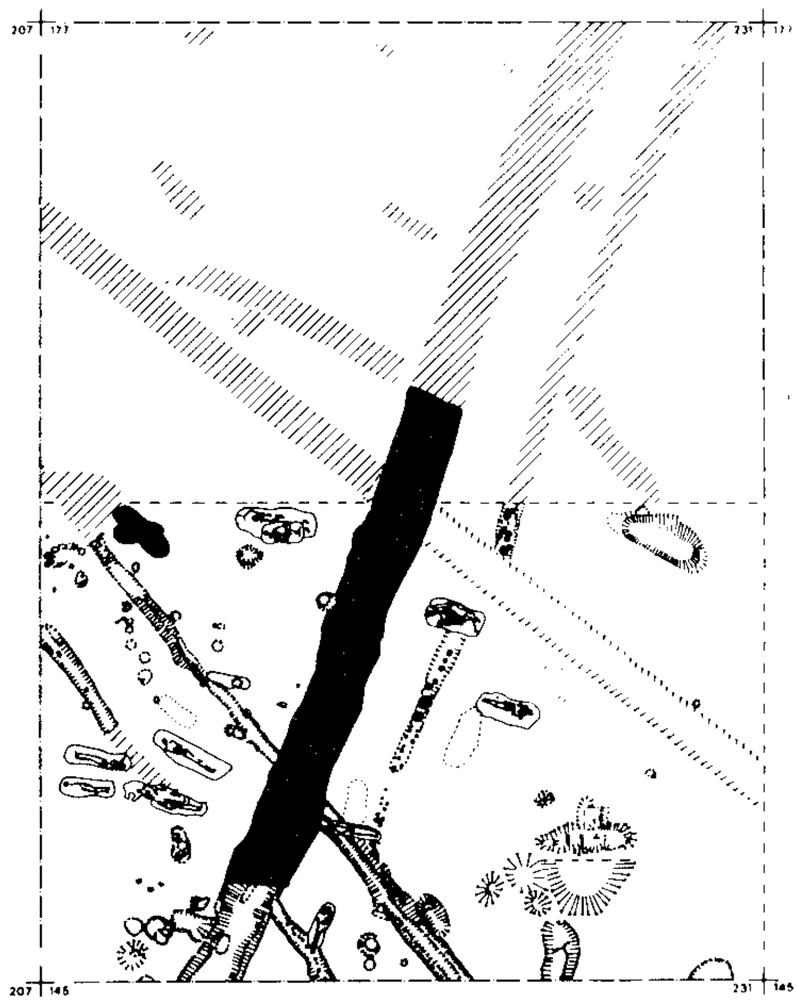
ZONE F

N

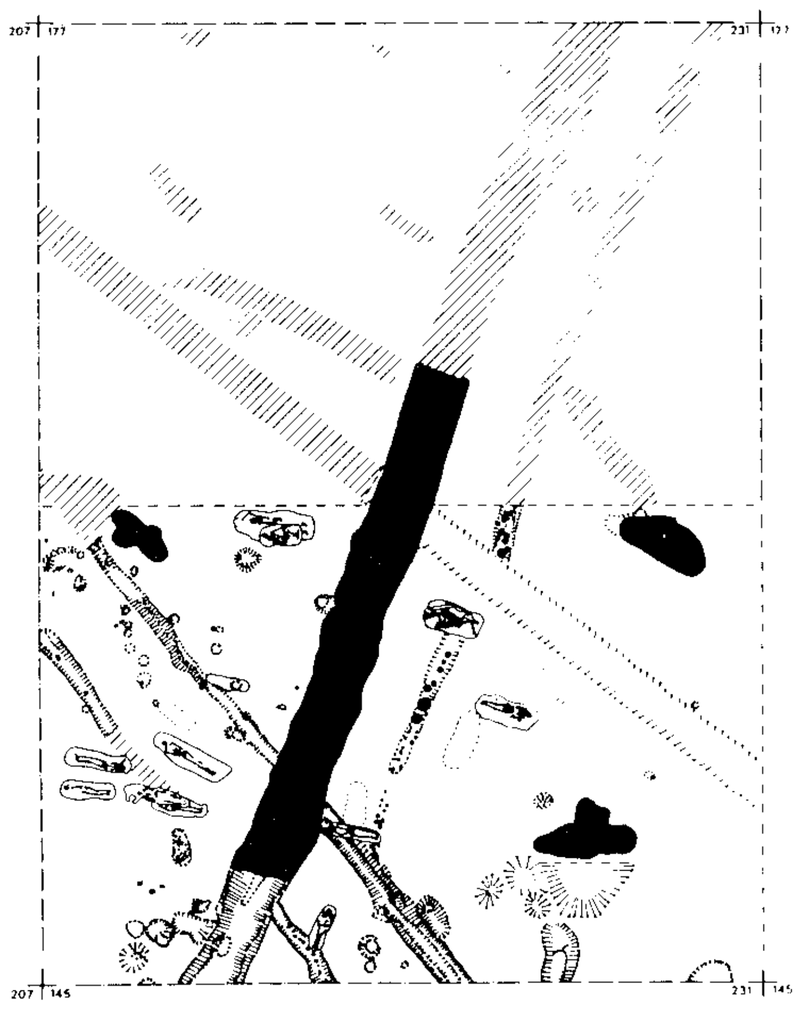
EXCAVATED AREA



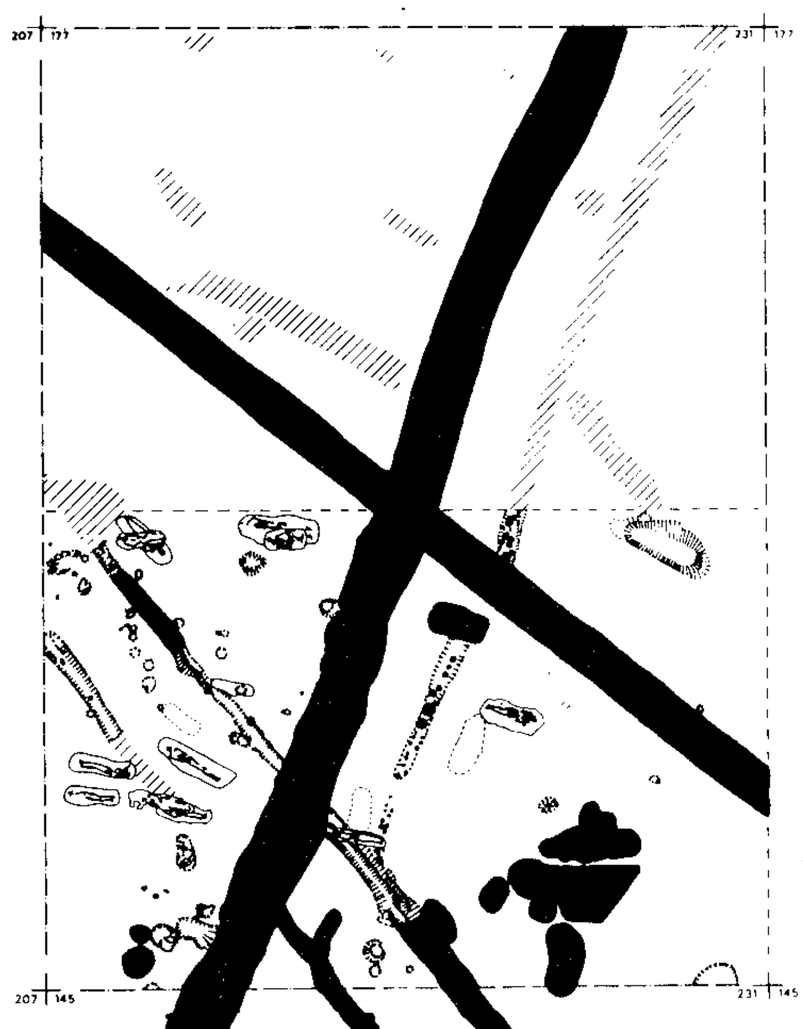
PROTON MAG.



FLUXGATE MAG.



RESISTIVITY



0 10 20m

Fig. 16: Plan of excavated area (INT. 32) and geophysical survey results, 1985 (Royle)

surveyed with a *fluxgate gradiometer* (INT. 35, Fig. 16). This, although less sensitive than the proton magnetometer used, would also be less sensitive to background noise from variations in the fluvioglacial deposits. The same large ditch appeared in the fluxgate results, although perhaps not so clearly. Several other anomalies including a D-shaped feature which were visible could then be pinpointed in the proton magnetometer results. The identity of these anomalies is not clear: some may be pieces of iron, others may be pits.

9. The same test-area covered by the two types of magnetometer was also covered by a *resistivity survey* (INT. 36, Fig. 16). A resistivity meter used at Snape (see above) had met with some success, so reasonable results were anticipated (Filmer-Sankey 1984). The results, in the form of varying dot-density plots, can be confusing to the untrained eye, and smaller features are difficult to identify. The large ditch appeared again, but so did an anti-glider ditch, the double palisade trench excavated in 1985 season, and the D-shaped feature. Other anomalies not yet covered by the excavated area could also be made out. The advantage of this plotting program is that normal or inverse dot-density plots may be altered to highlight high or low readings as desired. On the whole, this equipment appears to have more potential than the proton or fluxgate magnetometers.

10. Experiments with radar have been carried out elsewhere, but the *soil sounding radar* (INT. 29, Figs. 17, 18) designed by Mike Gorman of the Scott Polar Institute promised more detailed results than had previously been thought possible. At Sutton Hoo, several areas had radar transects laid across them, including parts of Mound 2, and Mound 12. The N–S track across Mound 12 shows an anomaly beneath the inverse reflection of the Mound, possibly a burial chamber. Similarly, tracks across Mound 2 may indicate a boat trench, but it is too early to say this with any certainty. Transects in Zone F at the site of INT. 32 are even more difficult to interpret, and, at the moment, with other equipment available for large area surveys, the radar may be best used to investigate the burial mounds themselves.

11. In collaboration with the project, the Cambridge Committee for Aerial Photography is undertaking a plot of all features known from *aerial photographs* which have been taken regularly since 1947. Although the Sandlings as a whole offers promise for systematic aerial survey, the immediate area of Sutton Hoo has not produced any density of features other than large ditches (Bryant 1984).

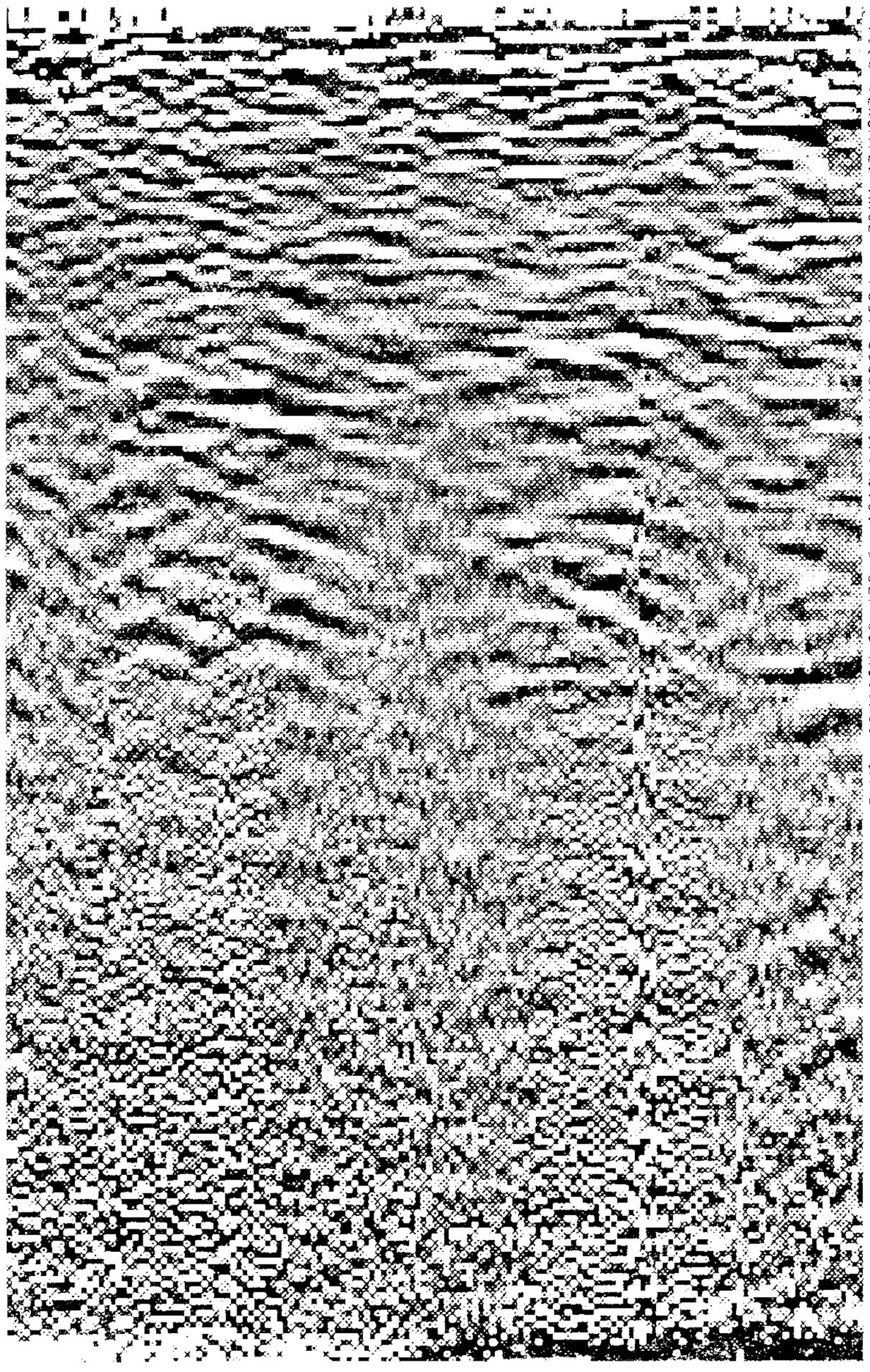
12. Following the work conducted by Dimbleby and Everard (Bruce-Mitford 1975), *environmental research* has been undertaken by a team from the Department of Quaternary Research, Stockholm University, led by Helen Atkinson. Preliminary work has included study of the sediments in the river valley (Fig. 19). The environmental study of Sutton Hoo is to be continued in parallel with a comparable survey of the contemporary Vendel site (Sweden) already in progress.

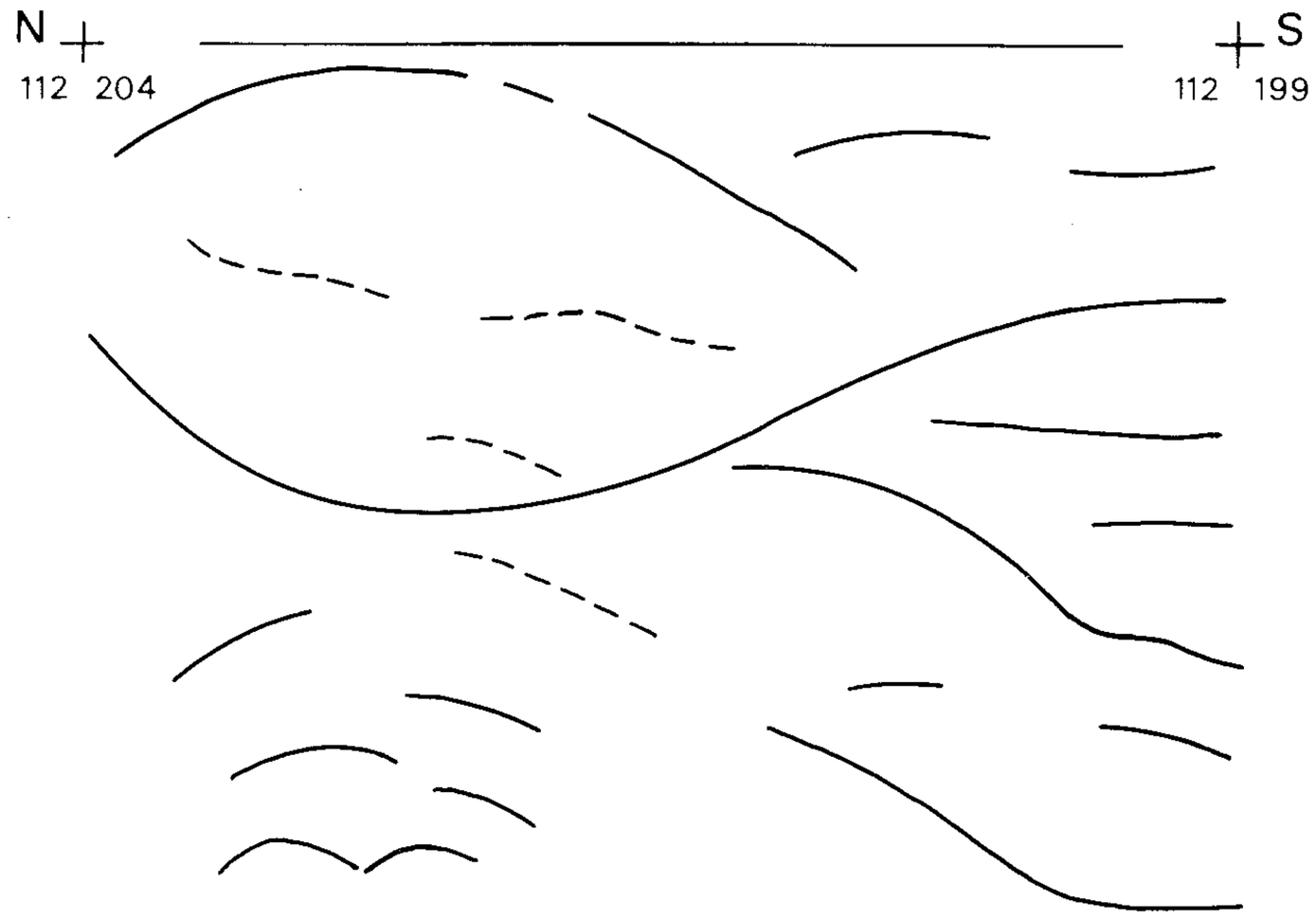
In conclusion, the response of the Sutton Hoo site to remote sensing can be summarised as follows. Large features, such as ditches, can be mapped over the whole area by resistivity, fluxgate gradiometry or aerial photography. The extent of prehistoric occupation, and the assemblages from particular activities can be mapped from fieldwalking. Within burial mounds, the presence of burial chambers, boats and robber pits ought to be detectable by radar. Smaller features are currently beyond the reach of the methods applied. In particular, early medieval graves and cremations could not presently be distinguished from the prehistoric background by remote sensing.

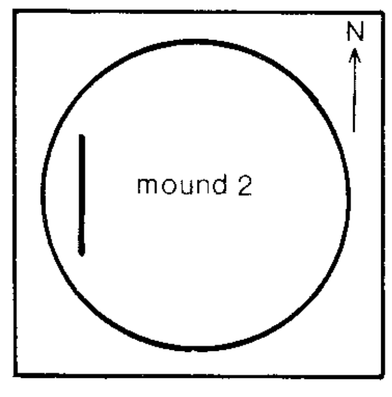
B. *EXPLORATORY CUTTINGS* (Fig. 8; Tables 4–7)

Eight exploratory cuttings were made in two seasons (1984 and 1985) and a total of 2812 square metres was examined (Fig. 8; INT. 20, 21, 22, 23, 24, 26, 31, 32). The purpose of these cuttings was as follows:

Sutton Hoo 1984 RADAR Int. 29 Mound 2







Location of transect

Fig. 17: Radar Transects in Zone A – through Mound 2 (Gorman/Copp)

- To confirm the edges of the prehistoric and early medieval site.
- To validate the techniques used for remote sensing, and determine how effective each would be in mapping the area of the site not to be excavated.
- To estimate the depth of stratification and the survival of archaeological features and different materials in various parts of the site.
- To characterise prehistoric and early medieval occupation by excavating a small number of features and their assemblages.
- To develop methods of excavating fugitive types of evidence, for example, very decayed human bodies.
- To determine accurately the optimum size, length of time and cost that excavation would require.

The results from these cuttings can be summarised as follows:

INT. 20, in the east field (Zone F) confirmed the prediction made from fieldwalking that an intensively occupied prehistoric site was fading at about 70m E of Zone A, at a point marked by a very slight dip in the ground. Prehistoric features here were pits, postholes, palisade trenches and ditches. A single inhumation was discovered at about 15m E of Zone A (the barrow site) and was guessed to mark the eastern extremity of the early medieval cemetery.

These indications were subsequently confirmed by the area excavation which was undertaken contiguously in 1985 (INT, 32). Several prehistoric features were identified as having been earthworks, from stone-enrichment and the relative level of later features cut through them. Two unexcavated soil marks within the clean area were suggestive of barrows. Thirteen more inhumations, all thought to be of early medieval date, were excavated. The furthest east was 20m E of Zone A, and no suspected graves were located in an extension 30m further to the E. Throughout the plough zones, the truncation of features was between 25-30cm, although some subsoiling was noted.

INT. 21 measured the erosion of the field since 1940 by cutting a section through the ploughed-out anti-glider ditch. The erosion was found to have been minimal. There were no prehistoric features.

INT. 22, in the south field, produced no burials, but a group of prehistoric ditches, postholes and other features, including a hearth, was scattered along its length. Ditches and post-rows at its N end ran approximately NNE to SSW, reflecting a boundary, probably once an earthwork, which fieldwalking had predicted from a vacant strip running parallel to the W. A medieval or post-medieval track crossed NE to SW and is probably to be identified with the hollow way crossing the barrow site in the same direction.

INT. 23 took advantage of a pre-existing anti-glider ditch to investigate conditions below ground over a long transect across Zone A. It was found that, in contrast to the ploughed field, the top 40cm beneath the turf had been badly scrambled by bracken roots, allowing observation only of deep features.

INT. 24 investigated conditions in the woodland. The lattice of tree roots was found to be largely horizontal and subsoil deposits were only mildly disturbed. The promontory opposite Mound 1 was confirmed to be composed of natural bedded sand. Two features were identified, a slit-trench, and a prehistoric ditch which was left unexcavated. The flat surface of Zone B remains unexplained, but examination of this significant topographic feature would be possible if the trees were removed.

INT. 25 was an attempt to investigate the feasibility of excavating the damaged top 40cm of the deposits in Zone A. An area was smothered in black polythene to kill the vegetation, a process which at time of writing (October 1985) has only had a partial effect after 18 months.

Sutton Hoo 1984 RADAR Int. 29 Mound 12

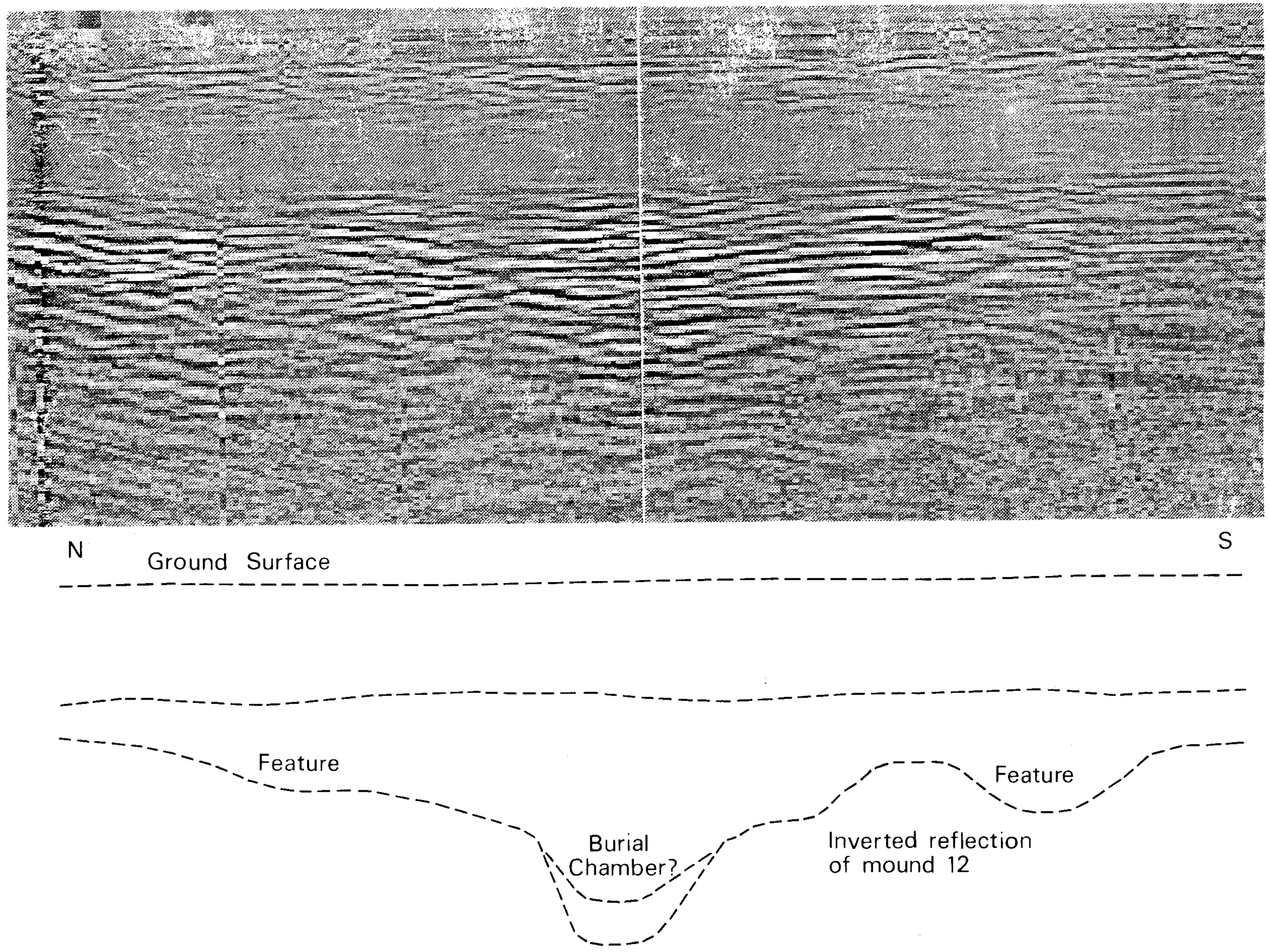


Fig. 18: Radar Transects in Zone A – through Mound 12 (Gorman/Copp)

INT. 26 was designed to investigate the strata within and beneath an extant barrow, using a pre-existing trench, in this case that cut by Basil Brown in 1938. Layers were found to be readable, and a complete sequence was postulated. The site chosen for Mound 2 may have been that of a prehistoric barrow (family of layers on the S side). A large clinker- built ship, laid in a trench and comparable to that beneath Mound 1 was suggested by a ferric surface, possibly part of the skin of the vessel, together with a possible clench-nail in situ, both as yet unexcavated. The profile of a keeled ship was seen in the section of the excavation on the west side. (Carver 1985, Fig. 2). The early medieval mound was constructed in a series of layers overlying possible upcasts from the ship trench, which in turn lay on the buried soil, here some 40cm deep (N side). The mound had been robbed at least once, and probably twice. It is postulated that the final robbing had cut through the bottom of the ship's hull and left a roughly boat-shaped pit which was that excavated by basil Brown in 1938. (Fig. 29).

INT. 31 was a section, cleaned but not cut, along the eastern edge of a silage pit dug originally in the 1950s and left open. It demonstrated a depth of stratification of a least 80cm extending for more than 20m N-S. It is possible that this deep stratification is owed to one or more (prehistoric) barrows.

INT. 32 *Techniques and Technical Experiments*

A number of different procedures for the definition of features was tried, and in general followed the pattern pioneered by Hope-Taylor at Yeavering, which Sutton Hoo resembles in so many ways (Hope-Taylor 1977). It was found that at first definition, after removal of plough-soil, only plough marks and strongly marked (generally recent) features such as anti-glider ditches could be observed. However at this level stone-enriched areas indicating demolished earthworks could be detected. Up to four or even five other definitions would follow, using trowel or brush as demanded by terrain and weather. There were no short cuts, either with digging or recording. At fourth definition, only 70% of the features later to be excavated were visible. The early medieval graves could not be mapped without excavation, for the same reason they eluded the remote sensing, namely that they were generally cut into a background of clustered prehistoric features from which they could be distinguished only by careful manual excavation. In calculating the right size of area for excavation, a balance was sought between two opposing factors: *observation*, which preferred a large area and *control* which, owing to the action of rain, sun and particularly wind, demanded a restriction of size. Experiments with shelters in the months of May to September were unsuccessful, owing to the strength of the wind and the lack of light within them. The optimum area for excavation was determined as 24 x 16m, being the size that can be cleaned by 10 people in one day.

Recording the definitions was found to most effective by photography. Experiments were tried with a photopod, towers, a kite, a model aircraft, a hot-air balloon and a helicopter. The optimum height was found to be about 200ft achieved most easily by kite on windy days (the norm) and by hot-air balloon when the air was relatively still. All photography was most effective in colour print. Experiments with IR enhancement were inconclusive for the earlier features, although effective for enhancing recent plough marks.

The excavation of features, particularly graves, also called for new techniques. The edges of features were stablised by the application of 'Vinamul' a PVA compound used by Suffolk farmers. Provided that a grave could be adequately sheltered (from the wind) and lit, its contents could be detemined in considerable detail. The human bodies, although containing very little bone, can be excavated as three-dimensional silhouettes ('sandmen') in which a series of concentric jackets of discoloured sand mark decay horizons. In some cases these horizons can be hypothesised as flesh or clothing contours but more usually represent the outer bone casing. The thickening of the silhouette to mark the flesh horizon, as opposed to the bone horizon, was most noticeable over the head, hands and feet. In most cases enough bone-frass survived to carry out a radio-carbon dating, and in some

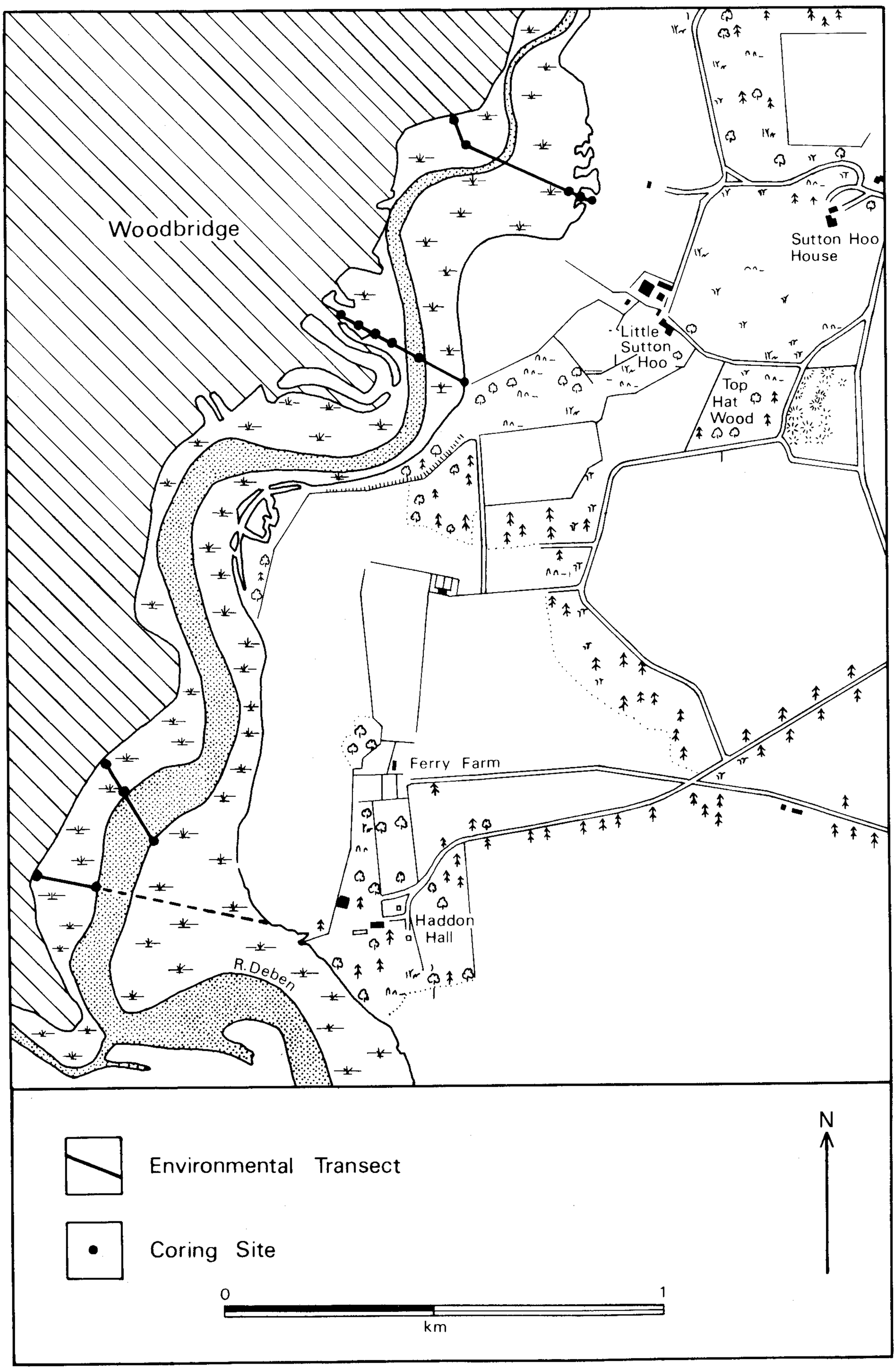


Fig. 19: Environmental studies – coring transects across River Deben (Atkinson/Copp)

cases the remains of teeth might produce an estimate of age; but in very few cases were the contours of any remains sufficiently accurate to give any indication of sex (Rogers, archive report).

Within the graves, material other than bodies has also been identified. Decayed wood has a slightly different colour (darker) and texture (finer) than decayed bodies, and it was found that using a U/V emmitter with a cadmium chloride filter over the lens would allow a body and its broken coffin (for example) to be distinguished photographically. The wood-derived remains are charateristically thin but their shape can be described by careful excavation using delicate tools and electric vacuum cleaners. Examples of wooden objects were coffins and the 'plough' in Grave F161. Excavators must be physically supported so that they bring no pressure to bear on the side of the grave and its contents. The recording of grave-contents included the successful trial of moulds using silcon-rubber, and the lifting of an entire burial-group using epoxy resin and polyurethane.

Working at night was tried as further experiment to improve observation and control. An array of lights powered by generators provided an even lighting in comparatively windless and humid conditions, and work was certainly possible. It did not provide, however, a marked improvement over the conditions that could be achieved at greater convenience by day.

The manpower required for each operation was monitored and is summarised in Table 7.

C. *REGIONAL SURVEY* (Figs. 20–21) (K.Wade)

Introduction

The multi-period sites at Sutton Hoo can never be fully understood in isolation from the social, economic, and political systems in which they functioned. Our understanding of those cultural systems evolves in a direct relationship with our knowledge of the total population of sites at each period.

Present knowledge of settlement location and density at all periods is totally inadequate, as it is largely based on the evidence of casual discovery. The same is true of settlement hierarchy with the added complication, in recent years, of sites being represented by different forms of evidence. Many sites are known solely from surface pottery and flint scatters, others solely from metalwork collections, and others from crop-marks alone. At each period the major sites, at the upper end of the settlement hierarchy, are mostly known, but the hierarchy below is still shrouded in the mist of biased and incomparable data.

On a regional basis this problem is to be tackled in the long term with a strategy of intensive systematic fieldwork in six sample areas of the East Anglian Kingdom (West and Wade 1983).

In the short term the problems and potential of such surveys is being evaluated in a pilot survey area in south-east Suffolk.

South Suffolk Pilot Field Survey

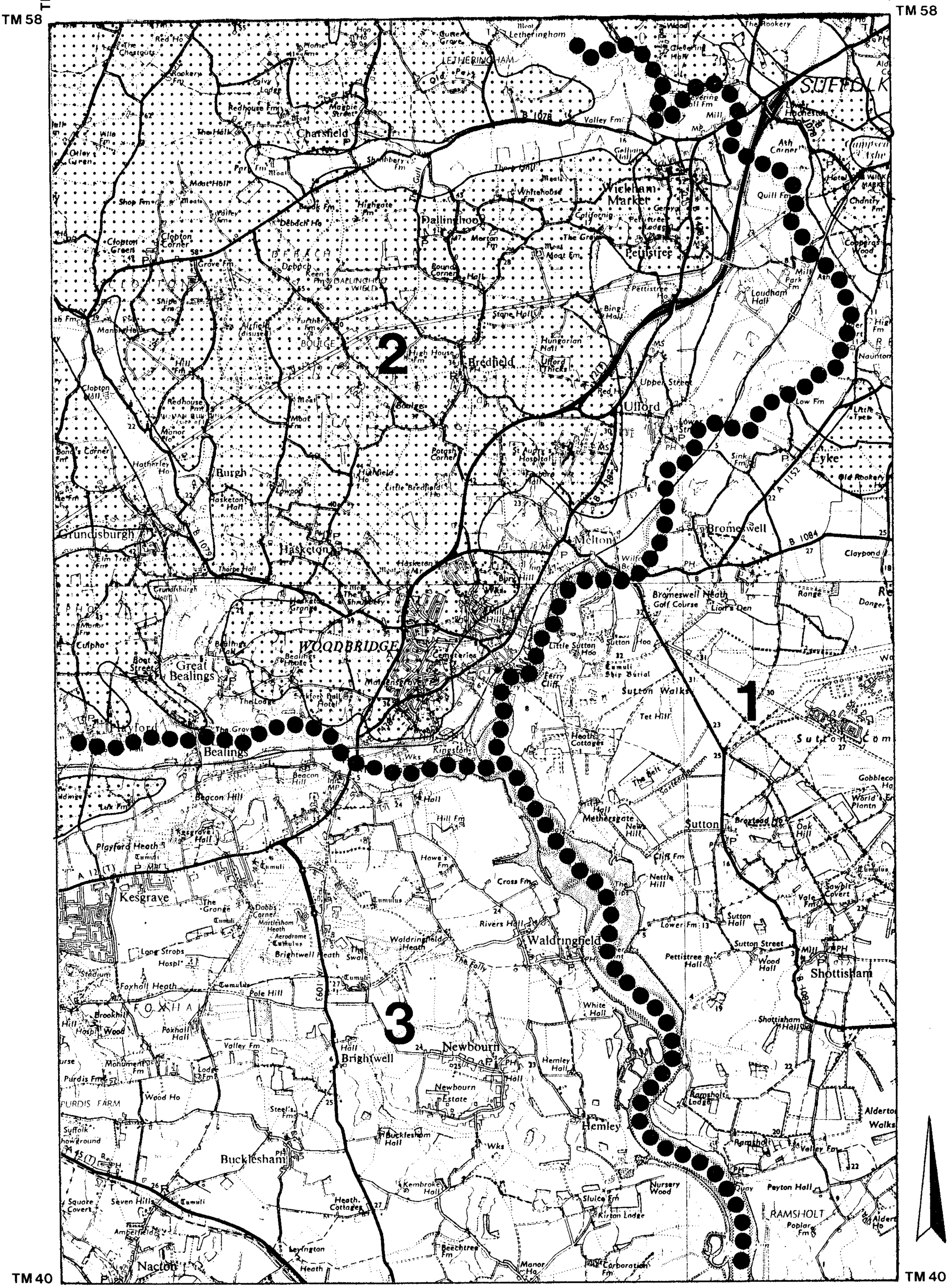
The survey area of 216km^2 centres on Woodbridge and the River Deben (Fig. 20). It was selected for the pilot survey for several reasons. It lies in the hinterland of both the Sutton Hoo cemetery and the Anglo-Saxon town of Ipswich i.e. within the area assumed to be the power base of the East Anglian Royal House. It covers both the light soils of the Sandlings and the edge of the boulder clay plateau (Fig. 20) and it is an area where metal-detecting is particularly popular (one third of the sites in this area know before fieldwork began were the result of recent metal-detector activity).

The survey, which involves both surface-collection in systematic transects at 20m intervals and follow-up intensive fieldworking and metal-detector survey, is progressing in three phases (Fig. 20):

Phase 1 (zone 1): Sandling - completed 1982/3-1984/5
Phase 2 (zone 2): Clay plateau - 1985/6-1987/8
Phase 3 (zone 3): Sandling - 1988/9-1990/1

TM 21 TM 33

TM 58 TM 58



TM 40 TM 40

BOULDER CLAY SAND/GRAVELS

Fig. 20: South-East Suffolk Survey Area, showing soil types and study areas (Wade)

a. Prehistoric sites

b. Romano-British sites

c. Early Anglo-Saxon/Middle Saxon sites

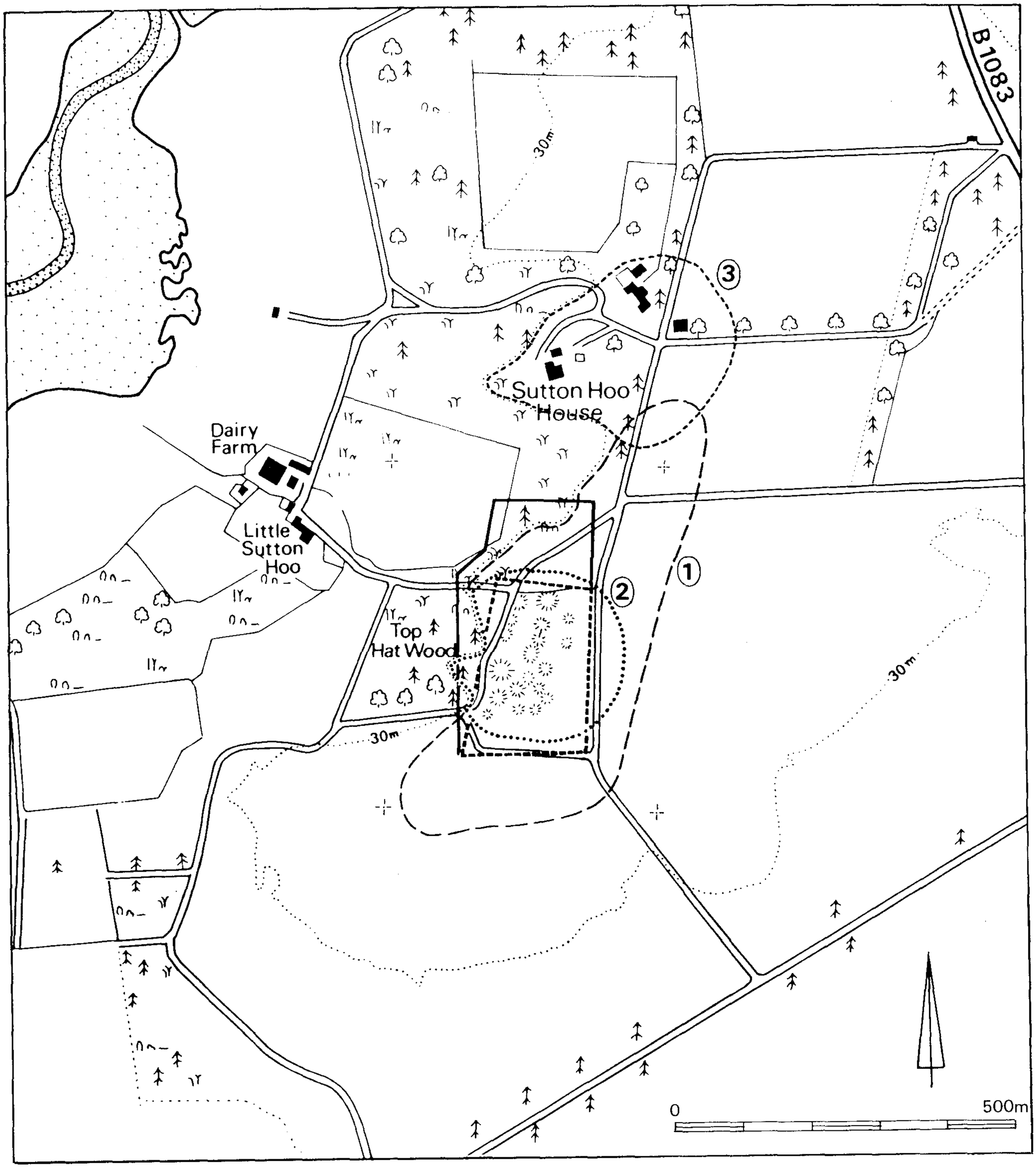
d. Late Saxon/Medieval sites

*SUTTON HOO

0 1km

.....1km from watercourse

Fig. 21: South-East Suffolk Survey Area: Results of Fieldwork in Zone 1 (Wade)



①——The prehistoric site ②·····The Early Medieval cemetery ③----The Early Medieval settlement

②&③ The Early Medieval site

Fig. 22: Extent of the Prehistoric and Early Medieval sites at Sutton Hoo (Hooper)