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Ancient Monuments Laboratory
Report 16/95

REPORT ON GEOPHYSICAL SURVEY, MARCH 1995, CRESSWELL FIELD, YARNTON CASSINGTON PROJECT, OXFORDSHIRE

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Neil Linford

Summary

This survey was conducted prior to the removal of topsoil from the majority of Cresswell field, Yarnton, Oxfordshire to facilitate the recording of archaeological features by the Oxford Archaeological Unit (OAU) in advance of its eventual destruction through gravel extraction. In defiance of the relatively disappointing geophysical results obtained from the Yarnton-Cassington Project area to date, the survey reported here has revealed a plethora of significant magnetic anomalies; these initial results have aided the precise location of the subsequent OAU excavation/recording programme.

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CRESSWELL FIELD

Report on geophysical survey, March 1995

Introduction

This survey was conducted prior to the removal of topsoil from Cresswell field, Yarnton, Oxon. to facilitate the recording of archaeological features by the Oxford Archaeological Unit (OAU) in advance of its eventual destruction through gravel extraction. Previous sample excavation (Hey 1994) and a limited pilot magnetometer survey (AML archive) have demonstrated both the presence of important archaeological remains and their favourable response to fluxgate magnetometer survey. It was envisaged that magnetic survey of the site would assist both the location of the subsequent OAU recording and provide further understanding of the parameters affecting the response of geophysical techniques throughout the Yarnton-Cassington Project area (Linford 1994a).

The site (SP 4610) lies over the second (Summertown-Radley) gravel terrace of the Upper Thames valley.

Method

A magnetometer survey was deemed to be the most suitable survey technique due to the large area of land to be covered and the success of a previous pilot magnetometer survey (AML archive). The survey was conducted in conjunction with a limited topsoil magnetic susceptibility survey.

A survey grid divided into 30m squares was established over the site (**Figure 1** - location plan) with partial squares extending to the field boundaries. The area was then surveyed with a Geoscan FM36 fluxgate gradiometer along successive N-S traverses separated by 1.0m intervals. Readings were logged every 0.25m and the data was downloaded to a microcomputer in the field. Final presentation of the data has been enhanced by the application of a local median filter to remove the intense response of buried/surface iron and a low pass Gaussian filter to suppress image noise (Scollar *et al* 1990); the survey is presented as a greyscale image of the raw data (**Plan A**), a traceplot of the raw data (**Plan B**), a greyscale image of the processed data (**Plan C**) and a greyscale image superimposed upon the OS map (**Figure 2**). A graphical summary of significant geophysical anomalies (**Plan D**) is included to assist with the following discussion of the results.

Topsoil samples were recovered at 30m intervals along the two traverses shown in **Figure 1** and subsequently measured for mass specific magnetic susceptibility (**Table 1**) using a Bartington MS1 meter and 100cc laboratory coil.

Results

<u>Magnetometer survey</u> - *Numerals within the following text refer to Plan D*

Modern interference

The interpretation of the magnetic data has to a certain extent been limited by the landowner's practise of ploughing unsuitable additions to his commercial "worm farm" into the topsoil of this site. It was noted that this, often foul smelling, detritus was largely composed of domestic waste products, including a high proportion of ferrous material, adding a considerable component of "topsoil noise" to the resultant magnetic data set.

A series of negative linear anomalies related to modern ploughing are evident at the edges of the rolled footpath (2) and along the southern edge of the survey (3); both anomalies arising from the topsoil void in the resulting irregular surface topography. In addition, a pattern of less distinct modern plough furrows can also be seen as a series of parallel striations running on an approximately north-south alignment over the majority of the survey area, although these are considerably less intense than (2) and (3). Other modern interference occurs along the southern edge of squares 35, 36 and 37 where the survey grid reaches the ferrous wire fence around the field.

Further broad negative striations appear to be superimposed upon the survey data and these have been interpreted as remains of a medieval "ridge and furrow" ploughing pattern (16). Note the apparent survival of these patterns on at least two distinct orientations; indicating the division of the land parcel into separately worked fields.

Archaeological activity

The most striking component of the dataset occurs as a series of positive linear/curvi-linear anomalies suggesting a number of enclosure ditches and possible hut circles. The largest of these (4) appears to form two sides of a rectangular enclosure continuing through the southern boundary of the survey area into the course of the former Victorian railway line now used as the road entrance to the ARC gravel processing plant. Note the magnitude of response (approximately 10nT) arising from the north-eastern section of this anomaly, possibly suggesting the inclusion of magnetically enhanced material from a semi-industrial process (*cf* David and Payne 1993 describing the results from a similar phenomenon that occurred during the magnetometer survey of a Romano-British villa complex at Rowler Farm, Northants). Similar linear anomalies also occur at (5), (6), and (7) but are too partial to suggest the presence of any additional rectilinear ditched enclosures.

Perhaps of greater interest are the two linear anomalies (8) and (9). Whilst these are again too partial to suggest enclosures both their magnitude (approximately 10nT) and association with further discrete positive anomalies may well indicate the presence of semi-industrial activity. The relationship between (7) and (8) is unclear as the former anomaly exhibits a much weaker response and neither extends beyond their convergence in survey squares 16 and 17.

Anomaly (9) is closely associated with a number of discrete positive anomalies one of which has produced a strong, angular signature when examined in trace plot form (**Plan B**). Whilst a significant archaeological origin for this anomaly can not be dismissed it seems most likely that it arises from more recent ferrous contamination.

Indeed this latter fact constrains the full interpretation of the plethora of buried pit type anomalies (10), as many of these may well be found to emanate from similar near surface ferrous contamination; Plan D therefore represents a tentative indication of the recorded anomalies thought most likely by the author to be the location of genuine archaeological features.

However, a far more confident interpretation of curvi-linear anomalies (11), (12) and (13) can be made in the light of the excavation results from the gravel processing area immediately south-east of Cresswell field where a number of circular middle Iron Age house gullies were discovered (Hey 1994). Despite the incomplete nature of the former anomalies it does not seem unreasonable to advance this interpretation and to perhaps extend it to include the partial curvi-linear anomalies (14) and (15).

A number of large scale, anomalies (17), (18), (19), (20) and (21) are also evident within the survey area. The most striking of these (18), follows the course of a buried paleao-channel and is similar to the example recorded and verified during the previous geophysical survey of ARC stage 4 (Linford 1994a). The remaining anomalies (19), (20) and (21) are again reminiscent of magnetic responses recorded during previous geophysical surveys within the Yarnton-Cassington project area (Linford 1994b and 1994c), although their origin remains unclear; the most likely explanation would appear to be the presence of a geomorphological feature, possibly a gravel lens or clay pocket related to the drift/solid geology interface.

Topsoil Magnetic Susceptibility survey

There is little apparent correlation between the values of enhanced topsoil magnetic susceptibility (Table 1) and the concentration of magnetic anomalies revealed by the gradiometer survey. Thus it is impossible to interpret the relationship between any local enhancement of topsoil magnetic susceptibility and the survival of significant archaeological remains. However, the following factors may well prove to be relevant:

(i) An increase in the inherent magnetic susceptibility of the soils developed over the sand and gravel on the high ground to the E of the survey in comparison to the topsoil derived from deposits of more recent alluvium associated with the palaeo-channel.

(ii) Protection from modern plough damage of *in-situ* archaeological deposits through alluvial overburden in the vicinity of the palaeo-channel. Such a mechanism would both explain the increase in significant archaeological magnetic anomalies to the west of the survey and the increase in topsoil magnetic susceptibility detected to the east due to the inclusion of magnetically enhanced sediment from ploughed-out archaeological features within the topsoil.

During the survey it was noted that a concentration of magnetic slag-type debris was distributed throughout the topsoil over the site. Two samples of this material were recovered for subsequent identification (Starley[1] and Eckstein[2] *pers comm*). This confirmed that one of the samples (χ = 997 SI units/kg) was probably a smithing slag. The second sample (χ = 38 SI units/kg) was identified as a river worn stone, rich in haematite and potentially viable as an ore, although no evidence for the extraction of iron was found on the site.

Conclusion

The relative clarity of the results reported here surpasses those from previous geophysical surveys conducted in the Yarnton-Cassington project area utilising exactly the same instrumentation and survey methodology. The location of a complex palimpsest of anomalies related to occupation features such as pits, boundary ditches and house gullies is particularly satisfying given the considerable information this has provided prior to the rescue excavation. The identification of a possible smithing slag and the magnitude of response from certain anomalies tentatively suggests the presence of semi-industrial activity upon this site. However, no convincing thermoremanent anomalies, indicative of kilns or hearths were located in the survey area and it has been noted from previous surveys that the distribution of magnetic "slag" extends over the majority of the first gravel terrace flood plain. It remains possible that this "slag" is in fact derived from track bedding hardcore under-seating the route of the former railway line that crosses the project area.

Surveyed by:	M Cole N Linford	Date of survey:	27/2/95 - 2/3/95
Reported by:	N Linford	Date of report:	3/5/95

[1]Dr D Starley, *Ancient Monuments Laboratory, English Heritage.*

[2]Dr K Eckstein, *Bochum Mining Museum, Germany.*

Table 1.

Topsoil Magnetic Susceptibility Results (SI units / kg)										
Traverse A West-East	34	62	60	55	114	105	118	105	93	49
Traverse B South-North	122	78	87	74	22					
NB Shaded values indicate samples from the intersection of Traverse A and B										

References

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Linford, N, 1994a Mineral Magnetic Profiling of Archaeological Sediments, *Archaeological Prospection* **1** *pp37-52.*

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Linford, N, 1994c Report on geophysical survey at Worton Rectory Farm, Oxon. *Ancient Monuments Laboratory Report Series* **113/93**

David, A, and Payne, A, 1993 Croughton, Northamptonshire: Interim report on geophysical surveys 1992-3. *Ancient Monuments Laboratory Report Series* **15/93**

Scollar, I, *et al* 1990 Archaeological Prospecting and Remote Sensing, 507-508, Cambridge.

Cresswell Field, Yarnton, Oxon.
Location plan of survey.

SP 4610.

N

0 90m

Topsoil Magnetic Susceptibility sample.

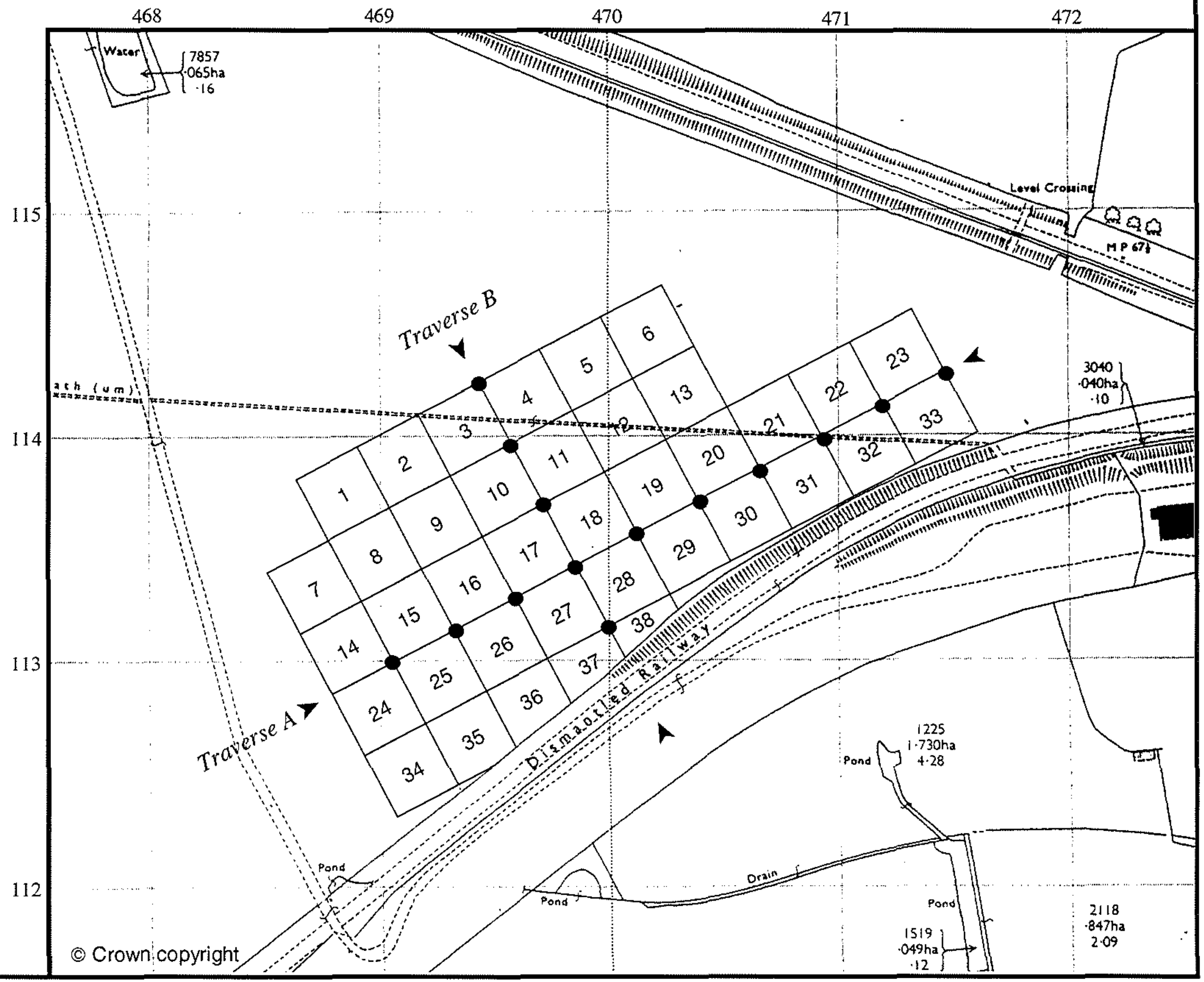


Figure 1.

Cresswell Field, Yarnton, Oxon.
Magnetometer data.

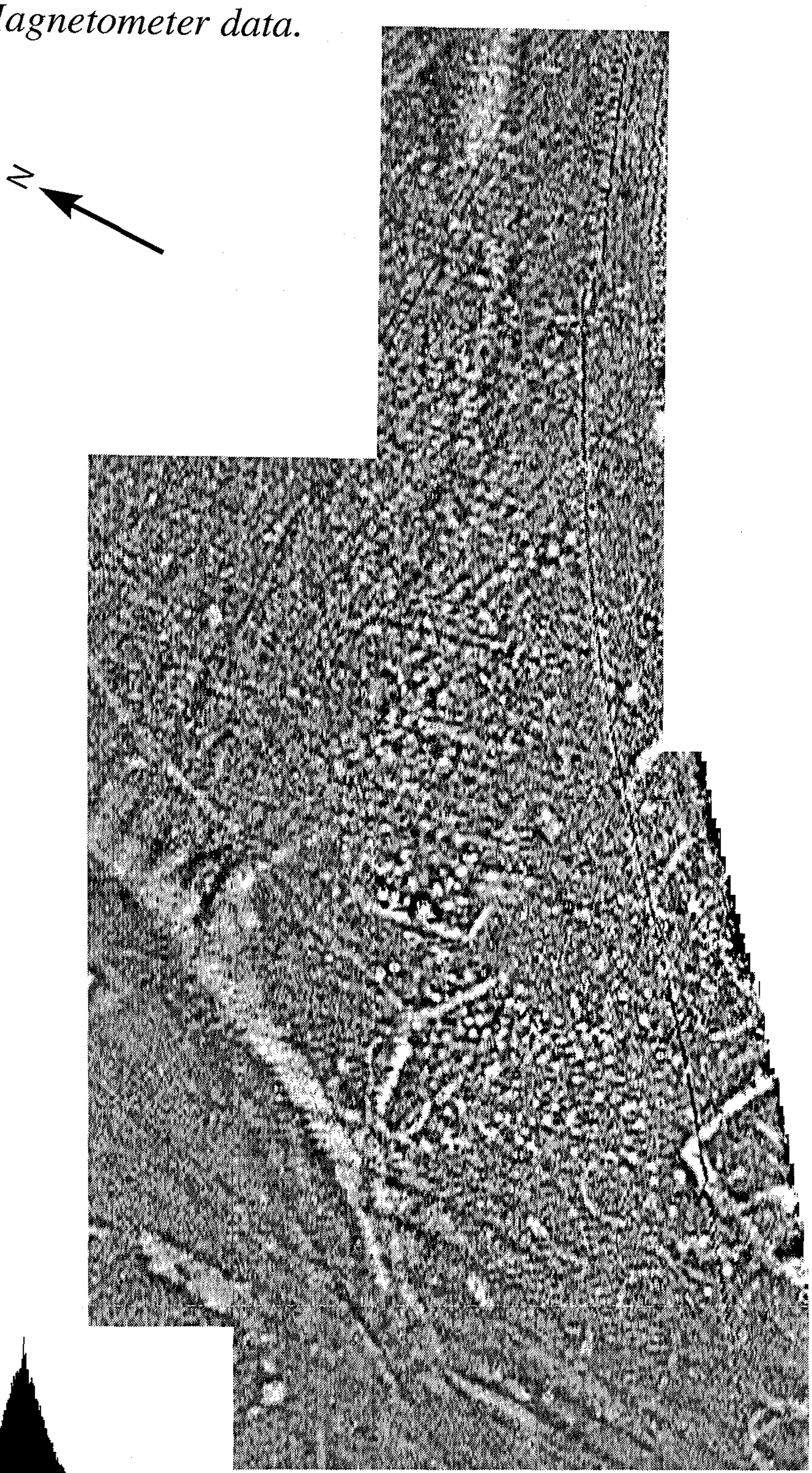
SP 4610.

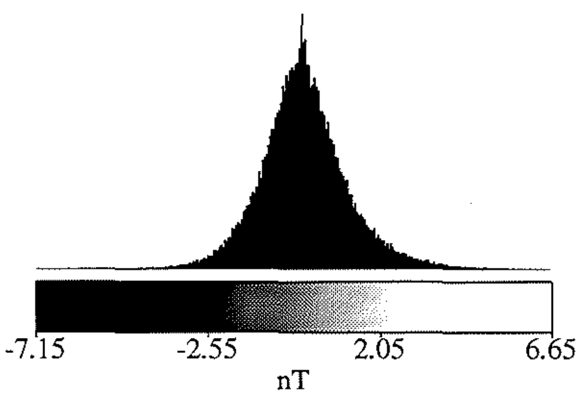
Figure 2.

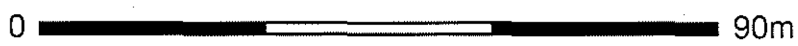
CRESSWELL FIELD, YARNTON, OXON.
Geophysical survey March 1995.

PLAN A

Raw Magnetometer data.







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Geophysical survey March 1995.

PLAN B

Traceplot of Raw Magnetometer data.

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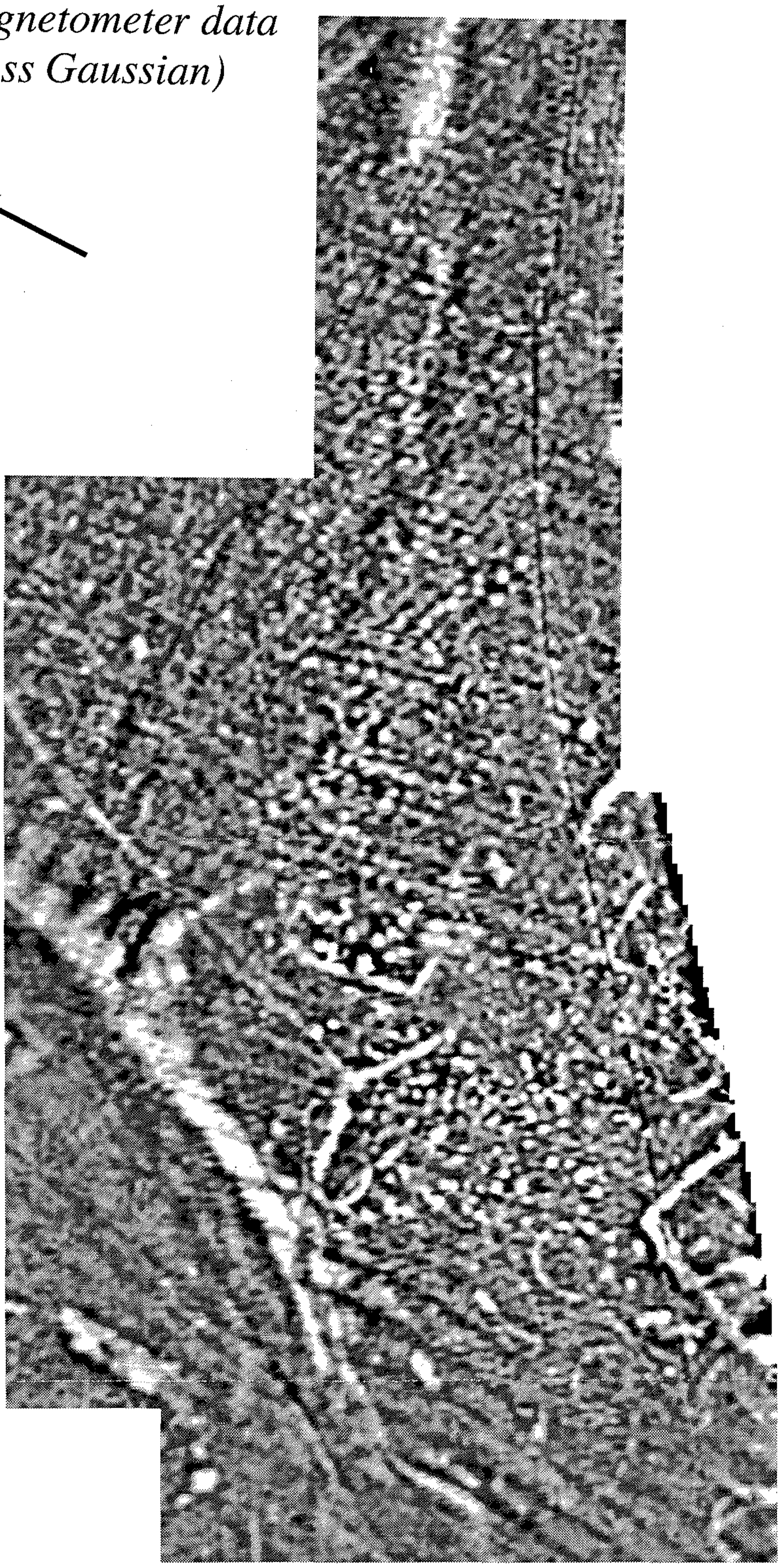
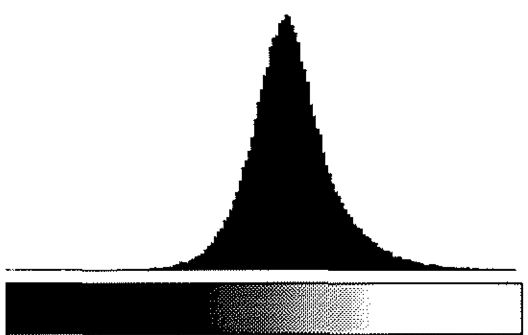
Geophysical survey March 1995.

PLAN C

Smoothed Magnetometer data
(1m low pass Gaussian)

N





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1:1000

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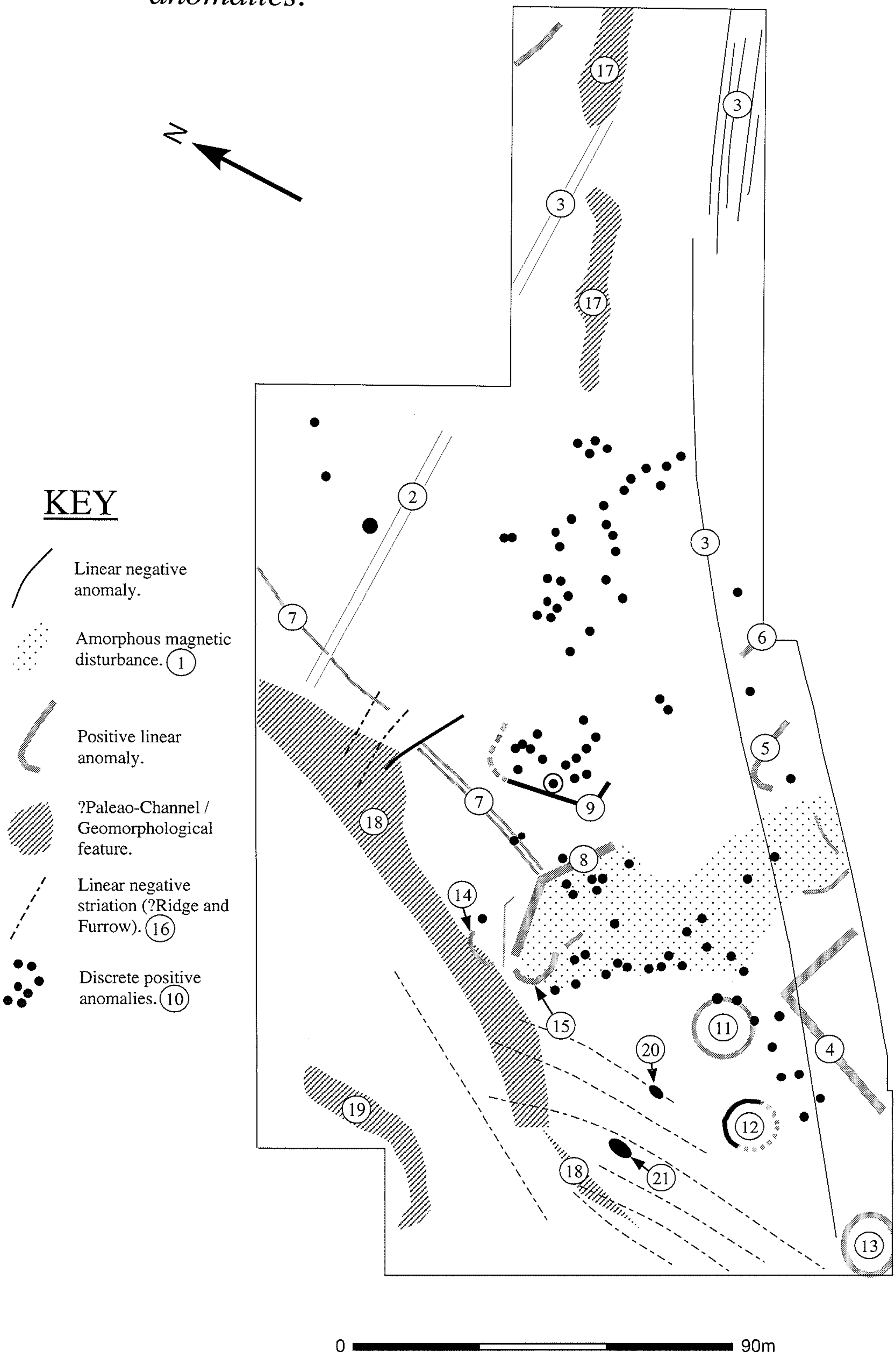
CRESSWELL FIELD, YARNTON, OXON.
Geophysical survey March 1995.

PLAN D

Summary of significant anomalies.



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