

ANCIENT MONUMENTS LABORATORY GEOPHYSICS SECTION

REPORT ON MAGNETOMETER SURVEY

SURVEY: IONA

DATE: 12 - 19.10.77

Report no. 35/77

1. SITE

OS grid reference: Field no. 640
628/9
Location: open ground to the north and south of the Abbey
Geology: raised beach deposits on sandstone and shale. Some basic dykes.
Archaeological evidence: existing earthworks, and evidence of ditches found during excavation and an earlier geophysical survey (1973). Aerial photography.

2. SURVEY

Object: to investigate selected areas for Early Christian remains, with particular attention to St. Columba's Vallum.

(a) Magnetic survey

Type of survey: automatic plotting

Magnetometer: fluxgate Range: 300
100 γ

Initial chart recorder settings - Y: 15 γ/cm
X: 1:200 scale

Logged for computing: yes/no

(b) Other tests

(i) Magnetic susceptibility:

topsoil:	subsoil:	fill:	$\times 10^{-6}$ emu/gm (ac bridge readings)
f. 640 : 50.75			
(ii) f. 628/9 : 17.5,	35		

Survey grid measured to: telegraph poles (f. 628/9)
west boundary wall (f. 640)

Plans/charts enclosed:

- 1 : site plan
- 2 : magnetometer traces, with interpretation (sqs. 10-27)
- 3 : magnetometer traces, with interpretation (sqs. 1 - 5)
- 4 : 1973 magnetic survey
- 5 : resistivity survey
- 6 : site plan, with anomalies and archaeological interpretation.

The survey undertaken by this Section in February 1973 over parts of the outlying earthworks demonstrated that ditches were detectable as magnetic 'depletion' features, ie. occurring as a noticeable (5 - 15 gamma) decrease in magnetic response where the digging of the ditch has destroyed the uniform detrital remanent magnetic field of the raised beach. This is shown particularly well on the area surveyed across the known course of the outer ditch to the north of the Abbey (see plan 4). The survey also demonstrated the frequency and confusing character of the quantities of magnetic stone in the soil (mostly local granite and basalt rocks), although where localized, this sort of disturbance was informative in suggesting the presence of buried structures such as lynchets (plan 4), and might be of use in detecting walls, roadways and stone-filled ditches.

It was bearing these factors in mind, and also the relative smallness of the area sampled in 1973, that made the prospect of covering a greater area seem worthwhile. It was decided to investigate the field to the south of the Abbey (f. 640) as intensively as possible in the time available, seeing that the aerial photography is uninformative in that area and yet clear evidence of ditches was found in 1973. It seemed likely that St. Columba's Vallum should pass through the field somewhere across its length. A succession of 30 m. squares was surveyed until the whole field had been covered with the exception of the rough ground near St. Mary's Chapel and a 25 m. (approx.) strip along the southern wall. The magnetometer traces are shown on plan 2.

RESULTS

The overall impression is that the entire area is badly confused by large numbers of magnetic stones in the soil. The response from these varies according to the size and depth of the stones - often producing anomalies similar to those one would expect from buried pits or other remains of early occupation. The latter are broader and more subdued than the more exaggerated sharp peaks resulting from stones and pieces of iron near the surface. Despite the jumbled appearance of the traces, however, there are some marked instances of continuity amongst the anomalies and ditches are plainly visible. Likely archaeological features have been plotted on plan 2. Uncertainties have been shown by dashed lines.

Perhaps the best defined features are the ditches in sqs. 23, 24, 25, 18 and 19. Part of this pattern was found in 1973, and it now appears partially to represent the ditches of two overlapping sub-circular enclosures. Unfortunately the magnetic response within and around these substantial ditches is too confused to allow related structures to be clearly detectable. Adjoining ditches and likely looking anomalies have been outlined on the plan, although one feels that, as elsewhere over the field, significant details are present but cannot be disentangled from the mass of spurious anomalies. There are distinct lengths of ditch and probable pits elsewhere in the field, although the concentration seems to be greatest in the northern half.

Some of the features may be relatively modern. The long straight feature running between sqs. 6 and 25 is a drain or pipe. The parallel anomalies in sqs. 7 and 13 suggest a cultivation pattern, although a ditch (dashed lines) appears to run through the same squares and may join with one of the enclosures below. Strong anomalies of the sort seen between sqs. 8 and 9 could result from metal-working or other industrial activities. The ditch running diagonally between sqs. 20 and 27 is faintly visible on some of the aerial photographs.

To the north of the Abbey (f. 628/9) a limited number of squares were surveyed with the object of proving the position of the inner enclosure ditch detected in 1973 and also visible as a cropmark. Squares 2 - 5 were located so as to confirm the turning of the ditch southwards at this point. The square over the actual corner was surveyed twice over, firstly with traverses N - S (sq. 2), and then with traverses E - W (sq. 3). In this way the position of the turn in the ditch was confirmed and it

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was followed into sqs. 4 and 5 where the anomaly peters out, its line merging with the edge of the road.

Square 1 was positioned on the same inner ditch at the eastern extremity of the visible cropmark. There is some considerable disturbance from magnetic stones, but the ditch is clearly detectable in the westernmost half-dozen traverses or so of the square. The anomaly then becomes indistinguishable and the ditch as a major feature probably ceases here although other anomalies are present in the square.

Resistivity survey:

Resistivity traverses made during the 1973 survey were successful in locating ditches later confirmed by the magnetic survey. On this recent occasion, resistivity surveying was restricted to the small triangle of lawn to the north of St. Oran's Chapel (see plan 1). The object was to locate any stone structures or ditches that might help in the interpretation of features seen during earlier excavations. A computer filtered dot-density plot is shown on plan 5. Unfortunately there is little to see beyond a vague patch of high resistance in the southern half of the area. This could indicate buried stonework, but no pattern can be distinguished. The diagonal line of high readings across the top of the area represents the edge of the extant medieval pathway.

CONCLUSIONS

A considerable amount of information has been gained from the magnetic survey, although this is restricted to the more substantial features that stand out from a generally disturbed and irregular magnetic background. To the south of the Abbey interest seems to be centred in the western part of the field, particularly where the two overlapping curved ditches occur, in the front of Reilig Oran and the Columba Hotel. Samples of the topsoil taken from this area show a very strong magnetic susceptibility compared for instance with that in the field to the north of the Abbey, and this also suggests that the area is rich in buried remains and may well indicate occupation activity of some sort.

With such a concentration of activity in this part of the field, one might expect the Vallum ditches to be yet further to the south. Indeed, if the area around Reilig Oran was a focus of past activity there is a possibility that the Vallum may return coastwards at some point even as far south as the bend in the road near McLean's Cross. Alternatively, the ditches may well be present as part and extensions (dashed lines, plan 2) of the smaller enclosure ditches. Although the anomalies here are poorly defined, there is an element of continuity, and one must remember how even substantial ditches can be lost in the confusion of magnetic noise. The superimposition of the two ditches implies two distinct phases of construction which relate directly to the courses of the two proposed vallum ditches. These in turn would correspond to the two phases recognizable to the north of the Abbey. The earlier phase would be represented by the alignment in sqs. 11, 17 and 23 with an enclosure, perhaps agricultural in nature, attached on the outside. In phase two the complete arrangement may have been rebuilt on a slightly different alignment to the south, thus expanding the main monastic enclosure as suggested by the placing of the ditches in the north field. The further archaeological implications of the magnetic anomalies are discussed by A. J. Clark in the Appendix.

Apart from the Vallum, it was also hoped that some hint as to the course of the Main Street might be found in this field. If this was paved with large magnetic boulders like the existing pathway from the Abbey to St. Oran's Chapel, one would expect to see it as a swathe of exaggerated magnetic disturbance running through the field. Unfortunately, the disturbance from magnetic stones is so general throughout the field that it is impossible to suggest even an approximate alignment.

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Were it not for the considerably greater time involved, an area resistivity survey over the significant parts of the field might clarify much of what is confused on the magnetic picture.

To the north of the Abbey the magnetic survey has clearly defined the inner ditch in places. Without greater coverage of this field it would be unwise to dismiss archaeological activity as slight here, although this is the general impression. Anomalies of possible significance were detected, but these may be relatively sparse compared to those on the other side of the Abbey. Magnetic susceptibility in the soil here is high, although noticeably lower than in the other field. It is worth noting here that the 'depletion' effect observed in 1973 occurs widely over the site, particularly in the case of probable boundary ditches. There are anomalies, however, some of which appear to be ditches, that are clearly positive rather than negative features. This is noticeable again in the area of concentration to the south of the Abbey and perhaps implies a particularly rich fill derived from occupation refuse, the local magnetic field of which is greater than the surrounding remanent detrital field. Results are still awaited for the measurement of magnetic directions in specially sampled portions of the sub-soil. These should give some indication of the presence and character of a remanent field in the raised beach.

This survey was commissioned and supported by RCAHM Scotland. We would like to thank the Iona Community for their hospitality during our stay on the island.

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IONA GEOPHYSICAL SURVEYS : INTERPRETATIVE NOTES BY A. J. CLARK

The following is an attempt to unravel the phases and functions of the remarkable series of ditches revealed in the 1973 and 1977 geophysical surveys. The development is assumed to be one of expansion, although strong direct evidence of this is lacking, and it cannot be ruled out that Phase 2 could have preceded Phase 1.

PHASE 1. The northerly part of this boundary was quite clearly marked both on the survey and on air photographs. Its course parallel to the present road under the crags, and its link with the ditches in field 640, are presumed. It does not seem likely to have followed the extant banks and ditches around Cnoc nan Carnan because this would have been a detour out of character with its rectilinear plan elsewhere merely to enclose a small area of rock; nor does its presumed southern side quite align with these defences. Its course approaching St Mary's Chapel is uncertain, and will be further discussed below.

PHASE 1A. Although first interpreted as a second phase, this is more probably an annexe to Phase 1. It, and Phase 2A, were both deduced to exist from the curious overlapping shapes of the two apparent enclosures formed by the ditches detected on the west side of field 640. Projected on this side, the Phase 1A ditch would seem to pass around the house opposite the St Columba's Hotel, and then to pick up the line of the faint earthwork on the west side of the rocks. After joining the main extant bank and ditch and following them for about 30 m, it would seem natural for it to have returned to join the Phase 1 line at the bend in Sruth Mhuilinn. Part of this presumed course is marked by apparent remnants of an artificial bank shown on the RCAHM plan.

PHASE 2. This would seem to follow the whole course of the substantial bank and ditch around Cnoc nan Carnan, and a mostly well marked ditch directly aligned with this across field 640.

PHASE 2A. This bears exactly the same relationship to Phase 2 as does Phase 1A to Phase 1. Its course is similar but, curving rather further to the south, it probably followed the stream (or the stream followed it) opposite the St Columba's Hotel. Possibly the straight pipe running across the survey plot of field 640 conveys the water of this stream to the sea.

INTERPRETATION. The ditches of Phases 1A and 2A both seem to form annexes to the main enclosures; they also follow a good natural defence line around the crags of Cnoc nan Carnan, and perhaps the most likely interpretation is that they were to protect stock from piratical incursions. In field 640, it is probably significant that both these outer ditches return to join the inner ones just short of apparent interruptions in these on the line of the ancient 'Main Street'. Phase 1 is much more clearly marked west of this junction than east of it; this indicates that the later history of these two sections of the same ditch were different, and one may surmise that the eastern part was obliterated upon the construction of Phase 2, but that the western part remained extant, possibly because the opportunity was taken to utilise the trapezoidal piece of ground between the ditches of Phases 1, 1A and 2 as the graveyard which was to become the Reilig Crain.

The bank between the Phase 1 and Phase 2 ditches near their north-east ends in field 629, once interpreted as part of the Vallum, was shown in the 1973 survey to be a lynchet containing many relatively large magnetic stones.

IONA

MAGNETOMETER SURVEY

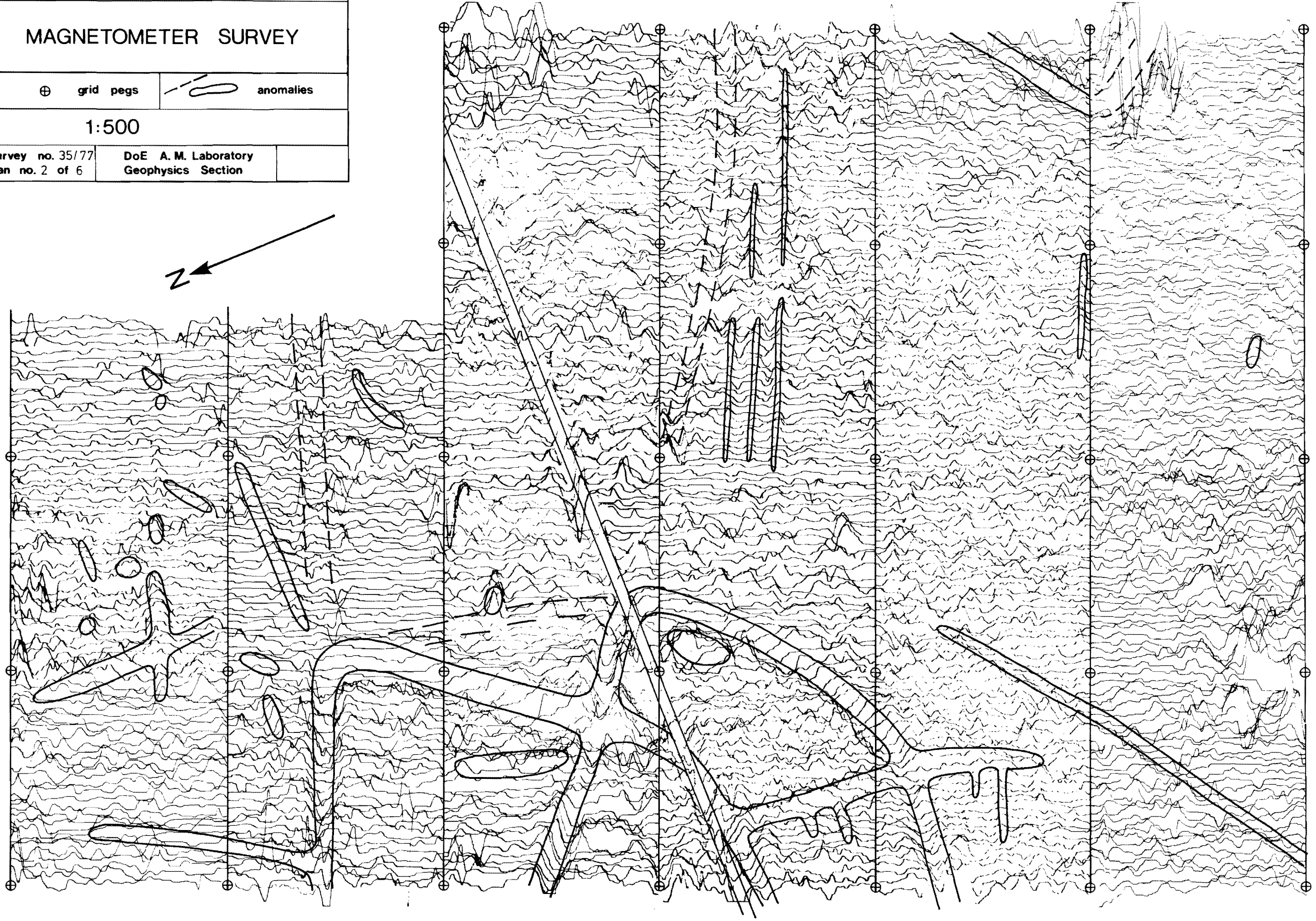
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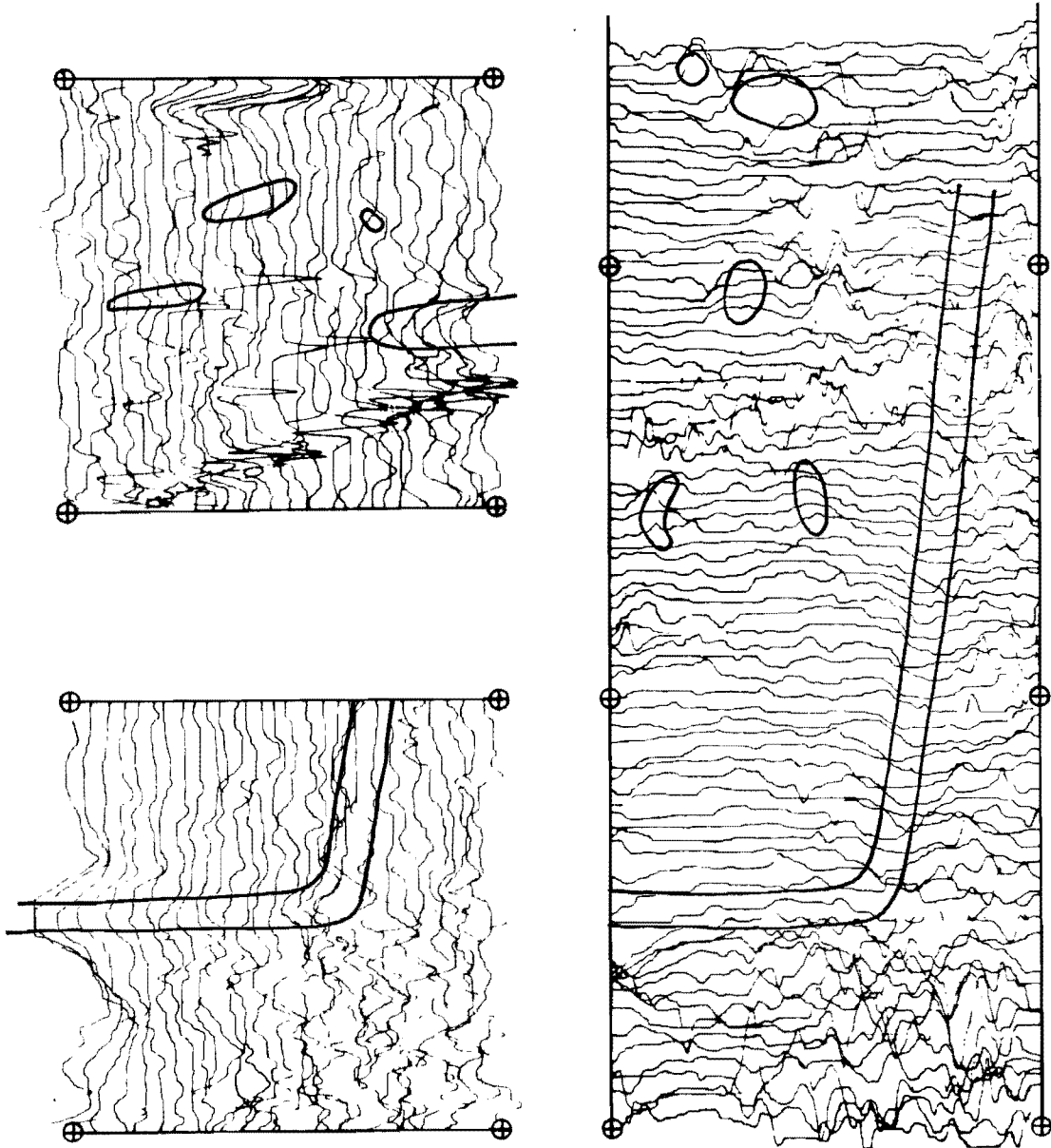
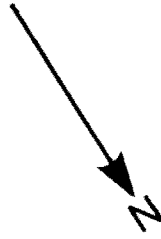
 anomalies

1:500

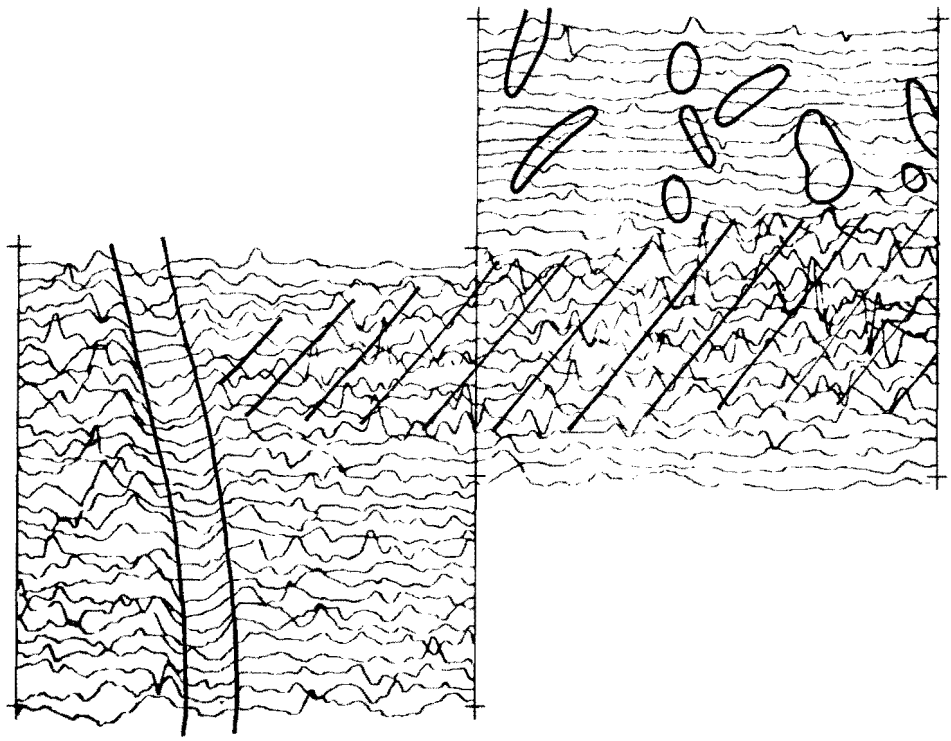
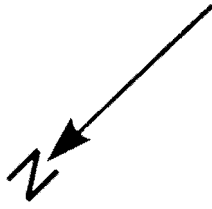
Survey no. 35/77
Plan no. 2 of 6

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<p>⊕ grid pegs ○ anomalies</p>	<p>MAGNETOMETER SURVEY</p>	<p>Site plan</p>	
<p>Survey no. 35/77 Plan no. 3 of 6</p>	<p>1:500</p>	<p>DoE A.M. Laboratory Geophysics Section</p>	



IONA

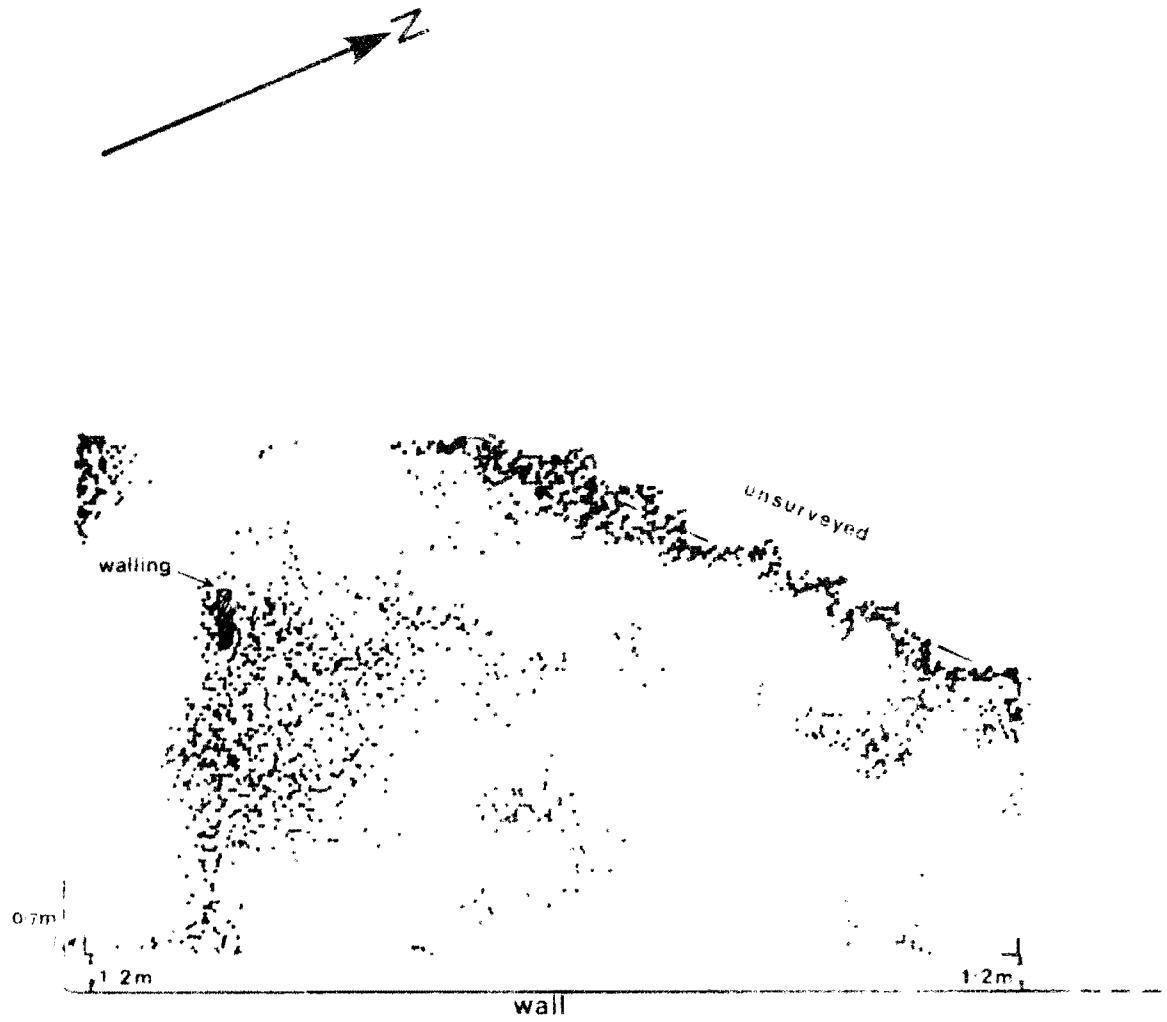
+ grid pegs
○ anomalies

MAGNETOMETER SURVEY
1973

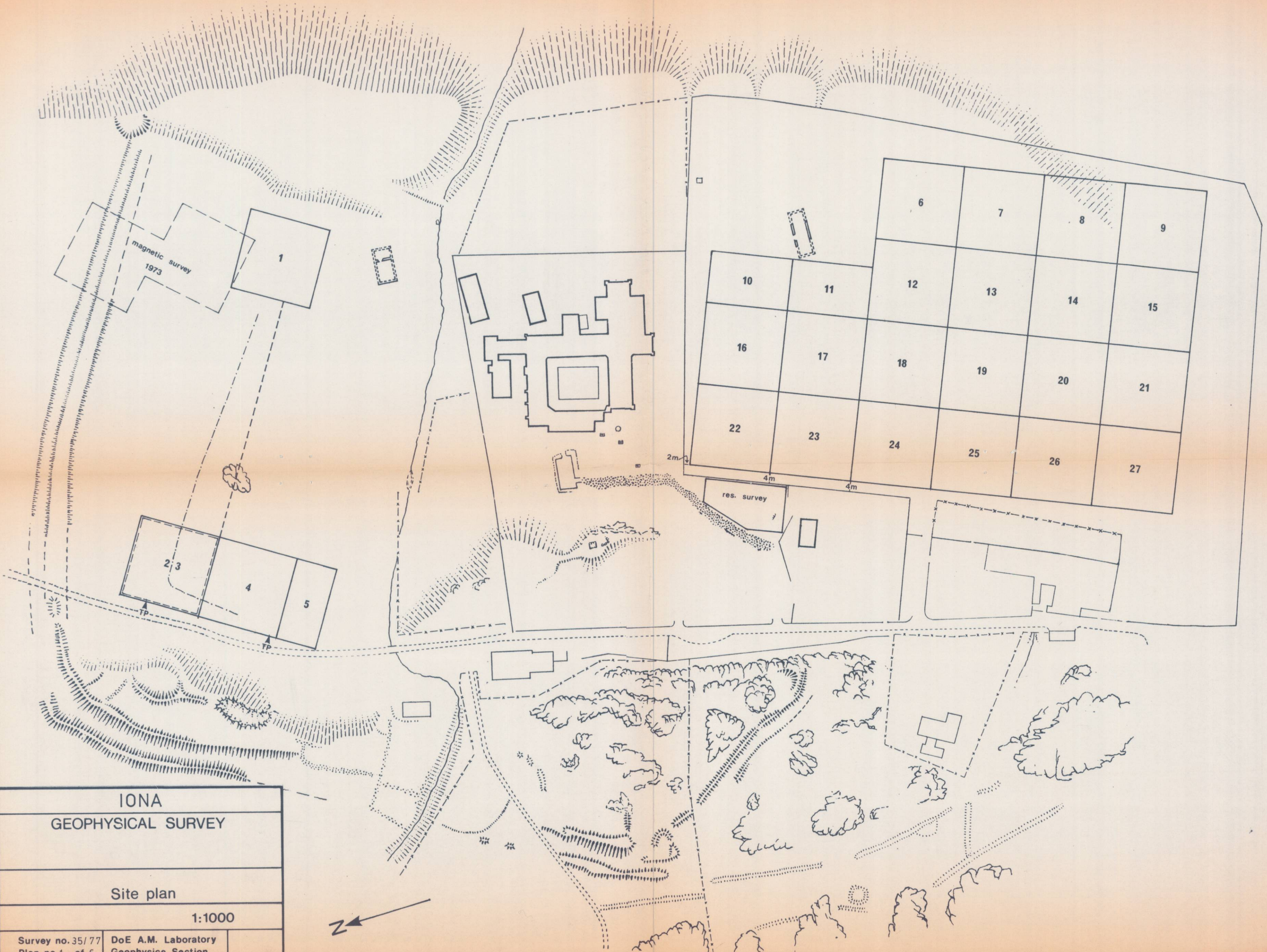
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	RESISTIVITY SURVEY		filtered Computer plot
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GEOPHYSICAL SURVEY	
Site plan	
1:1000	
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GEOPHYSICAL SURVEY

Interpretation:

Phase 1 : ————
 " 1a : - - - -
 " 2 : ————
 " 2a : - - - -

1:1000

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