RHYD Y GROES, RHOSGOCH YNYS MON

ARCHAEOLOGICAL ASSESSMENT

REPORT NO. 89

1053

Ymddiriedolaeth Archaeolegol Gwynedd
Gwynedd Archaeological Trust

RHYD Y GROES, RHOSGOCH YNYS MON

ARCHAEOLOGICAL ASSESSMENT

prepared for Ecogen Limited

March 1994

Gwynedd Archaeological Report No. 89

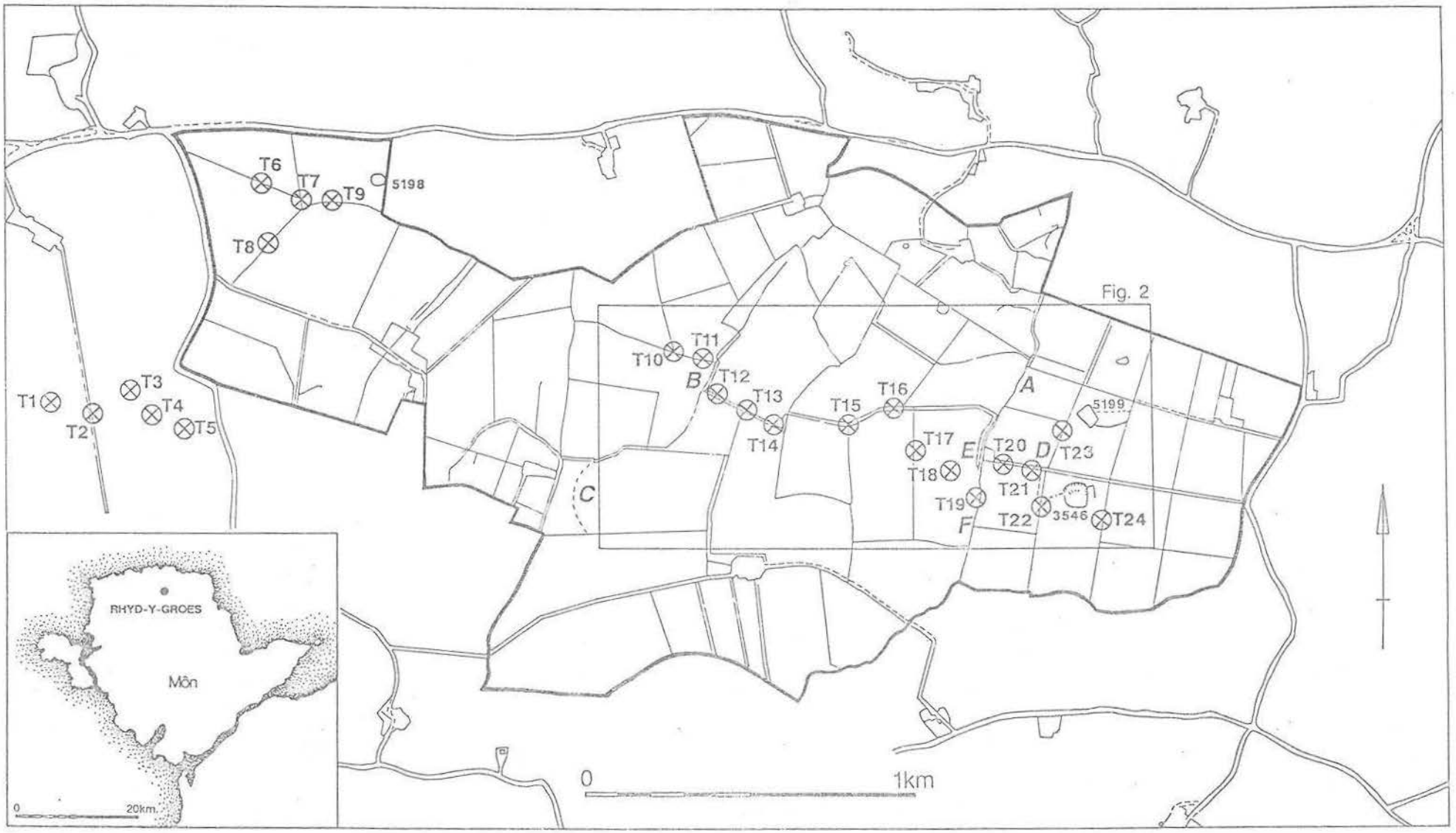


Fig. 1 The study area and location of turbines

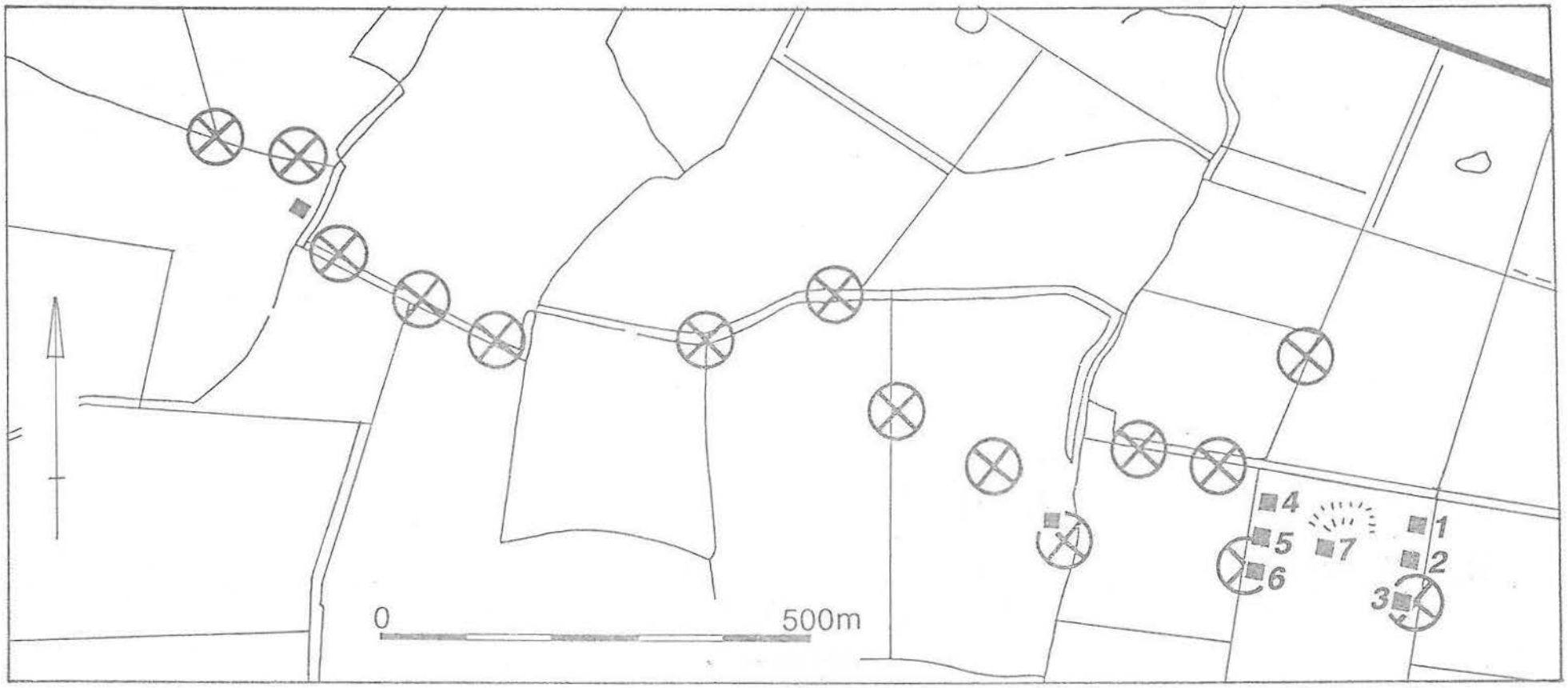


Fig. 2 The geophysical survey in relation to the turbines.

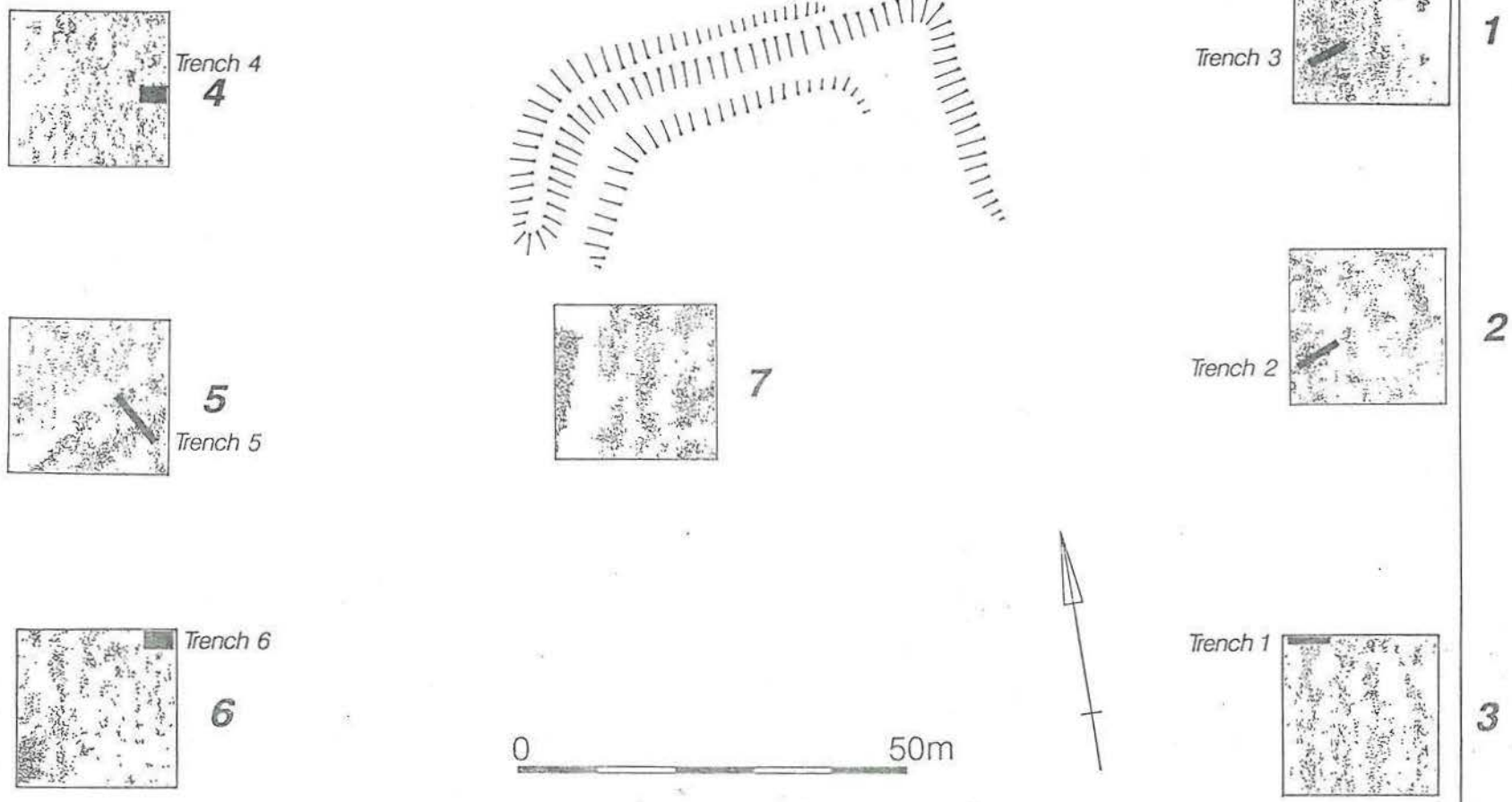


Fig. 3 Y Werthyr earthwork and adjacent geophysical survey.

ARCHAEOLOGICAL ASSESSMENT AT RHYD Y GROES, RHOSGOCH, YNYS MON

1. Introduction

It had been proposed by Ecogen Limited (The Plas, Machynlleth, Powys) that a wind farm be built in an area between Parys Mountain and the north coast of Anglesey. The proposal entailed the erection of a number of 30 metre high monopole wind turbine masts and their associated works. The total area involved was considerable.

In view of the nature of the proposal, and the size of the area involved, it was intended that an environmental statement accompany the planning applications. The Gwynedd County Sites and Monuments Record further recommended that an assessment of the archaeological implications of the scheme should form part of this statement in line with current Welsh Office advice on the treatment of the cultural heritage in Environmental Impact Assessments.

2. Assessment brief

It was proposed that the archaeological assessment should be carried out in two stages.

Stage 1
Initial assessment should attempt to identify all sites of archaeological interest within the application area, in order to secure their continued preservation. The results and recommendations from this initial assessment were to be taken into consideration when the final siting of the masts and ancillary works was decided, and should inform recommendations for further work during Stage 2.

Stage 2
Once detailed proposals for the siting of all the planned apparatus had been produced, the affected 'corridors' should be subject to detailed field assessment. Minor adjustments to the disposition of the apparatus should be recommended if the results of this assessment show that they are required.

Full and appropriate recommendations for the treatment of any sites or sensitive areas which still appeared likely to be damaged by the proposals were to be prepared.

3. Results of Stage 1

(1) Consultation of the Sites and Monuments Record revealed four sites of archaeological importance within the area, and several just outside. It was recommended that these latter should be taken into consideration as it is possible that associated features may lie within the area itself, but as the works which were to require ground disturbance were for the most part well away from the edges of the area it appeared that these sites were unlikely to be affected.

The four sites within the area are:-

PRN 3541	Werthyr standing stone
PRN 3546	Werthyr earthwork enclosure
PRN 5198	Cropmark enclosure: circular, with possible features in same field
PRN 5199	Cropmark enclosure: rectangular, with ancillary features

The sites close to the area are:

PRN 897	Neuadd - possible medieval place-name site
PRN 3056	St. Peirio's church
PRN 3060	Capel Gwen Hir (Betws), Site of
PRN 3545	Early Christian burials, Peibron
PRN 3555	Tumulus, Pen y Fynwent
PRN 3557	Place-name site - Pen y Fynwent

(2) The local archives were also searched and nothing further was noted.

(3) One further site was noted from an aerial photograph in the possession of one of the landowners involved in the scheme (C on map), but this seems to be clear of any turbines or other development and should remain unaffected.

Fieldwork
Fieldwork initially concentrated effort on specific areas marked on the planning application as the proposed sites for the wind turbine generators and transformers. Most but not all of these were visited on the first occasion, but the land beyond was not examined in any detail. Following changes to the positions of some of the turbines, a second field visit was made although further changes to the positions of the turbines were subsequently made.

(1) In general, the area of the application is grazing or arable land in a landscape which is craggy and in places sharply undulating. The present, relatively featureless, nature of the fields is the result of centuries of ploughing, and one consequence of this is that it is unlikely that archaeological sites will have remained as above-ground features. Most will have been ploughed flat, and will only be recognisable by other means (aerial photography, remote sensing, find-scatter collection or excavation).

(2) Initial fieldwork along the line of the proposed turbines as plotted on the planning application revealed a number of further features which may be of archaeological and/or historical interest:-

A	Circular mound at the stream-side
B	Two truncated banks, possibly walls, at the field edge
C	Aerial photographic site
D	Hollow-way, of uncertain date, now disused but formerly leading to the stream and enclosure E
E	Sub-square enclosure, formed by stone walling now largely tumbled, of uncertain date and function
F	Possible burnt mound beside the stream or clearance material

In addition, a number of different types of field boundary construction were noted, which form part of the historic landscape of the area.

(3) There was potential for recovering further archaeological information from a number of locations along the line of the proposed turbines/road. These locations are where the local topography and/or the presence of nearby recorded archaeological sites suggested further investigation might be warranted.

4. Recommendations arising out of Stage 1 Assessment

(1) The importance of safeguarding any known archaeological sites or areas of known archaeological remains was noted. Due to the nature of past land use any sites which existed as earthworks were considered to be particularly important, but below ground sites were also to be seen as worthy of preservation. The turbines and road were considered unlikely to destroy any known archaeological features of sufficient importance to merit preservation, but

would destroy parts of some sites of secondary importance and affect parts of others, and it was recommended that these be safeguarded by recording.

(2) Initial work had indicated that the two main areas of archaeological sensitivity lay at the two ends of the proposed line, around the known archaeological sites. The repositioning of several turbines at the western end of the area meant that the sensitive area here was unlikely to continue to be at risk.

(3) The proposed siting of the turbines would or might have affected archaeological deposits associated with features B, D, E and F and PRNs 3546 and 5199.

B. It was recommended that in this case further investigations should take place by trial trenching if the site was threatened by the development. The remains were unlikely to be worthy of preservation.

D. In the case of D, as the whole length of the track was to be taken in as part of the new road it was desirable that destruction should be kept to a minimum (the new road should run within the existing banks and damage them as little as possible) and the track should be recorded before resurfacing. Clearing and topsoil stripping work should be observed.

E. While not necessarily affected if there were to be a threat of damage (for example, by heavy vehicles turning), further work would be necessary to attempt to ascertain the purpose of the enclosure and any structural associations. Further work might be necessary.

F. If affected by turbine 19, the archaeological significance of feature F should be determined and appropriate action taken.

PRN 3546, the Werthyr earthwork, is almost certainly part of a complex of remains some of which would be affected by turbines 22 and 24 and the tracks leading to them. All the ground disturbance involved in these would require some archaeological input.

PRN 5199 might have been affected by turbine 23. Observation was recommended.

The storage area to the west of the site fell within an area covered by earlier fieldwork and did not appear to affect any sites. That at the east end of the site however is in a field which has not been investigated.

(4) There was also the possibility that further archaeological deposits which are presently unknown would be disturbed by the development, especially in the archaeologically sensitive areas around the known sites. It is therefore important that any such areas receive proper archaeological investigation before they are developed.

(5) The proximity of the two proposed turbines 22 and 24 to the Werthyr earthwork site (PRN3546) introduced the question of whether the application would affect the monument in its setting, a question best considered within any general discussion of the visual impact of the proposal on the landscape.

5. Stage 2 Brief

Following the completion of Stage 1 and taking account of the recommendations contained within the report for this stage, a programme of work was agreed for Stage 2 which allowed the results of each step to be taken into account before proceeding to the next step.

The steps involved:

1. Geophysical survey
2. Excavation of trial trench at Turbine 22

3. Excavation of trial trench at Turbine 24
4. Excavation of trial trenches along the tracks to Turbines 22 and 24
5. Excavation of trial trench across feature B
6. Excavation of trial trench at feature F
7. Investigate the nature of track D
8. Watching brief during construction.

6. Results of Stage 2

Further research established the status of features B and F. B was an old trackway, mostly ploughed out, which could be seen in section where the wind farm track crossed it, and F represented spoil from stream clearance. No further work was required in respect of these features beyond the maintenance of a watching brief on track B.

Step 1 Geophysical Survey
This was undertaken by Geophysical Surveys Limited of Bradford on 26th May. The results were received by the Gwynedd Archaeological Trust (GAT) on 19th June although GAT were provided with an interim statement of results in advance in order to expedite the fieldwork.

Nine trial squares, all 20m by 20m, were surveyed, seven in the immediate vicinity of Yr Werthyr earthwork at the eastern end of the development area. These were on the sites of Turbines 22 and 24 and the tracks leading to them, with one very close to the banks of the earthwork in an attempt to establish whether the enclosure extended beyond the visible remains. The eighth square was on the site of Turbine 19, and the ninth between the positions of Turbines 11 and 12, to identify any anomalies associated with the suspected hut circle (Feature B) (see Fig. 1) which had not been confirmed as a relict trackway at that stage in the assessment.

The small size of the survey squares, together with the fact that the land had been well ploughed in the past, presented difficulties in the interpretation of anomalies. However, no anomalies of possible archaeological interest were detected in squares 1, 3, 4, 6, 8 and 9.

Square 2 showed anomalies which were interpreted as possible pits, although a geological explanation is possible. Square 5 showed two clear linear anomalies which were interpreted as ditches associated with the earthwork. Square 7 also showed an anomaly which resembled a ditch on a projection of the visible ditch of the earthwork, and other anomalies within this square were thought to represent "ridge and furrow" (the linear banks and furrows of ancient ploughing), although they too could be associated with the earthwork.

Nothing was found to alter the opinion that only the immediate area of the earthwork was likely to contain archaeological features subject to damage by the development. A recording strategy for these had been recommended and the geophysical survey was able to target the most sensitive areas. However, the absence of identifiable archaeological anomalies in some relevant areas was not considered sufficient reason for abandoning work proposed for these areas on the grounds of uncertainties of interpretation.

Step 2 Excavation of trial trench in position of hole for Turbine 22.
A trial trench, 3m by 2m (Trench 6), was excavated in the north-east corner of Square 6 of the geophysical survey. No traces of any archaeological feature, nor any artefacts, were found (See Fig. 3).

Step 3 Excavation of trial trench in position of hole for Turbine 24.
A trial trench, 6m by 1m (Trench 1), was excavated in the north-west corner of Square 3. No archaeological features were noted, and all finds were modern, nineteenth century and later (see Fig. 3).

Step 4 Excavation of trial trenches along the tracks to Turbines 22 and 24.
Trial trenches were excavated in Squares 1, 2, 4 and 5 (Trenches 3, 2, 4 and 5 respectively). These were all 1m by 6m, except that in Square 4 (Trench 4), which was 3m by 2m. They were located within the squares in order to test apparent or possible anomalies (see Fig. 3).

Trench 3 (Square 1). Examination of an aerial photograph of this area had suggested that features might be present, although no anomalies of interest showed during the geophysical survey. The excavation revealed no features and no finds.

Trench 2 (Square 2). Although anomalies were identified during geophysical survey no features were observed during excavation and no finds were recovered.

Trench 4 (Square 4). It was noted that the soil was waterlogged.

Trench 5 (Square 5). This trench was located in order to test the two linear anomalies identified during geophysical survey. The trench was recorded by drawn cross section and a slight dip was observed in the topsoil horizon near the middle of the trench. This may represent the heavily truncated former existence of a ditch. There were also occasional traces of burnt clay in the area of the dip.

The results of the trial trenching provided little further information of archaeological significance and confirmed that no damage would be done to archaeological remains by the development. It was recommended, however, and agreed, that a watching brief should be maintained on the work to the tracks to Turbines 22 and 24 as the possibility of further discoveries could not be ruled out.

Steps 5 and 6 Abandoned following confirmation of the status of Features B and F.

Step 7 Determine the nature of Track D.

The access track to the site was to be made along Track D, and this was, consequently, the first work to be undertaken. The brief for Stage 2 specified that two trenches, near either end of the track, should be machine-dug across it and the sections recorded. It was agreed that this would be arranged on site with the contractors when work began.

GAT was notified of the start of work on 29th July, and when GAT personnel arrived on site on the morning of 30th July, the track had already been stripped. The surface was inspected, but nothing of interest was noted. It is possible that original surfacing may have been removed.

Watching Brief

The preliminary framework for the watching brief, as laid out in the brief for Stage 2, provided for the observation of work to the holes of Turbines 9 and 23, Track D, and parts of the conduit and track near Turbine 9. There was also provision for the monitoring of work near B and F. In the case of F, this was now unnecessary, but in the case of B a watching brief was still required to observe a section through the track (B) if possible.

Arising from work done in Stage 2, a watching brief for the tracks to Turbines 22 and 24 was also agreed.

Other observations were made of work for which a watching brief had not been specified as time allowed between identified work stages.

Hole for Turbine 9 and track nearby.
This work was carried out without notification by the contractors despite undertakings to do so. It proved possible, however, to observe the excavated hole, still open except for a 50mm

concrete pad in the base. The sections were examined and no features were identified in these. Hardcore had already been laid over the track and no recording was possible there.

Conduit trench near Turbine 9.
A watching brief was carried out on 3rd September and no archaeological features were noted.

Hole for Turbine 23.
This was excavated by machine on 3rd August to a depth of approximately 0.3m. This effectively removed all topsoil and revealed the natural subsoil over the whole area. No features were observed and there were no finds.

Track D
As described above, the topsoil had been stripped from Track D without notification of the start of work. This work was, therefore, not observed. However, sections were cut through both north and south banks of Track D (to allow access to Turbines 23 and 22 respectively), and these were cleaned, observed and drawn.

The banks were very similar, the only difference being the random inclusion of some large stones in that to the north. Three distinct layers were noted below the turf line, the uppermost closely resembling the local subsoil, the middle one darker mixed material and the lowest, overlying undisturbed subsoil, a very clear grey layer with yellow and black patches. This last is interpreted as the original ground surface, and the other two layers as material dug out from the area between the banks, that is, the track surface, and piled over that surface.

There were no finds by which the formation of the track could be dated, but as fairly substantial trees had grown on its surface before stripping, it had clearly been out of use for many years. It is shown on early Ordnance Survey maps of the 19th century.

Any original metalled or rutted surface had been destroyed by the topsoil stripping.

Feature B
The creation of the track passing this feature was observed, and a dark area was noted which was possibly associated with Feature B. There appeared to be some stones set into the subsoil on either side of the dark area.

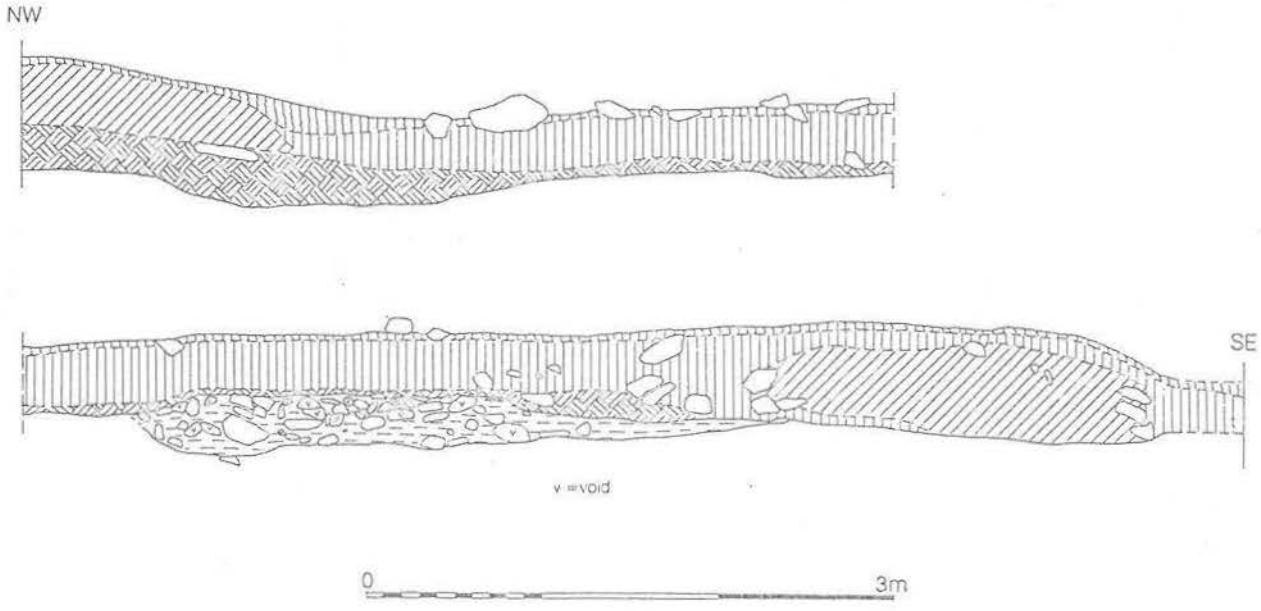


Fig. 4 Section through Feature B.

The hole for Turbine 10 would damage feature B, and the opportunity was taken of cutting a trench across the feature before this happened so that a section could be inspected. The track showed up clearly as a packed stone surface between two earth banks. The excavation of the trench was completed by hand, the stone surface revealed planned, and the section drawn. A very slight agreed adjustment to the position of the hole for Turbine 10 enabled recording to be completed.

A watching brief was carried out on the excavation of the hole for Turbine 10 but no features associated with the track were noted.

Track to Turbine 22.
This track, and that leading to Turbine 24, had already been stripped before GAT was informed of the start of work. However, the hardcore had not yet been laid and inspection of the surface was possible. Three features were identified, one probably natural and the other two associated with each other.

Near the northern end of the track a U-shaped dark deposit could be seen in the east section. Cleaning of this and the surface of the track revealed a similar dark patch on the track surface, but any physical relationship between the two had been destroyed. In one place the subsoil overlay the dark deposit, and this would appear to suggest a geological origin for the feature.

To the south, a linear differentiation was observed between the naturally yellow subsoil and the brown sandy silt of a feature extending approximately north-south along the length of the track. About 50m south of Track D a large spread of stones was recorded set in this silt with amongst them, a rotting fence post and the remains of some barbed wire. Two test pits were dug, one at the join of silt and subsoil and one at the extreme western edge of the track. The former showed that the silt and subsoil met with an almost vertical interface, and that the feature filled with silt was about 0.25m deep with a level bottom. The second test pit confirmed the depth and that the bottom remained level, but did not find the western edge of the feature.

The fence post and wire would suggest that the spread of stones is modern, as is the silt-filled feature.

Track for Turbine 24
No archaeological features were observed and there were no finds.

Other observations
The excavated hole for Turbine 24 was examined. A small U-shaped feature - a deposit of compact grey clay, below the topsoil but not visibly cutting it - was observed in the southern section. Further investigation was not possible as hardcore had already been laid over the surrounding area.

Near the hole for Turbine 13 (in its turning area) a dark feature about 1.5m by 0.8m was noted, cut into the subsoil. This was cleaned, following which it could be seen to be roughly crescent-shaped and filled with a dark brown silty sand containing small concentrations of charcoal. It was interpreted as a tree pit.

The hole for Turbine 8 was inspected at the same time as that for Turbine 9. No features were seen.

Conclusions

The production of this report fulfils Step 8 of Stage 2, which is now complete. All work required as a result of the watching brief was carried out, and work on site finished on 3rd September, 1992.

Very few archaeological features were identified during Stage 2, and those observed were difficult of interpretation or badly preserved. The most rewarding was the track, B, but like the others this was undated.

It is possible that the slight dip noted in the section of Trial Trench 5, also observed as a linear anomaly in the geophysical survey, is the remains of a ditch associated with the earthwork or of a field boundary appended to it.
No features of archaeological significance were damaged by the development.

Thanks are due to Ecogen Limited, Team Surveys and Amey (the contractors) for their co-operation in allowing GAT to complete this work.

APPENDIX

Technical report on Geophysical Survey

SITE SUMMARY SHEET

92 / 46 Rhyd-y-Groes Wind Farm

NGR: SH 408 925

Location, topography and geology

The geophysical survey covered selected areas within a proposed wind farm development located at Rhyd-y-Groes, Amlwch on the north coast of Anglesey. The primary area under investigation lies within a field approximately 500m south-west of Werthyr Farm. Two additional areas, approximately 200m and 1.2km to the north-west, were also surveyed.

The five areas had varying topography and ground cover, primarily pasture. The underlying drift geology consists of boulder clay, overlying the New Harbour Group comprising quartzites, shales and pillow lavas.

Archaeology

The geophysical survey was confined to the eastern half of the development area where there is a surviving earthwork. To the west of the earthwork there are areas of possible archaeological interest including a mound and a hut circle.

Aims of Survey

Magnetometer surveys over the proposed location of turbines and tracks in archaeologically sensitive areas were undertaken with the aim of locating any features of archaeological interest. The geophysical surveys form part of a wider archaeological assessment being carried out by Gwynedd Archaeological Trust prior to the construction of the wind farm by EcoGen.

Summary of Results *

Anomalies of archaeological interest were located in the east of the development area, near the earthwork. However, the limited size of the survey areas and agricultural processes makes a definitive interpretation difficult.

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

SURVEY RESULTS

92 / 46 Rhyd-y-Groes Wind Farm

1. Survey Areas (Figures 1 and 2)

1.1 Nine grids, all 20m by 20m, within the proposed development area were surveyed using the magnetic technique. The areas to be surveyed were set out in a brief by Gwynedd Archaeological Trust (GAT).

1.2 The surveys were located over the proposed location of selected turbines and tracks, as indicated in Figure 1.

1.3 The survey grids were set out by Geophysical Surveys of Bradford and tied-in by GAT.

2. Display

2.1 The results are displayed as dot density plots and X-Y traces. These display formats are discussed in the *Technical Information* section, at the end of the report.

2.2 Interpretations at a scale of 1:500 are provided for each area.

3. General Considerations - Complicating factors

3.1 In general the conditions for survey were good, the ground being relatively flat and free of obstructions. The one exception was Area D which was situated on a steep slope alongside a stream.

3.2 The small size of the survey areas makes interpretation of anomalies extremely difficult, particularly when they lie on the edge of the survey area. Responses from past agricultural processes has also hindered the interpretation.

4. Results

4.1 Area A (Grids 1-3)

4.1.1 Area A lies to the east of the earthwork along the existing field boundary, as indicated in Figure 1. The grids are situated over the proposed location of Turbine 24 and the track leading to it.

4.1.2 The data from Grid 1 have been distorted by the close proximity of a wire fence to the east. No

anomalies of possible archaeological interest were detected.

4.1.3 There are suggestions of pit-type responses visible in Grid 2. While these may be archaeological, a natural or agricultural origin seems likely.

4.1.4 Responses from ploughing trends, aligned approximately NNE-SSW, dominate the data from Grid 3.

4.2 Area B (Grids 4-6)

4.2.1 Area B lies to the west of the earthwork, adjacent to a field boundary, as shown in Figure 1. The grids cover the proposed location of Turbine 22 and the track leading to it.

4.2.2 No anomalies of archaeological interest were detected in Grid 4. There are a couple of iron spikes which are almost certainly due to surface ferrous material.

4.2.3 Two clear linear anomalies have been detected in Grid 5. These coincide with a break in slope and are believed to be ditches associated with the earthwork.

4.2.4 Grid 6 is generally magnetically quiet. There is an area of magnetic disturbance in the west due to a metal gate. There is also the suggestion of a linear anomaly in the west. However, this is almost certainly a ploughing trend, as seen in Grid 3, Area 1.

4.3 Area C (Grid 7)

4.3.1 Area C is situated over a portion of the earthwork. The grid was positioned so as to cover part of the bank and interior in an area where the earthwork was not as well preserved on the ground, as indicated in Figure 1.

4.3.2 There is a very clear response along the western limit of the grid. While the form of the anomaly, and its location with respect to the earthwork, suggest a ditch, the responses are extremely strong. Given that the anomaly is on the edge of the grid and its full extent is unknown, it is very difficult to formulate an interpretation. It is possible that the anomaly is geological in origin, perhaps due to pillow lavas which occur in the area.

4.3.3 There are several additional responses within this grid which may be significant, given their context. However, it seems probable that these anomalies are due to ridge and furrow.

4.4 Area D (Grid 8)

4.4.1 Area D covers the proposed location of Turbine 19, near a 'mound'. There are two diffuse areas of increased magnetic responses, as indicated on the interpretation plan. Given the topography of the area and the very shallow top soil, a natural origin seems most likely.

4.5 Area E (Grid 9)

4.5.1 This survey is situated over the proposed location of Turbine 11 which is in the vicinity of a known hut circle.

4.5.2 The level of magnetic response over this area was extremely low. Two clear 'ferrous peaks', probably due to surface ferrous material, are visible and these area indicated on the interpretation plan. No anomalies of archaeological potential were detected.

5. Conclusions

5.1 1 Interpretation of the results was hindered by the small survey areas, agricultural trends and occasional ferrous debris.

5.1.2 In the surveys surrounding the monument two ditches were located together with other anomalies of possible significance.

Project Co-ordinator: Dr S Ovenden
Project Assistant: C Stephens.

18th June 1992
Geophysical Surveys of Bradford

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 1m intervals giving 400 readings per 20m x 20m grid. The data are then transferred to portable computers 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 computers linked to appropriate printers and plotters.

Instrumentation

(a) Fluxgate Gradiometer - Geoscan FM36

This instrument comprises of 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

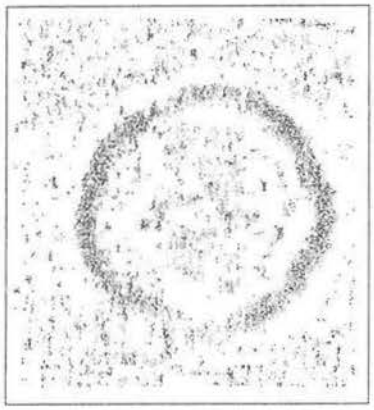
This measures the electrical resistance of the earth, using a system of four electrodes (two current and two potential.) Depending on the arrangement of these electrodes an exact measurement of a specific volume of earth may be acquired. This resistance value may then be used to calculate the earth resistivity. The "Twin Probe" arrangement involves the paring of electrodes (one current and one potential) with one pair remaining in a fixed position, whilst the other measures the resistance variations across a fixed grid. The resistance is measured in Ohms and the calculated resistivity is in Ohm-metres. The resistance method as used for area survey has a depth resolution of approximately 0.75m, although the nature of the overburden and underlying geology will cause variations in this generality. The technique can be adapted to sample greater depths of earth and can therefore be used to produce vertical "pseudo sections".

(c) Magnetic Susceptibility

Variations in the magnetic susceptibility of subsoils and topsoils occur naturally, but greater enhanced susceptibility can also be a product of increased human/anthropogenic activity. This phenomenon of susceptibility enhancement can therefore be used to provide information about the "level of archaeological activity" associated with a site. It 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 phenomenon is either a field coil or a laboratory based susceptibility bridge. For the latter 50g soil samples are collected in the field.

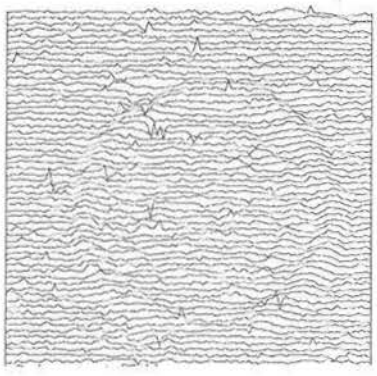
Display Options

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) 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.). Usually the C.F. = 1, producing a linear scale between the cut-off levels. Assessing a lower than normal reading involves the use of an inverse plot, This plot simply reverses the minimum and maximum values, resulting in the lower values being presented by more dots. In either representation, each reading is allocated a unique area dependent 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.



(b) 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 indiviual anomalies. Results are produced on a flatbed plotter.

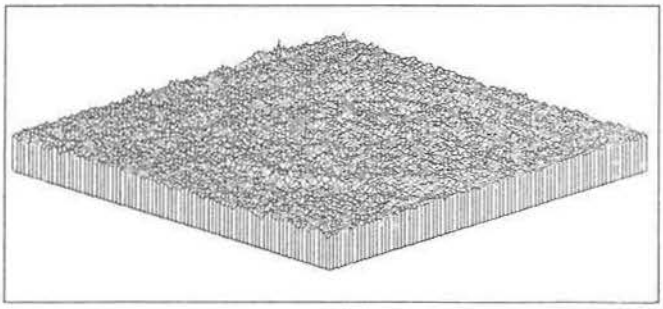
(c) Grey-Scale

This format divides a given range of readings into a set number of classes. These classes have a predefined arrangement of dots or shade of grey, 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.

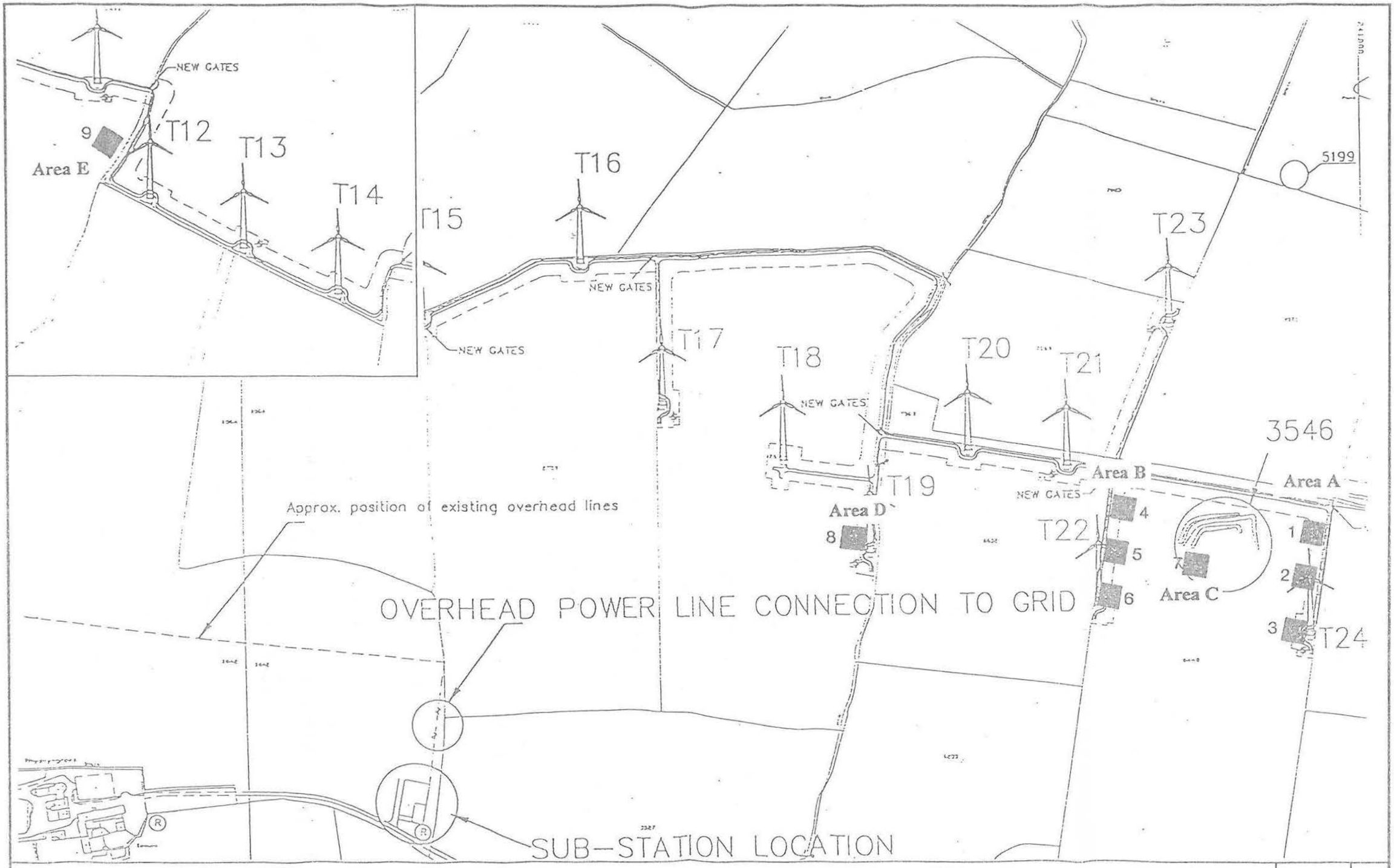
(d) Contour

This display format is commonly used in cartographic displays. Data points of equal value are joined by a contour line. Closely packed contours indicate a sharp gradient. The contours therefore highlight an anomalous region. The range of contours and contour interval are selected manually and the display is then generated on the computer screen or plotted directly on a flat bed plotter / inkjet printer.



(e) 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. The output may be either colour or black and white. A hidden line option is occasionally used (see (b) above).



GEOPHYSICAL SURVEYS OF BRADFORD PROJECT: RHYD-Y-GROES WIND FARM TITLE: GRID LOCATION

2 Grid Number

SCALE: 1:2500

Based Upon a Plan Supplied By Gwynedd Archaeological Trust

FIGURE 1

RHYD-Y-GROES

WIND FARM

Area A

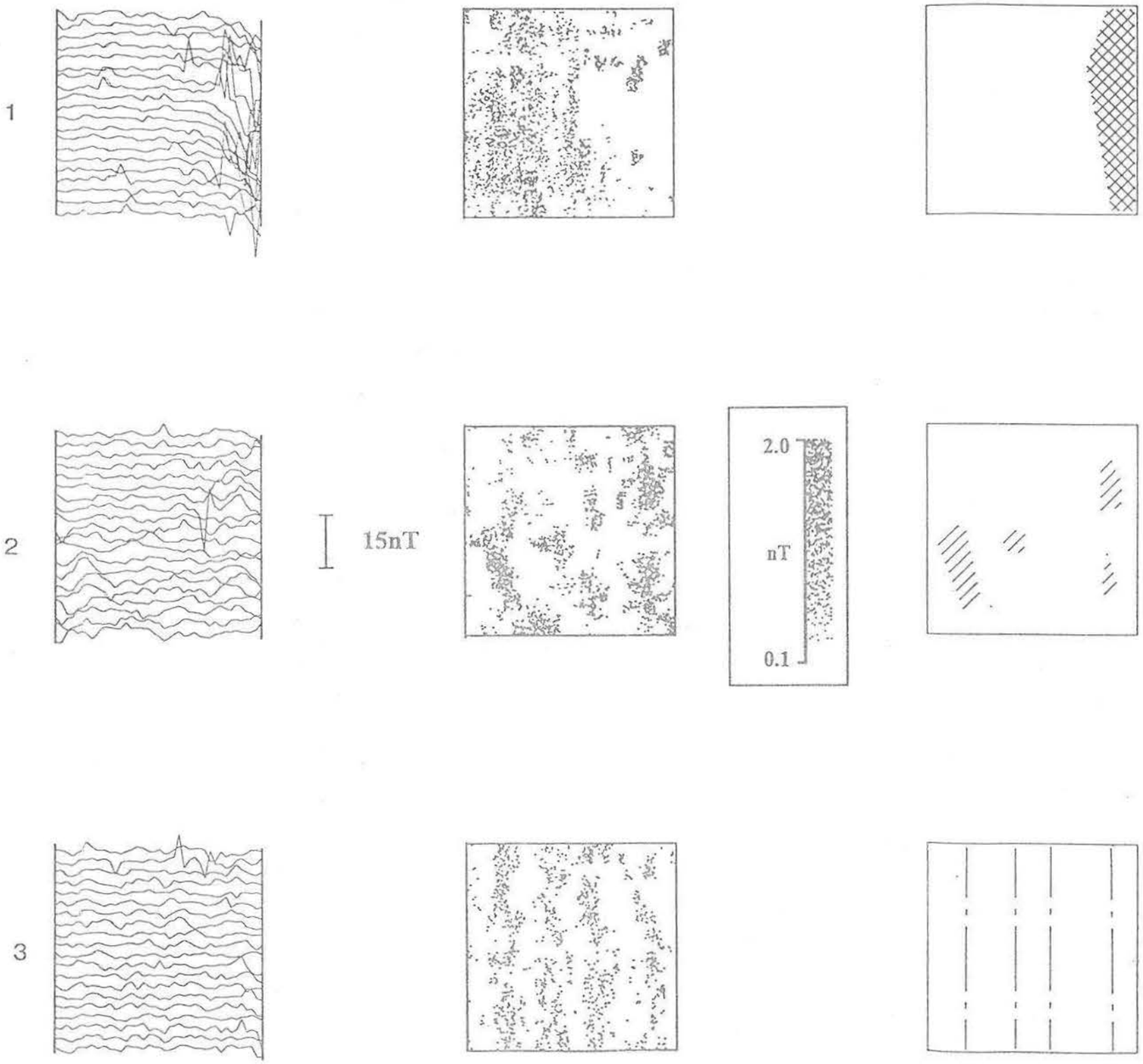


Figure 2

RHYD-Y-GROES

WIND FARM

Area B

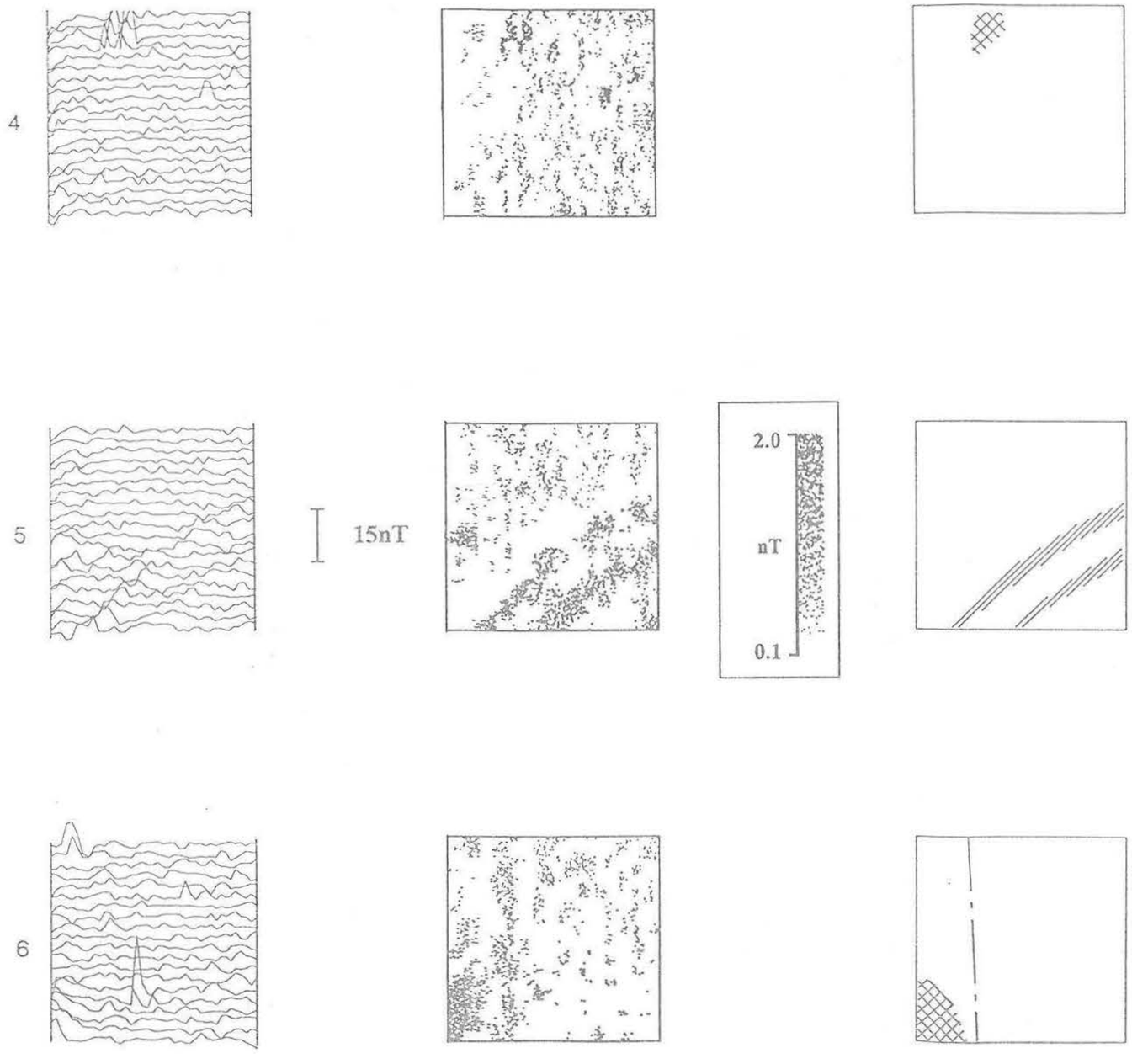
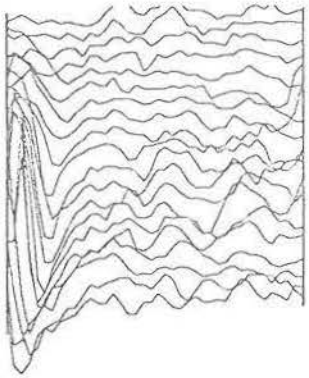


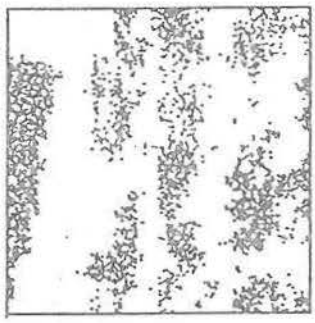
Figure 3

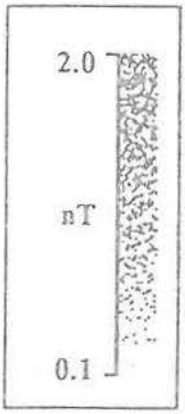
RHYD-Y-GROES WIND FARM

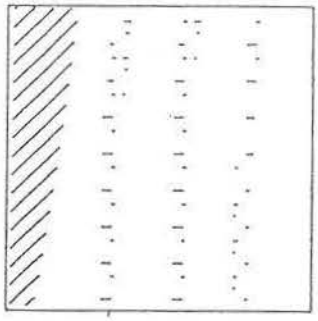
Area C



15nT







? Archaeology

? Agricultural

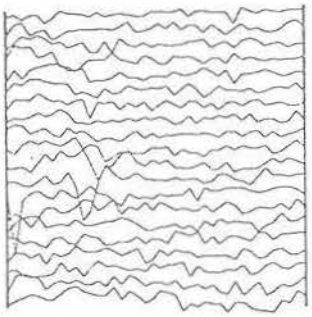
0 20

m

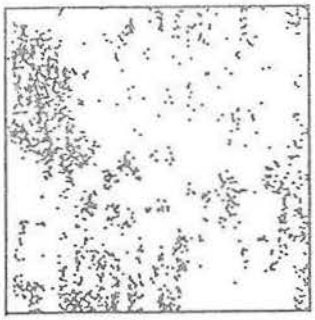
Figure 4

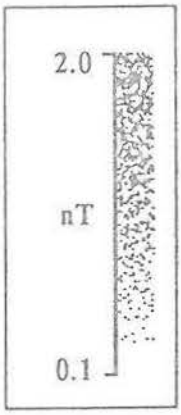
RHYD-Y-GROES WIND FARM

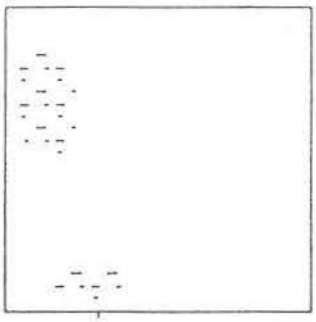
Area D



15nT







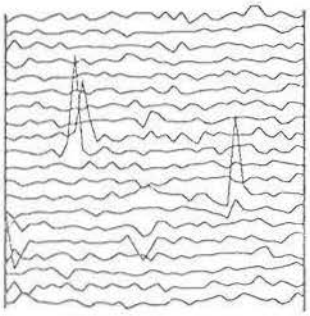
? Natural

0 m 20

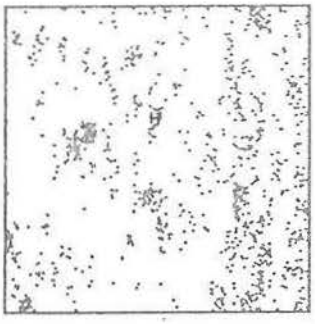
Figure 5

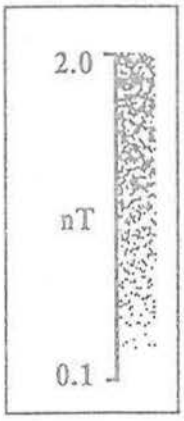
RHYD-Y-GROES WIND FARM

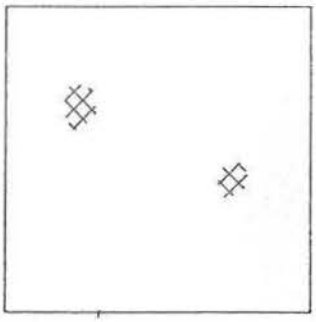
Area E



15nT







Ferrous

0 m 20

Figure 6