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GEOPHYSICAL SURVEY REPORT 2003/100

WHISBY QUARRY
Lincolnshire

Client:

JSAC JOHN SAMUELS ARCHAEOLOGICAL CONSULTANTS

SITE SUMMARY SHEET

2003 / 100 Whisby Quarry, Lincolnshire

NGR: SK 887 662 (Approximate centre)

Location, topography and geology

The area under investigation lies 2km to the south-west of Whisby and to the south east of the village of Eagle. The topography is flat with a ground cover of oilseed, young cereal, pasture, set-aside and plough. The soils are stagnogleyic typical sandy gleys formed from a parent of fluvioglacial sands and gravels (SSEW 1983).

Archaeology

There is little evidence for archaeological remains within the application area. However, Eagle appears to have been a focus of some activity of interest, as Eagle Hall was a former Templars' Preceptory and fragments of Roman pottery have been found in the village. In 2001, GSB Prospection carried out a gradiometer survey of the application area using a combination of scanning followed by detailed survey of approximately 10% of the (then) application area. The scanning found the background magnetic response to be very quiet and a small number of anomalies were noted. Subsequent detailed survey recorded some responses that appeared to have archaeological potential and others that were associated with recent agriculture and pedological variations.

Aims of Survey

The aim of the 2003 geophysical investigation was to undertake a 50% sample of the application area, (revised in size prior to the current work) with more sensitive fluxgate gradiometer instruments. It was hoped that these instruments, that were not available in 2001, would identify very weak magnetic responses of possible archaeological origin should they exist within the survey area. This survey forms part of a wider archaeological investigation being undertaken by **John Samuels Archaeological Consultants (JSAC).**

Summary of Results *

In general, the 2003 gradiometer survey found a low level of magnetic response, a result consistent with those of the previous survey. The majority of the anomalies that have been recorded are associated with underlying variations in the soils and geology. In areas of overlap between detailed survey in this report and the 2001 work the data are comparable.

Two small clusters of possible former occupation activity were detected near to the western edge of the survey; they comprises possible pit clusters, enclosures and field systems. These anomalies are contained within a region of slightly increased magnetic response. With one or two exceptions the anomalies are generally magnetically weak and diffuse. There are suggestions that archaeological features have been disturbed by ploughing / possibly past ridge and furrow cultivation. Elsewhere, archaeological type anomalies comprise isolated responses, small clusters and linear trends, but as such interpretation is cautious. It is likely that many of these anomalies are due to surface debris, agricultural disturbance and localised soil changes.

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

SURVEY RESULTS

2003 / 100 Whisby Quarry, Lincolnshire

1. Survey Area

1.1 The evaluation area, covering approximately 50ha, was subject to a 50% sample of detailed gradiometer survey. Figure 1 shows the location of the current detailed survey areas, together with those of the previous work (GSB 2001) and the extents of the former and present application areas.

1.2 The survey grids were set out by **GSB Prospection** and tied to existing boundary features using an EDM system and tapes. Detailed tie-in information has been lodged with the client. A number of spray painted wooden stakes were left *in situ* to allow for the reconstruction of the survey grid.

2. Display

2.1 Figures 2 to 9 present the data as summary greyscale images with accompanying interpretation diagrams produced at a scale of 1:2500. For purpose of comparison, the results of the previous survey are also shown on these diagrams. On the interpretation diagrams the results of the 2001 survey have been simplified to ?archaeology and ?natural; for detailed analysis the earlier report should be consulted (GSB 2001). Figures 10 to 60 present the data for each current survey sample as XY traces, dot density plots and interpretation diagrams at a scale of 1:625. For display at this scale some of the areas have been subdivided (1A, 1B etc)

2.2 The display formats and the interpretation categories employed are discussed in the *Technical Information* section at the end of the report.

2.3 Numbers in parentheses in the text refer to specific anomalies highlighted on the relevant interpretation diagrams.

3. General Considerations and Complicating Factors

3.1 The ground conditions varied from field to field. The majority had been rolled and sown with winter cereal while those in the southwestern part of the site were mostly ploughed. In the east some of the fields had a crop of sugar beet.

3.2 The soils encountered within the survey area consist of deep homogeneous coarse loams and sands over gravels that are subject to a high water table. Such soils are not ideal for magnetic gradiometry and many features, such as isolated ditches and pits, can be at or beyond the limits of detection. However, it was hoped that locations associated with industrial activity or domestic occupation would be detected.

3.3 The survey was carried out with a Bartington Grad 601-2 instrument and data was collected at 0.25m intervals along traverses separated by 1.0m. With the fluxgate sensors fixed apart at 1m and adjusted to be around 0.1m from the ground surface there is a greater degree of sensitivity over that provided by the Geoscan FM36 (0.5m) instruments used in the previous survey. One metre instruments are inherently more sensitive and the ability to drop the sensors closer to the ground on the Bartington additionally increases the signal derived from the target. Typically a

2nT response measured by a Bartington instrument will result in a 1-1.5 nT signal on the Geoscan; however these are only estimates as the response will changes depending on target geometry and depth.

3.4 Small-scale ferrous type anomalies have been detected throughout each of the survey areas. They are considered to be due to modern debris in the plough soil and are not thought to be of archaeological interest. The most prominent of these are noted on the interpretation diagrams, but are not referred to in the text unless they are considered significant.

4. Results of Survey

The text in italics at the beginning of each section refers to the results of the previous geophysical survey (GSB 2001).

Field 1 (Figures 2 and 3) - Areas 1A, 1B and 1C

No anomalies of archaeological interest were encountered during the 2001 scan of this field and no detailed survey was carried out.

4.1 A series of field drains, aligned north-south, can be seen to be present throughout Areas 1A and 1B. An intermittent linear response running along the western edge of Area 1A is characteristic of a pipe or drain.

4.2 At the western end of Area 1A a broad linear response (1), approximately 12m wide, has been identified that indicates a band of magnetically enhanced soils thought to be natural in origin. However, it is possible that it represents the course of a former trackway. The anomaly continues southward into Area 2A (see paragraph 4.10 below).

4.3 There is a noticeable increase in the level of magnetic response at the eastern end of Area 1B and throughout Area 1C. There is no obvious reason for this, though it is possible that debris has been imported from elsewhere (see the results from adjacent Field 5, paragraph 4.20, below).

4.4 Several groups of linear responses and trends have been recorded in Area 1C; for the most part they are parallel and are thought to reflect field drainage features and ploughing disturbance. A cluster of pit type anomalies (2) and a short ditch length may have been recorded in the northernmost part of Area 1C. It should be noted, however, that there had been recent ground disturbance in this area.

Field 2 (Figures 2 and 3) - Areas 2A and 2B

During the 2001 scan no anomalies considered to be of archaeological interest were encountered, but a sample (2001, Area 1) was surveyed in detail close to the village of Eagle.

4.5 Two clusters of archaeological type responses (3) and (4) have been identified and these appear to represent small pockets of possible occupation activity located around 60m apart. The responses, although distinct, are very weak with the majority well below 2nT in strength. The two clusters appear to be contained within a region of slightly increased magnetic response; this may relate to enhanced magnetic material ploughed out of archaeological features.

4.6 At (3) several linear anomalies and a group of pit type anomalies have been recorded and there are suggestions of an enclosure. The anomalies (4) include a possible rectangular enclosure within which a broad anomaly could indicate a floor surface (5), though this anomaly could be one of a number of natural looking responses present in this and neighbouring fields. The ditch (6) lying immediately to the east appears to indicate an elevated level of magnetic enhancement that is consistent with occupation.

4.7 To the west and north of anomalies (4) several linear responses and possible enclosures have been detected but they are magnetically very weak and ill-defined. Two linear responses (7) and (8), though different in character, could indicate the courses of former field boundaries, as they are aligned with the existing hedge and ditches. Indeed, the broader anomaly (7) could continue into Field 3, immediately to the south where it has been described as a possible headland (see paragraph 4.12 below).

4.8 A scatter of small-scale pit type anomalies (9) recorded in the southwestern corner of Area 2A may represent further evidence of occupation activity. However, there is no discernible archaeological pattern and there is a strong possibility that they are due to natural soil variation. Anomaly (10), identified in the eastern corner of Area 2B may be a burnt structure, such as a hearth, though a deeply buried ferrous object might account for this response.

4.9 Isolated linear trends have also been recorded that, given the context, may be of archaeological significance. However, they are magnetically weak and could be associated with ploughing and/or indicate the courses of modern field drains.

4.10 A broad but well defined anomalous region in the northwestern part of Area 2A is a continuation of anomaly (1) recorded in Area 1A (paragraph 4.2 above). Although assigned a natural origin, the possibility that it represents the course of a former trackway should also be considered.

Field 3 (Figures 2 and 3) - Areas 3A, 3B, 3C and 3D

Detailed survey (2001, Area 2) examined an anomaly and a slight topographical rise observed at the time of the scan. The data were thought to contain amorphous anomalies believed to be pedological although the possibility that they were of archaeological interest could not be dismissed. Several trends, thought to result from ploughing, were also identified.

4.11 A region of increased magnetic response (11), in the centre of the Area 3A, coincides with a visible ridge and the location of Area 2 of the 2001 survey. The anomaly strength is increased in the Bartington data and this allows a more detailed pattern to emerge.

4.12 It is possible that ploughing has disturbed a region of naturally magnetically enhanced soils to produce the responses at (11). However, given the nature of the anomalies recorded in the field immediately to the north, the results could indicate past ridge and furrow cultivation over archaeological deposits. The linear responses (12) may represent a former boundary ditch and/or a headland coincident with a ridge in the ground surface.

4.13 A large but apparently isolated anomaly (13) has been recorded in the centre Area 3B and has been assigned natural in origin. However, this anomaly could represent an archaeological feature associated with the presumed settlement remains recorded in the field immediately to the north.

4.14 A region of increased magnetic responses (14) containing a number of trends suggests past ridge and furrow cultivation continuing into Area 3C from Area 3A. There is a noticeable decline in the level of response produced by this region of magnetic enhancement.

4.15 Broad and apparently isolated magnetic anomalies detected in Area 3D are similar to those recorded throughout the application area; they have been assigned a natural origin.

4.16 A line of possible pits (15) has been detected in the northwestern part of the survey area though modern debris, such as fragments of field drain disturbed by ploughing, might produce a similar response. A linear trend (16) that might represent the remains of a buried ditch equally could indicate the course of a field drain.

4.17 Other magnetically weaker responses have been recorded elsewhere within the field but the archaeological potential of these is tentative. Some are parallel to field boundaries and may be due to ploughing.

Field 4 (Figures 2 and 3) - Areas 4A and 4B

This part of the present application area lies outside the scope of the previous study and, therefore, was not investigated by scanning in 2001.

4.18 Two apparently isolated anomalies (17) and (18) have been detected in Area 4A that may be of interest, though the archaeological interpretation is tentative; they are accompanied by several trends but these may have been caused by ploughing. An increase in the level of magnetic response is just discernible in the eastern third of the survey area. Here clay soils provided harder walking conditions and a slight increase in instrument noise has occurred; this increase is not thought to be archaeologically significant.

4.19 Several isolated and small-scale anomalies have been highlighted in the interpretation diagram for Area 4B. The archaeological potential of these responses is low; they may be due to localised fluctuations caused by natural or ferrous sources.

Field 5 (Figures 4 and 5) - Area 5

After the scan, detailed survey was undertaken (2001, Area 4) to investigate two scanned anomalies but few responses of archaeological merit were recorded. An alignment of ferrous anomalies towards the west of the area was thought to relate to a former drain/field boundary.

4.20 The results from this sample, which strongly contrast with those recorded anywhere else in the application area, are dominated by dense concentrations of small-scale ferrous type anomalies. It is almost certain that these responses represent modern debris. There was evidence of such material on the ground surface at the time of the survey and heaps of garden waste and dung were present in the eastern and southern margins of the field.

4.21 Despite the disturbance, several trends are discernible in the data. A linear trend (19), that divides the main area into two parts, may indicate the course of a drain or field boundary located during the first survey.

4.22 During the detailed survey, several very poorly defined trends were noted in the centre of the block and the area was 'filled in' to try to confirm the presence or absence of a possible enclosure (20). Such a feature has been highlighted but the interpretation is highly tentative. It is possible that these magnetically weak trends are due to modern disturbance, such as the ploughing in of ferrous or brick debris.

Field 6 (Figures 4 and 5) - Area 6A, 6B and 6C

A sample block (2001, Area 3) investigated a scanned anomaly at the southwestern corner of the field. No responses of unambiguous archaeological potential were recorded. Two ill-defined anomalies were detected but presumed to be modern. A number of trends were identified but were not thought to be archaeologically significant.

4.23 Several pit type anomalies (21) have been detected in the western part of the survey area that are associated with slight trends in the data. These might be of archaeological interest, but they could relate to drainage features, such as those found in other parts of the application area.

4.24 A second group of broad but magnetically weaker anomalies (22) has also been highlighted that are thought to be natural in origin, though an archaeological source cannot be ruled out entirely.

4.25 A ferrous response recorded at the eastern extreme of the survey area is due to modern debris adjacent to a boundary ditch. It could also relate to magnetic material used to form a farm track.

4.26 A cluster of pit type responses (23) has been identified in the western part Area 6B. These were investigated during the previous survey but no archaeological pattern emerges from the present set of results and it is thought that they are due to local soil changes. Anomalies (24) and (25) are also thought to be due to natural variations though material cleared from a nearby ditch might account for (25).

4.27 An anomaly (26) recorded on the southern edge of the survey area, in the centre of the block, could be of archaeological interest. Again however, the nature of the response is equally characteristic of those caused by localised soil changes.

4.28 Several trends are indicated on the interpretation diagram that may be of interest, though ploughing disturbance could account for these.

Field 7 (Figures 4 and 5) - Area 7A, 7B and 7C

The 2001 scan identified a zone of fluctuating response in this field. Detailed survey (2001, Area 5) revealed broad, amorphous anomalies that were thought to be natural in origin. Numerous trends were noted but an archaeological explanation was considered to be unlikely.

4.29 The eastern end of Area 7B coincides with Area 5 of the previous survey and in both cases broad irregular anomalies were recorded. Such responses are typical of those produced by localised changes in the underlying pedology/geology.

4.30 Linear trends (27) have been recorded in the centre of Area 7B that could be of archaeological interest. However, field drainage features or recent ploughing disturbance could have generated these anomalies.

4.31 There is a discrete cluster of anomalies (28) in the western part of Area 7C. The broad nature of the anomalies and the lack of a recognisable archaeological pattern suggests that they are associated with natural soil processes or a spread of modern magnetically enhanced material.

4.32 As with previous survey areas some magnetically weak trends are present and are thought to be due to ploughing.

Field 8

Scanning in 2001 noted an area of fluctuating response that was targeted by detailed survey (2001, Area 6). The data contained an amorphous response that was presumed to be natural and several trends of indeterminate nature.

4.33 Given the size of the original survey block in relation to the area of the field, and the presence of a survey block immediately to the north in Field 7, no further work was carried out in Field 8.

Field 9 (Figures 6 and 7) - Area 9

No anomalies of archaeological interest were encountered during the 2001 scan and the field was not sampled by detailed survey.

4.34 A number of broad anomalies have been detected that could be of archaeological interest, though no recognisable pattern is present in the data to support this interpretation. It is likely that they relate to subsoil variations that are localised and natural in origin.

Field 10 (Figures 6 and 7) - Areas 10A and 10B

No anomalies of archaeological interest were encountered during the 2001 scan and no detailed survey was undertaken.

4.35 A series of broad and irregular anomalies are present in both survey areas; they are generally aligned northeast to southwest. These anomalies are typical of those produced by underlying variations in the pedology and geology and they are not considered to be of archaeological significance.

4.36 Several trends are present on the same alignment as the responses described in the above and are thought to represent recent ploughing disturbance.

4.37 Trends recorded in the centre of Area 10B might indicate the presence of a ring (27) measuring approximately 15m in diameter. However, it should be noted that these responses are barely visible above background noise levels and as such the interpretation is highly speculative.

4.38 Ferrous disturbance at the eastern extreme of each of the two survey areas is due to the adjacent railway line. A pipe may be present just beyond the northeastern part of Area 10A.

Field 11 (Figures 6 and 7) - Area 11

During scanning in 2001 an area of fluctuating response was noted. However, subsequent detailed survey (2001, Area 7) did not detect any anomalies of archaeological potential.

4.39 A block of detailed gradiometer survey was carried out to the north of the previous survey area and recorded anomalies similar to those detected in Field 10, immediately to the north. The strongest response (30) is present at the western end of the survey area while the remaining responses are merely trends in the data. No anomalies of archaeological interest have been recorded.

Field 12 (Figures 6 and 7) - Area 12

Two anomalies identified in the 2001 scan were invesigated by detailed survey (2001, Area 8). These transpired to be part of a number of broad and amorphous responses. They were thought most probably natural rather than archaeological in origin, though the proximity of a railway suggested that the responses might reflect disturbance relating to the construction of the line.

4.40 Detailed survey in Area 12 comprises two 'wings' that were subsequently joined in the west. It lies to the north of the 2001 detailed survey area.

4.41 The gradiometer survey has detected an extensive area of broad but magnetically strong responses along the western edge of the survey area. These anomalies are consistent with those recorded in the earlier work and can be interpreted in the same way; i.e. most probably natural in origin. The extent of these responses could indicate the site of a former body of water or a palaeochannel. There is no real evidence to suggest that the adjacent railway has affected the data collection, though such a possibility cannot be dismissed.

4.42 Several trends have been recorded in the data but ploughing disturbance and natural soil changes could account for these.

4.43 A number of ferrous anomalies and a trend (31) running east-west across the southern edge of Area 12 are consistent with the course of a former drain and/or field boundary.

Field 13 (Figures 8 and 9) - Areas 13A, B, C and D

No anomalies of archaeological interest were encountered during the 2001 scan and the area was not sampled by detailed survey.

4.44 Broad and irregular responses indicative of underlying soil variations have been recorded at the eastern ends of Areas 13A, 13B and 13D. They are consistent in form and alignment with similar responses recorded in fields to the west. They are not thought to be of archaeological interest.

4.45 Several small-scale pit type anomalies have been recorded in the eastern half of Area 13A. An archaeological origin cannot be ruled out but it is likely that they are natural or due to modern debris.

4.46 A number of magnetically weak linear trends, most oriented northwest-southeast, are thought to indicate the direction of ploughing or the courses of field drains. Anomaly (32) is a magnetically weak and intermittent linear that runs across 13A, B and D.

4.47 Ferrous disturbance along the northern edge of Area 13A is due to an electric fence while a gate and adjacent boundaries have produced interference in the northwestern corner. A pipe may be present in the southeastern corner of Area 13D.

Field 14 (Figures 8 and 9) - Areas 14A, B and C

Detailed survey (2001, Area 12) was positioned to examine a broad spread of anomalies noted during scanning. The resulting data suggested that natural processes and/or spoil dredged from an adjacent ditch had produced the anomalies, although an archaeological cause for some could not be wholly rejected. An ill-defined band of ferrous-type responses along the southern edge of the area was attributed to debris within spoil dredged from the adjacent ditch.

4.48 The current survey results suggest that the level of background response in this sample is elevated above that recorded in adjacent fields. However, there is no indication that this is due to the presence of archaeological features.

4.49 The dominant response (33) is that produced by an iron pipe and capping of a bore hole in the western part of Area 14A. A region of 50 to 60m has been affected and any anomalies produced by archaeological features present in this area will be hidden by this disturbance. A smaller area of disturbance along the northern edge of Area 14A is due to a ferrous object outside the survey area.

4.50 A cluster of anomalies (34) recorded in Area 14C could be of archaeological interest. They may represent the remains of pit type features but the evidence is slight. It is probable that these anomalies have been produced by debris in the topsoil or pedological variations.

Field 15 (Figures 8 and 9) - Area 15

No anomalies of archaeological interest were encountered during the 2001 scan and the field was not sampled by detailed survey.

4.51 Several anomalies characteristic of those produced by natural processes have been detected. They are similar to those recorded in fields to the west. They are not thought to be archaeologically significant.

4.52 Two groups of linear responses have been recorded. One aligned east-west represents the courses of field drains and is similar to anomalies recorded elsewhere within the application area. A second group, aligned north-south is magnetically weaker and less well defined. These responses may be due to ploughing disturbance or another group of drains.

4.53 A linear response and a pit anomaly (35) have been highlighted on the interpretation diagram that could be of archaeological potential.

5. Results of Survey

5.1 The 1m gradiometer survey has confirmed the magnetically weak response of the soils within the application area that was suggested by the original survey. The majority of the anomalies that have been recorded in both the 2001 and 2003 surveys are associated with underlying variations in the soils and geology. Such responses tend to be more isolated in the west and increase in number and extent in the east.

5.2 Field 2 has provided anomalies of archaeological interest and these include evidence of occupation activity and possible field systems contained within a region of elevated magnetic response. With one or two exceptions the anomalies are generally magnetically weak and ill-defined and there are suggestions that archaeological deposits have been plough damaged.

5.3 Elsewhere, archaeological type anomalies comprise isolated responses, small clusters and linear trends. However, the interpretation is uncertain; it is likely that many of these anomalies are due to surface debris, agricultural disturbance and localised soil changes.

Project Co-ordinators: D Shiel
Project Assistants: J Anderson, J Adcock, Dr C F Gaffney, B Urmston, M Saunders, C Stephens & E Wood

Date of Survey: 1st December 2003
Date of Report: 5th January 2004

References:

GSB 2001 Report on the Geophysical Survey at *Whisby Quarry, Lincolnshire Report No 2001/115*. GSB Prospection 2001. Unpublished report.

SSEW 1983 *Soils of England and Wales. Sheet 4, Eastern England.* Soil Survey of England and Wales.

TECHNICAL INFORMATION

The following is a description of the equipment and display formats used in **GSB Prospection Ltd (GSB)** 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 **GSB.**

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.

Instrumentation

(a) Fluxgate Gradiometer - Geoscan FM36 / FM256 and Bartington *Grad*601-2

Both the Geoscan and Bartington instruments comprise of two fluxgate magnetometers mounted vertically apart at a distance of 500mm and 1000mm, respectively. The gradiometers are 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. Readings are logged at 0.25 intervals along traverses 1.0m apart, unless stated otherwise in the report. Having two gradiometer units mounted laterally with a separation of 1.0m, the Bartington instrument can collect two lines of data per traverse. The *Grad*601-2 has marginally greater sensitivity afforded by the increased fluxgate separation, unfortunately this also increases the instrument's susceptibility to external sources of interference.

(b) Resistance Meter - Geoscan RM15

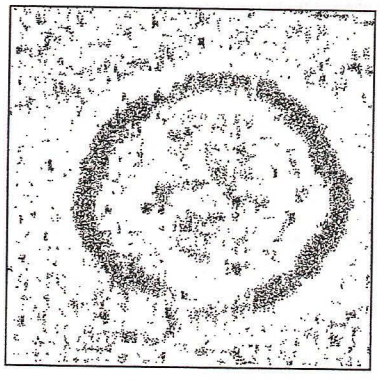
This measures the electrical resistance of the earth, using a system of four electrodes (two current and two potential.) Depending on the arrangement of these electrodes an exact measurement of a specific volume of earth may be acquired. This resistance value may then be used to calculate the earth resistivity. 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". In area survey readings are logged at 1.0m x 1.0m intervals, unless stated otherwise in the report.

(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. Sampling intervals vary widely but are often at the 10m or 20m level. The instrument employed for measuring this phenomenon is either a field coil or a laboratory based susceptibility bridge. The field coil measures the susceptibility of a volume of soil. The laboratory procedure determines the susceptibility of a specific mass of soil. For the latter 50g soil samples are collected in the field. These are then air-dried, ground down and sieved to exclude the coarse earth (>2mm) fraction. Readings are made using an AC-coil and susceptibility bridge, with results being expressed either as SI/kg x 10^{-8} or m^3/kg.

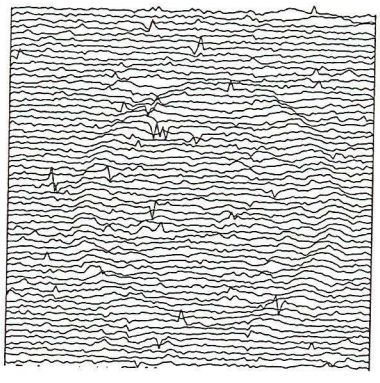
Display Options

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.



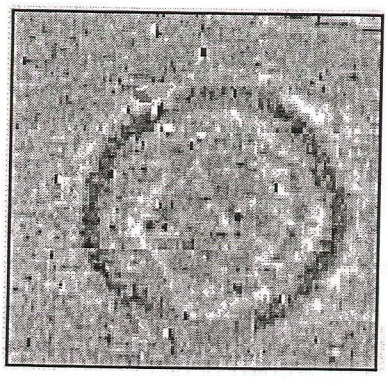
(a) Dot Density

In this display minimum and maximum cut-off levels are chosen. Any value that is below the minimum will appear white, whilst any value above the maximum will be black. Values that lie between these two cut-off levels are depicted with a specified number of dots depending on their relative position between the two levels. Assessing a lower than normal reading involves the use of an inverse plot that 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. However, this display is favoured for producing plans of sites, where positioning of the anomalies and features is important.



(b) XY 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. The advantages of this type of display are that it allows the full range of the data to be viewed and shows the shape of the individual anomalies. The display may also be changed by altering the horizontal viewing angle and the angle above the plane. The output may be either colour or black and white.



(c) Greyscale

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, greyscales tend to be more informative.

Terms commonly used in the graphical interpretation of gradiometer data

Ditch / Pit
This category is used only when other evidence is available that supports a clear archaeological interpretation e.g. cropmarks or excavation.

Archaeology
This term is used when the form, nature and pattern of the response is clearly or very probably archaeological but where no supporting evidence exists. These anomalies, whilst considered anthropogenic, could be of any age. If a more precise archaeological interpretation is possible then it will be indicated in the accompanying text.

? Archaeology
The interpretation of such anomalies is often tentative, with the anomalies exhibiting either weak signal strength or forming incomplete archaeological patterns. They may be the result of variable soil depth, plough damage or even aliasing as a result of data collection orientation.

Areas of Increased Magnetic Response
These responses show no visual indications on the ground surface and are considered to have some archaeological potential.

Industrial
Strong magnetic anomalies, that due to their shape and form or the context in which they are found, suggest the presence of kilns, ovens, corn dryers, metal-working areas or hearths. It should be noted that in many instances modern ferrous material can produce similar magnetic anomalies.

Natural
These responses form clear patterns in geographical zones where natural variations are known to produce significant magnetic distortions e.g. palaeochannels or magnetic gravels.

? Natural
These are anomalies that are likely to be natural in origin i.e geological or pedological.

Ridge and Furrow
These are regular and broad linear anomalies that are presumed to be the result of ancient cultivation. In some cases the response may be the result of modern activity.

Ploughing Trend
These are isolated or grouped linear responses. They are normally narrow and are presumed modern when aligned to current field boundaries or following present ploughing.

Trend
This is usually an ill-defined, weak, isolated or obscured linear anomaly of unknown cause or date.

Areas of Magnetic Disturbance
These responses are commonly found in places where modern ferrous or fired materials are present e.g. brick rubble. They are presumed to be modern.

Ferrous Response
This type of response is associated with ferrous material and may result from small items in the topsoil, larger buried objects such as pipes or above ground features such as fencelines or pylons. Ferrous responses are usually regarded as modern. Individual burnt stones, fired bricks or igneous rocks can produce responses similar to ferrous material.

NB This is by no means an exhaustive list and other categories may be used as necesssary.

List of Figures

GSB PROSPECTION Ltd.	PROJECT: 2003/100 WHISBY QUARRY	TITLE: Location Diagram	Based on a plan supplied by the client

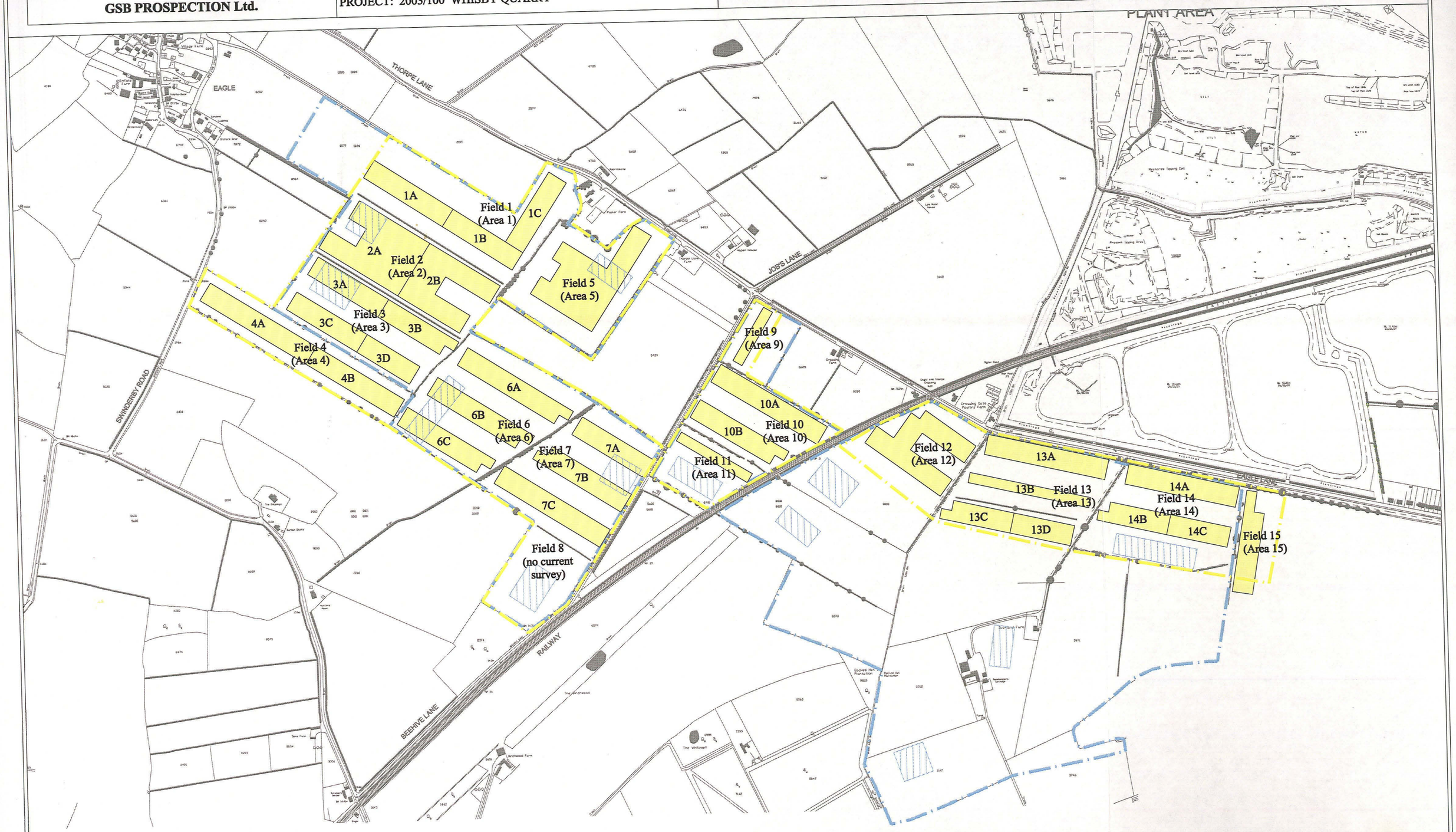
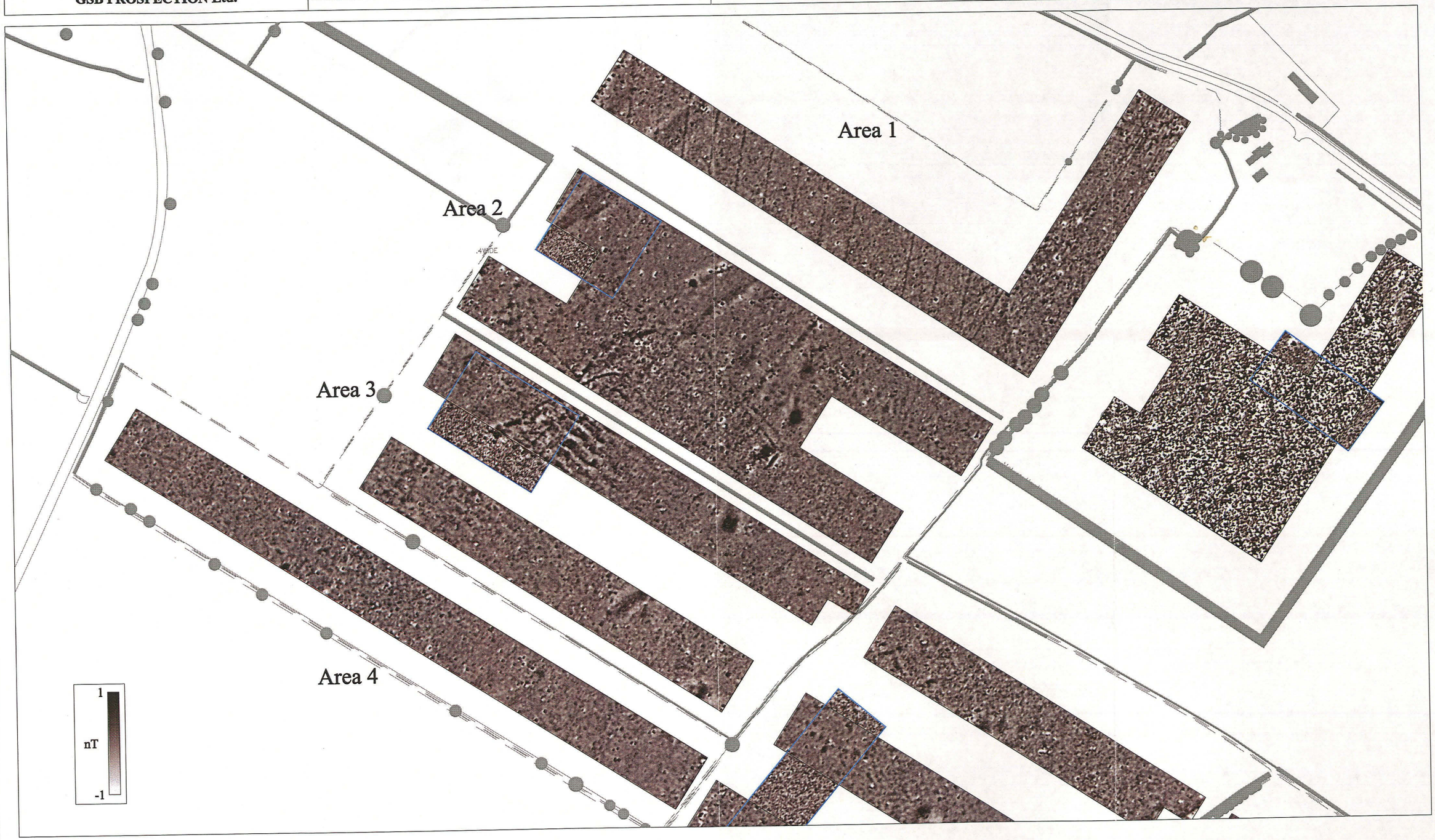


Figure 1

GSB PROSPECTION Ltd.	PROJECT: 2003/100 WHISBY QUARRY	TITLE: Summary Greyscales (Areas 1-4)	Based on a plan provided by the client.



2001 Survey Area

0 metres 100

Figure 2

GSB PROSPECTION Ltd.	PROJECT: 2003/100 WHISBY QUARRY	TITLE: Summary Interpretation (Areas 1-4)	Based on a plan provided by the client.

0 metres 100

2001 Survey Area

?Archaeology (2001)

?Natural (2001)

?Archaeology

Increased Magnetic Responce

Trend

?Natural

Ridge & Furrow

Drain

Magnetic Disturbance

Ferrous

Figure 3

GSB PROSPECTION Ltd.
PROJECT: 2003/100 WHISBY QUARRY
TITLE: Summary Greyscales (Areas 5-7)
Based on a plan supplied by the client.

0 metres 100

1 nT -1

Area 5

Area 6

Area 7

2001 Survey Area

Figure 4

GSB PROSPECTION Ltd.
PROJECT: 2003/100 WHISBY QUARRY
TITLE: Summary Interpretation (Areas 5-7)
Based on a plan provided by the client.

0 metres 100

Area 5

Area 6

Area 7

6A

6B

6C

7A

7B

7C

2001 Survey Area

?Natural (2001)

?Archaeology

Increased Magnetic Responce

Trend

?Natural

Ridge & Furrow

Drain

Magnetic Disturbance

Ferrous

Figure 5

GSB PROSPECTION Ltd.	PROJECT: 2003/100 WHISBY QUARRY	TITLE: Summary Greyscales (Areas 9-12)	Based on a plan provided by the client.

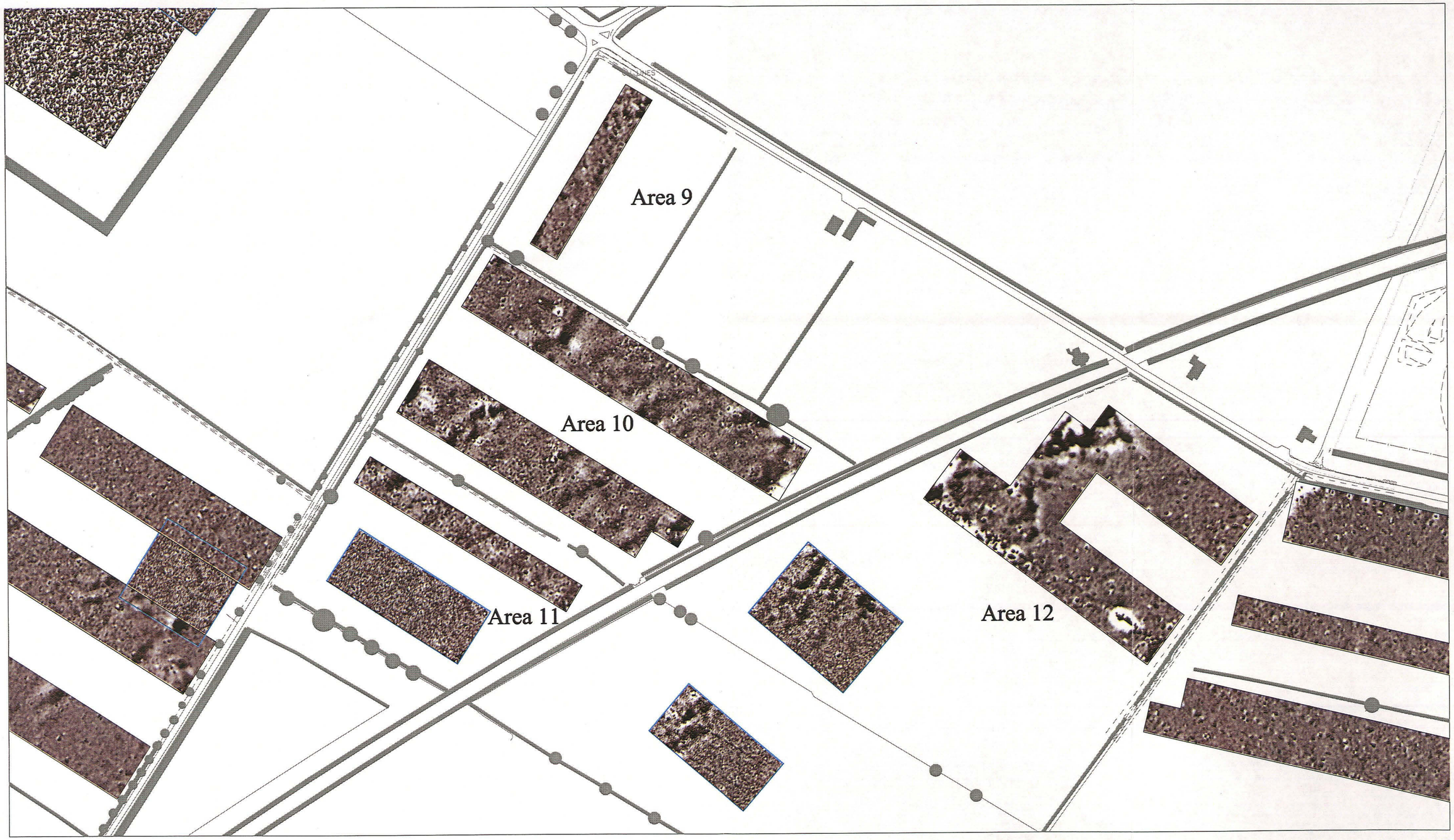


Figure 6

GSB PROSPECTION Ltd.	PROJECT: 2003/100 WHISBY QUARRY	TITLE: Summary Interpretation (Areas 9-12)	Based on a plan provided by the client.

0 metres 100

2001 Survey Area

?Archaeology (2001)

?Natural (2001)

Trend

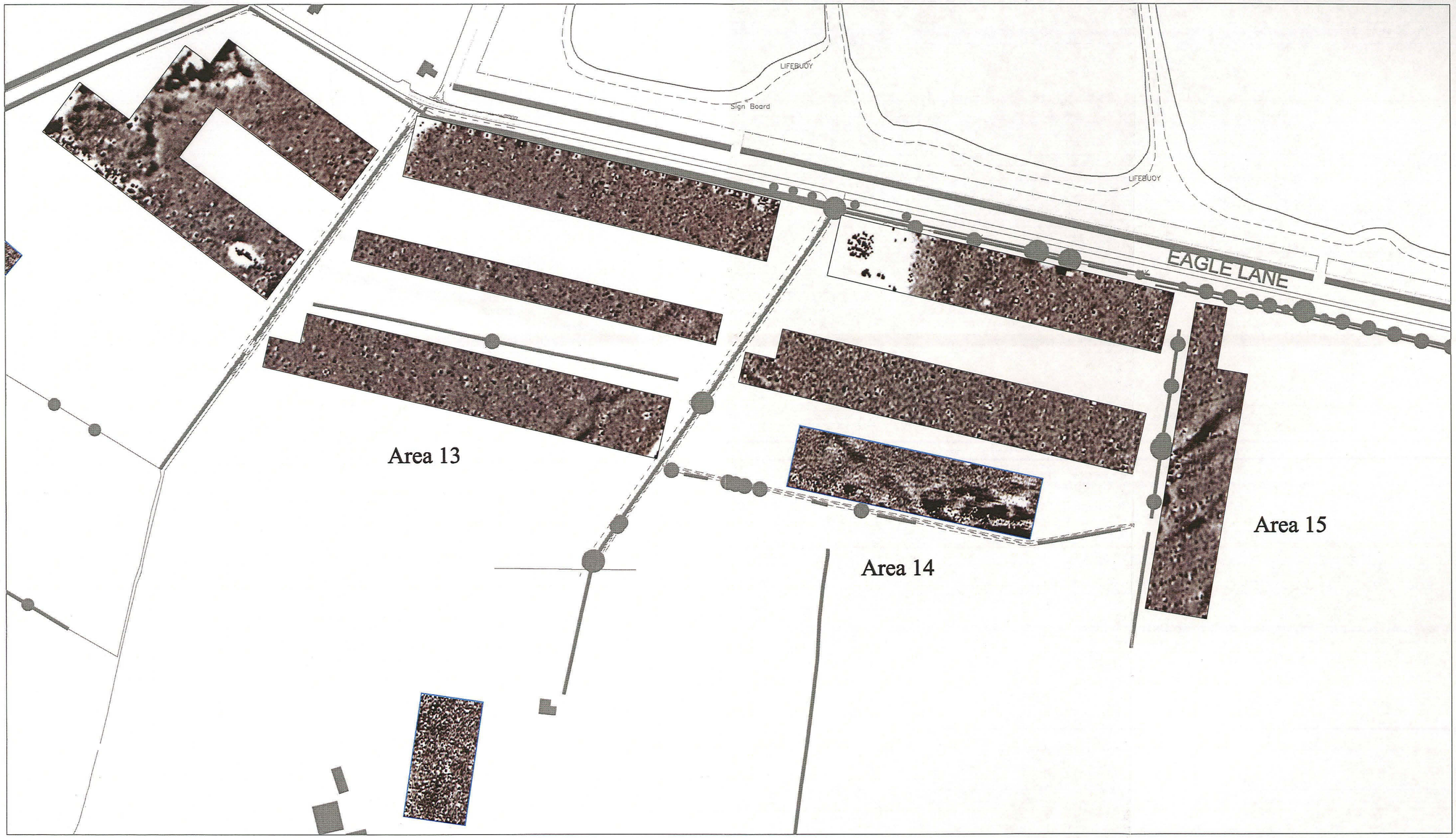
?Natural

Magnetic Disturbance

Ferrous

Figure 7

GSB PROSPECTION Ltd.	PROJECT: 2003/100 WHISBY QUARRY	TITLE: Summary Greyscales (Areas 13-15)	Based on a plan provided by the client.



2001 Survey Area

0 metres 100

1 nT -1

Figure 8

GSB PROSPECTION Ltd.	PROJECT: 2003/100 WHISBY QUARRY	TITLE: Summary Interpretation (Areas 13-15)	Based on a plan provided by the client.

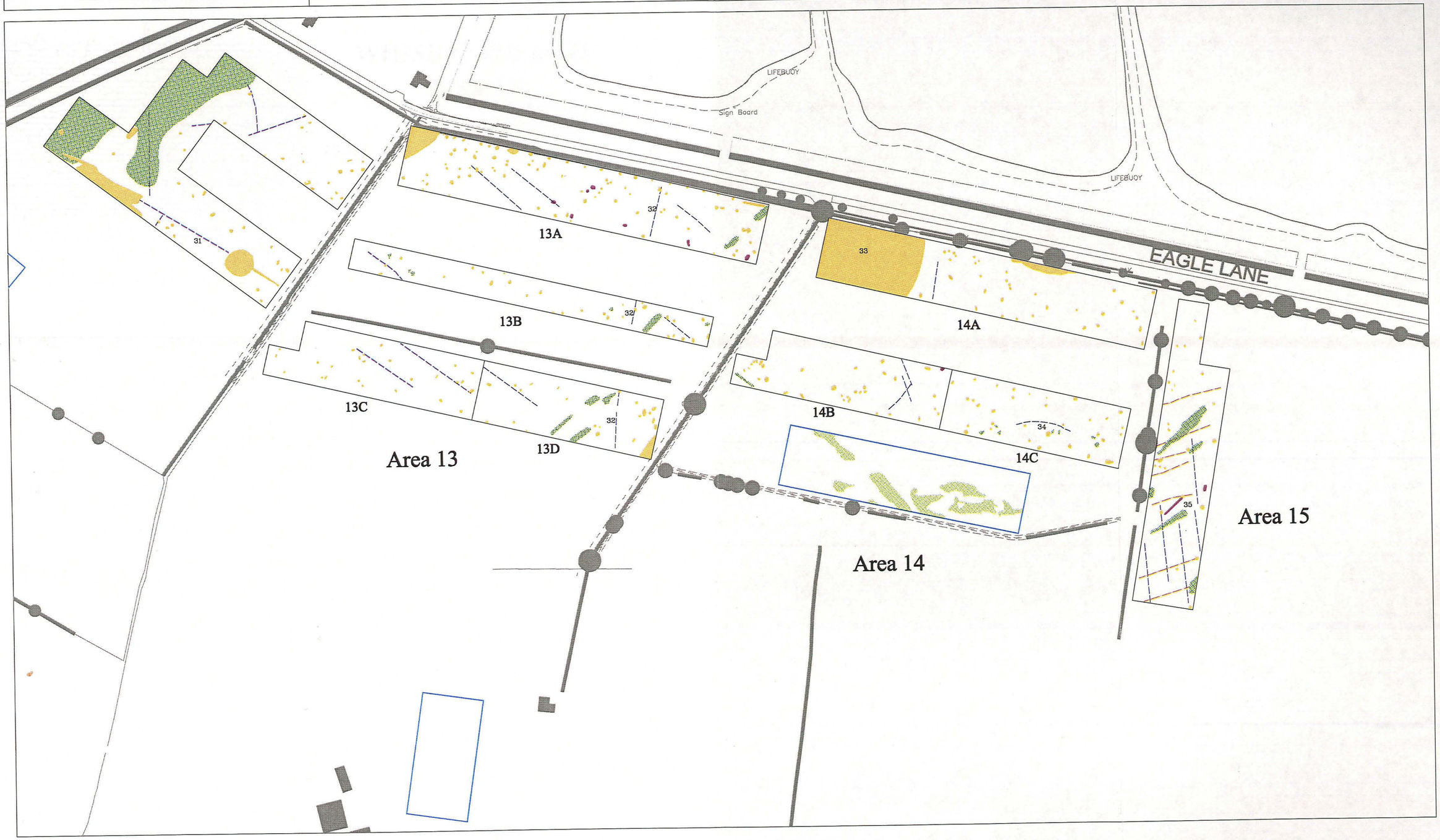
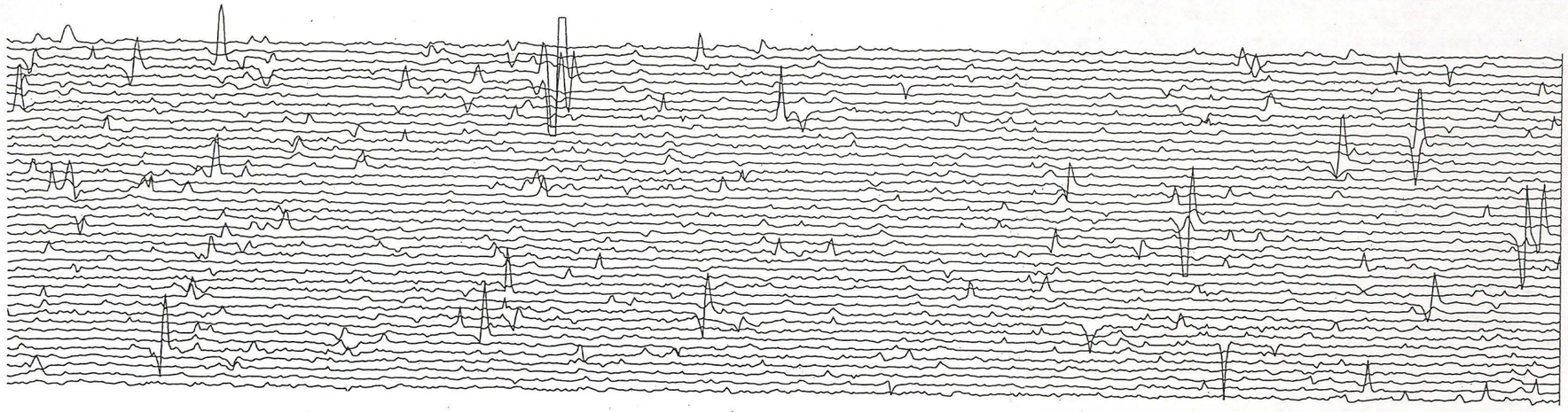
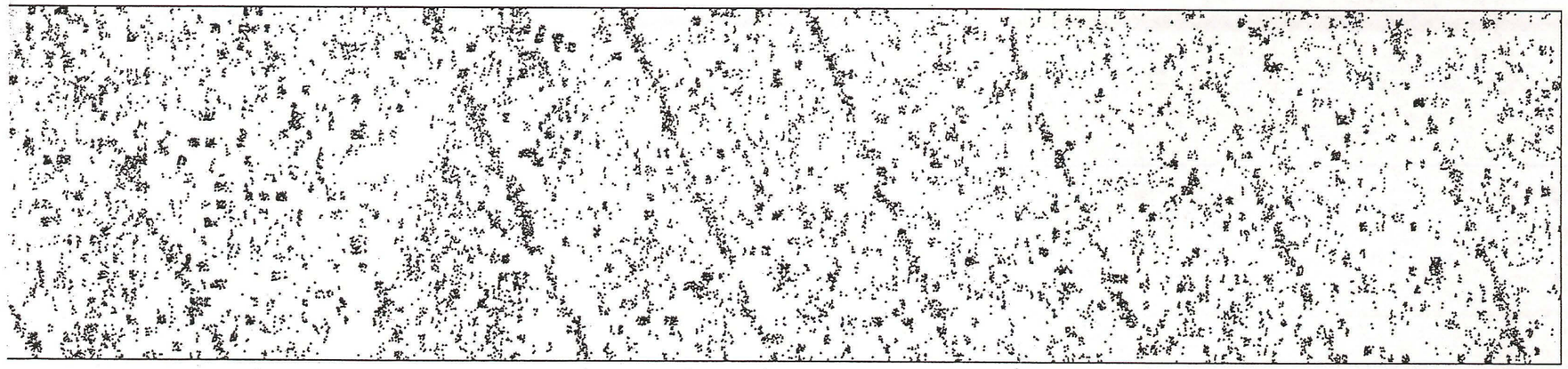


Figure 9

WHISBY QUARRY
Area 1A



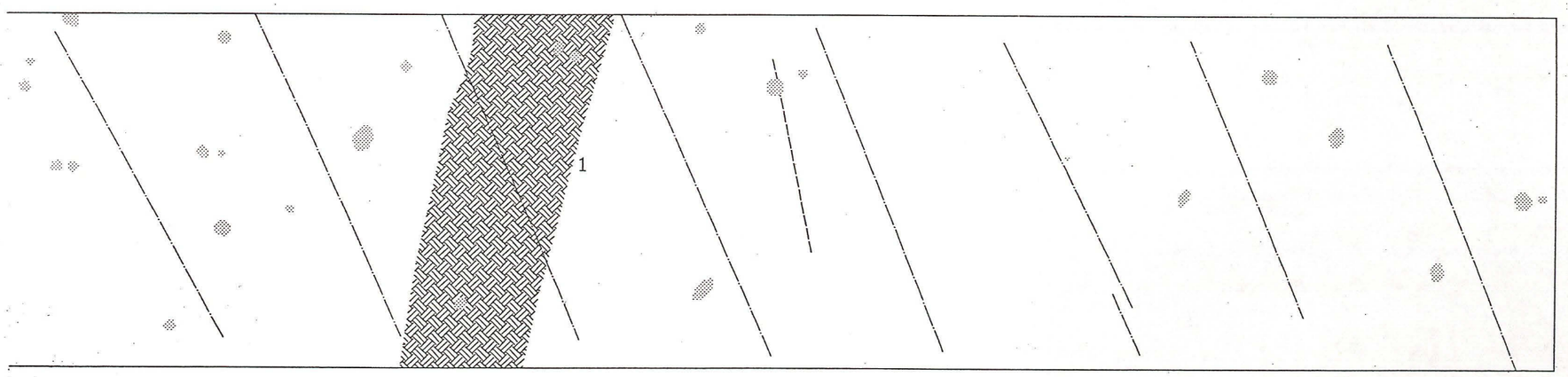
15 nT



1.0

nT

0.1



Trend

?Natural

Field Drain

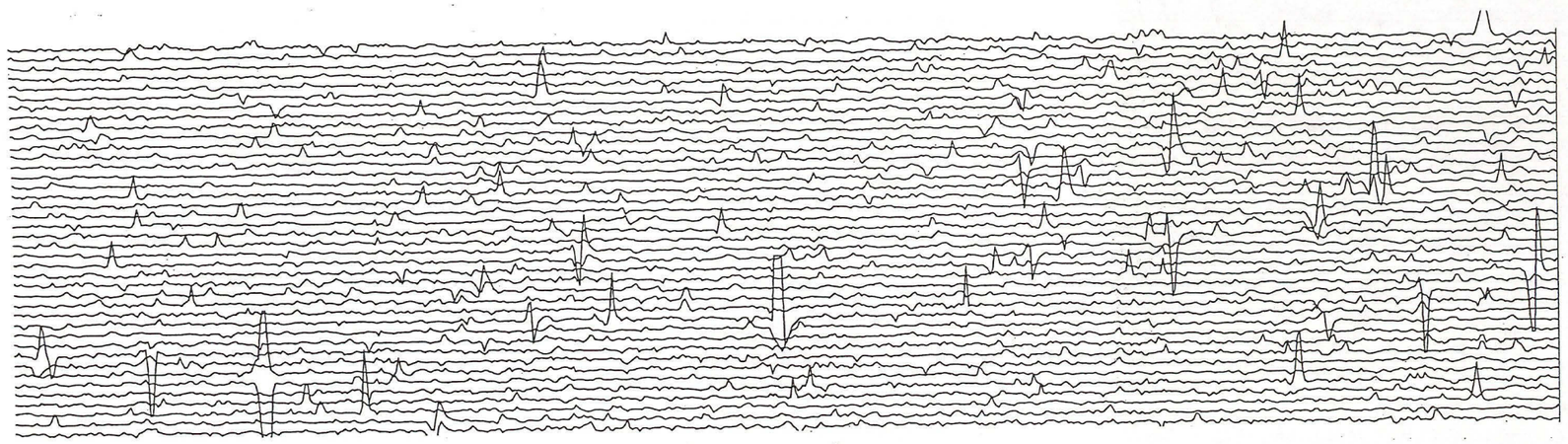
Ferrous

0 m 20

GSB Prospection Ltd. 2003/100

Figure 10

WHISBY QUARRY
Area 1B



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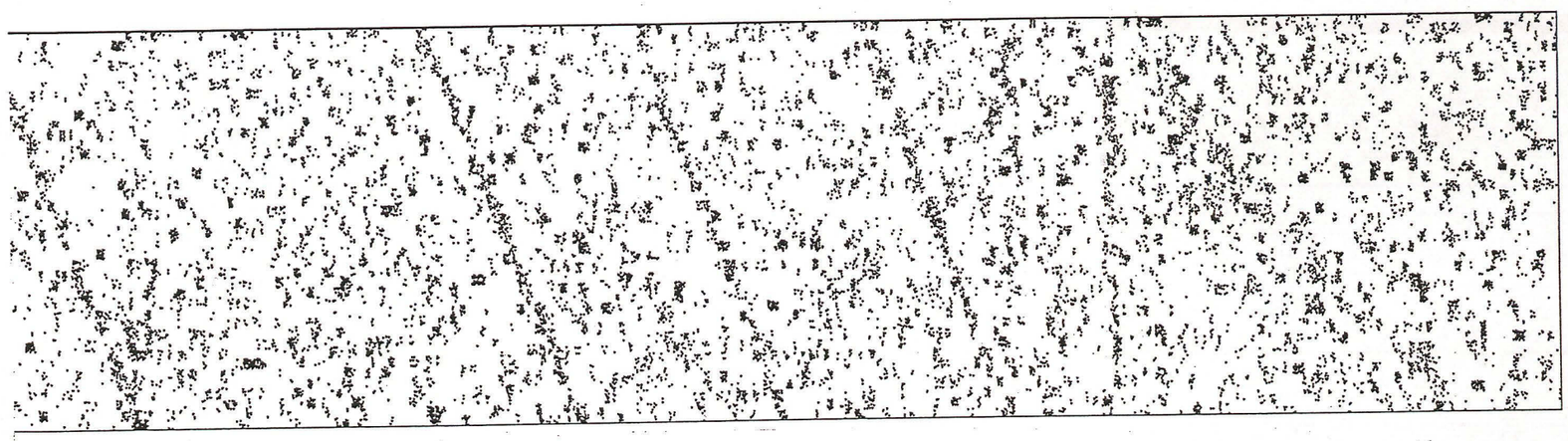
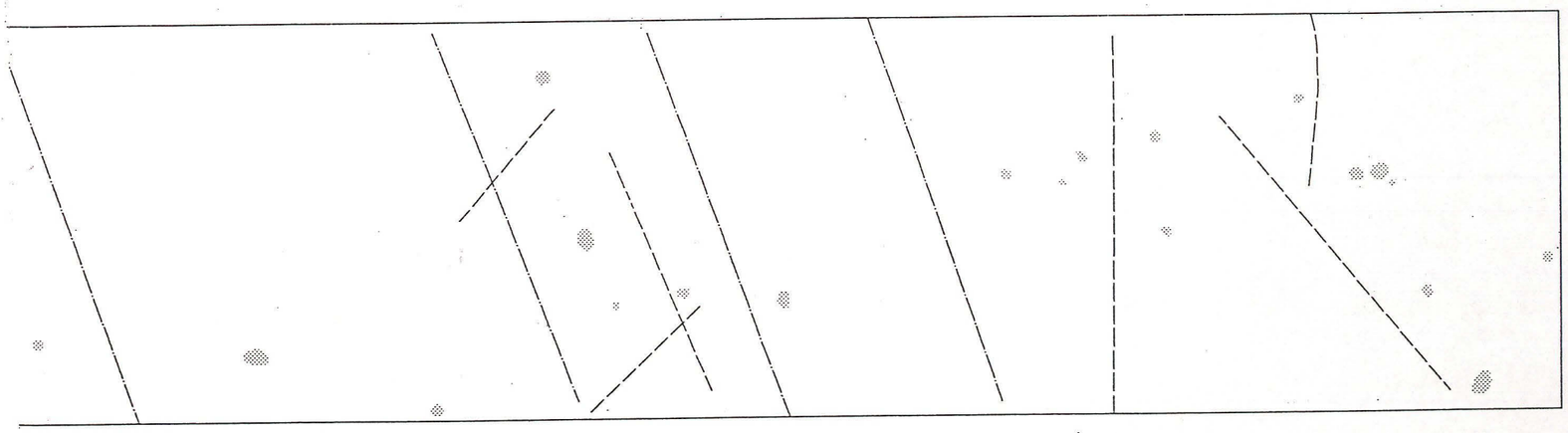


1.0

nT

0.1



Trend

Field Drain

?Natural

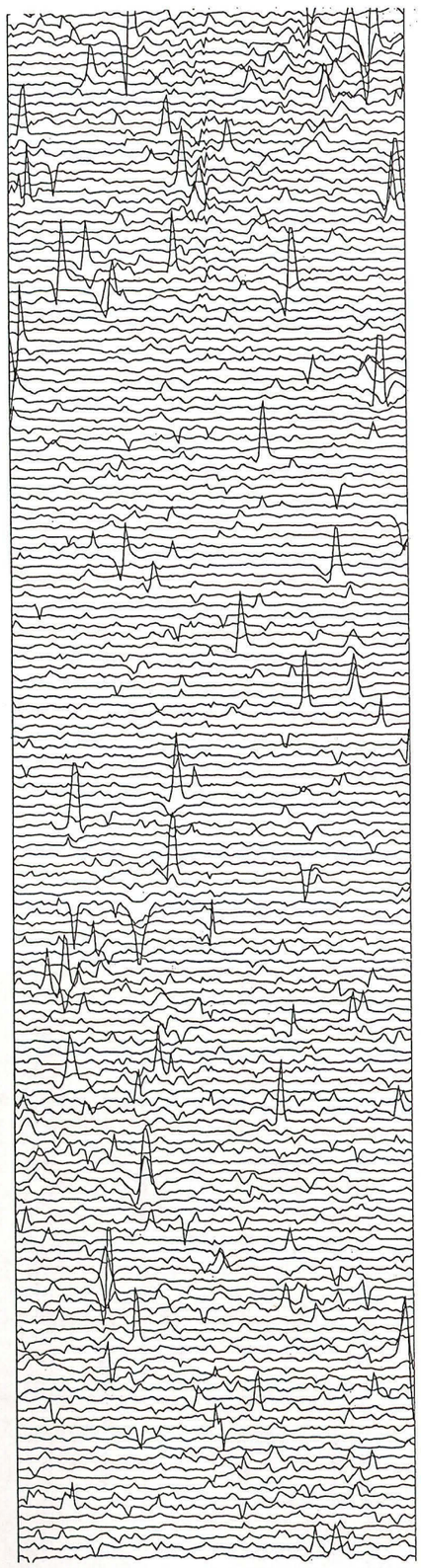
Ferrous

0 m 20

GSB Prospection Ltd. 2003/100

Figure 11

WHISBY QUARRY
Area 1C



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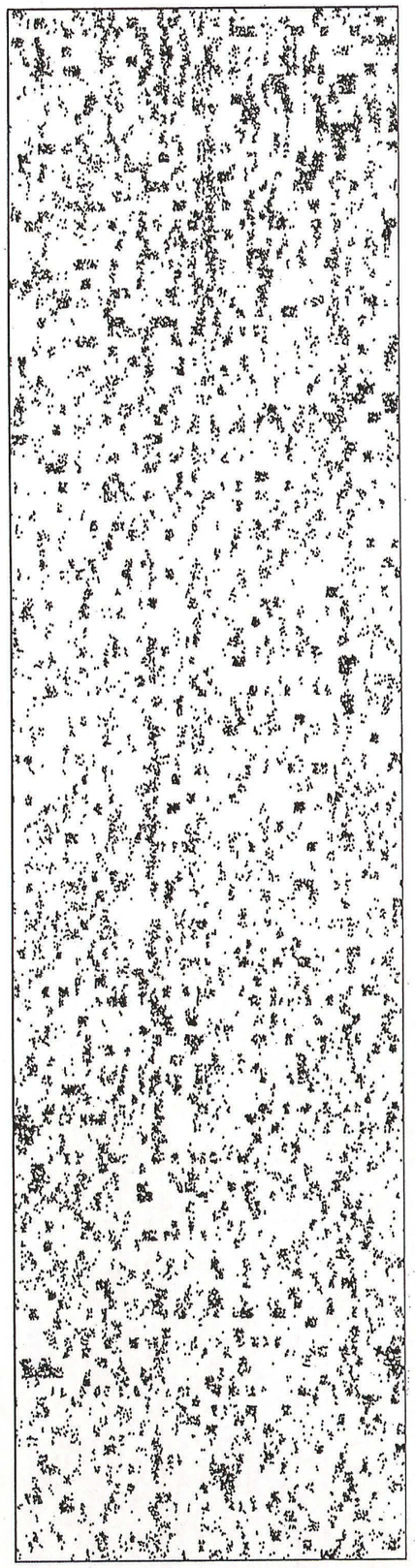
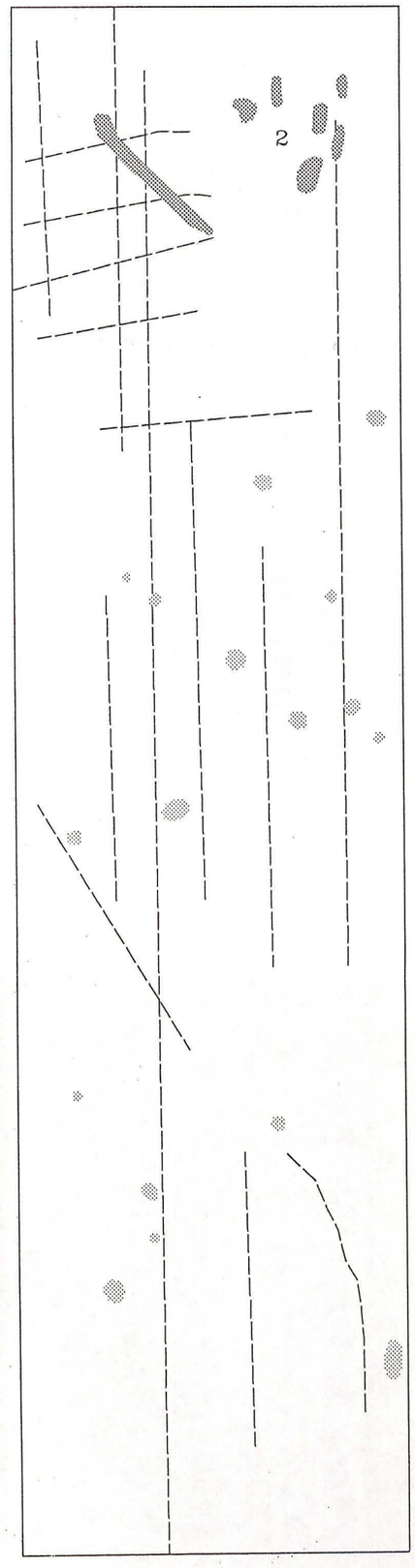
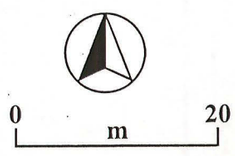




?Archaeology

Trend

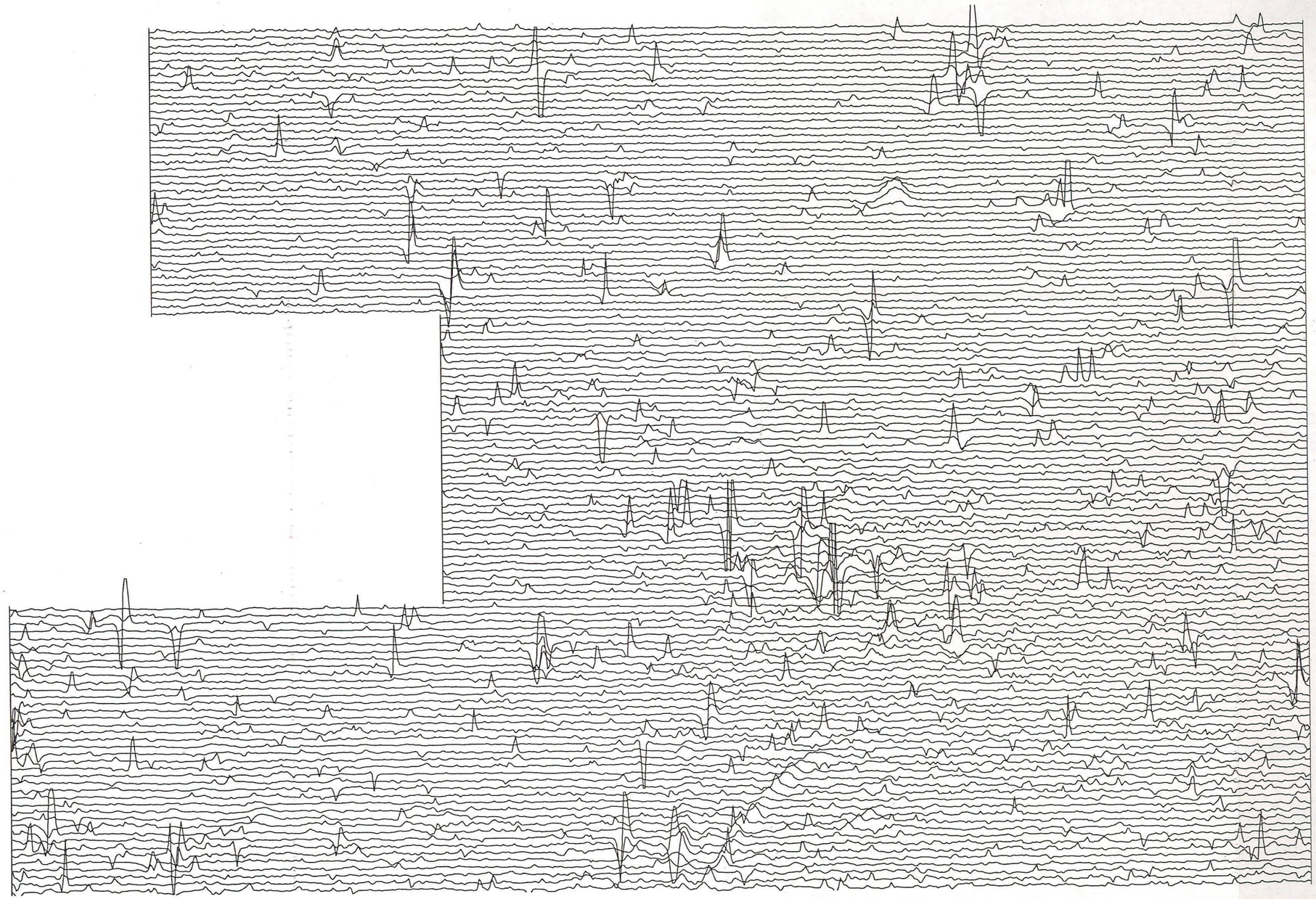
Ferrous



GSB Prospection Ltd. 2003/100

Figure 12

WHISBY QUARRY Area 2A



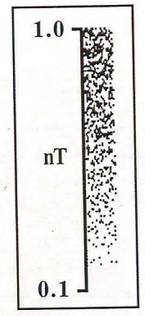
15 nT

0 m 20

Figure 13

GSB Prospection Ltd. 2003/100

WHISBY QUARRY Area 2A

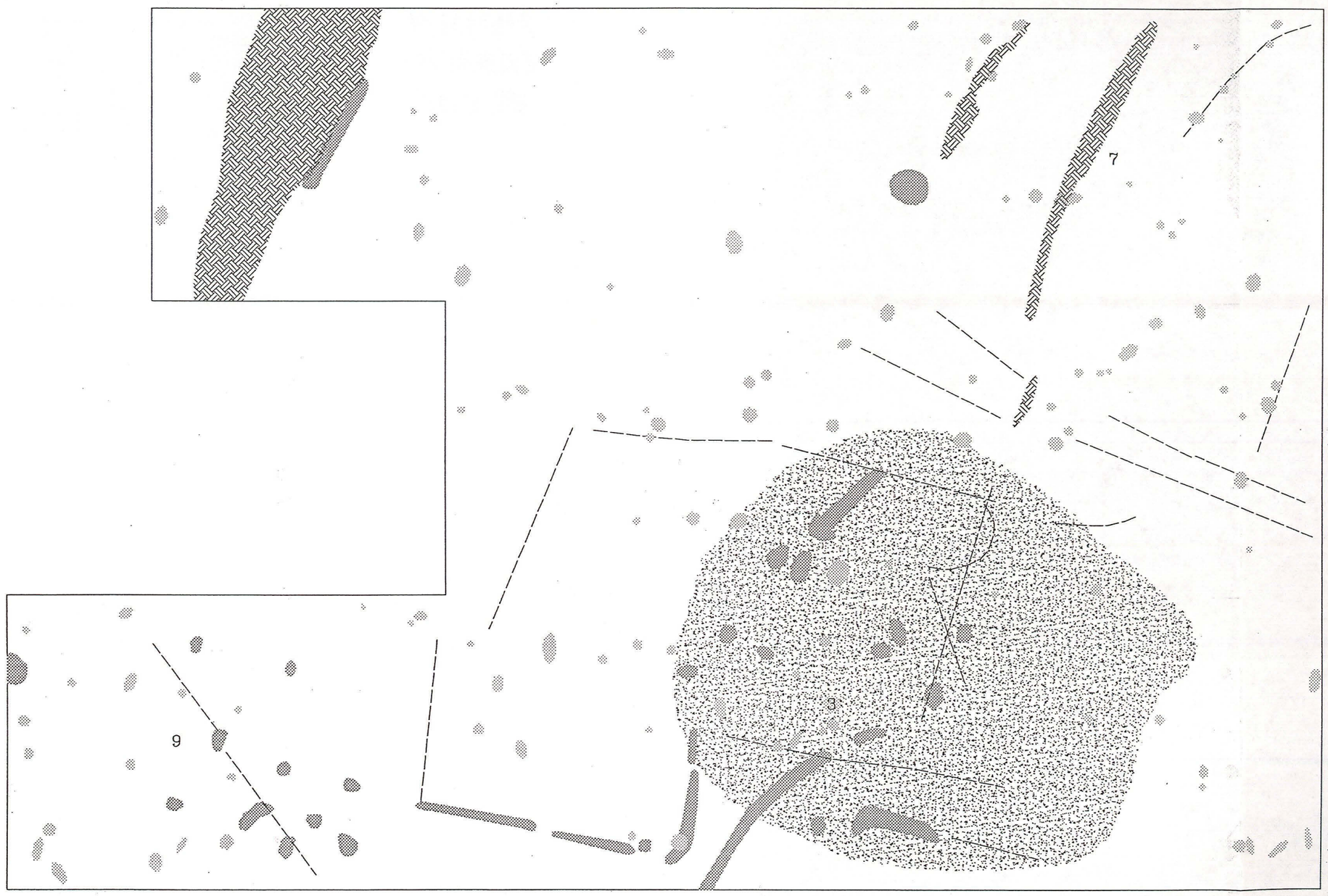


0 m 20

Figure 14

GSB Prospection Ltd. 2003/100

WHISBY QUARRY Area 2A



?Archaeology

Trend

Area of Increased Magnetic Response

?Natural

Ferrous

0 m 20

GSB Prospection Ltd. 2003/100

Figure 15

WHISBY QUARRY Area 2B

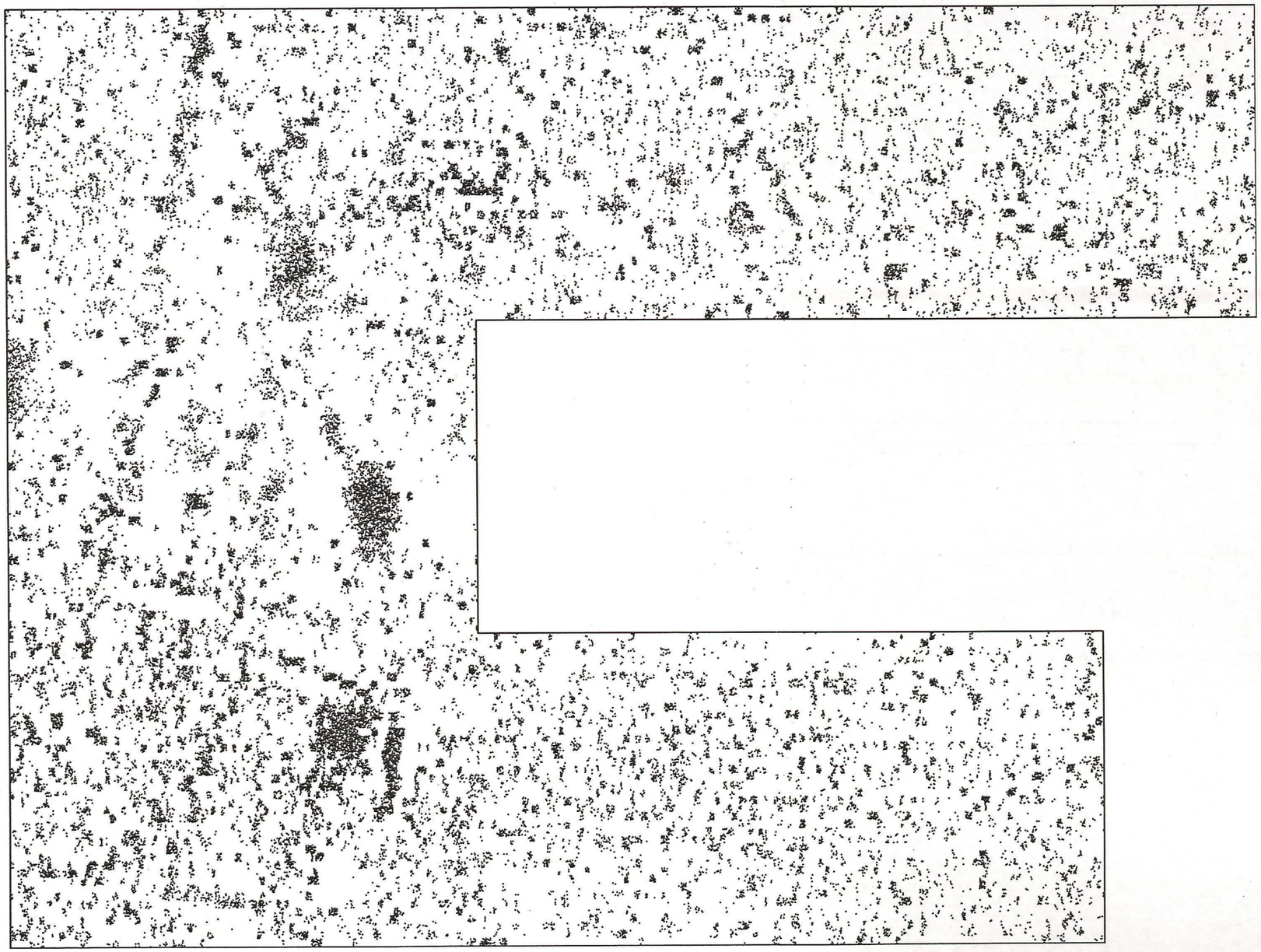
15 nT

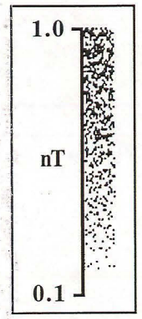
0 m 20

GSB Prospection Ltd. 2003/100

Figure 16

WHISBY QUARRY Area 2B





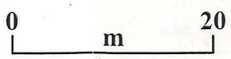
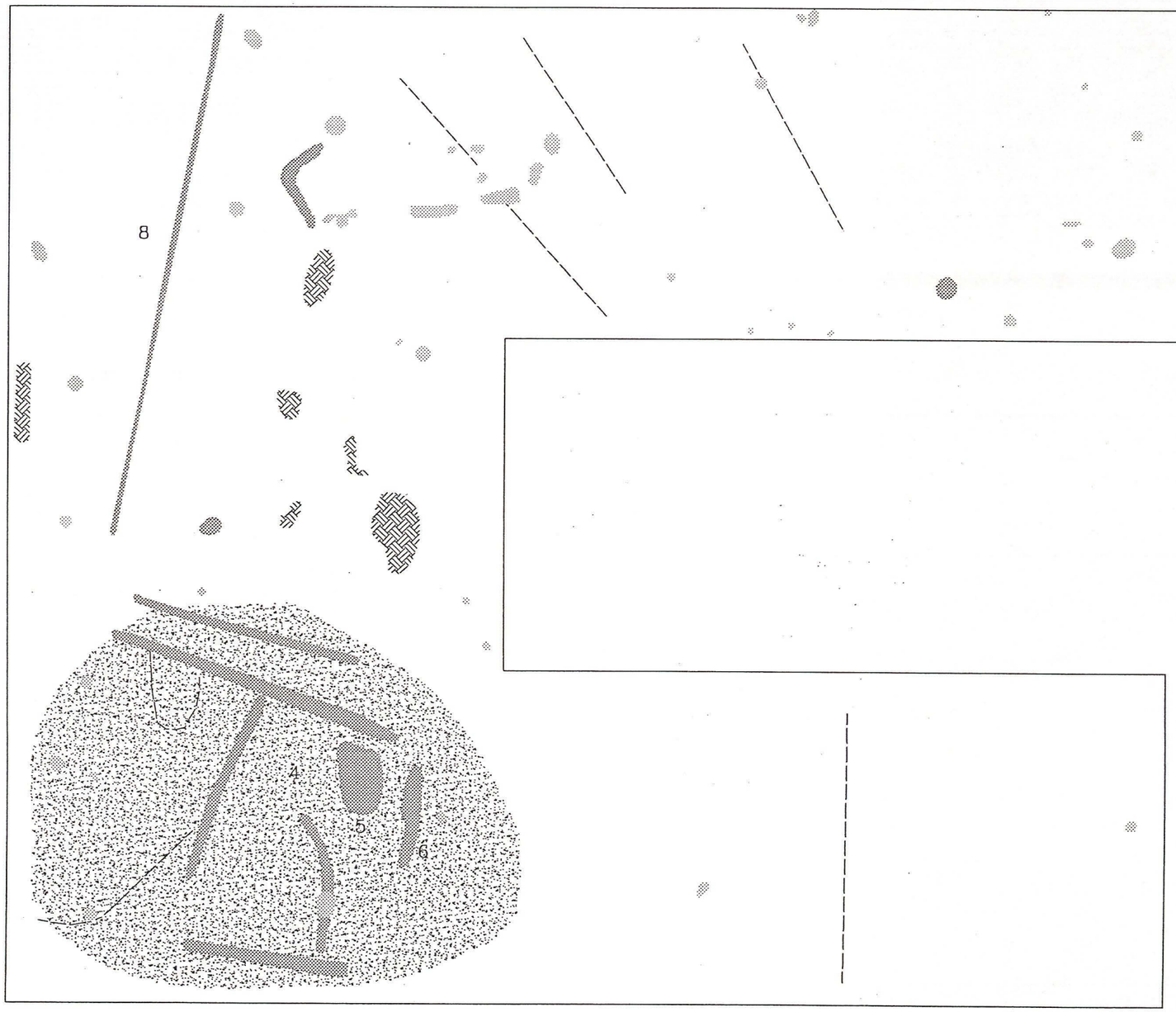


Figure 17

WHISBY QUARRY Area 2B



?Archaeology

Trend

Area of Increased Magnetic Response

?Natural

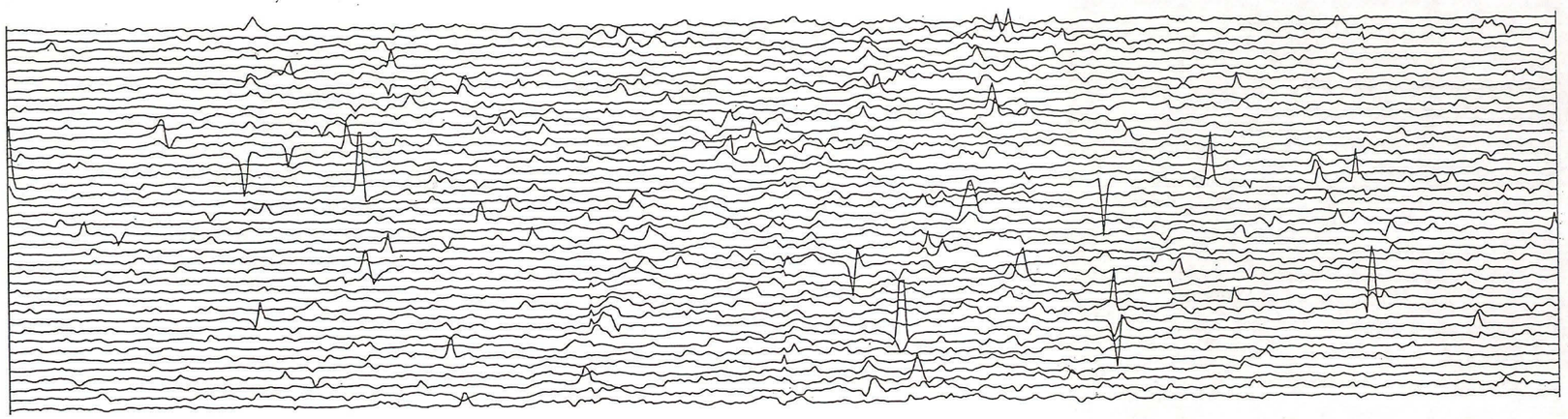
Ferrous

0 m 20

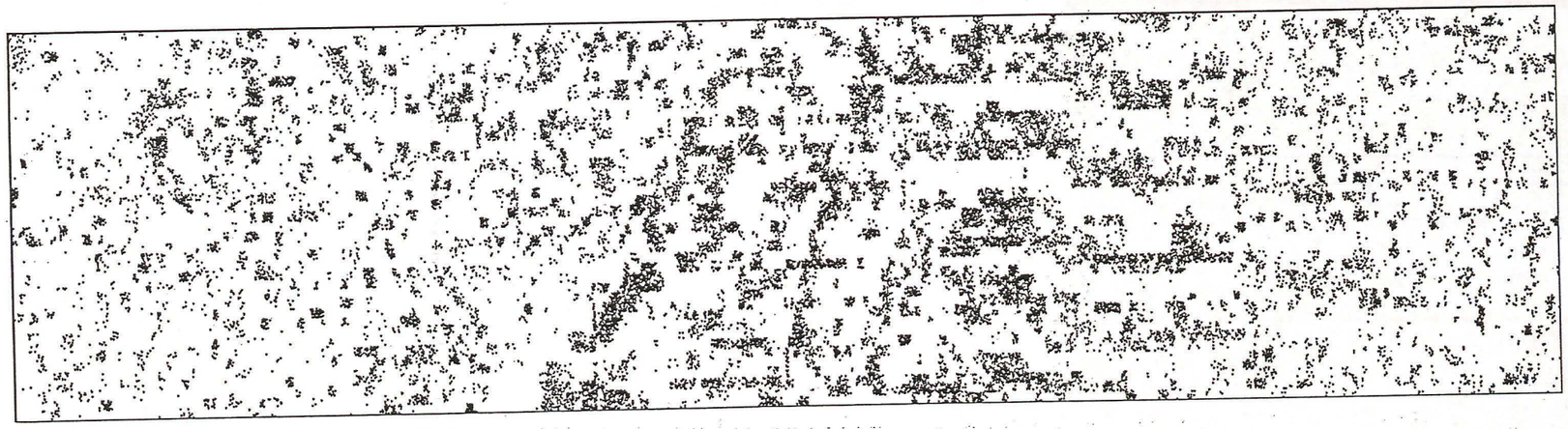
GSB Prospection Ltd. 2003/100

Figure 18

WHISBY QUARRY
Area 3A

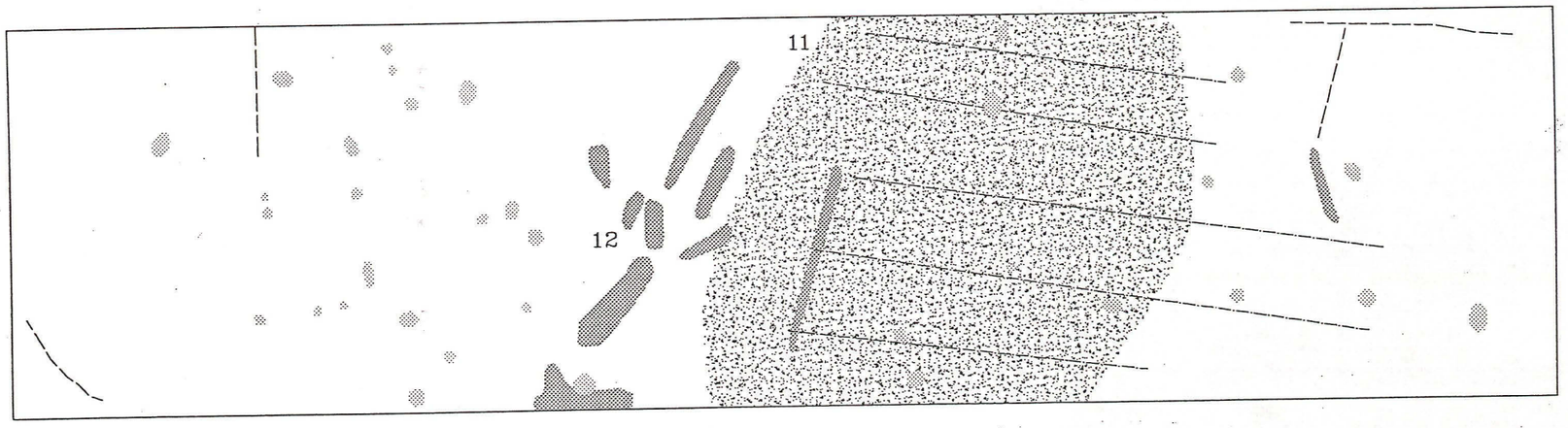


15 nT



1.0
nT
0.1

?Archaeology



Trend

Area of Increased
Magnetic Response

Ridge & Furrow

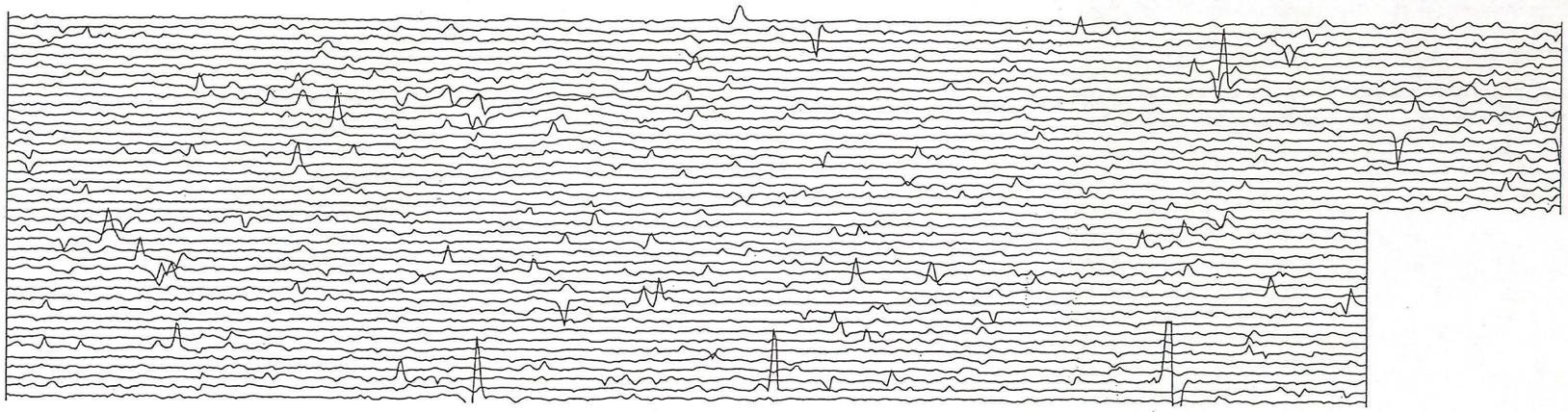
Ferrous

0 m 20

GSB Prospection Ltd. 2003/100

Figure 19

WHISBY QUARRY
Area 3B



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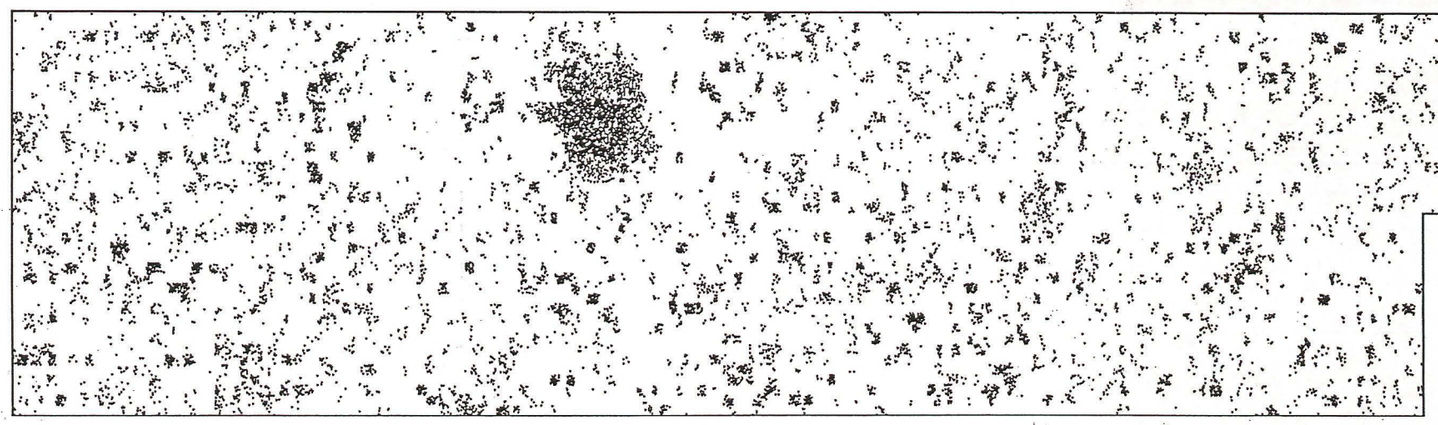
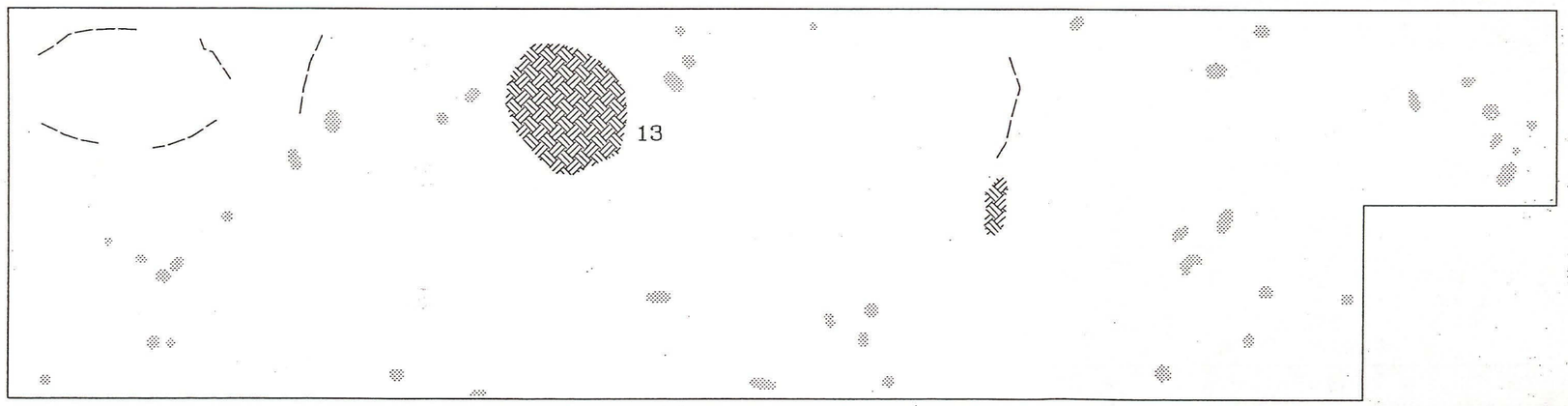


1.0
nT
0.1



Trend

?Natural

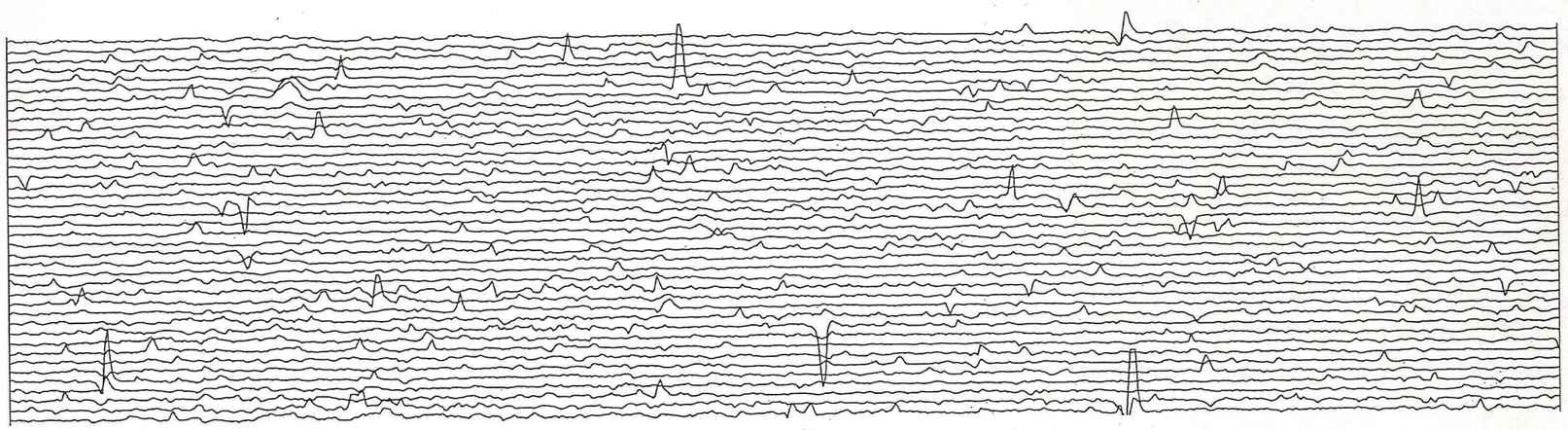
Ferrous

0 m 20

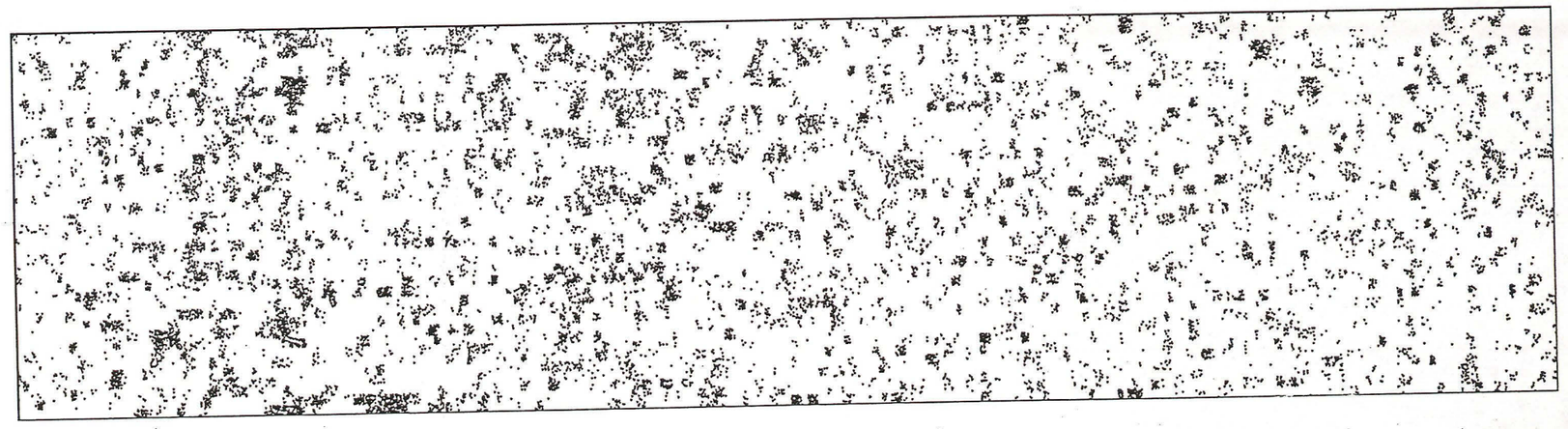
GSB Prospection Ltd. 2003/100

Figure 20

WHISBY QUARRY
Area 3C



15 nT



1.0
nT
0.1

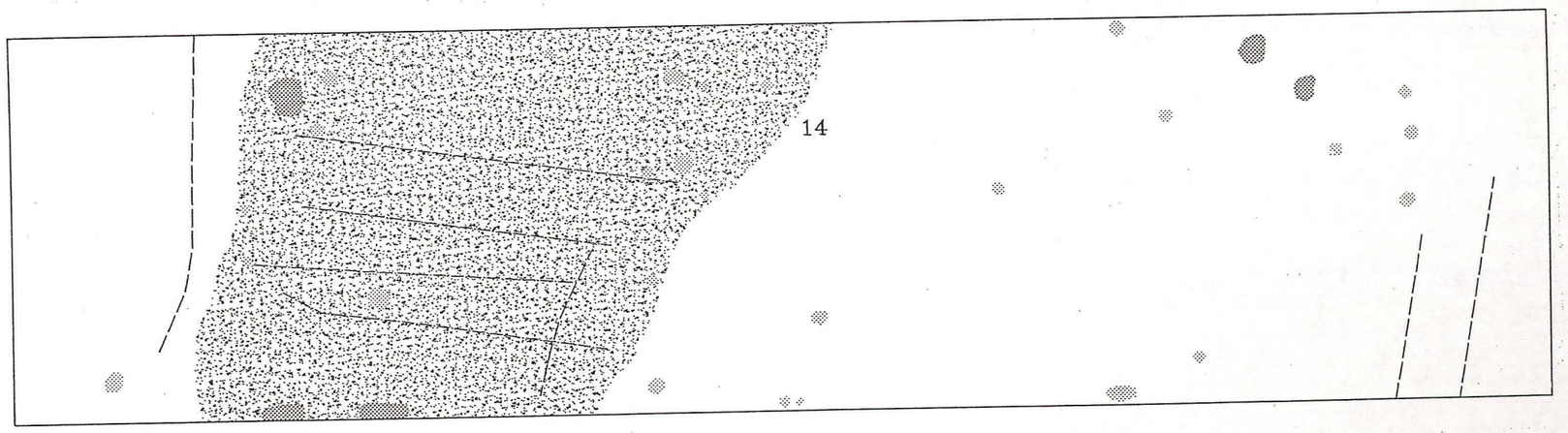
?Archaeology

Trend

Area of Increased Magnetic Response

Ridge & Furrow

Ferrous

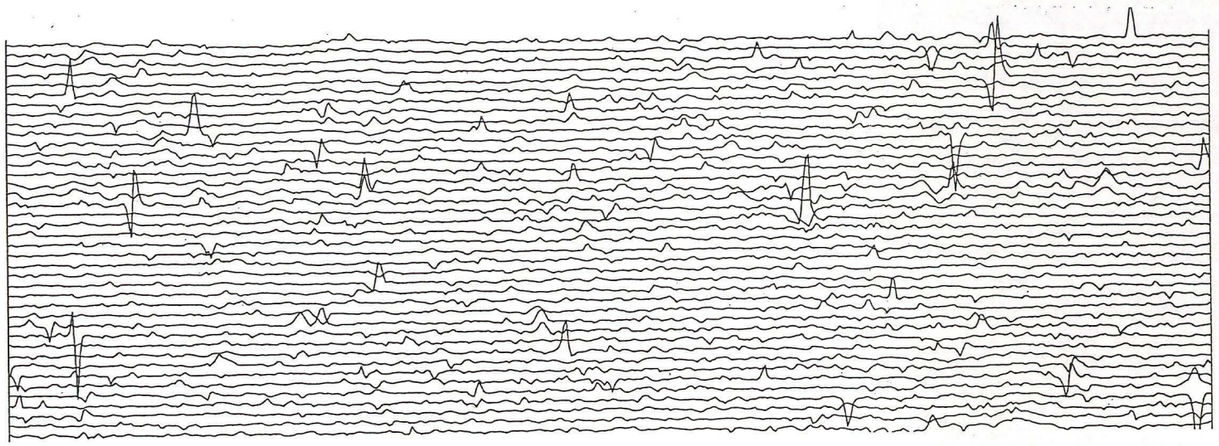


0 m 20

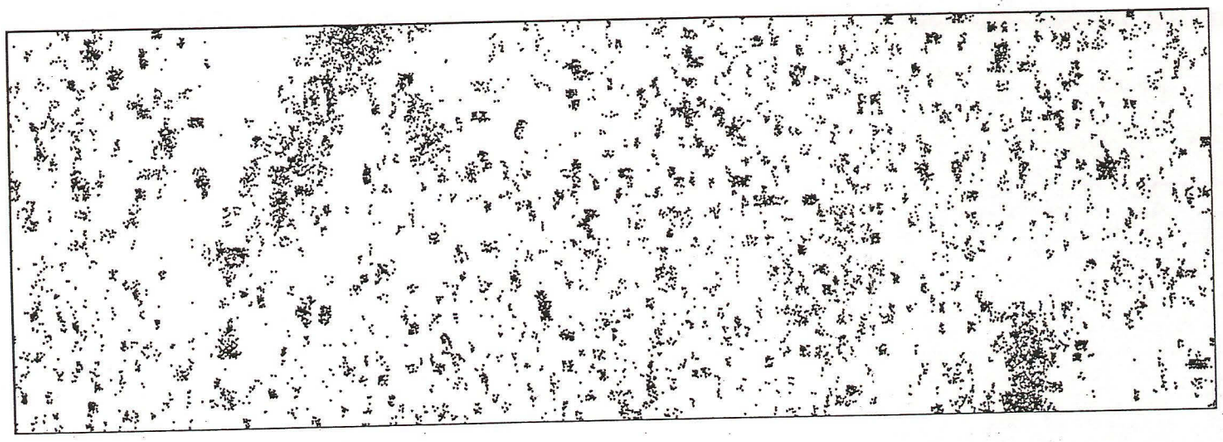
GSB Prospection Ltd. 2003/100

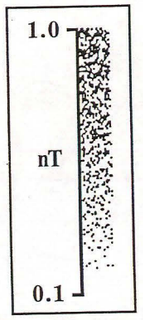
Figure 21

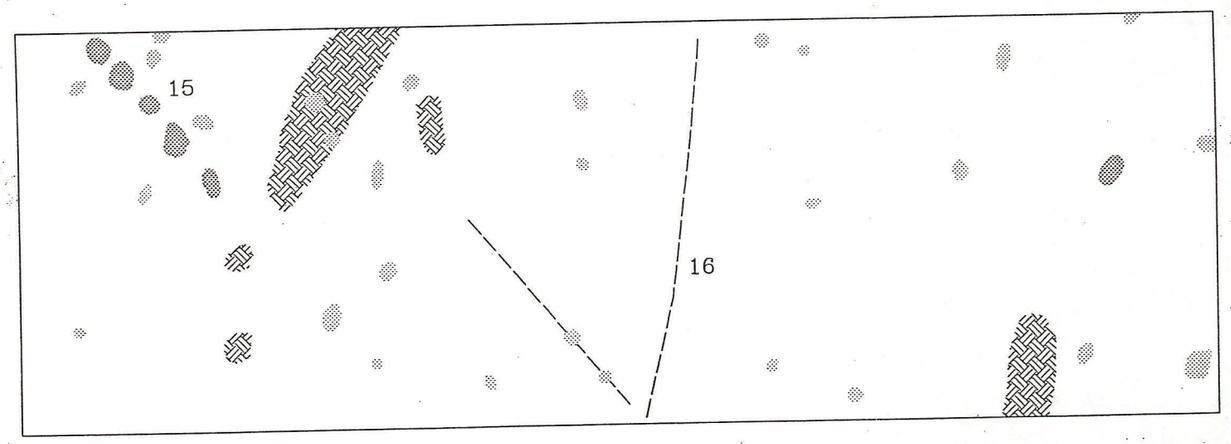
WHISBY QUARRY
Area 3D



15 nT





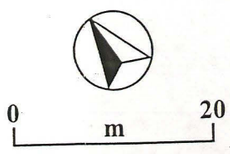


?Archaeology

Trend

?Natural

Ferrous

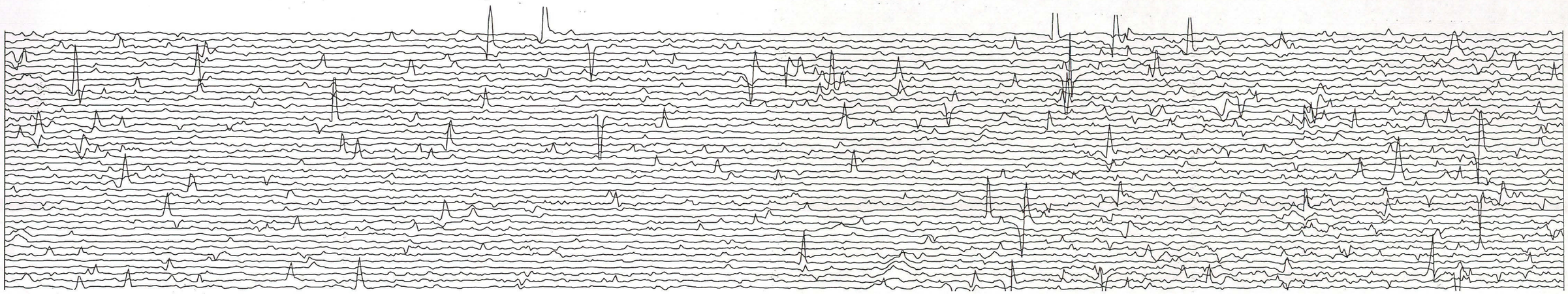


0 m 20

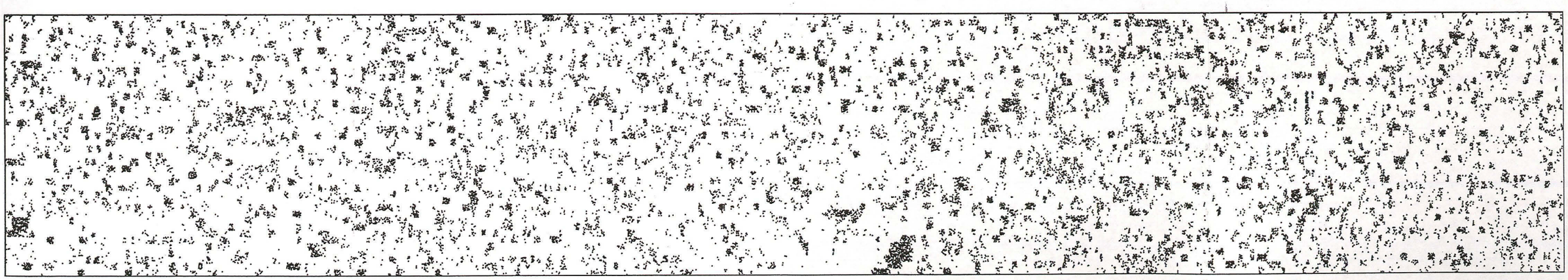
GSB Prospection Ltd. 2003/100

Figure 22

WHISBY QUARRY
Area 4A



15 nT



1.0

nT

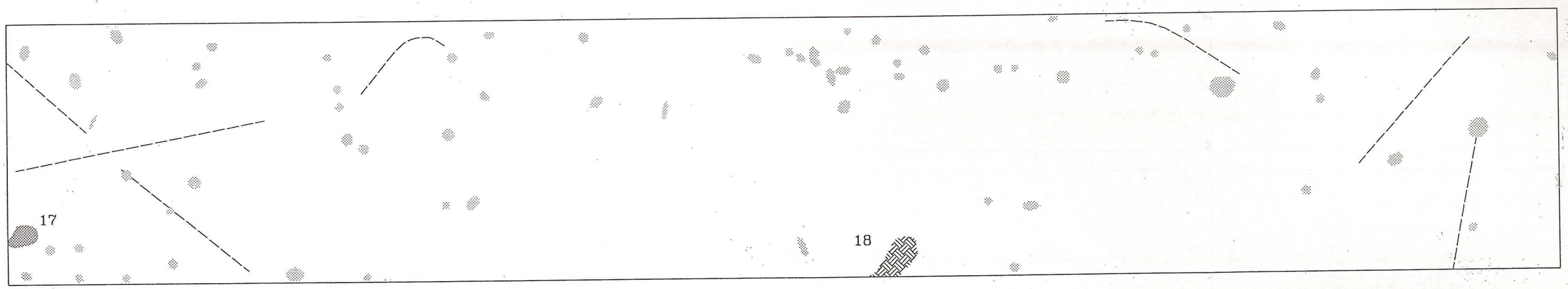
0.1

0 m 20

GSB Prospection Ltd. 2003/100

Figure 23

WHISBY QUARRY
Area 4A



?Archaeology

Trend

?Natural

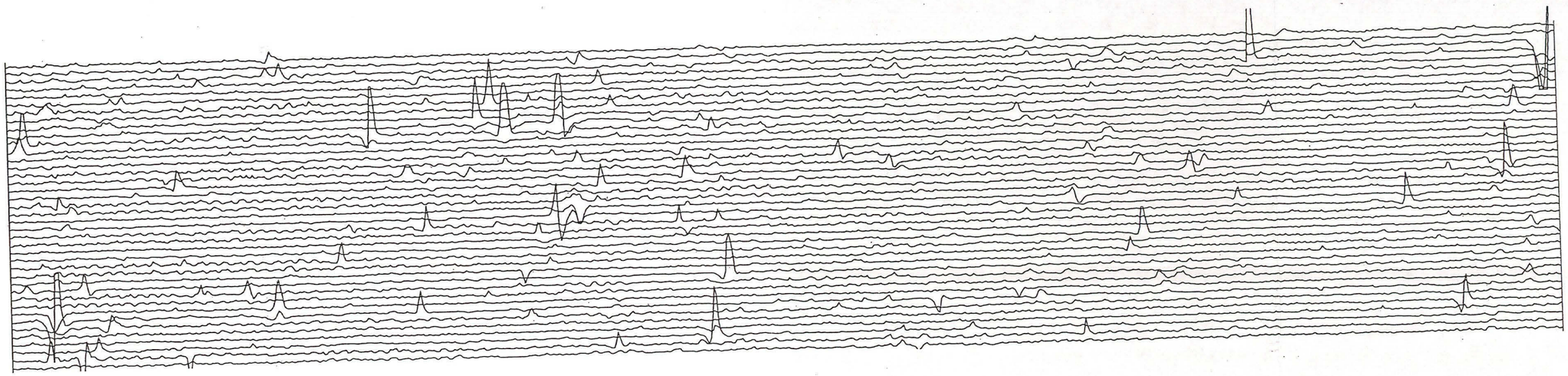
Ferrous

0 m 20

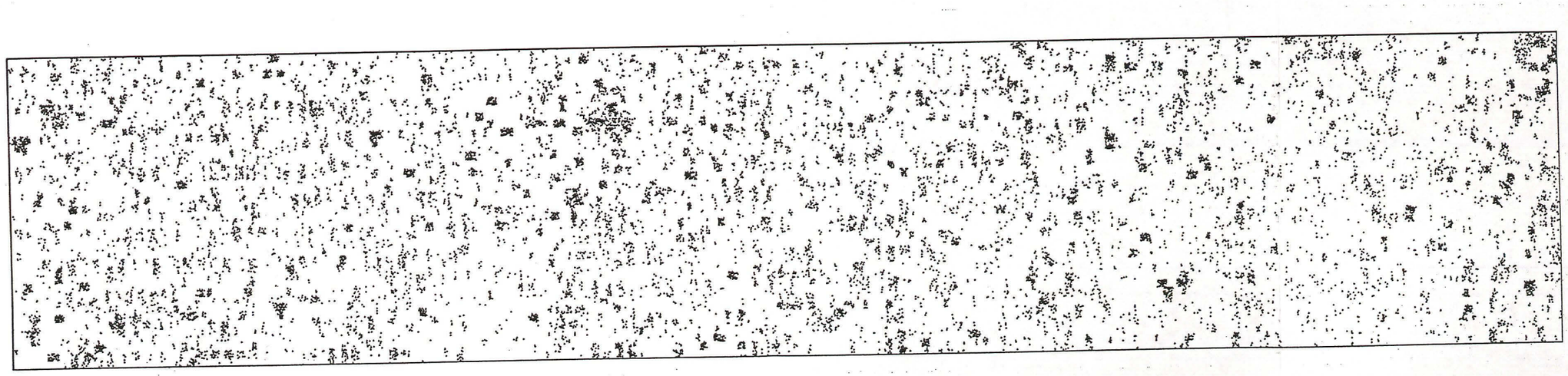
GSB Prospection Ltd. 2003/100

Figure 24

WHISBY QUARRY
Area 4B



15 nT



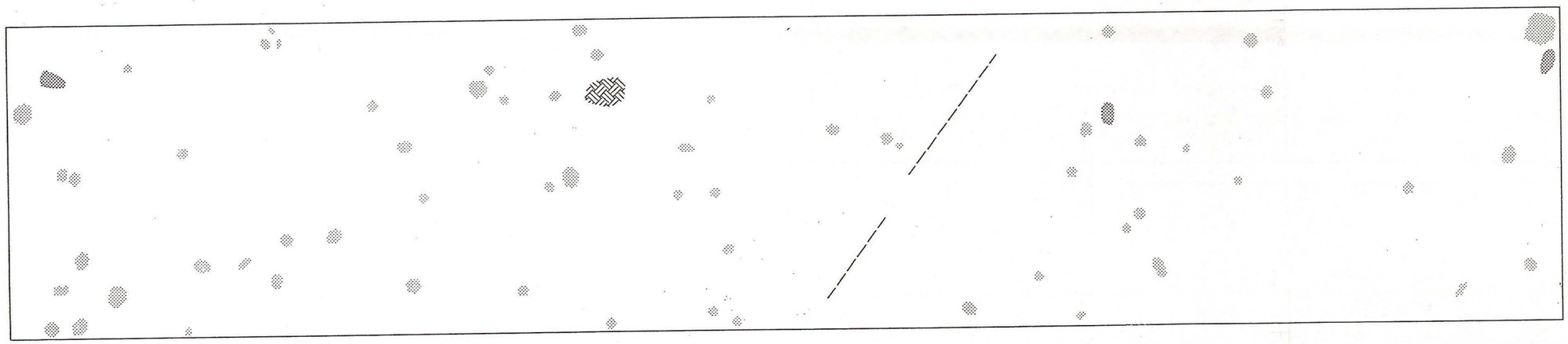
1.0
nT
0.1

0 m 20

Figure 25

GSB Prospection Ltd. 2003/100

WHISBY QUARRY
Area 4B



?Archaeology

Trend

?Natural

Ferrous

0 m 20

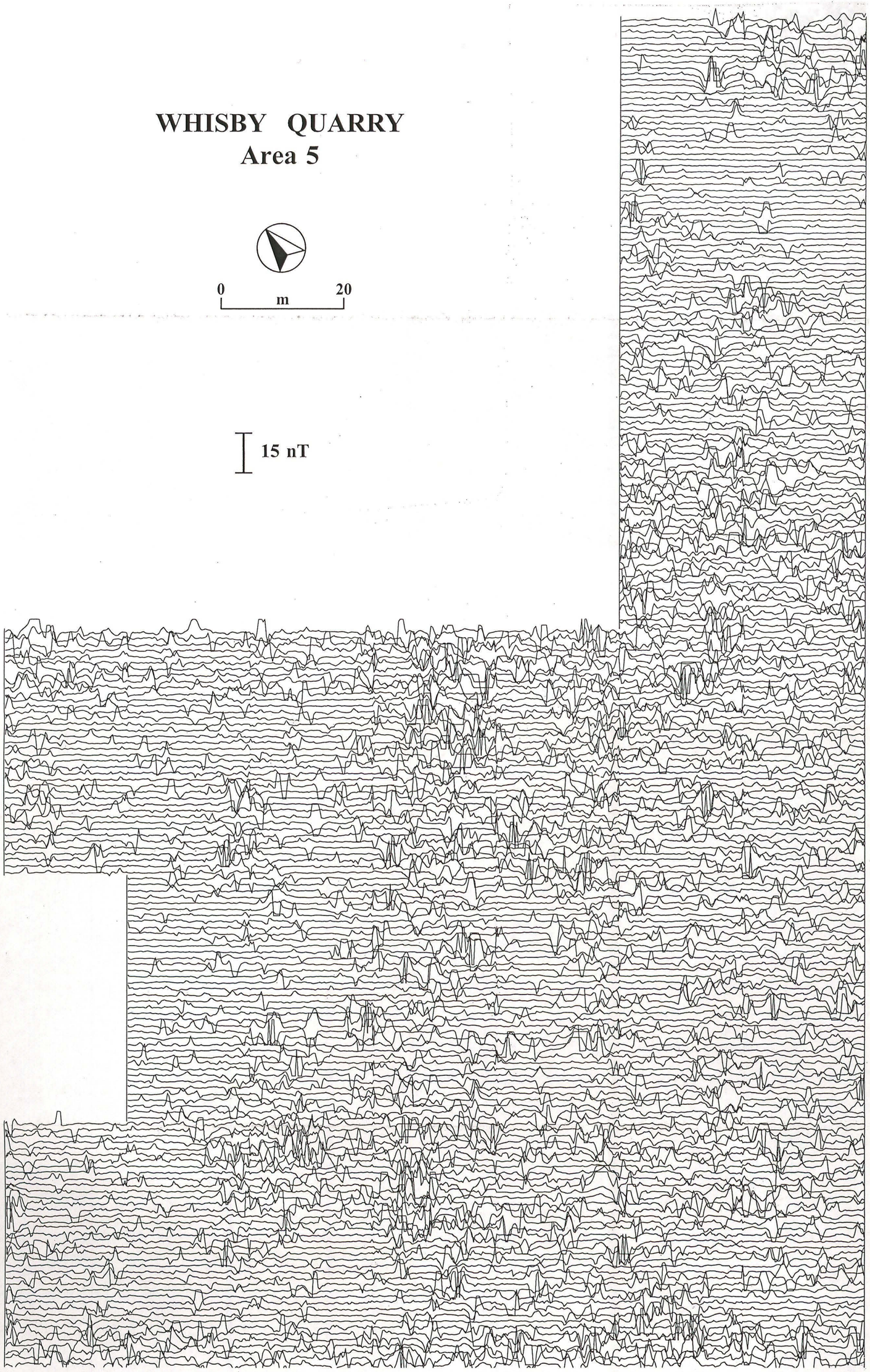
GSB Prospection Ltd. 2003/100

Figure 26

WHISBY QUARRY
Area 5

0 m 20

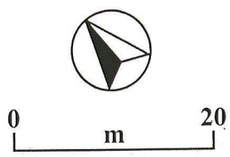
15 nT

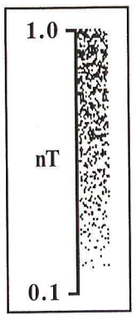


GSB Prospection Ltd. 2003/100

Figure 27

WHISBY QUARRY
Area 5

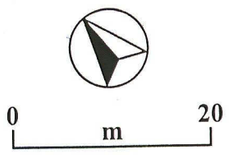




GSB Prospection Ltd. 2003/100

Figure 28

WHISBY QUARRY
Area 5



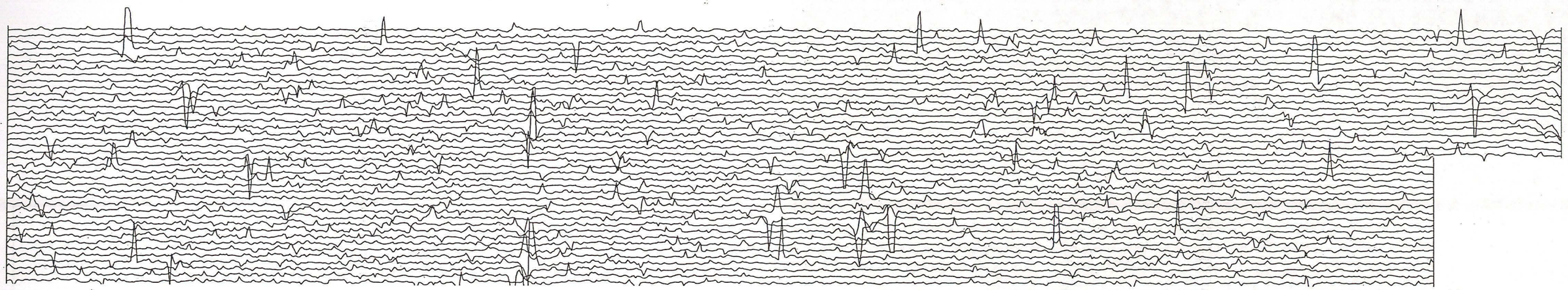
Trend

Area of Magnetic Disturbance

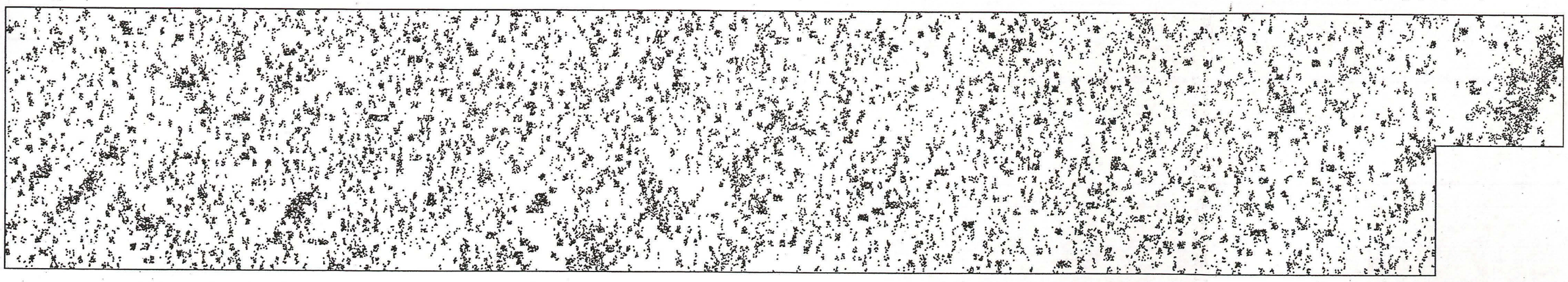
GSB Prospection Ltd. 2003/100

Figure 29

WHISBY QUARRY
Area 6A



15 nT



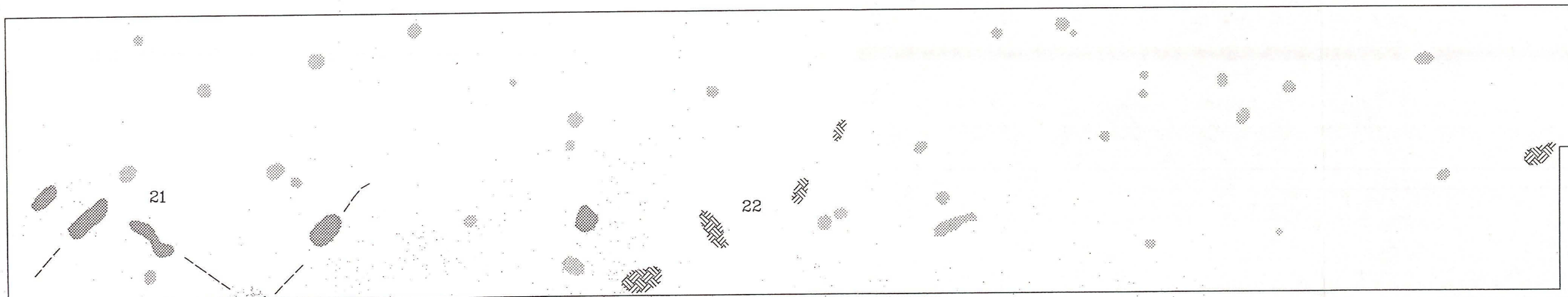
1.0
nT
0.1

0 m 20

GSB Prospection Ltd. 2003/100

Figure 30

WHISBY QUARRY
Area 6A



?Archaeology

Trend

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Ferrous

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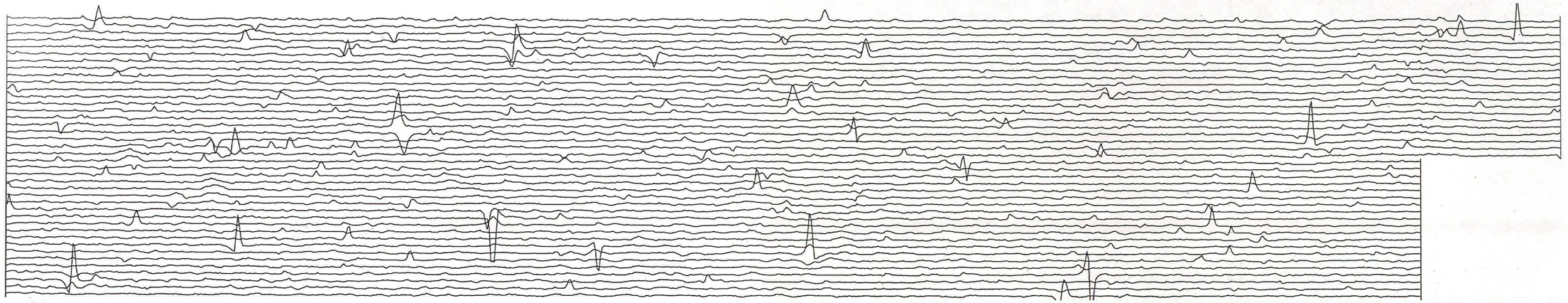
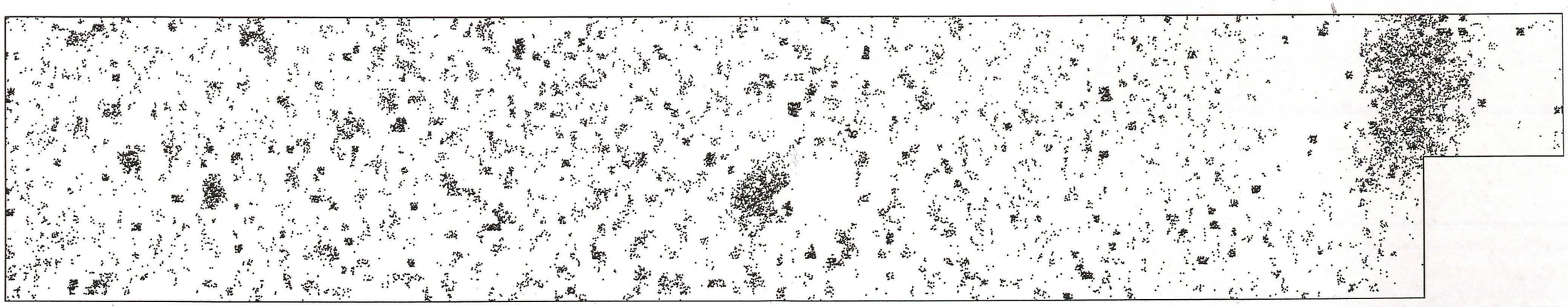
GSB Prospection Ltd. 2003/100

Figure 31

WHISBY QUARRY
Area 6B



15 nT



1.0
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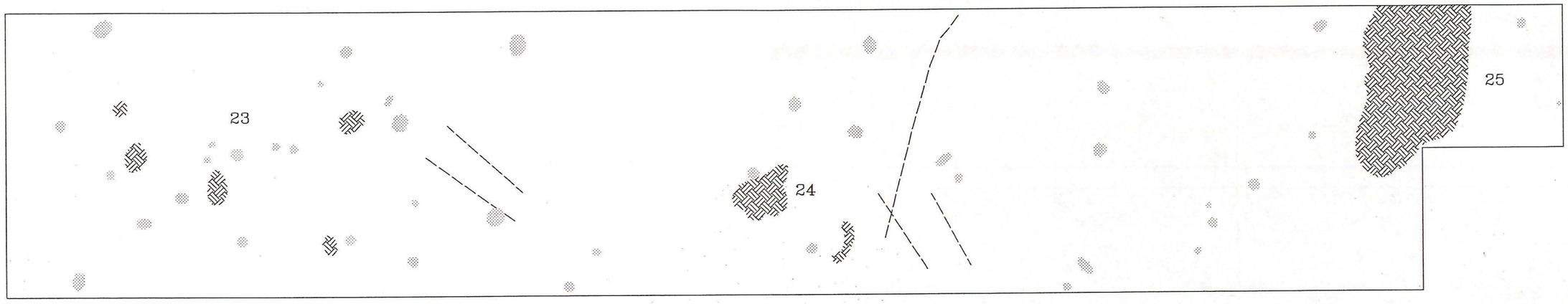
0 m 20

GSB Prospection Ltd. 2003/100

Figure 32

WHISBY QUARRY
Area 6B



Trend

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Ferrous

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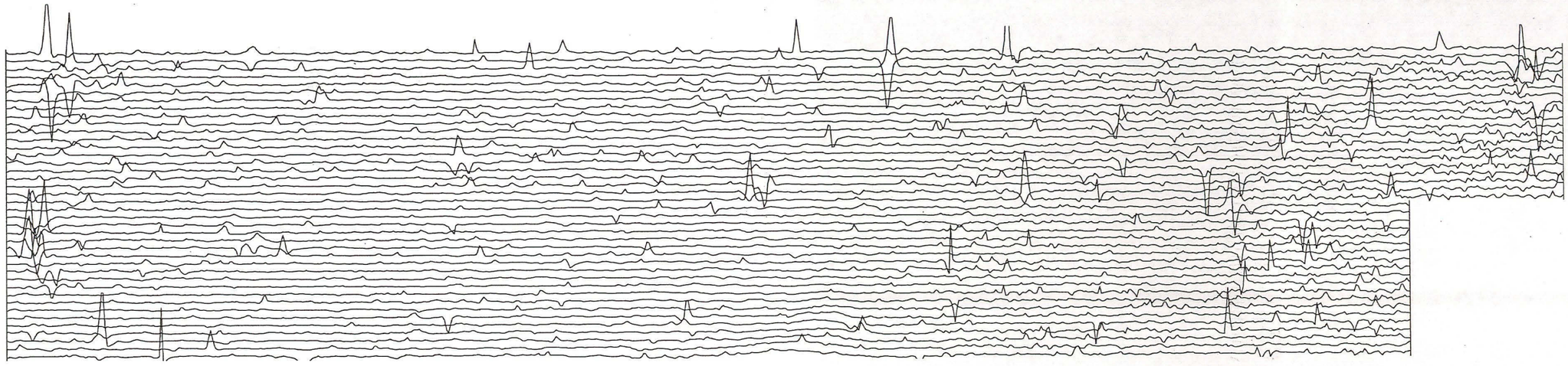
GSB Prospection Ltd. 2003/100

Figure 33

WHISBY QUARRY
Area 6C



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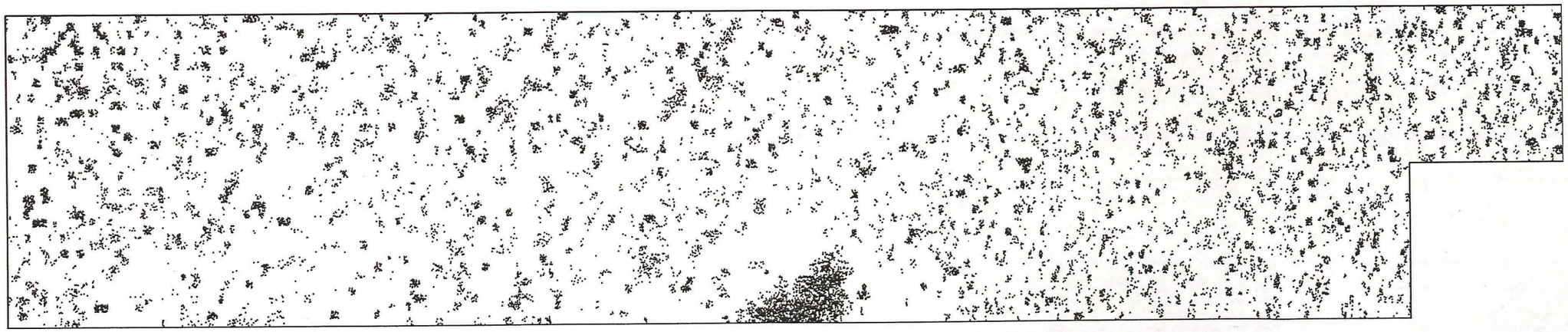

1.0
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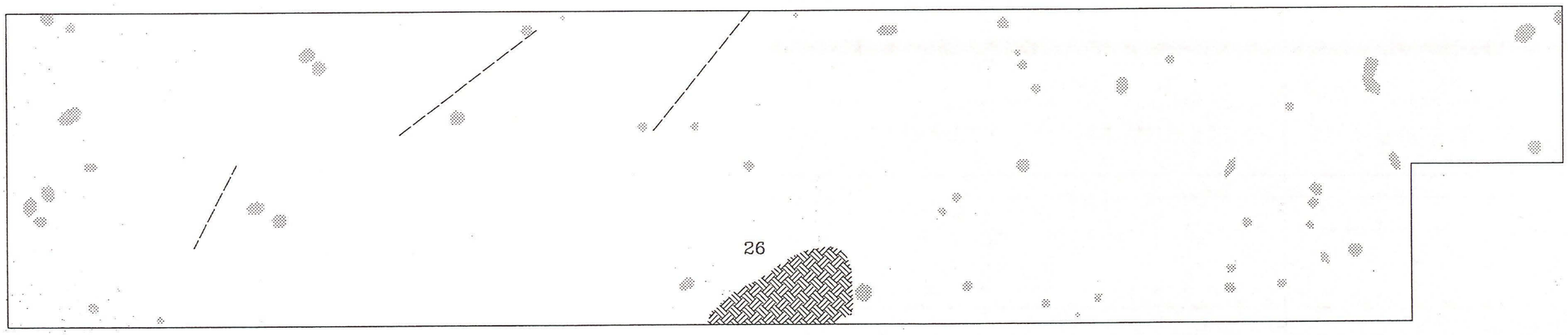
GSB Prospection Ltd. 2003/100

Figure 34

WHISBY QUARRY
Area 6C



Trend

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Ferrous

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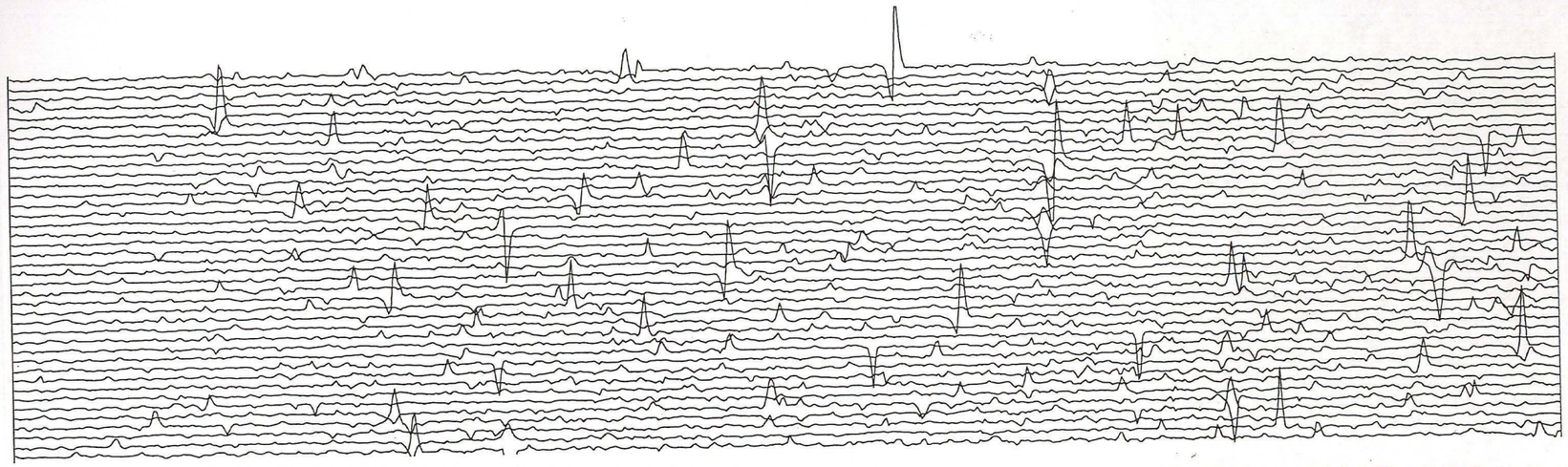
GSB Prospection Ltd. 2003/100

Figure 35

WHISBY QUARRY
Area 7A



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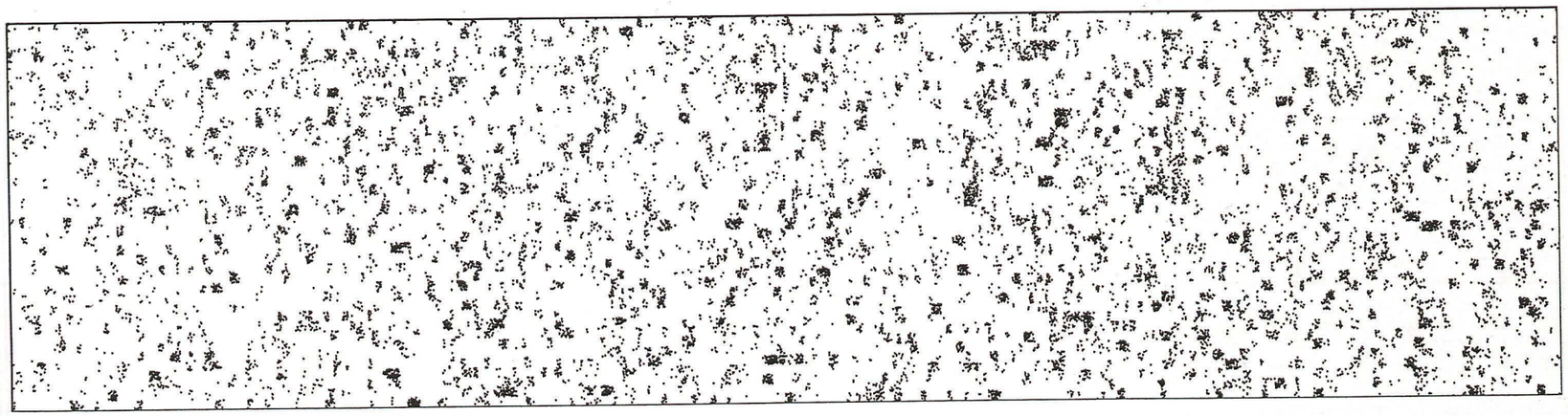

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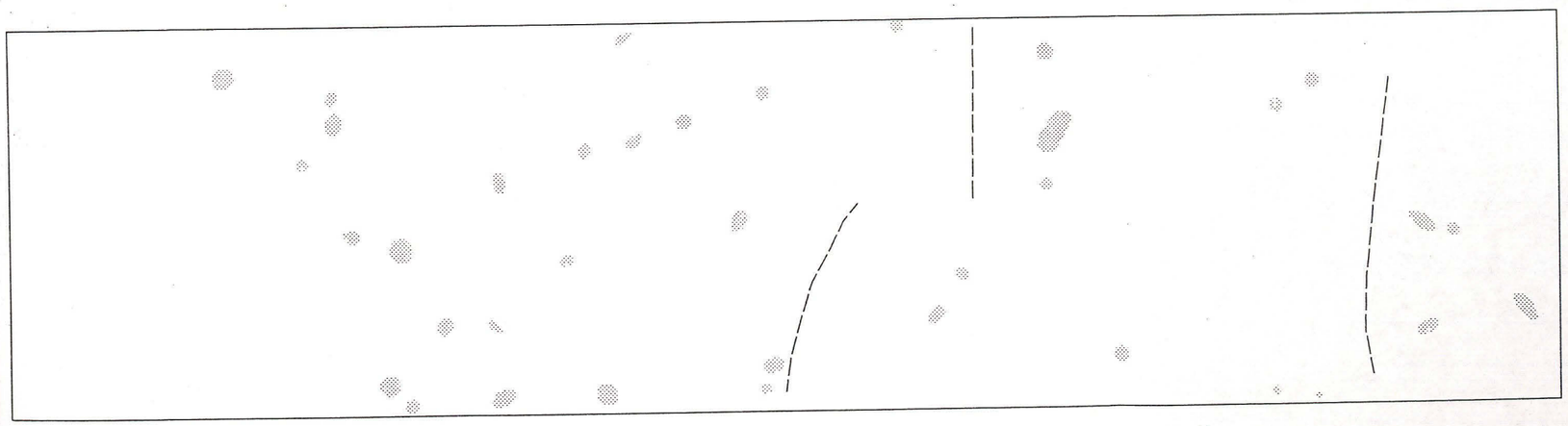

Trend

Ferrous

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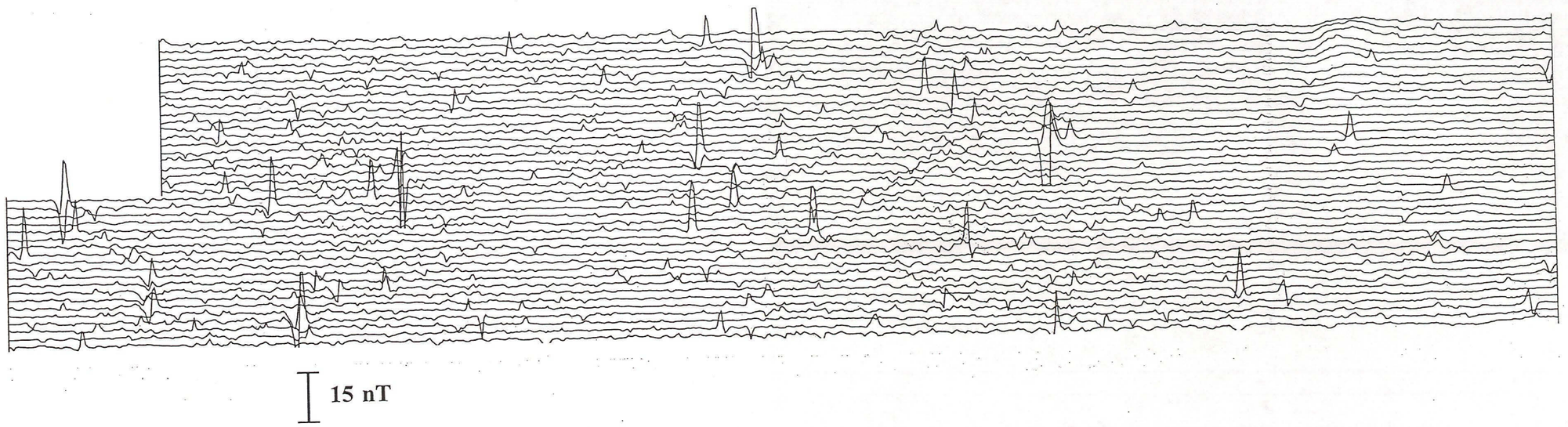
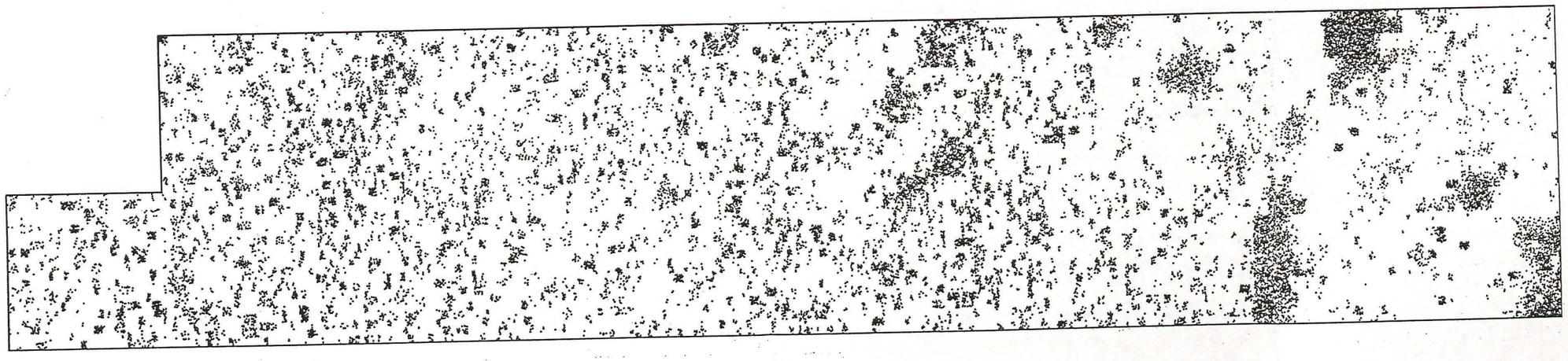
GSB Prospection Ltd. 2003/100

Figure 36

WHISBY QUARRY
Area 7B

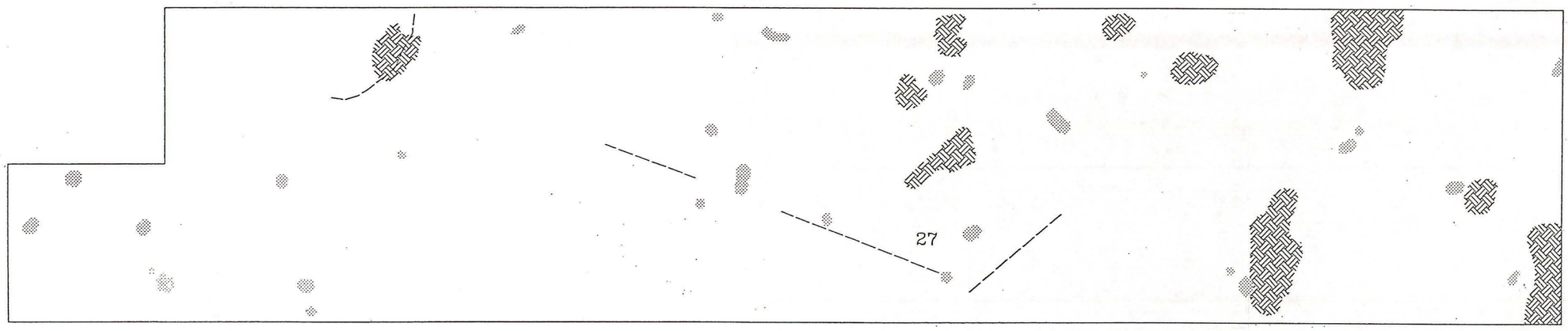




GSB Prospection Ltd. 2003/100

Figure 37

WHISBY QUARRY
Area 7B



Trend

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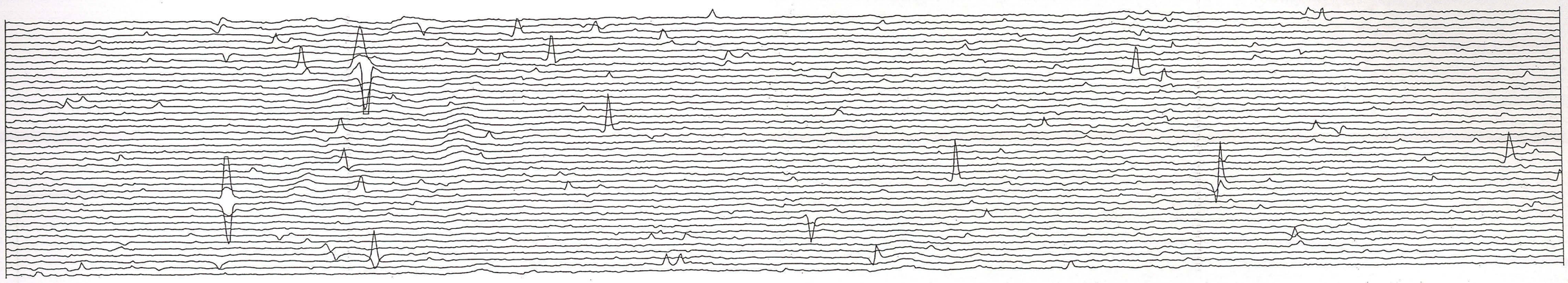
Ferrous

0 m 20

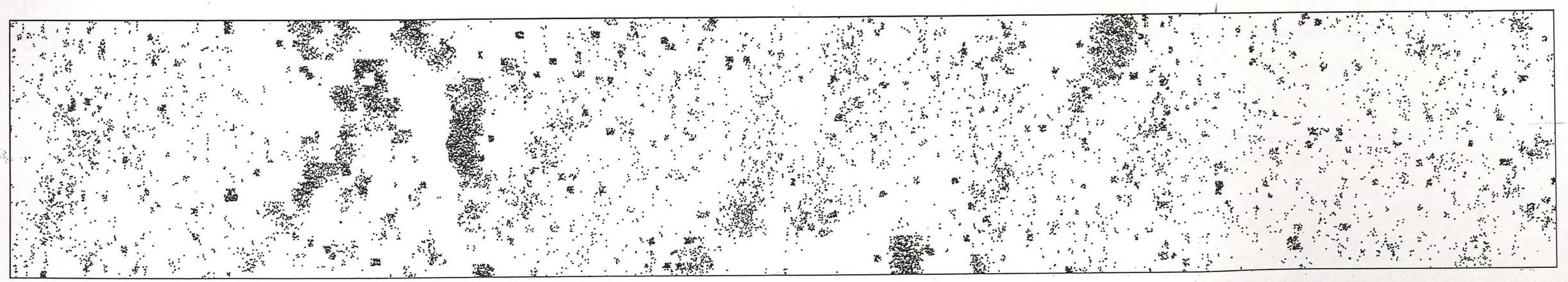
GSB Prospection Ltd. 2003/100

Figure 38

WHISBY QUARRY
Area 7C



15 nT



1.0
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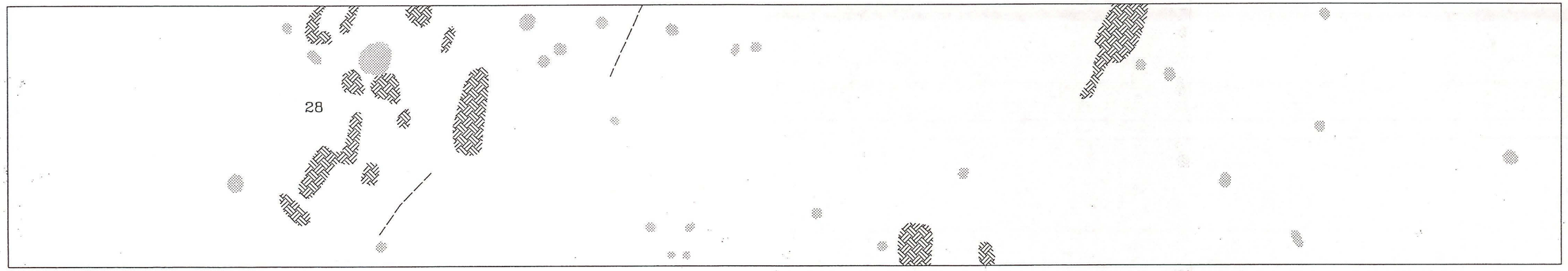
GSB Prospection Ltd. 2003/100

Figure 39

WHISBY QUARRY
Area 7C



Trend

?Natural

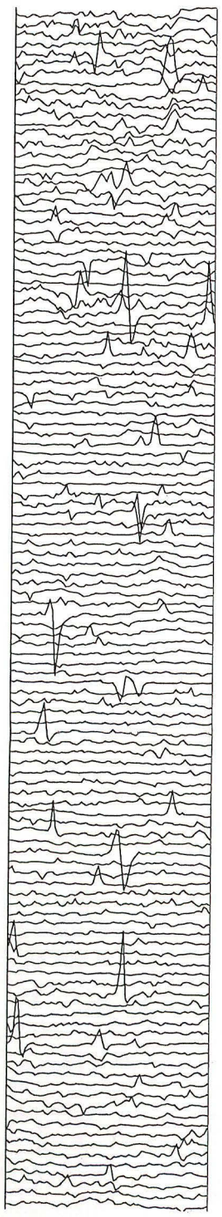
Ferrous

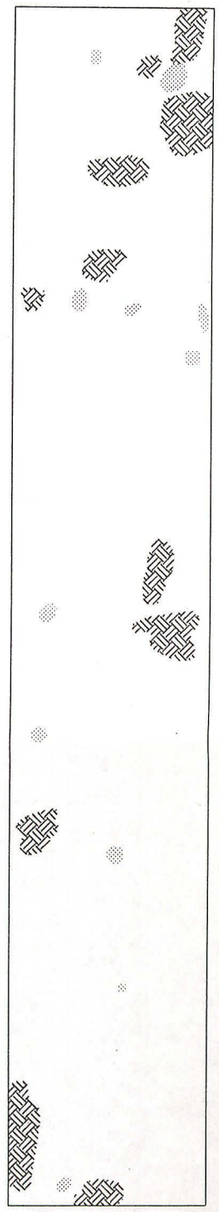
0 m 20

GSB Prospection Ltd. 2003/100

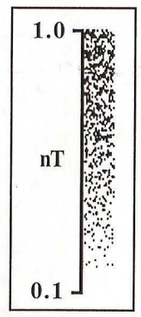
Figure 40

WHISBY QUARRY
Area 9





15 nT



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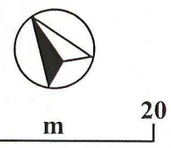

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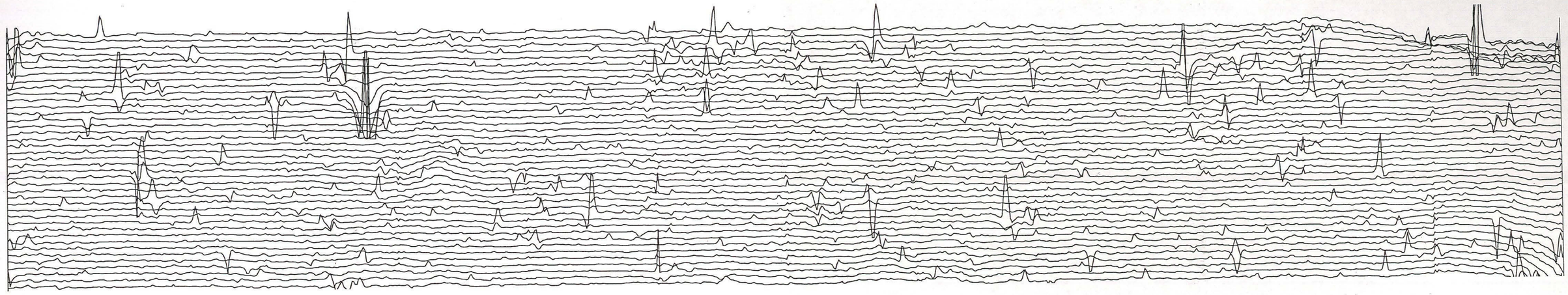
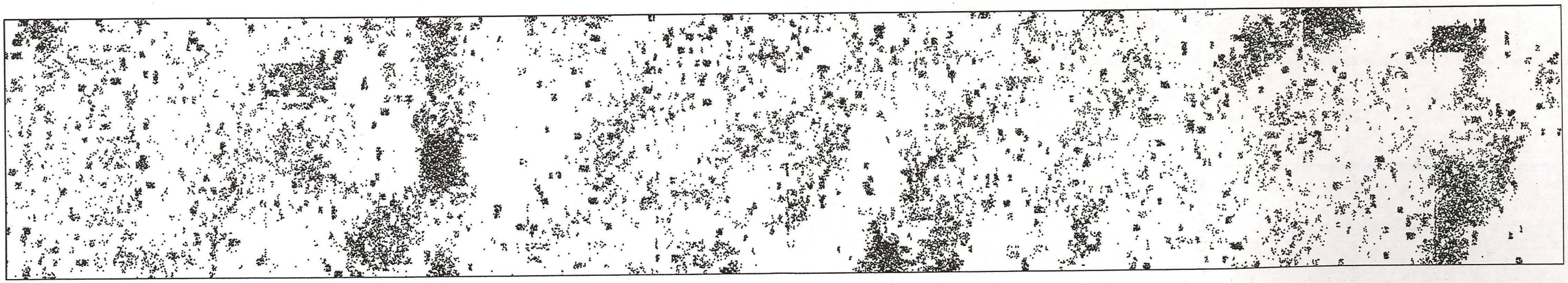
Figure 41

WHISBY QUARRY
Area 10A



15 nT



1.0
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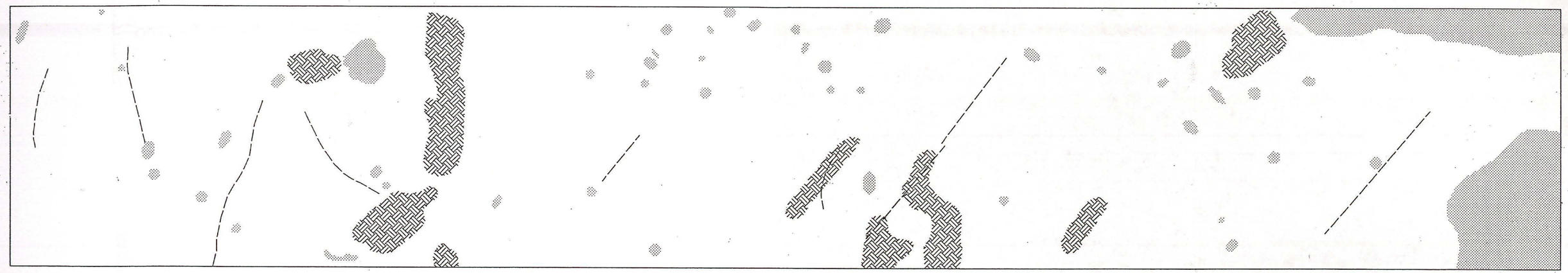
GSB Prospection Ltd. 2003/100

Figure 42

WHISBY QUARRY
Area 10A



Trend

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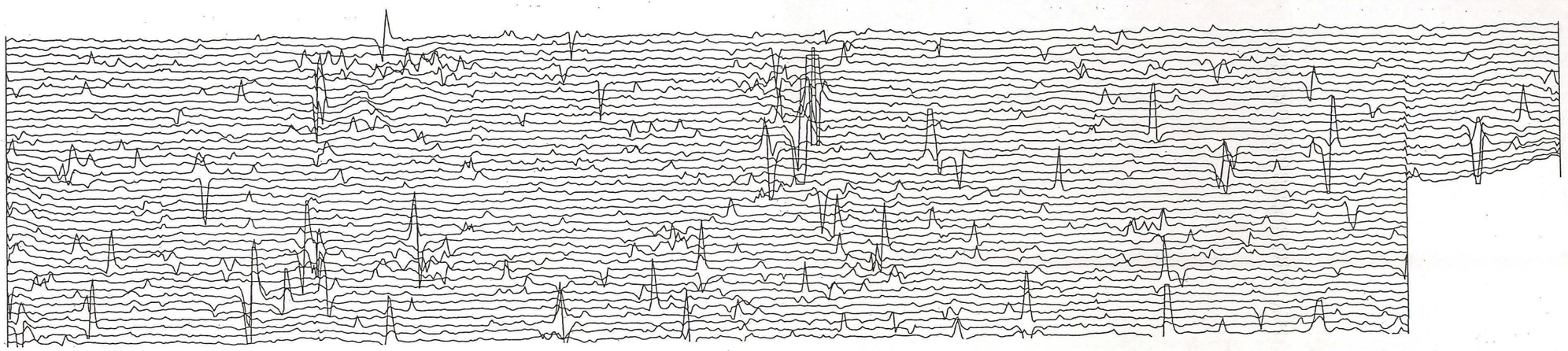
Ferrous

0 m 20

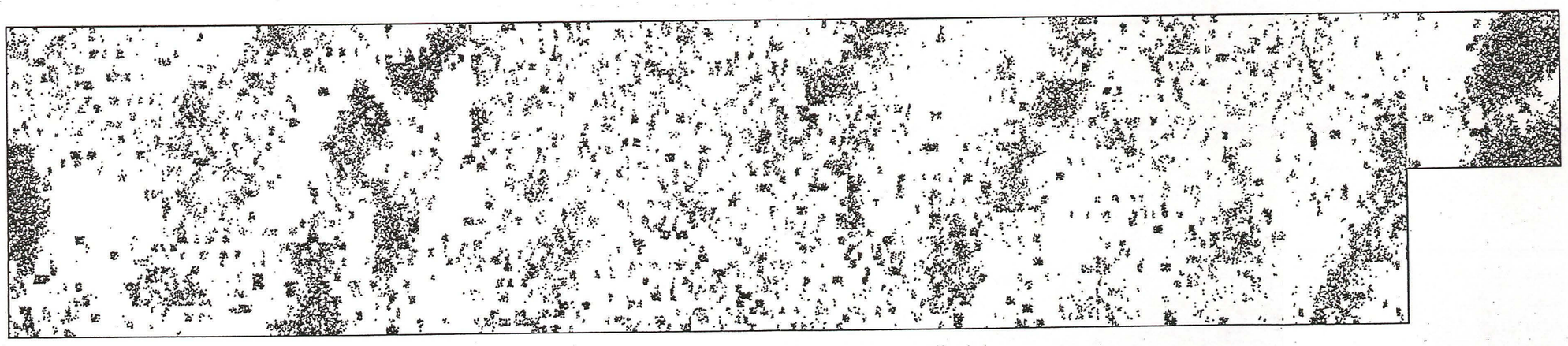
GSB Prospection Ltd. 2003/100

Figure 43

WHISBY QUARRY
Area 10B



15 nT



1.0
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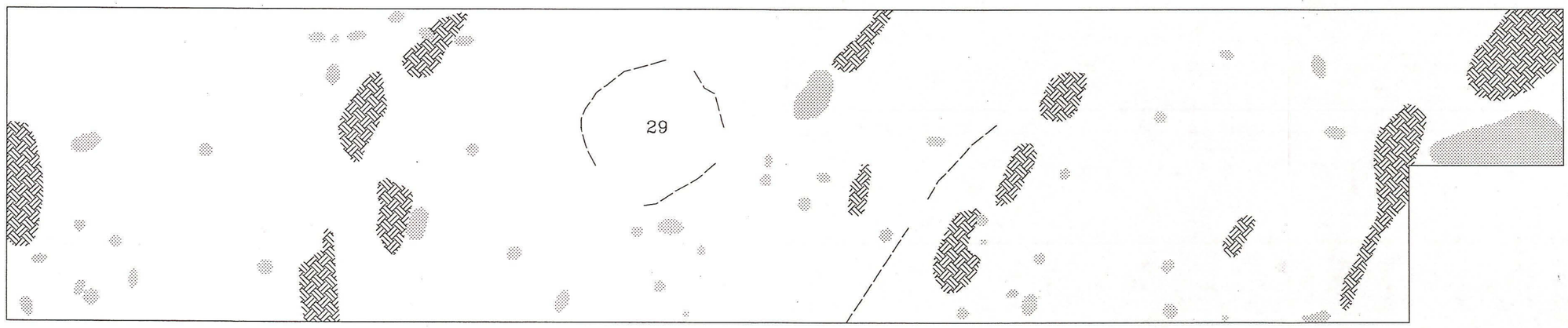
0.1

0 m 20

GSB Prospection Ltd. 2003/100

Figure 44

WHISBY QUARRY
Area 10B



Trend

?Natural

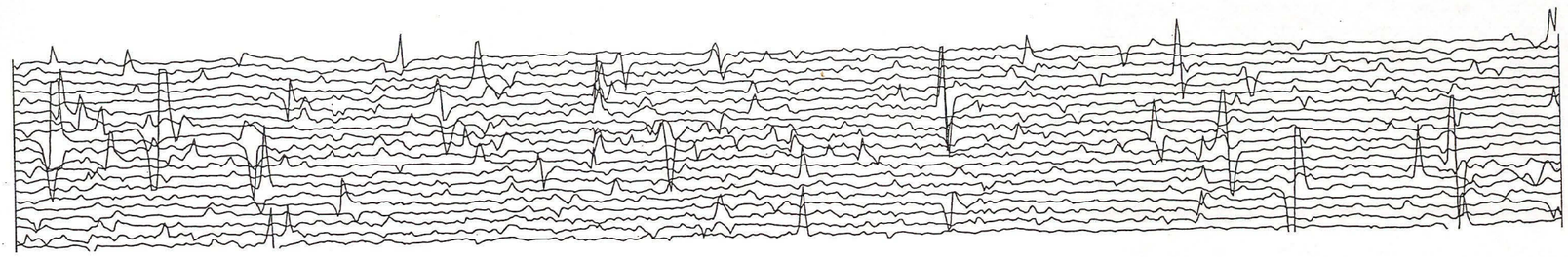
Ferrous

0 m 20

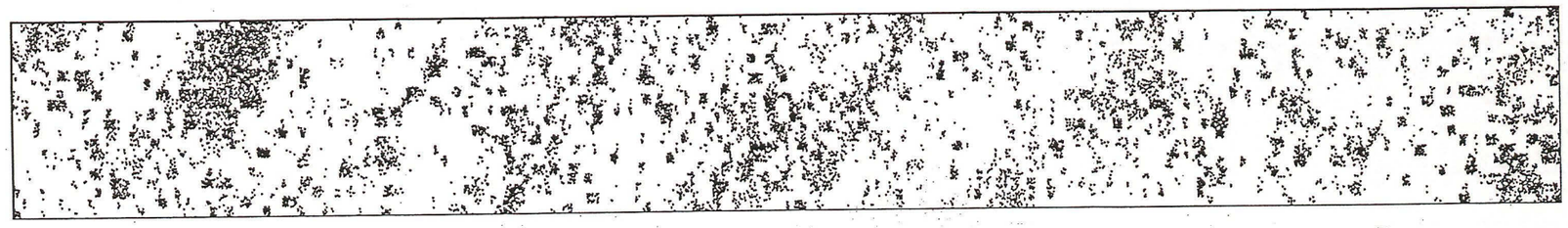
GSB Prospection Ltd. 2003/100

Figure 45

WHISBY QUARRY
Area 11



15 nT



1.0
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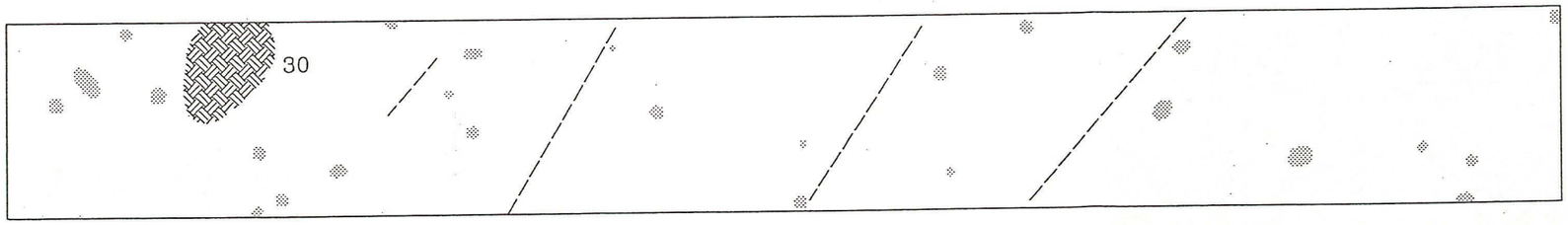

Trend

? Natural

Ferrous

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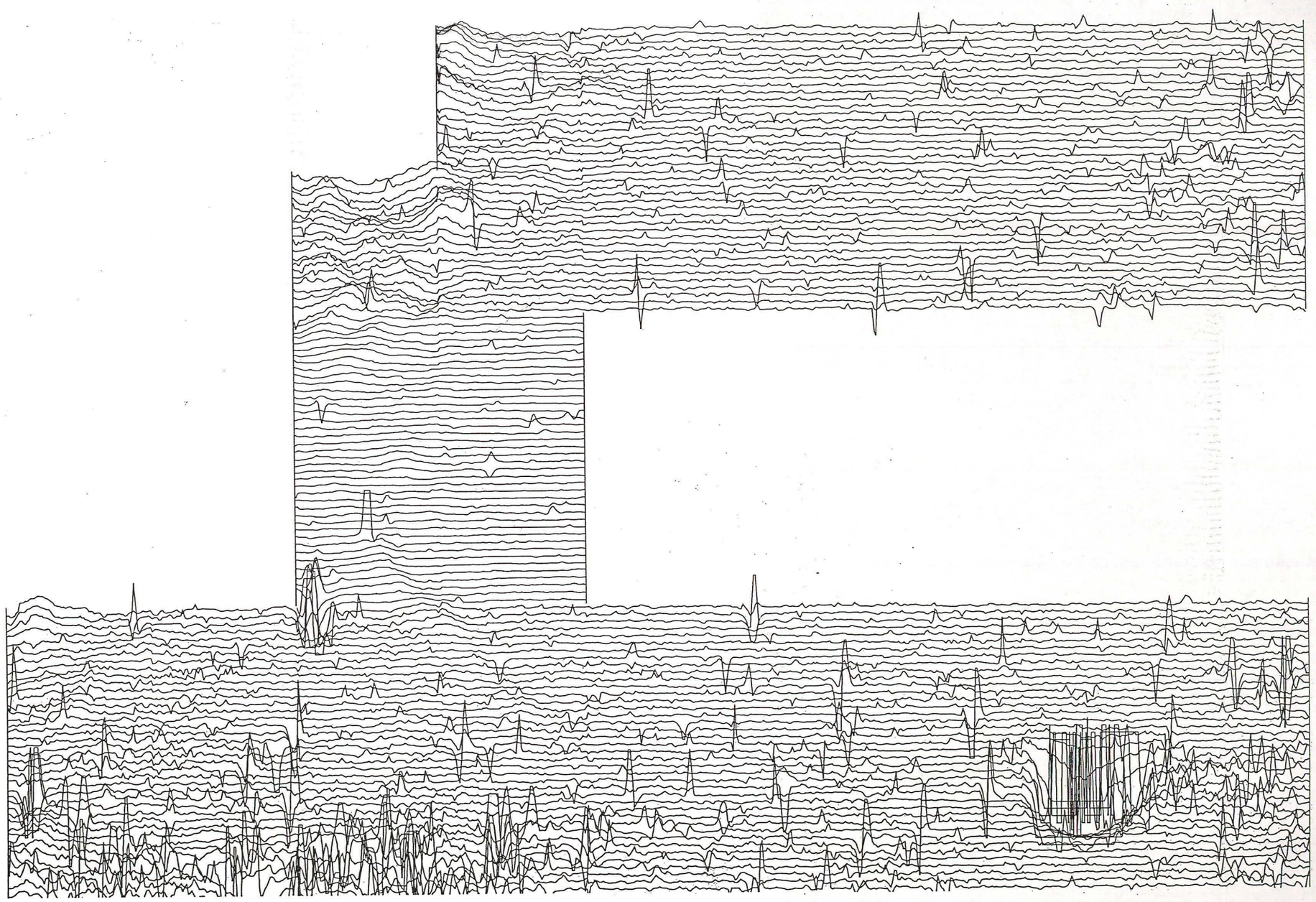
GSB Prospection Ltd. 2003/100

Figure 46

WHISBY QUARRY
Area 12



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GSB Prospection Ltd. 2003/100

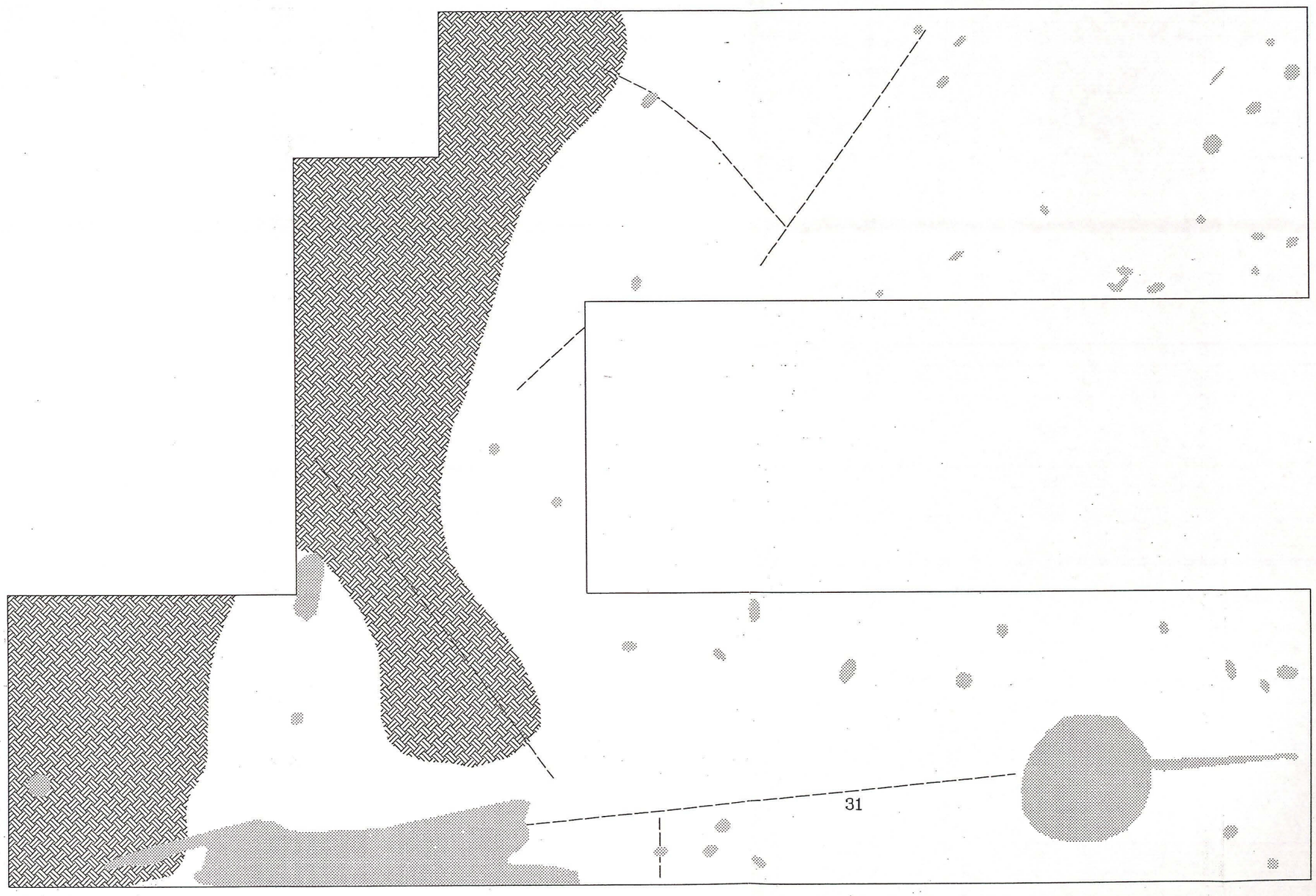
Figure 47

WHISBY QUARRY
Area 12

GSB Prospection Ltd. 2003/100

Figure 48

WHISBY QUARRY
Area 12



Trend

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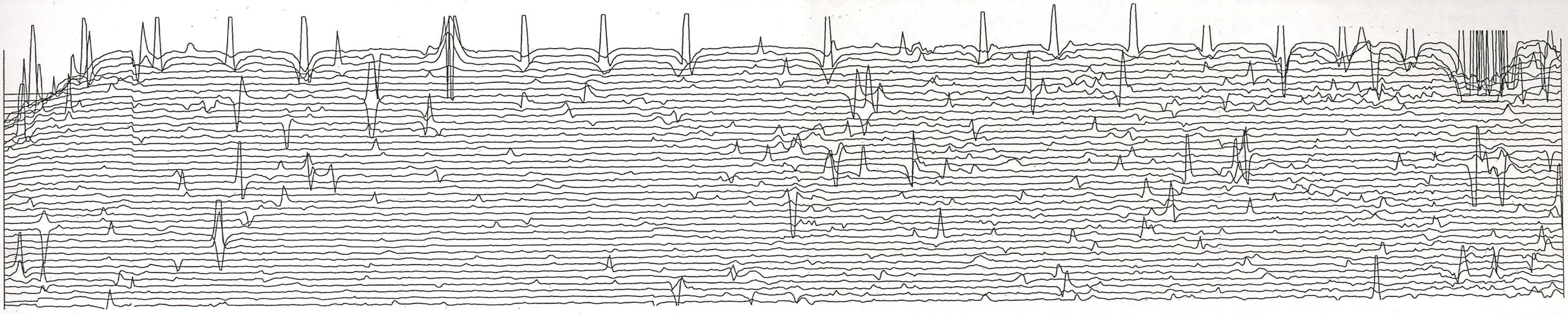
Ferrous

0 m 20

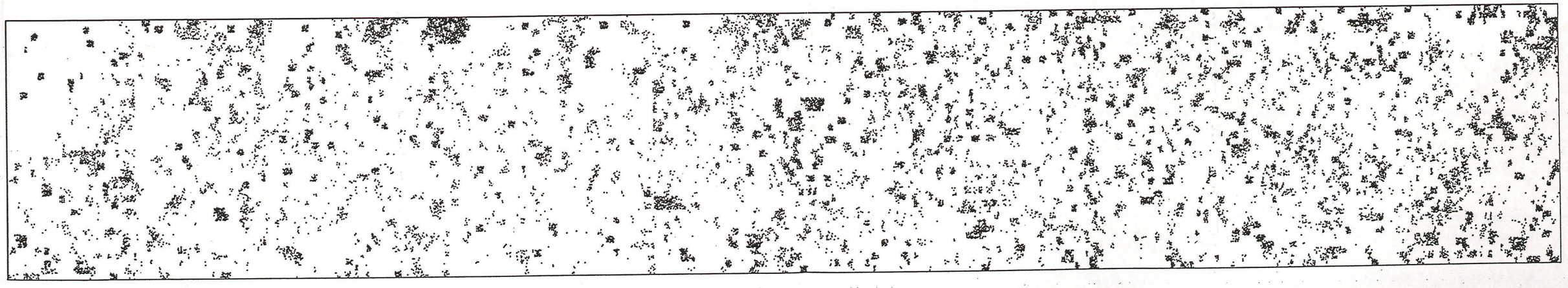
GSB Prospection Ltd. 2003/100

Figure 49

WHISBY QUARRY
Area 13A



15 nT



1.0
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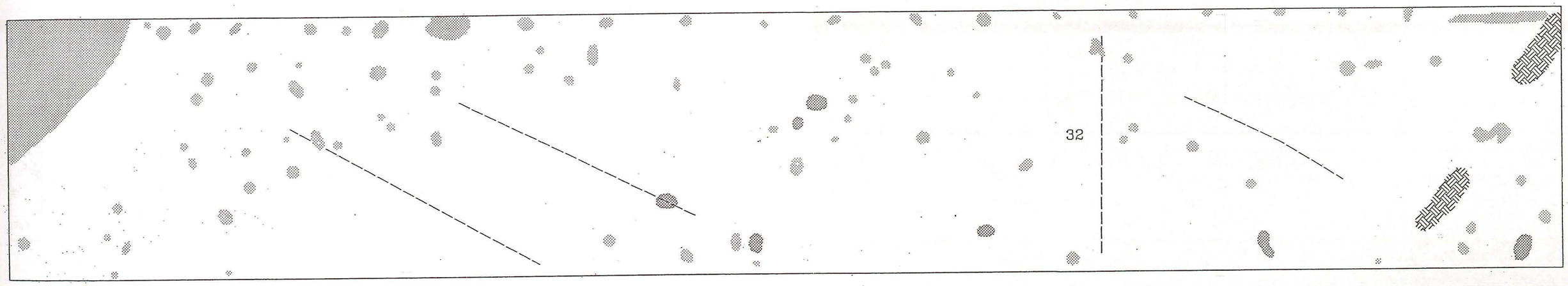
0 m 20

GSB Prospection Ltd. 2003/100

Figure 50

WHISBY QUARRY
Area 13A



?Archaeology

Trend

?Natural

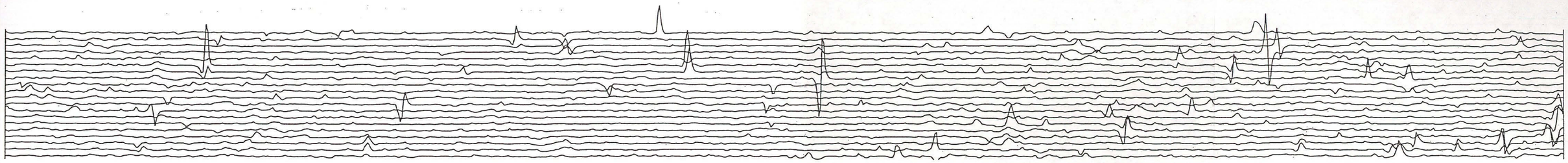
Ferrous

0 m 20

GSB Prospection Ltd. 2003/100

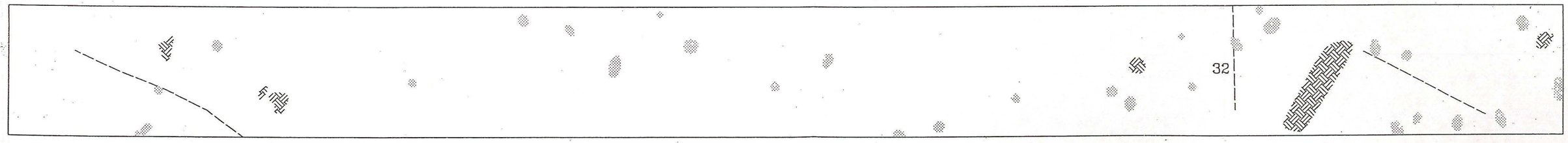
Figure 51

WHISBY QUARRY
Area 13B



15 nT

0.1 nT 1.0



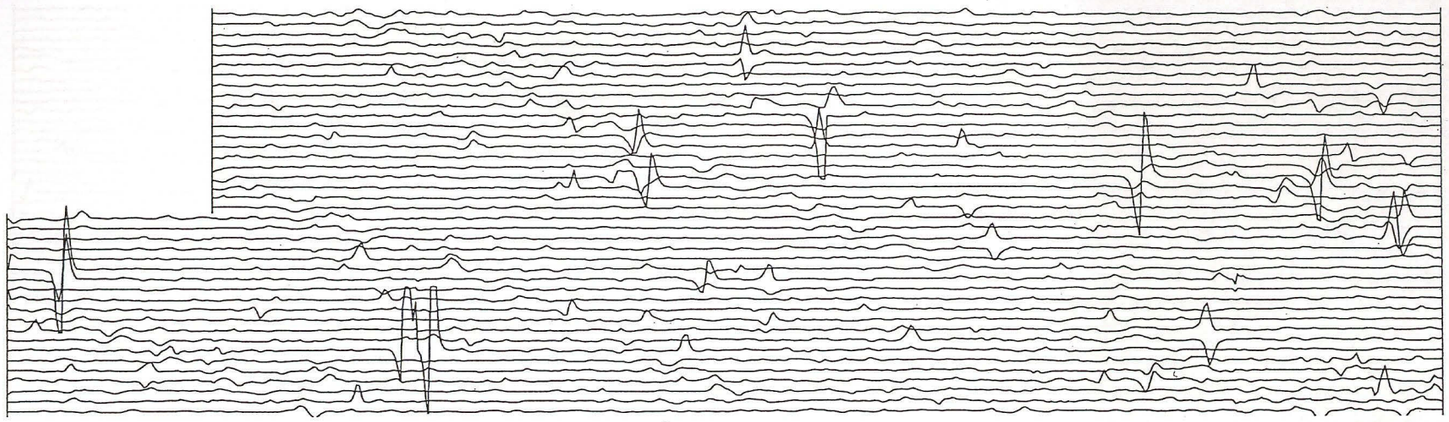
Trend

? Natural

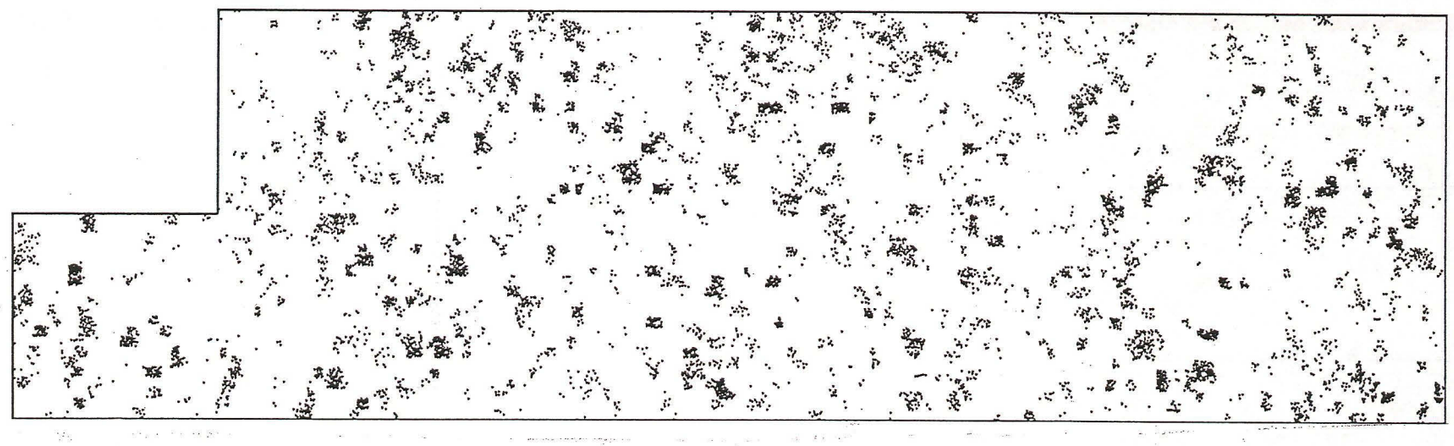
Ferrous

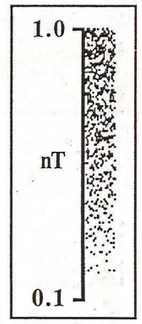
0 m 20

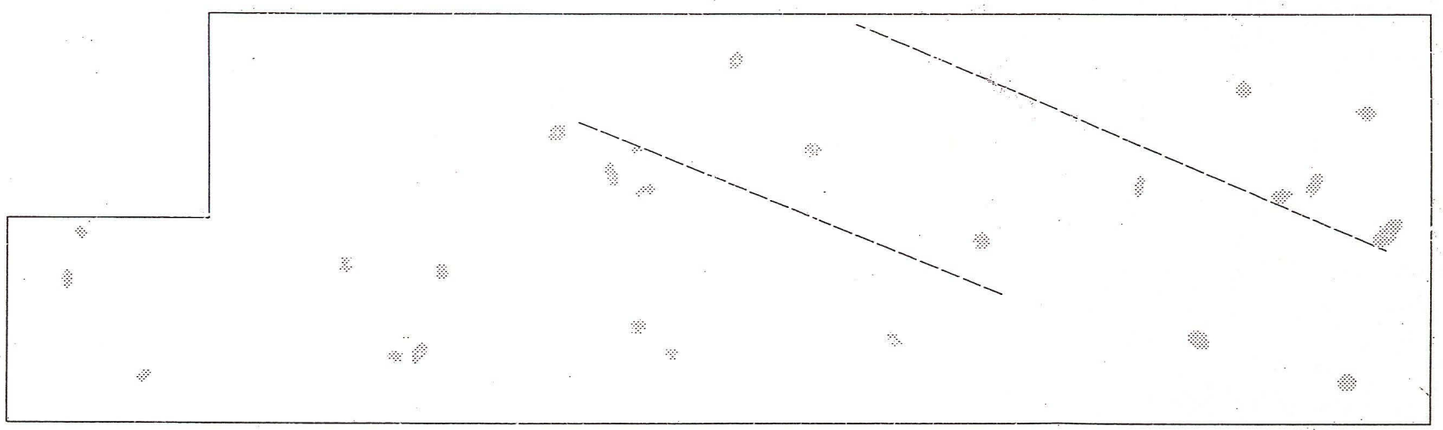
WHISBY QUARRY
Area 13C



15 nT







Trend

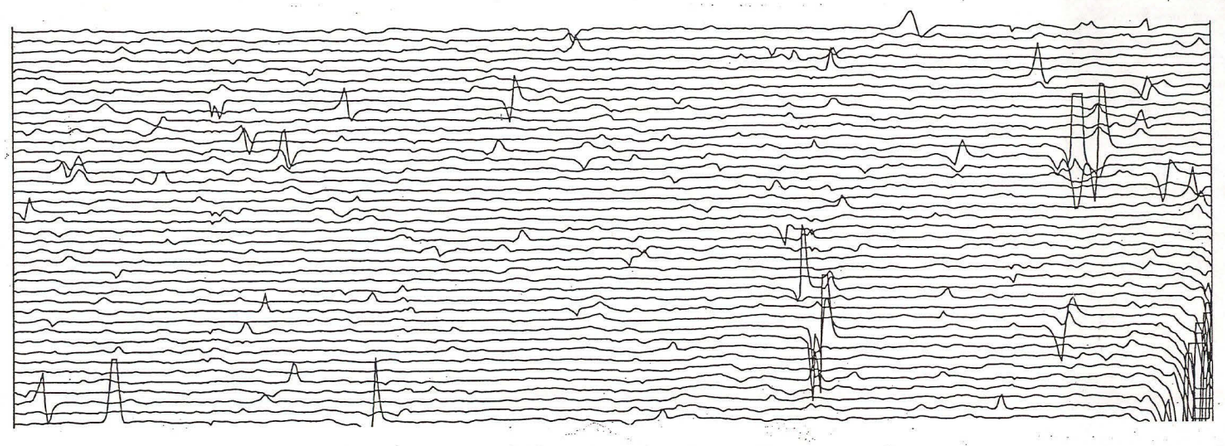
Ferrous

0 m 20

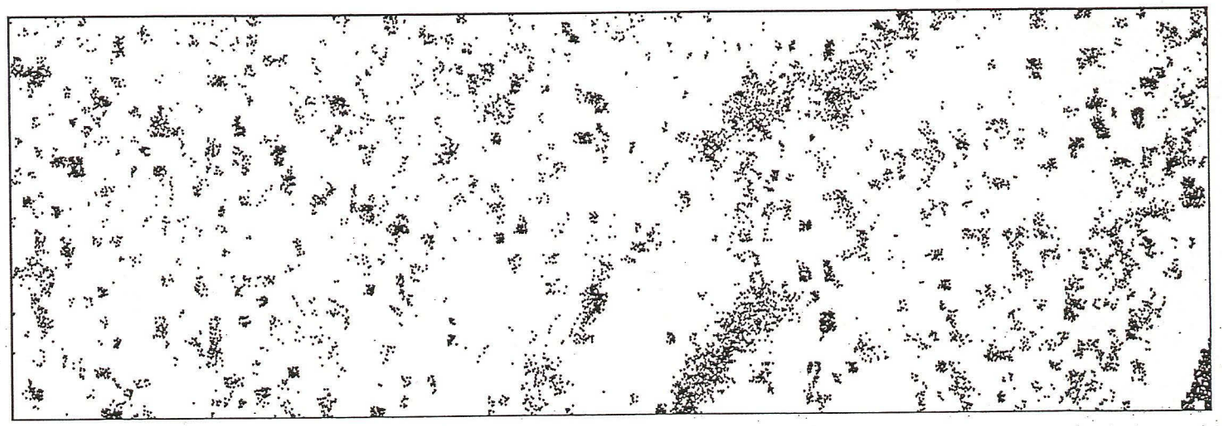
GSB Prospection Ltd. 2003/100

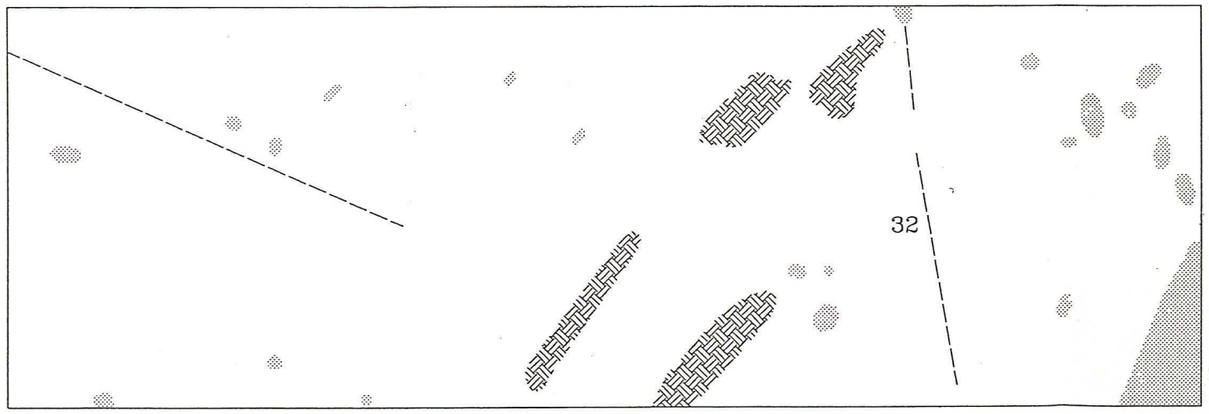
Figure 53

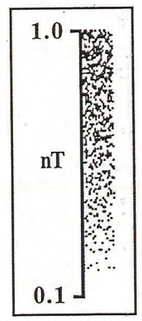
WHISBY QUARRY
Area 13D



15 nT







Trend

?Natural

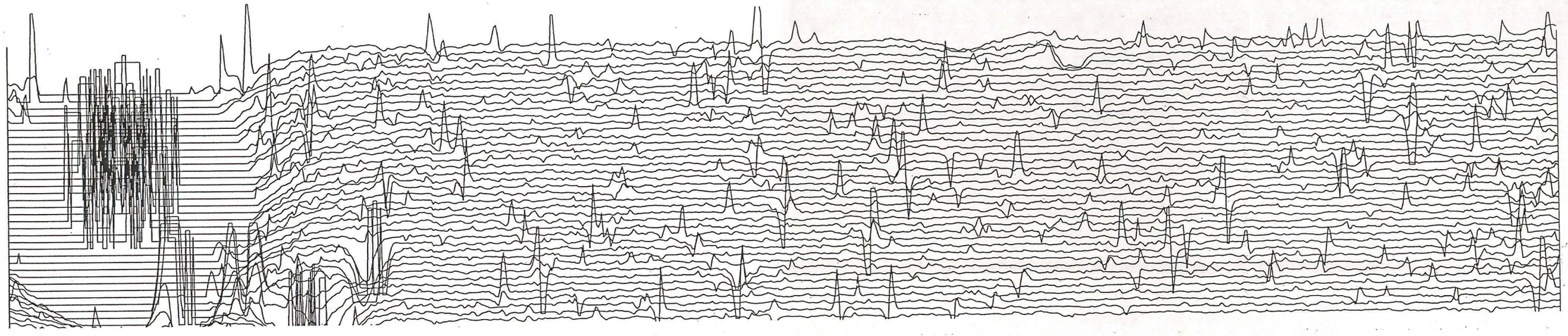
Ferrous

0 m 20

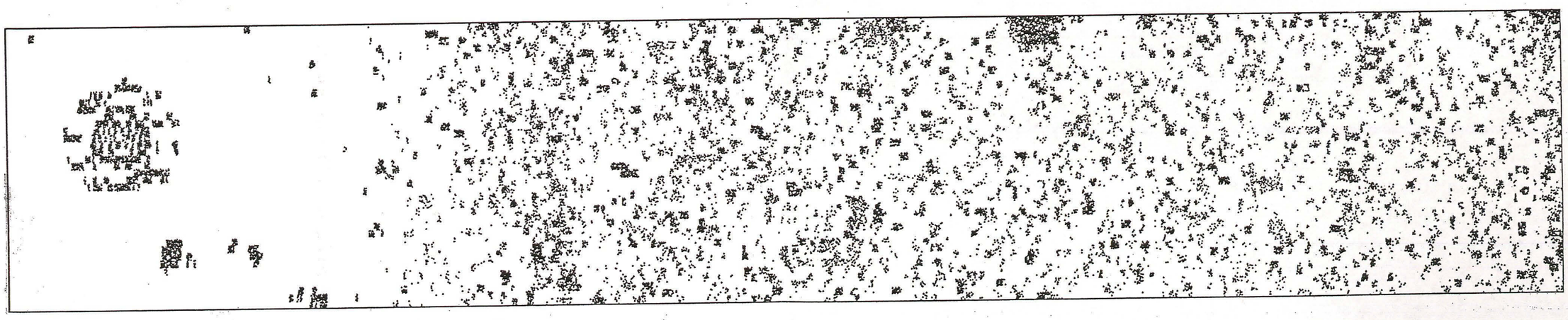
GSB Prospection Ltd. 2003/100

Figure 54

WHISBY QUARRY
Area 14A



15 nT



1.0
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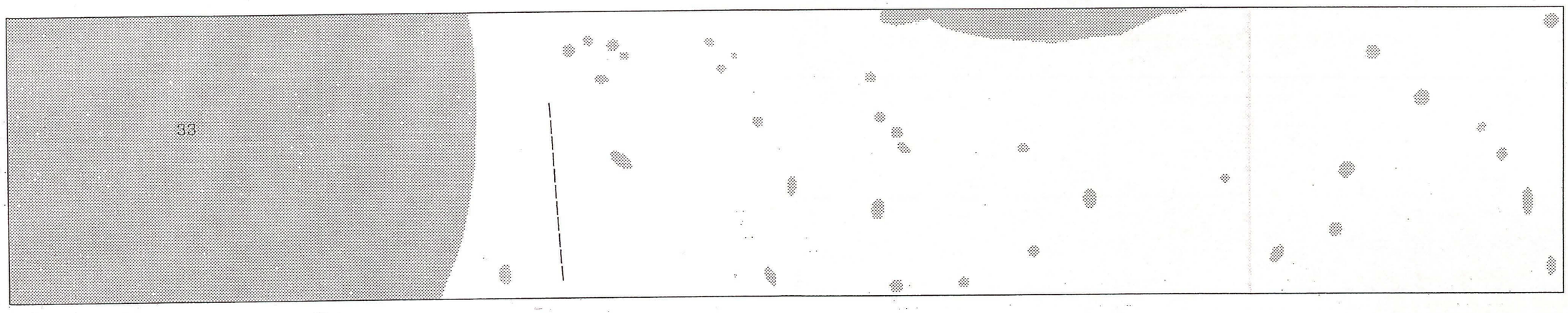
0 m 20

Figure 55

GSB Prospection Ltd. 2003/100

WHISBY QUARRY
Area 14A



Trend

Ferrous

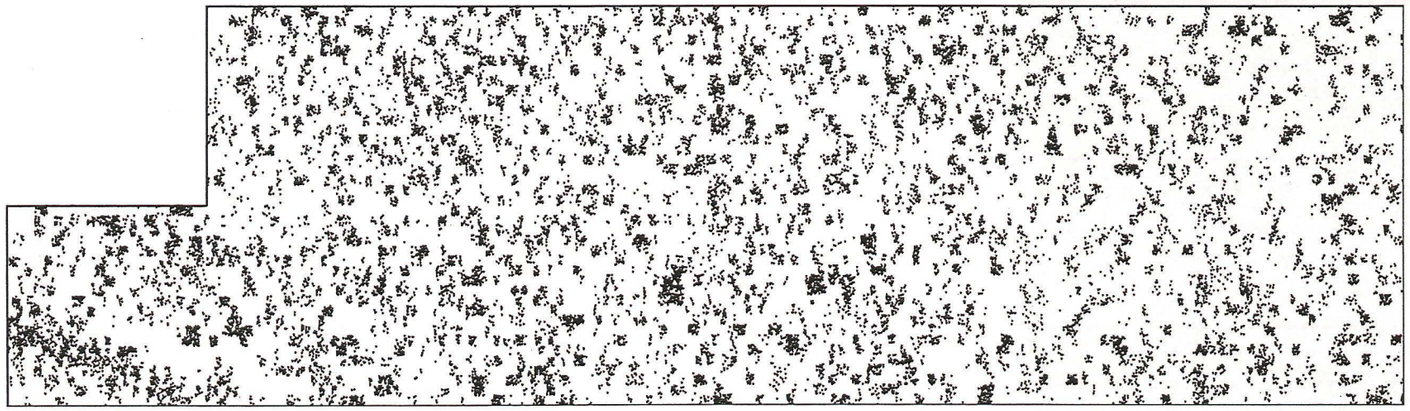
0 m 20

GSB Prospection Ltd. 2003/100

Figure 56

WHISBY QUARRY
Area 14B

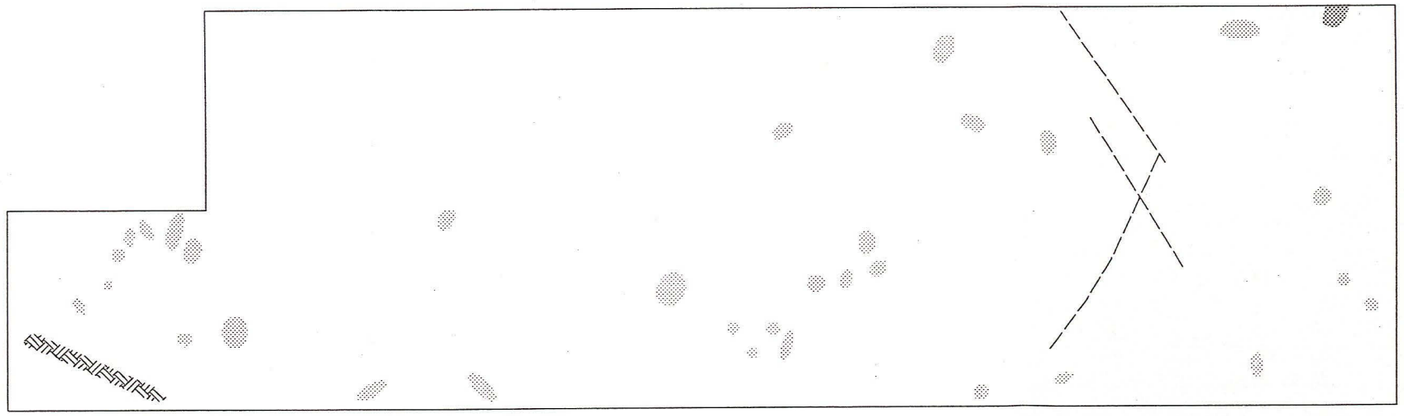
15 nT



1.0

nT

0.1



?Archaeology

Trend

?Natural

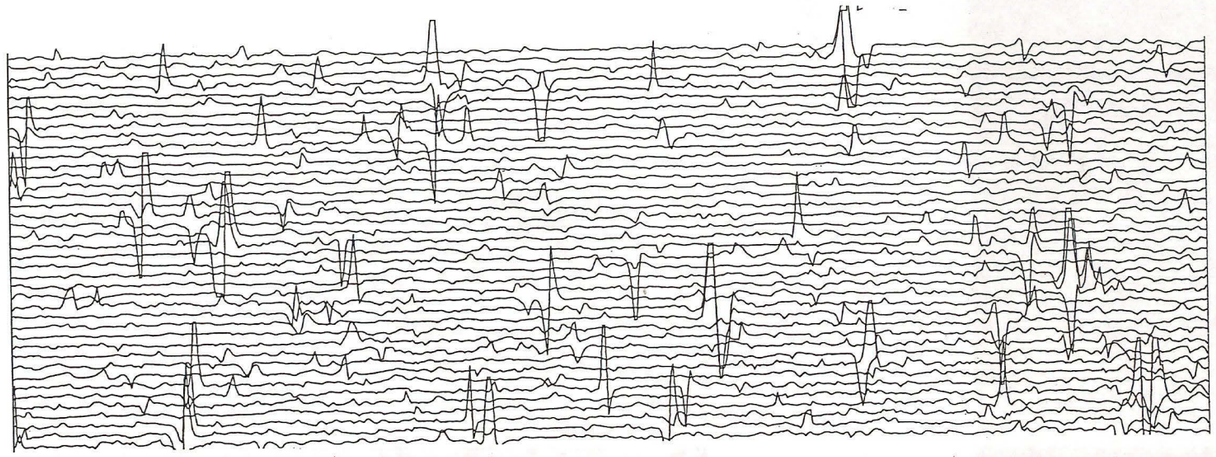
Ferrous

0 m 20

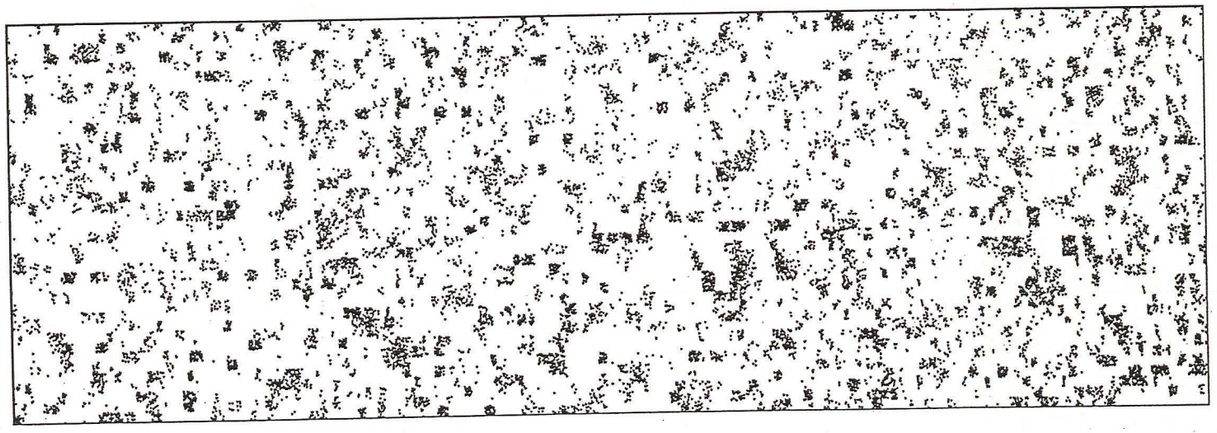
GSB Prospection Ltd. 2003/100

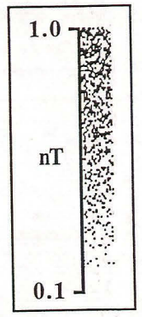
Figure 57

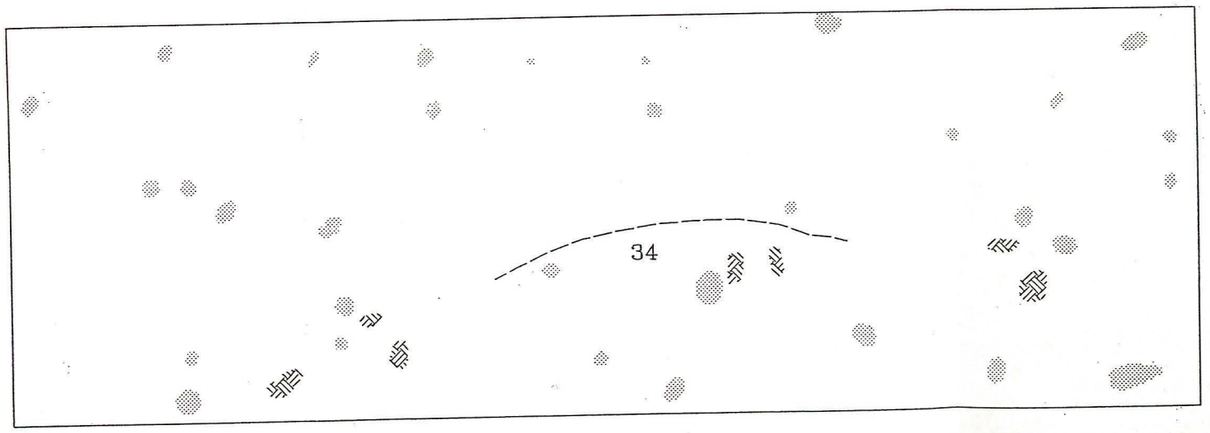
WHISBY QUARRY
Area 14C



15 nT



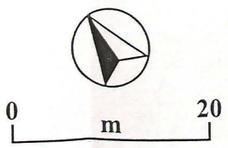




Trend

?Natural

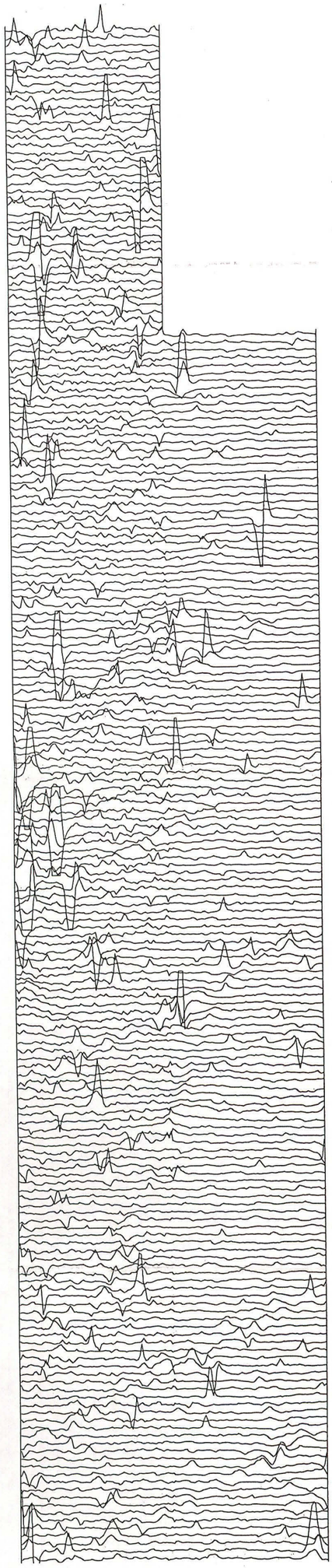
Ferrous



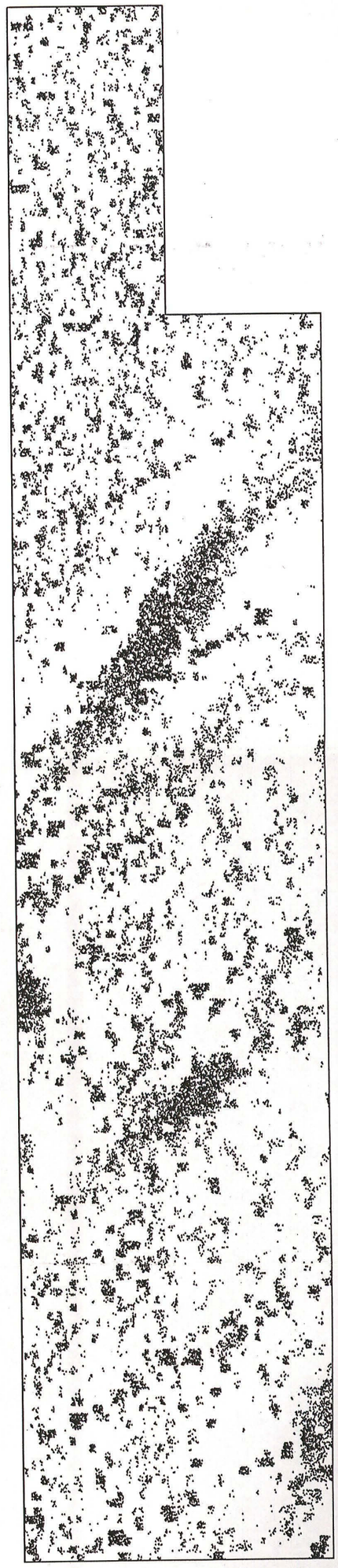
0 m 20

Figure 58

WHISBY QUARRY
Area 15



15 nT



1.0
nT
0.1

0 m 20

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Figure 59

WHISBY QUARRY
Area 15

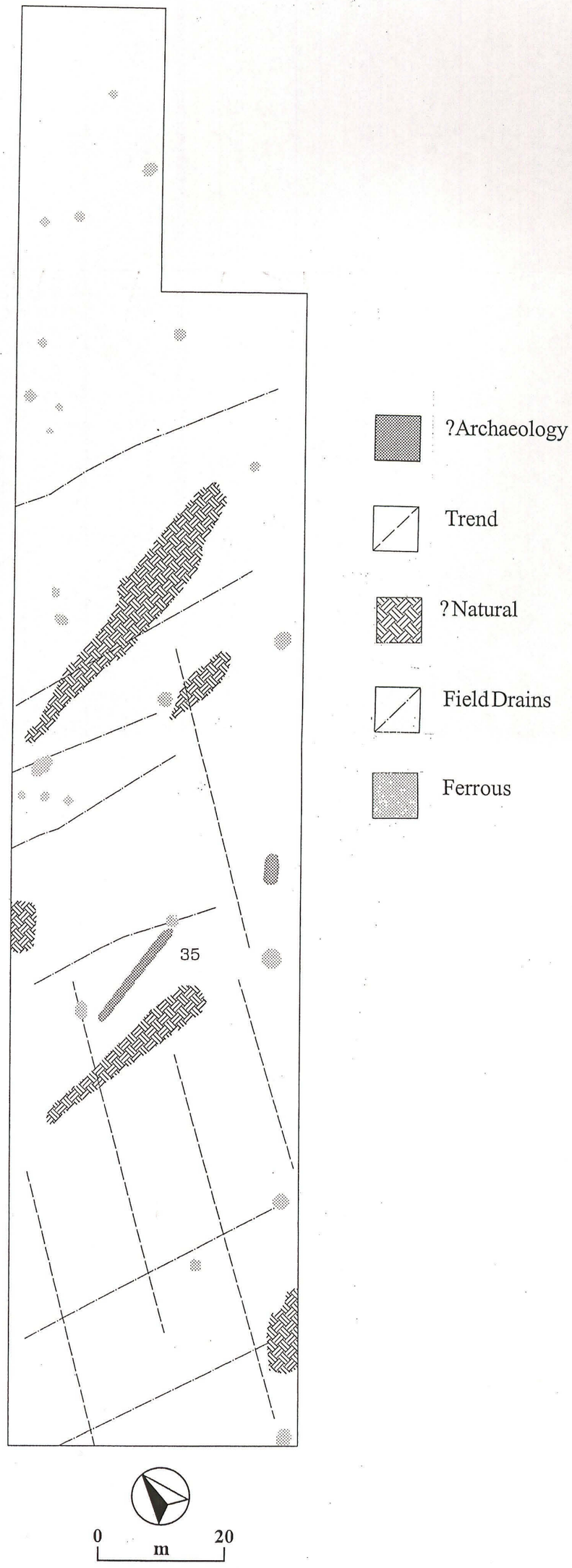

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Figure 60