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Magnetometer Results

by

Robert J. Huggins and John Weymouth

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Under the supervision of
David A. Breternitz, Senior Principal Investigator

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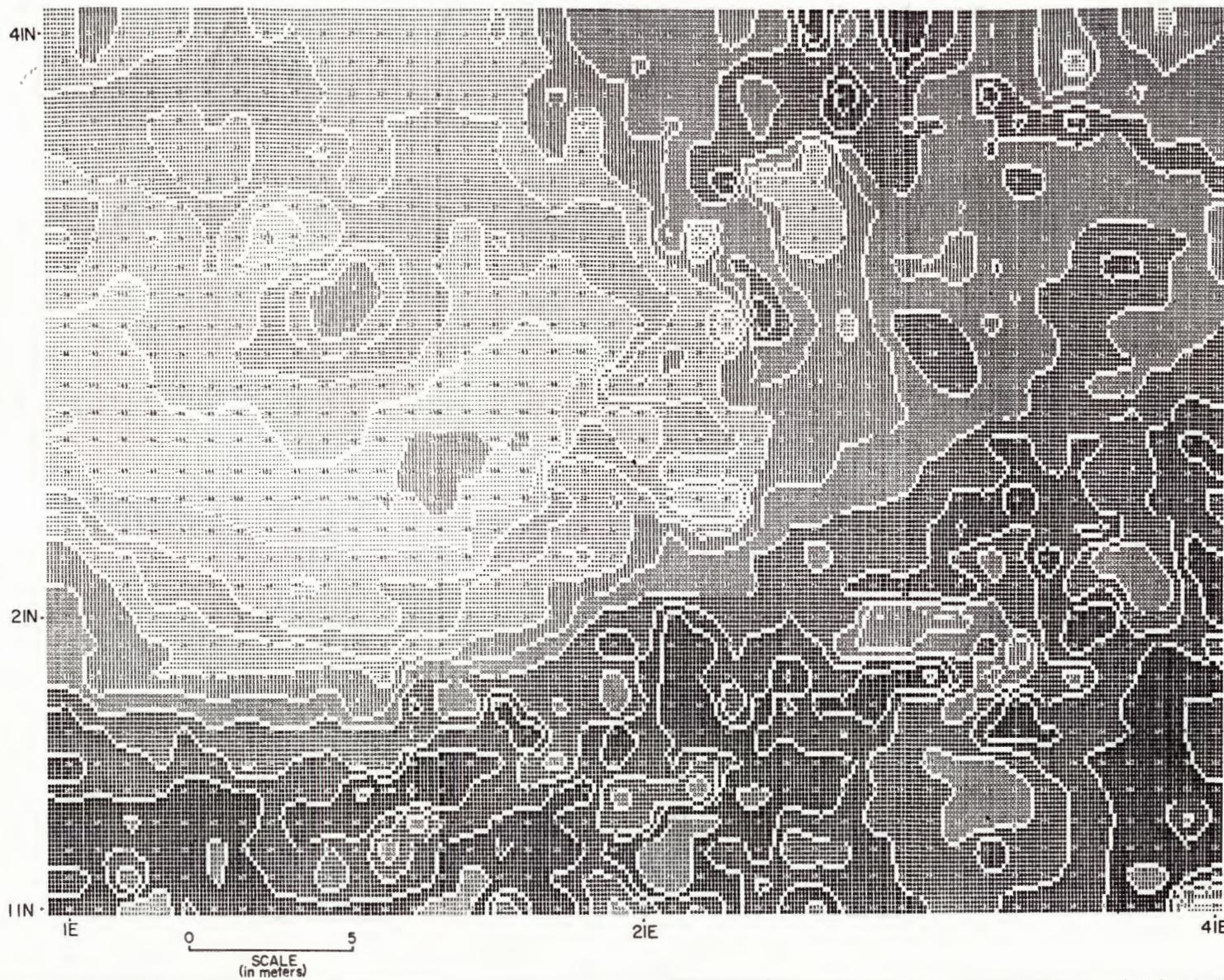
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7.1
 DESPIKED DATA,
 UNFILTERED

NUMERICAL VALUES ARE TOTAL MAGNETIC FIELD DEVIATIONS IN GAUSS OF
 1/4 SECOND SURVEY AND INDICATED WITH SIGN, IN DIFFERENTIAL MODE,
 BY 100, AND INDICATED BY POSITIVITY OF SIGNATURE.

DATA VALUE RANGES (G) -101.00 121.00

LEVEL	10-00	10-05	10-10	10-15	10-20	10-25	10-30	10-35	10-40	10-45	10-50
PERCENTAGE OF TOTAL SURVEYED POINTS FALLING TO EACH LEVEL	10.00	10.00	9.70	9.70	9.70	9.70	9.70	9.70	9.70	9.70	10.00
PERCENTAGE OF DATA POINTS IN EACH LEVEL											

CONTOUR INTERVALS- 30, 25, 20, 20, 20, 20, 20, 20 30 QUARTER
 GAMMAS.

ABSTRACT

As part of Dolores Cultural Resources Mitigation Program Field Operations in 1978, a magnetometer survey test program was implemented to determine the efficacy of such methods in facilitating excavation strategies. The program was begun on 12 September 1978 and was continued until late October. A total of 46 20 by 20 m blocks at 14 prehistoric sites was surveyed and the resultant data sent to the University of Nebraska for analysis and interpretation. By the report submission date (May 1979) 90 percent of the data had been processed; the remainder was completed in the summer of 1979 and the results were added to the manuscript. Magnetic anomalies recorded at prehistoric sites in the program area appear to reflect several primary sources: prehistoric cultural architecture or features, geological features, and modern ferrous artifacts (nails, cans, etc.). By considering the characteristics of each individual anomaly, it is usually possible to make a preliminary interpretation regarding the source and the potential for recovering archaeological data. Interpretations of magnetic maps for all of the 14 prehistoric sites examined in 1978 are presented and recommendations are made for future testing of promising anomalies by excavation.

INTRODUCTION

As part of the Dolores Archaeological Program, a magnetic reconnaissance survey was implemented in the fall of 1978 to assist in the investigation of areas affected by the proposed construction of the McPhee dam and reservoir and other facilities. The primary aim of the study was to use existing magnetic survey technology to aid in the location of subsurface archaeological features and to refine field and computing techniques to improve the resolution of magnetic methods in the Dolores Valley and similar archaeological areas. Preliminary results were presented in the form of a progress report submitted in February 1979; this report was submitted for editing and typing to the University of Colorado in May 1979. Most of this manuscript is devoted to individual summaries for each tested site, including descriptions of the suspected features, and computer maps of the magnetic fields.

The area to be affected by project construction and other activities contains over 1000 prehistoric archaeological sites which range in age from perhaps 5000 BC (the Archaic Tradition) to AD 1300 (the Anasazi Tradition). Most of the sites appear to be small in size, consisting of one or two house structures and other smaller peripheral features; however, there are a few very large sites with 10-20 houses. The sites are situated in most cases on ridgelines, hillocks or on gentle slopes. The valley itself is a floodplain of the Dolores River and the sites in the valley are located on flat lying sedimentary strata with few important discontinuities. The bedrock which underlies the sites (usually encountered between 1 and 5 m in

depth) is a uniform sandstone and appears to have weak magnetic properties.

The archaeological features excavated are constructed of a variety of natural materials ranging from adobe to sandstone blocks and wood substances. During archaeological excavations, burned features (potential magnetic anomalies) are often encountered; these include burned pithouses, storage rooms, and hearths. Several of the sites have been disturbed by farming and it is likely that postarchaeological iron objects are present on and in the sites.

MAGNETIC RECONNAISSANCE FIELD WORK

The magnetic reconnaissance survey field operations were initiated in September 1978 and were directed by Rob Huggins. For the first week, suitable field equipment was devised for accurately locating the reading points, grids were set out to define the boundaries of the survey, and a field crew of three people was trained and tested to ensure accurate data collection. The actual survey commenced 12 September 1978 and continued until late October. Two quarter gamma sensitive proton magnetometers were used to take readings of total magnetic field in the difference mode with one stationary and one moving magnetometer. All the sites were surveyed at a 1 sq m sampling rate, and a total of 46 20 by 20-m "blocks" (13,400 sq m) was ultimately sampled in this fashion. A more detailed presentation of magnetic reconnaissance field operations is presented by Hathaway [1].

INTERPRETATIONS

The results of the reconnaissance will be presented on a site-by-site basis as the interpretation of each requires a separate report. The interpretations follow a common format: 1) a written description detailing all of the pertinent anomalies with suggestions about their origin, geometry, and depth (where possible), 2) suggested location of excavation test squares, and 3) projected areas of interest outside the survey boundaries.

Data Description

As in archaeology, physics has developed a nomenclature to aid in the accurate description of the quantities with which it deals. This complicates communication in an interdisciplinary field such as archaeomagnetism, so the following discussion has been included to help clarify any ambiguity in the site-by-site description of the magnetic reconnaissance.

In simplified terms, a magnetic anomaly is caused by differences in the concentration, orientation, and mineralogical composition of the iron oxides between the feature of interest and the surrounding medium. This difference is known as the "susceptibility contrast" and is produced by a variety of cultural and noncultural processes. When the contrast of a feature has sufficient magnitude, an "anomaly" in the earth's magnetic field can be detected in the vicinity of the feature, using a proton magnetometer. There are several cultural processes which can produce susceptibility contrasts. These are:

1. Intense burning, found in fire hearths and other burned

architectural features. Anomalies produced by this process are generally the largest in magnitude.

2. Differences in compaction of the soil, as found in frequently traveled pathways, masonry structures, and softer fill in buried architectural features.

3. Organic fermentation, as occurs in trash-filled cists or food storage areas. Production of this contrast requires moisture so it is of lesser importance in the dry Dolores area.

Delineation of cultural features would be simplified if not for noncultural geological and more recent processes. Because of varying rates of sedimentation and changes in source areas, soil in river bottoms and flood plains such as the Dolores Valley can have a variety of susceptibility contrasts and introduce unwanted anomalies. Other anomalies, such as those resulting from other artifacts of iron implements of historic origin, also confuse the magnetometer readings.

Anomalies produced from cultural and noncultural processes have a large range of sizes and shapes. One of the most distinctive shapes is the "dipole," which is typified on a SYMAP or a line contour map by a high region with a closely associated low, or negative, region. Undisturbed prehistoric culturally formed dipole anomalies also have an "orientation" which can be used to distinguish them from recent or geologic features. In the former case a line drawn from the center of the high to the center of the low, points toward the magnetic north pole present at the time the anomaly was formed-which was in the range of 0 degrees to 10 degrees E of our present-day magnetic north. This particular orientation will be referred to as "normal" as it is the position in which most dipole prehistoric anomalies are formed. This position is contrasted with

"reoriented" dipoles, whose orientation is other than 0 degrees to 10 degrees E of north. The sources of reoriented dipoles are usually nonarchaeological in nature. Shallow, localized archaeological features such as fire hearths and well-decayed cists produce normally oriented dipoles whose low contribution is about 15 percent of the high. Bits of metal, igneous glacial boulders, and other nonarchaeological magnetic materials usually produce reoriented dipoles which typically have a low to high ratio of greater than 15 percent.

If an anomaly-producing feature is less localized and more extended, the contribution from the low is reduced, often to such an extent that only a single high region is detectable with the magnetometer. In other cases only isolated lows or negative anomalies are observed, a result of a reduced susceptibility contrast. These types of anomalies are known as "monopoles." High monopoles occur over larger or deeper burned features such as the pithouses at Dos Casas Hamlet (5MT2193), over frequently traveled pathways, or over masonry structures with a high susceptibility contrast. Geological features such as resedimented stream beds can also produce low or high monopoles depending on their susceptibility contrast; the size of these latter phenomena usually suggests they are nonarchaeological. In summary, archaeologically encountered magnetic anomalies can be described as a continuum ranging from the dipole to the monopole, each with a different possible shape, orientation, and magnitude.

Depth calculations to features are sometimes possible and are elementary if the source can be approximated by a single point dipole or monopole. This depth estimation is gained from a formulation known as the full width half maximum method (FWHM). In this case the depth to the

feature from the sensor is equal to the width of the anomaly profile at one-half the maximum value.

Where practical, actual susceptibility measurements have been taken from soil samples of the archaeological features, using a separate instrument. These measurements can be used to create models of what the magnetic field might look like over idealized features, to aid location and depth estimations.

Fortunately, most of the noncultural anomalies have either distinctive shapes or orientations which distinguish them from archaeological ones. However, there are cases where the difference is indistinguishable, for example, when archaeological sources have been physically reoriented or when nonarchaeological sources are small in magnitude and have fields directed northwards. The solution to many of these problems appears to lie in a combination of analytical calculation and plain experience. However, there are cases where the source produces an ambiguous anomaly and only excavation will yield the answer.

Assignment of Test Squares

The test squares on each grid were chosen on the basis of several interacting criteria. For each site we have a high degree of confidence that certain anomalies are caused by cultural features, whereas others are due to recent historical, geological or unknown factors. Consequently, test squares over suspected cultural anomalies are numbered in preferred order of excavation, with "1" indicating the square in which there is a greater likelihood of encountering an archaeological feature. However, digging a sterile square reduces the probability of similarly numbered squares being productive, so a decision should be made whether it might be

worth continuing their excavation. Some suspected noncultural anomalies are also occasionally of interest, and it would be useful to excavate them if time permits; this would give a better understanding of their source and assist interpretation when similar responses recur. Test squares over these anomalies have a similar priority scheme but they are marked with an "E" to distinguish them from test squares of primary interest.

Areas of Projected Interest

Some of the anomalies extend off the map or imply features in areas not surveyed. A suggestion has been made in each case as to the direction that the survey might take, if a decision is made to extend the grid.

RESULTS OF THE ANALYSIS

Analysis of the data collected in the field and submitted to the University of Nebraska in the fall of 1978 was approximately 90 percent complete by the submission date of this report (May 1979); the remainder was completed during the following summer. Detailed analysis and finished maps are now completed for all sites (5MT0023, 5MT2192, 5MT2193, 5MT2194, 5MT2198, 5MT2199, 5MT2203, 5MT2236, 5MT2844, 5MT2848, 5MT2853, 5MT4478, 5MT4512, 5MT4545, and 5MT4614); a site-specific discussion of analytical results to date is presented below for the 15 sites. Before the detailed discussion, a glossary of technical terms is included to aid in interpretation.

Glossary

A brief glossary of technical terms used in the site-specific narrative is as follows:

dipole - a feature whose anomaly is characterized by an associated low-high pair.

normal dipole orientation - a line, from the center of the high to the center of the low, points between 0 degree to 10 degree east of north

reoriented dipole - the line, from the high to the low, points other than from 0 degree to 10 degree east of north.

monopole - a feature whose anomaly is a separate high or a separate low.

susceptibility contrast - a quantitative measurement of the magnetic properties of a feature distinct from the magnetic properties of the material which surrounds it.

High positive susceptibility = high anomaly

Low positive susceptibility = low anomaly

Negative susceptibility = negative anomaly

Site 5MT0023 (Grass Mesa Village), Grid 1

Grid 1 at Site 5MT0023 (Grass Mesa Village) was surveyed on 3 and 4 October; Grid 1 covered two full blocks (20 by 20 m) and two half blocks (20 by 10 m). Several problems were encountered in the field and during the data processing; corrective measures were taken where possible. Thick vegetation on the site impeded progress and had to be removed manually. Holes large enough to affect the magnetic field were present at several locations and had to be mapped carefully in relation to the survey grid by the field crew. These irregularities are too numerous to list; the reader should refer to the original field notes for a comprehensive map. Besides the small "pot hole" topographic irregularities, a large circular depression approximately 25 m in diameter and 2 m deep in the center was included in the grid location. Because of the moderate slope of the depression, pronounced effects on the magnetic field are unlikely. The magnetic features visible within the depression are caused by varying susceptibility contrasts rather than by contributions from the topography.

During the course of the survey, several ferrous metal objects were found on the site and removed. Erratic readings in other localized areas suggested the presence of ferrous metal objects buried beneath the surface; the effects of these objects were reduced during the data processing, but some ambiguities still remain.

In an attempt to minimize the smaller topographic effects, the topographic variation was plotted directly on the line contour maps during analysis which allowed a qualitative judgment of how the terrain affected the magnetic field. The unfiltered, despiked magnetic field is shown in the two different magnetic representations of the surveyed area, Figure

Figure 7.1: Magnetic contour map (SYMAP) of Grid 1, Site 5MT0023, Grass Mesa Village. The contour levels include data ranges of 30, 25, 20, 20, 20, 20, 20, 20, and 30 quarter gammas.

7.1, the SYMAP, and Figure 7.2, the line contour map. The despiking procedure (to remove large intrusions in the field most likely caused by ferrous objects) was calculated by hand and involved replacing the irregular data value by an average of its surrounding neighbors. In total, about 60 data values were replaced by this method, which improved the resolution of the type of anomalies suspected to be caused by archaeological features.

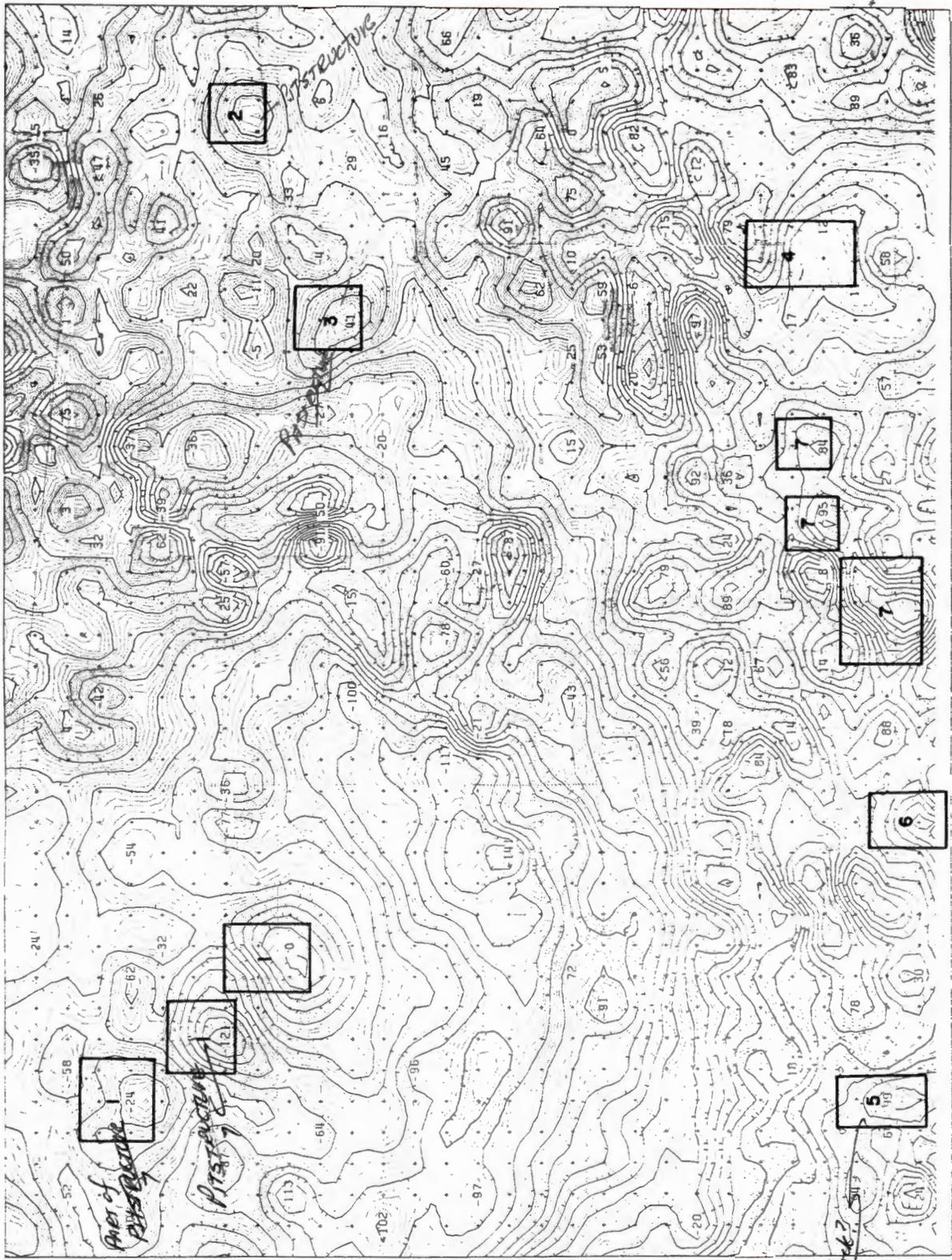
Filtering methods were utilized in an attempt to gain more information. Convolution filtering was carried out on the data and parameters were chosen to enhance anomalies that were 1 to 2 m wide (Figure 7.3) and 3 to 5 m wide (Figure 7.4).

In examining the despiked, unfiltered data (Figures 7.1 and 7.2), a few dominant features are evident. The large depression is magnetically lower than its surroundings. This implies a feature which was originally deeper than at present and which has accumulated a depth of less consolidated sediment. This appears likely, as the soil has the characteristics of wind blown deposition.

In the center of the depression is a pronounced high, centered on point (32N,11E), which rises about 20 gammas above the background (assumed to be about -65 quarter gammas in this locale). FWHM measurements suggest an unreasonable depth; it can only be inferred that the source might be a buried, burned feature. However, the presence of a low anomaly to the northwest introduces an ambiguity: whether the high is actually an isolated monopole. If the high and low are magnetically associated, the anomaly might be caused by a piece of metal. In Figure 7.3 (the band pass filtered data which enhance anomalies under 2 m wide) the high and low anomaly are more distinct; another high, at point (28N,26E), appears, which was

Figure 7.2: Line contour map of Grid 1, Site 5MT0023
with 10 quarter gamma contour intervals.

CONTAIN MAP
DOLONT 3 ARCHAEOLOGICAL PROJECT -- HAND DESPIKED DATA.
INTERVAL = 10.0



41 31 0 5
SCALE
(in meters)

11 21 31 41
DESPIKED UNFILTERED DATA - VALUES ARE IN 1/4 GAMMA UNITS.

SQUARES INDICATE SUGGESTED
TEST AREAS. THE NUMBERING
SCHEME IS EXPLAINED IN THE
INTRODUCTION.



7.2

Figure 7.3: Magnetic contour map (SYMAP) of Grid 1, Site 5MT0023, showing data filtered with a convolution filter to enhance anomalies 1 to 2 wide. Contour levels include data ranges of 23, 7, 6, 4, 4, 5, 6, and 23 quarter gammas.



DESPIKED DATA FILTERED
TO ENHANCE ANOMALIES
1 TO 2 METERS WIDE.

MAP OF POINTS WITH HILLS IN REPRESENTING HILLS—VALUES ARE IN
METERS (FEET) POINTS ARE INDICATED BY THE POSITION OF THE SQUARE
AND 10%—100% HILLS (PROPORTION OF HILLS) 100% OF POINTS.

DATA VALUE RANGES ARE: -10.00 40.00

PERCENTAGE OF TOTAL HILLS VALUE RANGE ANALYZED TO EACH LEVEL

LEVEL	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
PERCENTAGE	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00

PERCENTAGE DISTRIBUTION OF DATA POINTS VALUE TO EACH LEVEL

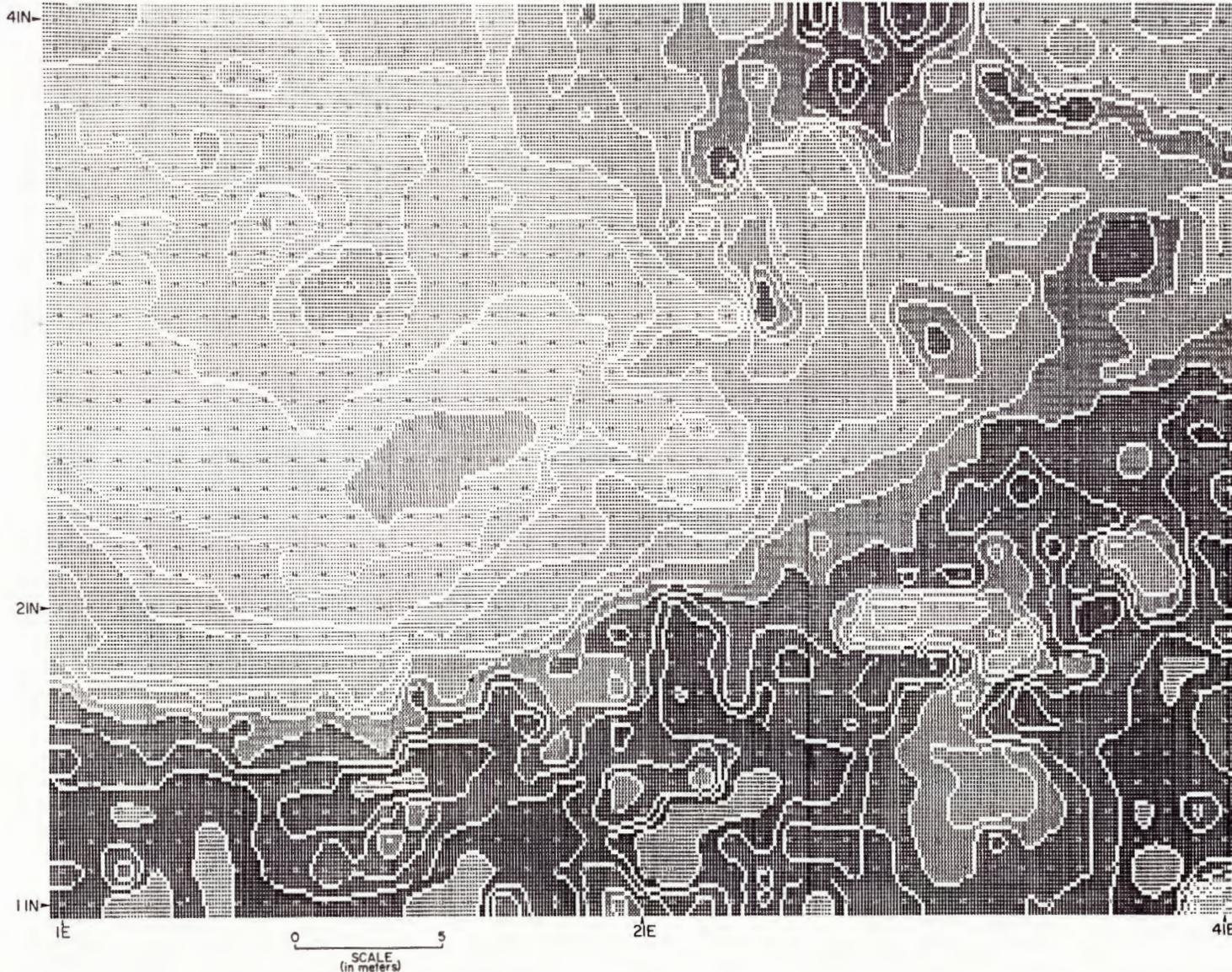
LEVEL	10-20	20-30	30-40	40-50	50-60	60-70	70-80	80-90	90-100
PERCENTAGE	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00

CONTOUR INTERVAL = 23, 7, 6, 4, 4, 5, 6, 23 QUARTER
GAMMAS.

7.4
73

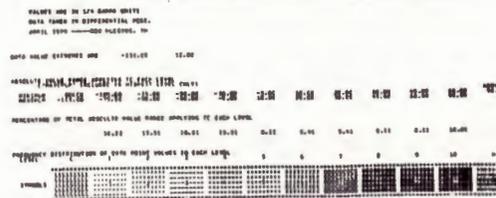
Figure 7.4: Magnetic contour map (SYMAP) of Grid 1, Site 5MT0023, showing data filtered with a convolution filter to enhance anomalies 3 to 5 wide. Contour levels include data ranges of 30, 25, 20, 25, 15, 10, 10, 15, 15, and 20 quarter gammas.

DOLORES ARCHAEOLOGICAL PROGRAM SITE 0023 (GRASS MESA)



7.3
7.4

DESPIKED DATA FILTERED
TO ENHANCE ANOMALIES
3 TO 5 METERS WIDE.



CONTOUR INTERVALS = 30, 25, 20, 25, 15, 10, 10, 15, 15, 20
QUARTER GAMMAS.

masked in the unfiltered data (Figure 7.1). Like the larger monopole high to the southeast, this high is close to the low but lacks the tight association that is characteristic of the anomaly caused by an iron object. In summary, it appears that there is a feature in the center which might have archaeological affiliations, but if the source is entirely cultural it is more complex than a simple hearth. It is worth investigating, and an excavation test square has been assigned to the anomaly (Figure 7.2).

Around the periphery of the depression is an area of high magnetic variability. This is due in part to the topography and in part to some unwanted ferrous contributions to the magnetic field that the despiking was unable to remove. Although several anomalies are visible, only those which appear to have archeologically significant contributions to the magnetic field (accounting for topography and metal objects) have been selected as test locations. The first, visible in the area (11-14N,6E) on the line contour map (Figure 7.2) and on Figures 7.3 and 7.4, is a monopole high suggestive of a burned region. Because of the disturbances in the field introduced by despiking and filtering, depth estimates to the source of the anomalies have not been considered in the following cases.

Another monopole high of potential interest is located at point (11N,15E). There are no despiked points here and no prominent topography; thus the contribution might be from a burned feature.

The next monopole high is located within the points (11N,19E), (16N,22E), (15N,27E), and (11N,24E), and corresponds to a section with a mound of earth in the center, but the anomaly appears to be somewhat larger than the contribution expected from the topographic feature. Recommended locations of excavation test squares are indicated in Figure 7.2. The third anomaly in this area, characterized by high magnetic variance, is a

circular low, situated around the point (14N,33E). It has all the characteristics of a circular feature filled with soft sediment and is best illustrated in Figure 7.4.

Another region of interest is a monopole high centered on the point (33N,38E). The area is topographically flat and there are no despiked points close by. It appears to be one of the better possibilities for indicating an archaeological feature.

One anomaly visible on the filtered map is almost undetectable on the unfiltered data. It is a monopole high situated on the point (30N,31E) and appears to indicate a burned feature.

In summary, there are other anomalies which might have archaeological sources but because most of these anomalies have a close association with the topography or an irregular data value caused by metal objects, there is a degree of uncertainty about the source. This region of Grass Mesa Village represents conditions which tax the utility of the magnetic reconnaissance method by introducing enough nonarchaeological debris to greatly increase the possibility of erroneous interpretation. The magnetic maps can be used to select other excavation test squares, but the probability of success is reduced.

Site 5MT0023, Grass Mesa Village, Grid 2

The data collection at Site 5MT0023, Grid 2 (Figure 7.5), commenced on 11 May 1979 and continued intermittently until the beginning of August. Grid 2 is located east of Grid 1, which covers the depression on the west end of the site. Repetition of two blocks was necessary because of inconsistency in the data caused by the highly irregular terrain and instrument difficulties. Although the magnetic field over Grid 2 has a

high degree of variation, individual anomalies of potential archaeological interest are much more distinct than on Grid 1. Several igneous river cobbles composed of a rock with a typically high magnetic contrast were found on the site. These cobbles could be the source of the strong localized dipole and monopole anomalies found intermittently on Grid 2 and in abundance around the periphery of the large depression on Grid 1. Some of these strong anomalies can also be accounted for by the presence of ferrous objects, such as tin cans found on the surface.

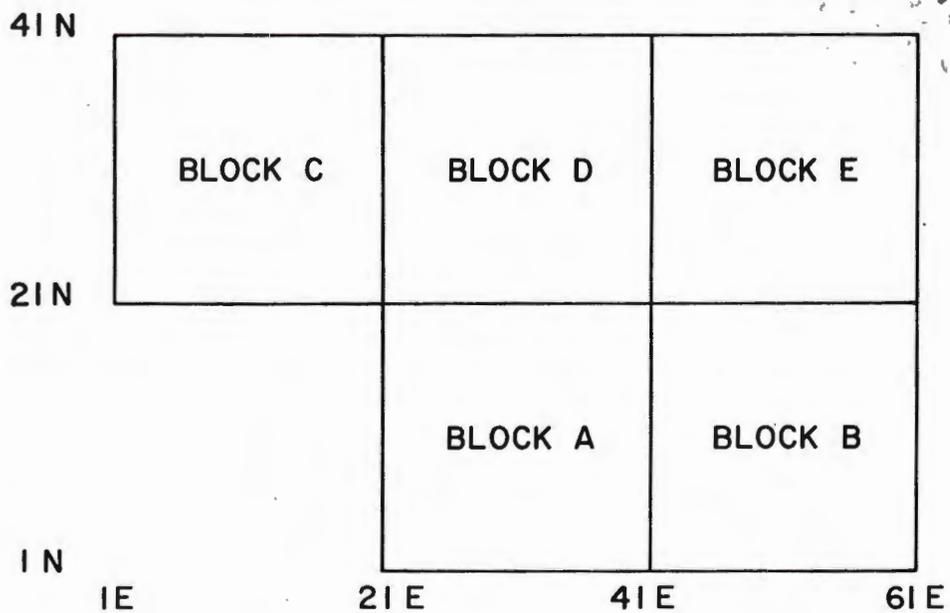
The topography of the site was highly irregular and contributed to difficulties in both the data analysis and the field work. Copies of the field maps drawn by the field crew are shown in Figures 7.6, 7.7, 7.8, 7.9, and 7.10 and proved very useful in distinguishing the potential archaeological anomalies from those caused by terrain.

After preliminary analysis, in early July, information on Blocks C and D was sent to the Dolores Program, with a description of four anomalies and a computer map, for use in the field. Once the data on the remaining three blocks arrived and were interpreted, a second preliminary report was sent (on 2 August), including maps and an explanation of the juxtaposition of Grid 1 and Grid 2 (shown in Figure 7.5). The remainder of the report re-examines each anomaly to attempt a more exacting description as well as showing some other filtering experiments which revealed two more anomalies of potential archaeological interest. The anomalies are indicated in the SYMAPS (Figure 7.11 and 7.12) and the line contour map (Figure 7.13) of Grid 2, Site 5MT0023.

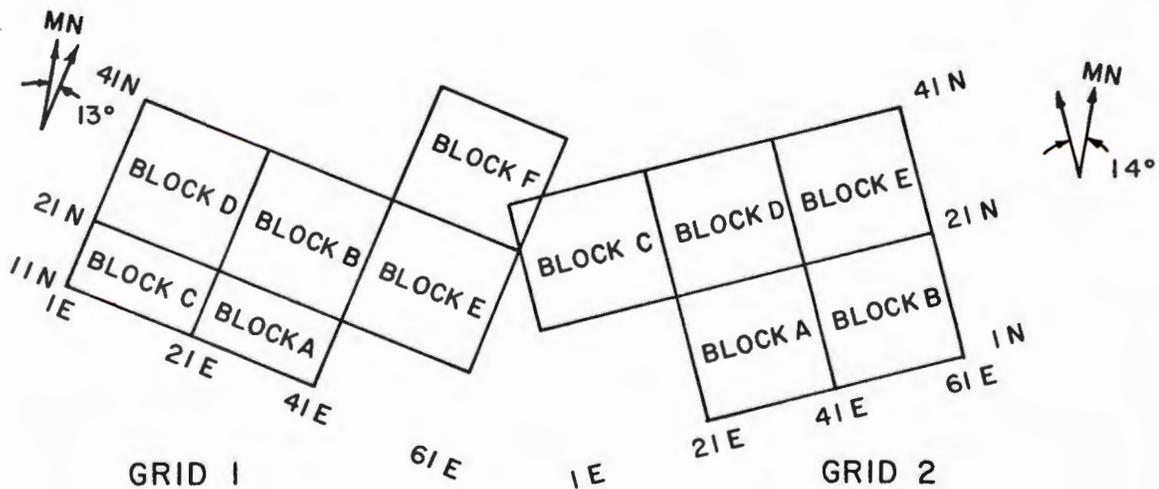
Anomaly 1a

This anomaly appears to be a likely pitstructure. It is a monopole high located at point (38N,40E) with a small low to the north, suggesting

Figure 7.5: Outline of the block designations for Site 5MT0023, Grid 2 (upper diagram), and positioning of Grid 1 with respect to Grid 2 (lower diagram).



MAGNETIC SURVEY BLOCKS, SITE 5MT0023 GRID NO. 2

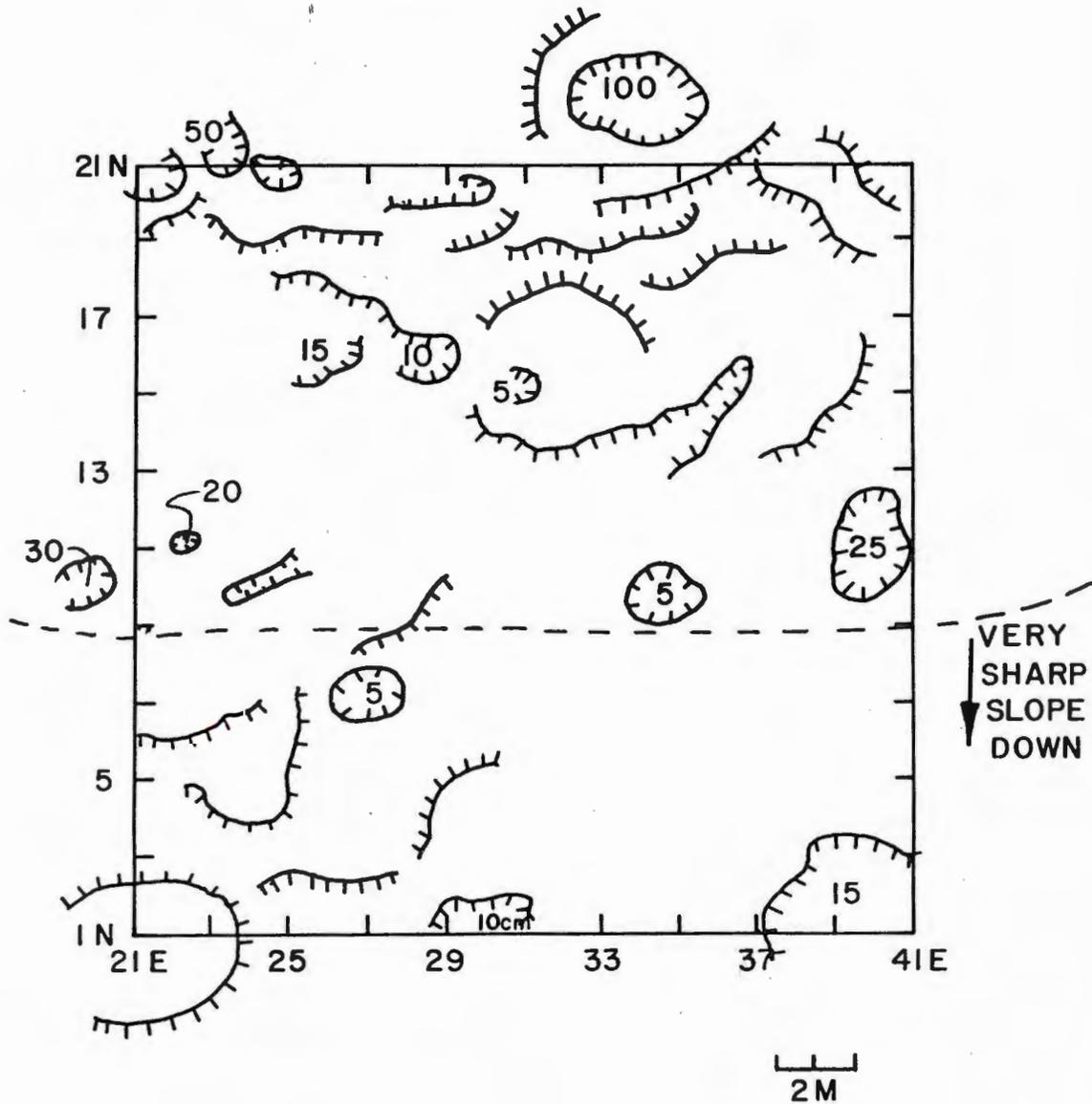


RELATIVE POSITIONING OF GRID 1 AND GRID 2
ON SITE 5MT0023, GRASS MESA

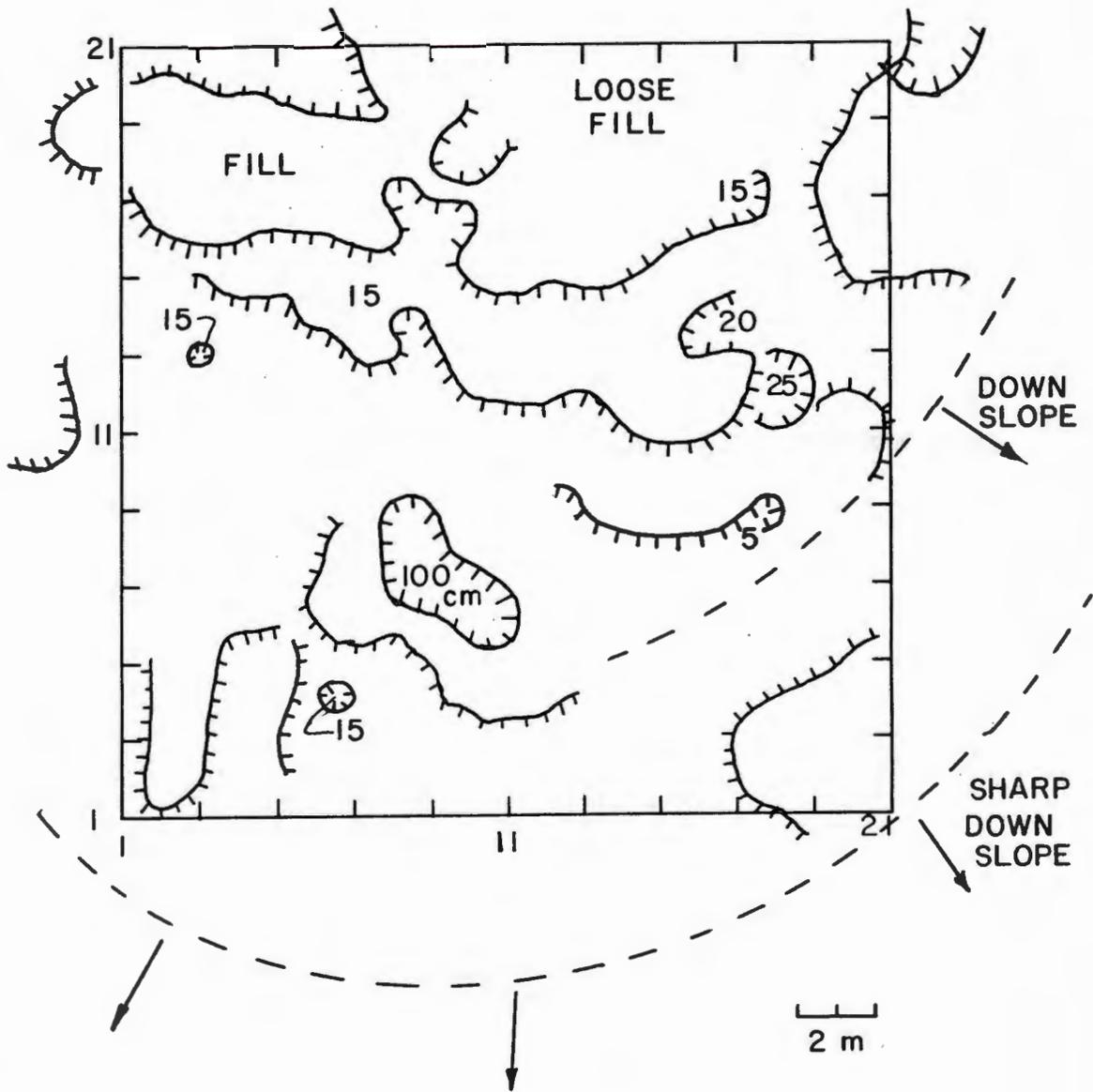
7.11 & 7.12

Figures 7.6, 7.7, 7.8, 7.9, and 7.10: Field maps showing approximate topographic relief for Blocks A, B, C, D, and E on Site 5MT0023, Grid 2. Depth of depressions are expressed in centimeters.

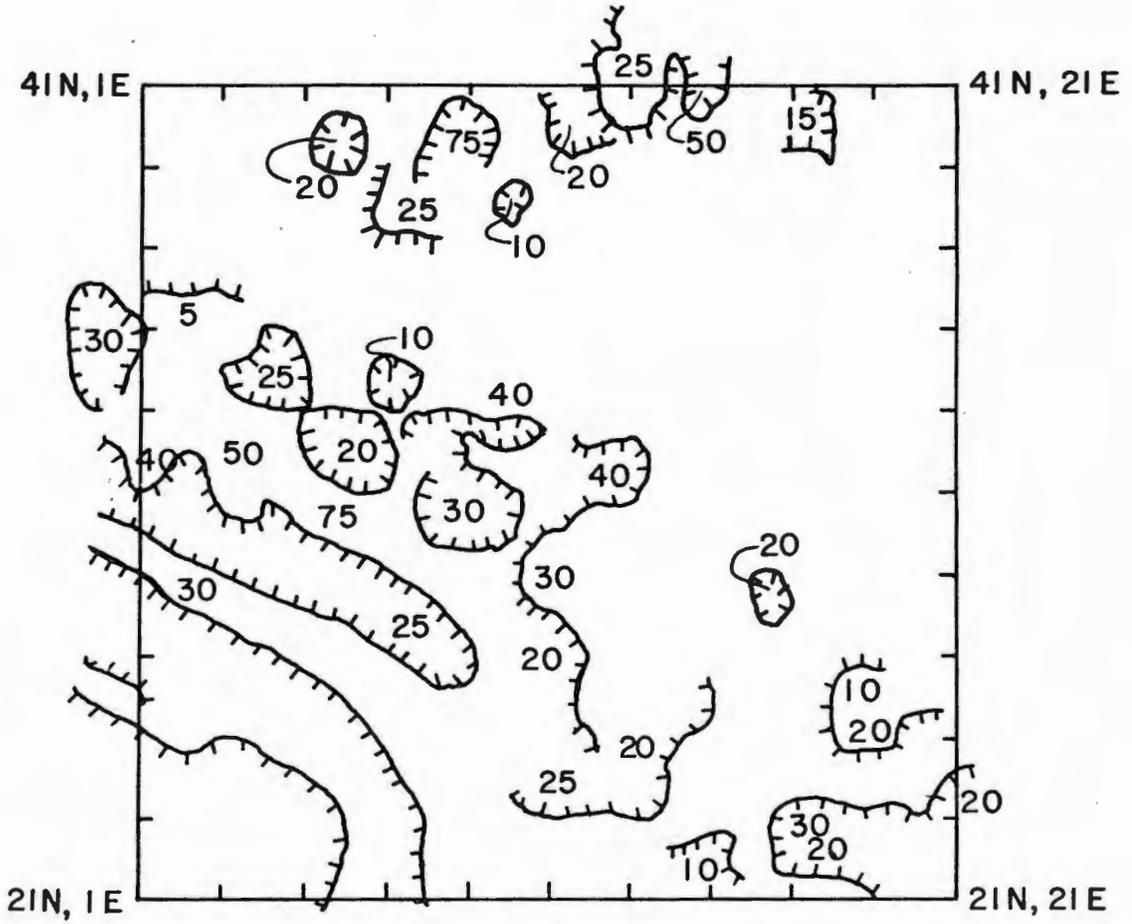
SITE 5MT0023, GRID 2, BLOCK A



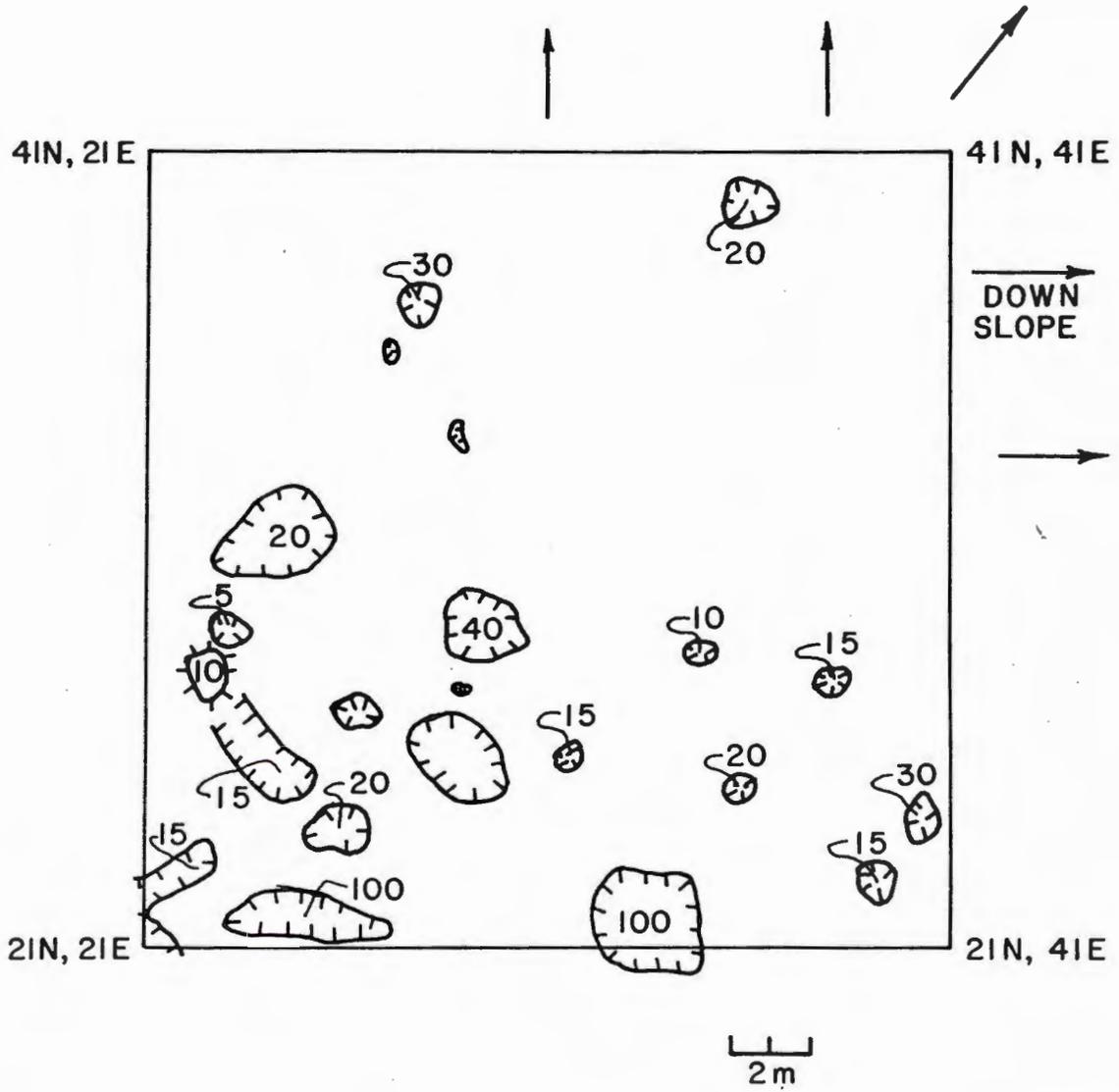
SITE 5MT0023, GRID 2, BLOCK B



SITE 5MT0023, GRID 2, BLOCK C



SITE 5MT0023, GRID 2, BLOCK D



SITE 5MT0023, GRID 2, BLOCK E

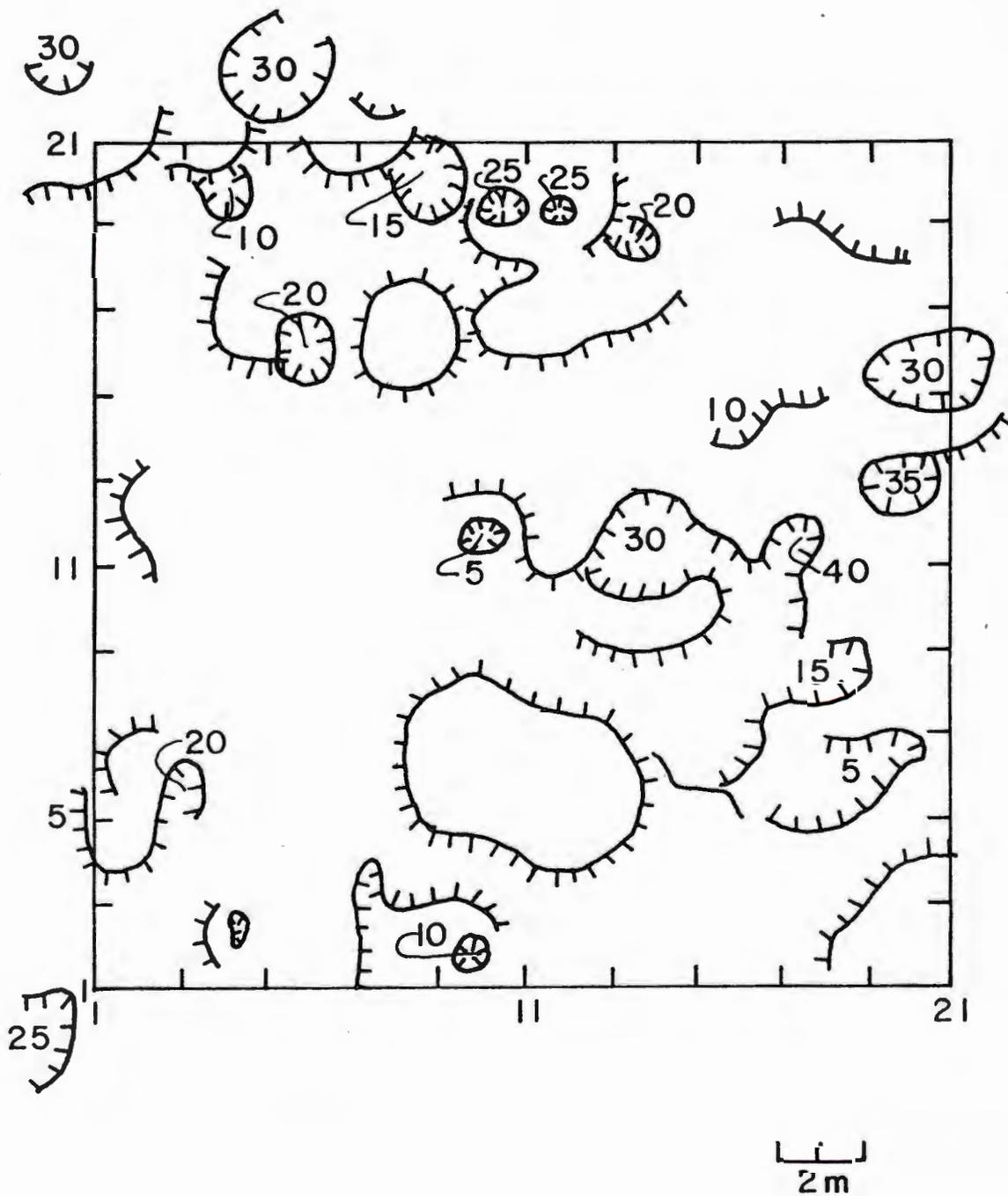
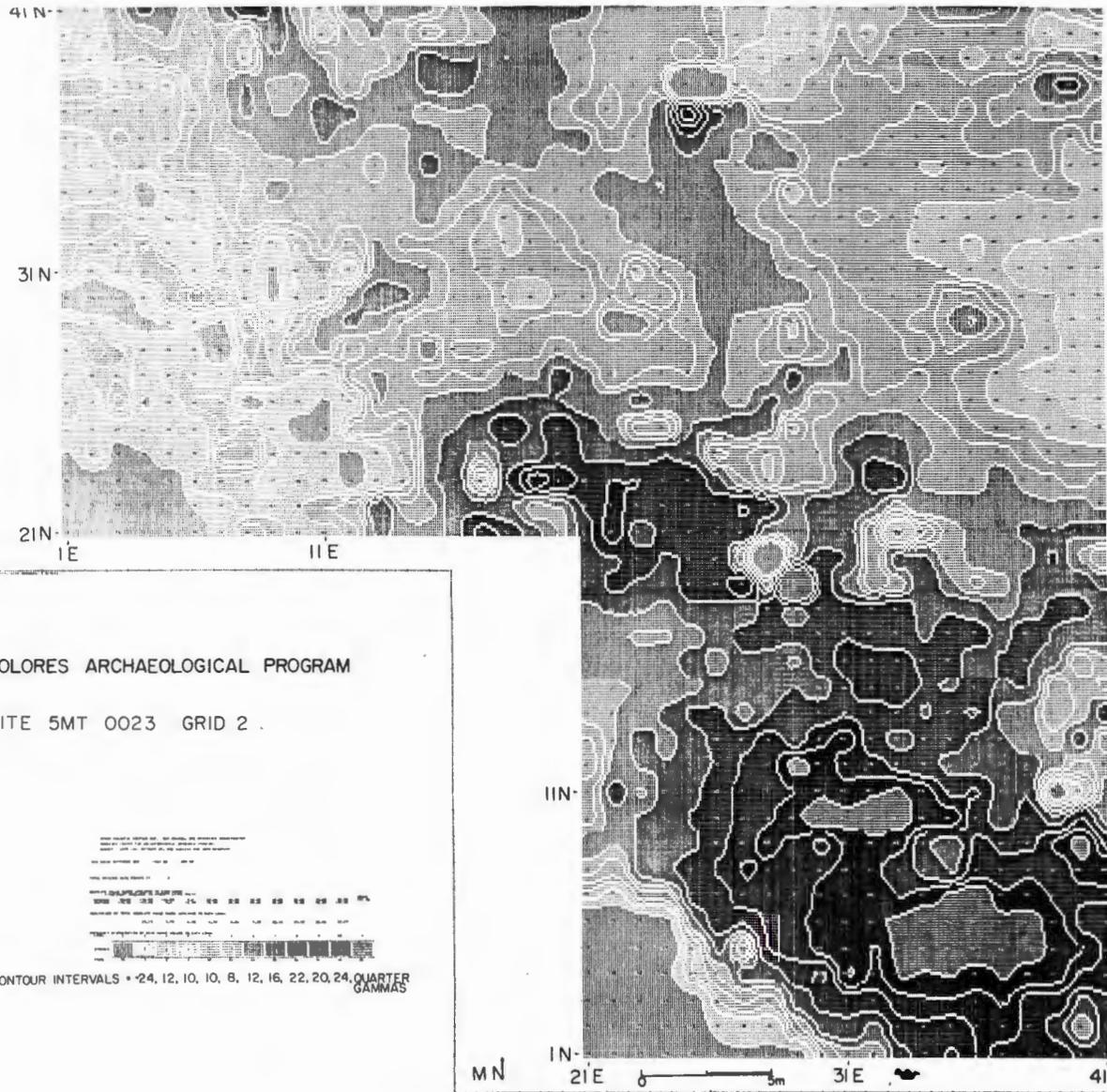


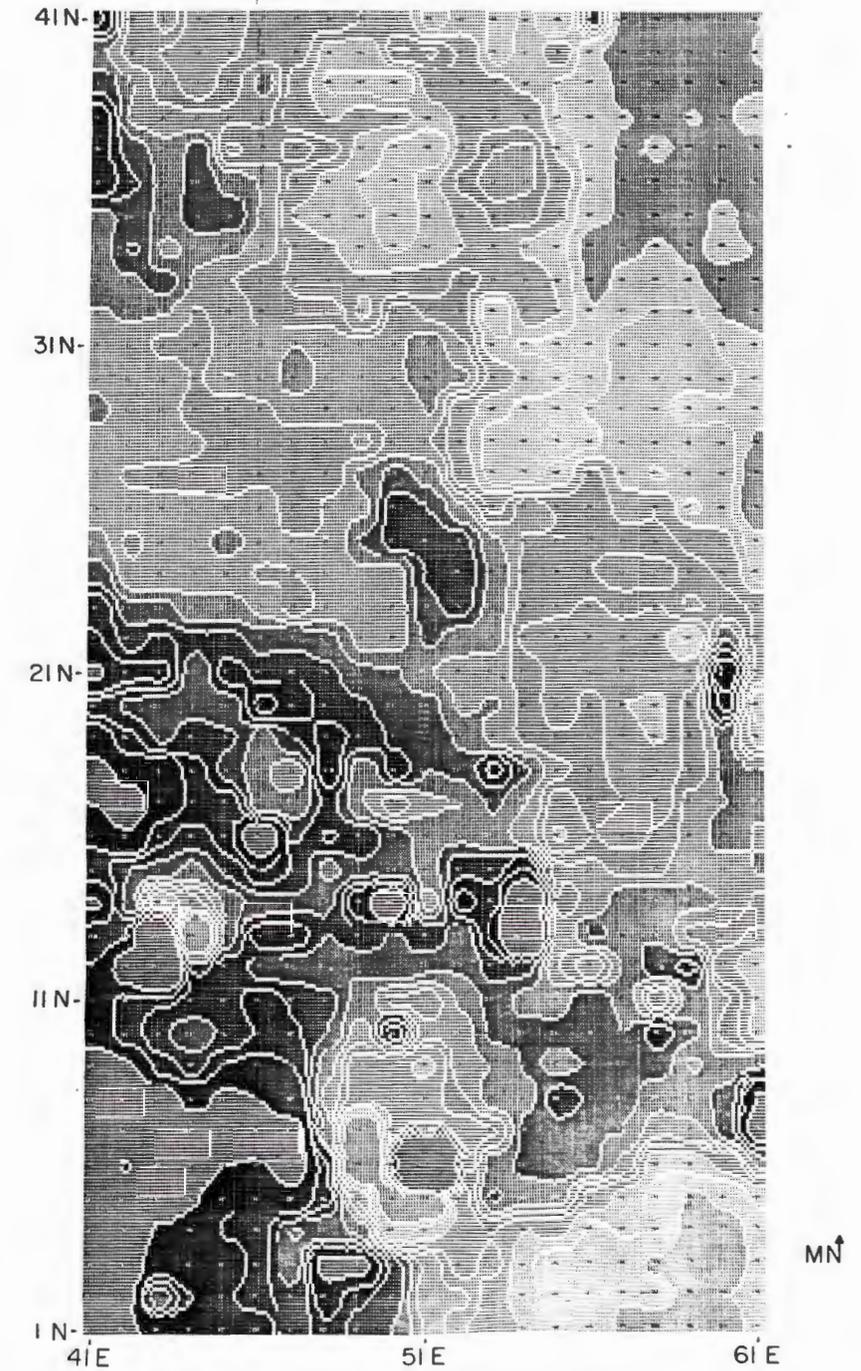
Figure 7.11: Magnetic contour map (SYMAP) of
Blocks A, C, and D, Grid 2, Site
5MT0023.



711

Figure 7.12: Magnetic contour map (SYMAP) of Blocks B and E, Grid 2, Site 5MT0023.

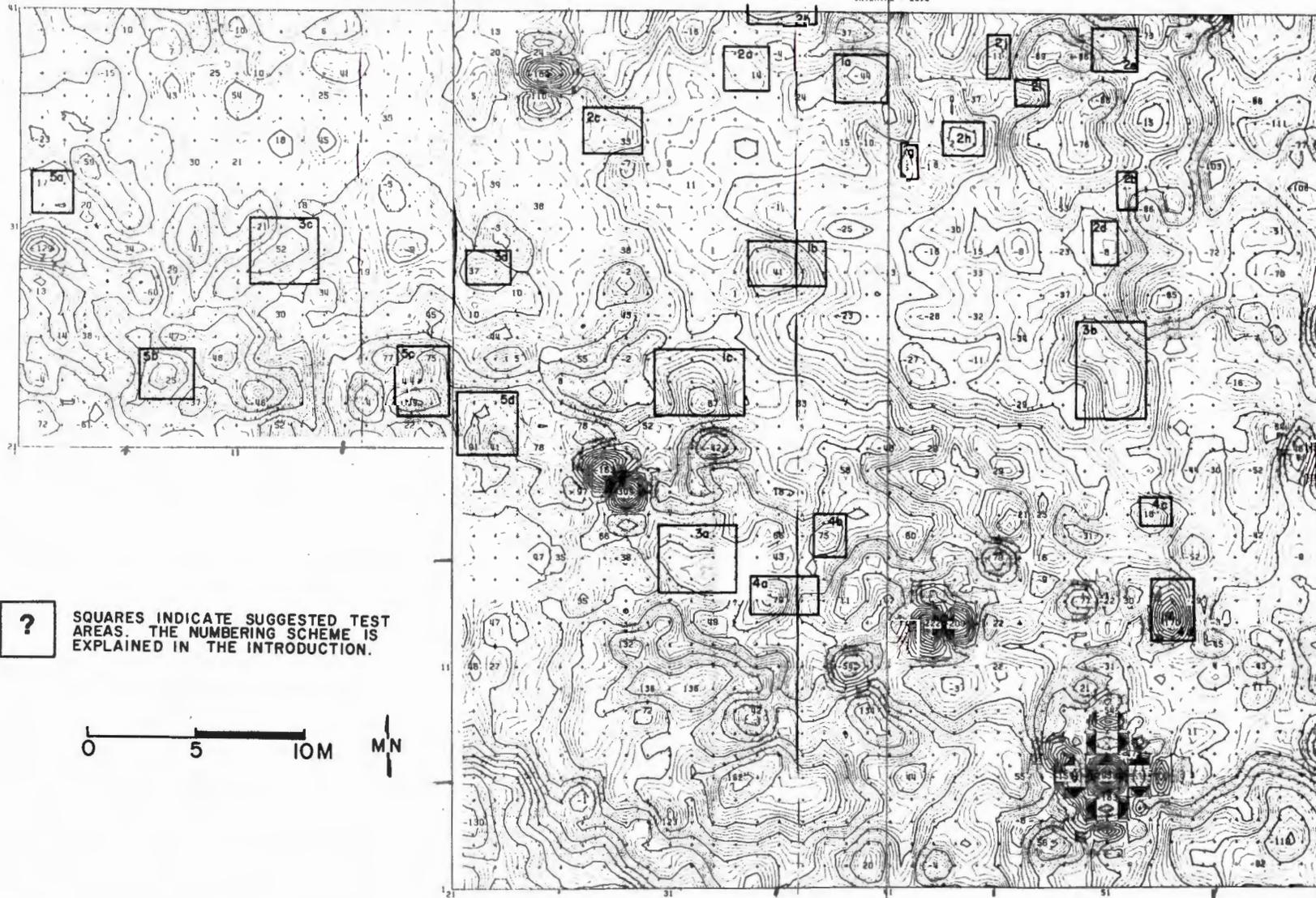
DOLOROS ARCHAEOLOGICAL PROGRAM
 SITE 5MT 0023 GRID 2



CONTOUR INTERVALS = 25, 15, 15, 10, 10, 10, 10, 10, 20. QUARTER GAMMAS

Figure 7.13: Line contour map of Grid 2, Site 5MT0023
with contour intervals of 20 quarter
gammas.

CONTOUR MAP
DOLORES ARCHAEOLOGICAL PROJECT SITE 5HT0023, 5 BLOCKS
INTERVAL = 20.0



? SQUARES INDICATE SUGGESTED TEST AREAS. THE NUMBERING SCHEME IS EXPLAINED IN THE INTRODUCTION.



7.13

that the structure is composed of burned material. The anomaly is too wide for standard depth estimations. There is a lobe which extends to the southwest, but it is difficult to assess what the cause of this might be. However, the anomaly warrants investigation. Profiles of the potential pitstructure are shown in Figure 7.14.

Anomaly 1b

This is also a likely candidate for a pitstructure. The similarity of this anomaly at point (29.5N,36E) to Anomaly 1a suggests they might be contemporaneous (they are similar in shape and magnitude, and both have small associated lows to the north). Because of the width of the anomaly depth calculations are inaccurate, but a moderate depth of under 1 m is likely. Profiles are shown in Figure 7.15.

Anomaly 1c

This anomaly is a monopole high situated about the point (24N,32.5E) and also has pitstructure characteristics. It has a different magnitude than the previous two anomalies and has a strong low the southeast which suggests the possibility that the anomaly is due to a metal object. A test square here would be valuable to resolve the ambiguity; its profile is shown in Figure 7.16.

Anomaly 1d

A smaller, more diffuse monopole high is located at point (36.5N,53.5E); of the four anomalies, this appears to be the least likely choice for a pitstructure. There is a lobe which extends to the southwest to two other anomalies which may be associated features such as fire hearths; again, no depth calculations could be made. A profile is shown in Figure 7.17.

Figure 7.14: Magnetic profiles of Anomaly 1a, a potential pitstructure in Grid 2, 5MT0023. The top profile (a) is according to an east-west axis (on Grid Line 38N), while the bottom (b) is oriented north-south (on Grid Line 40E).

PROFILES ACROSS ANOMALIES

5MT0023 GRID 2

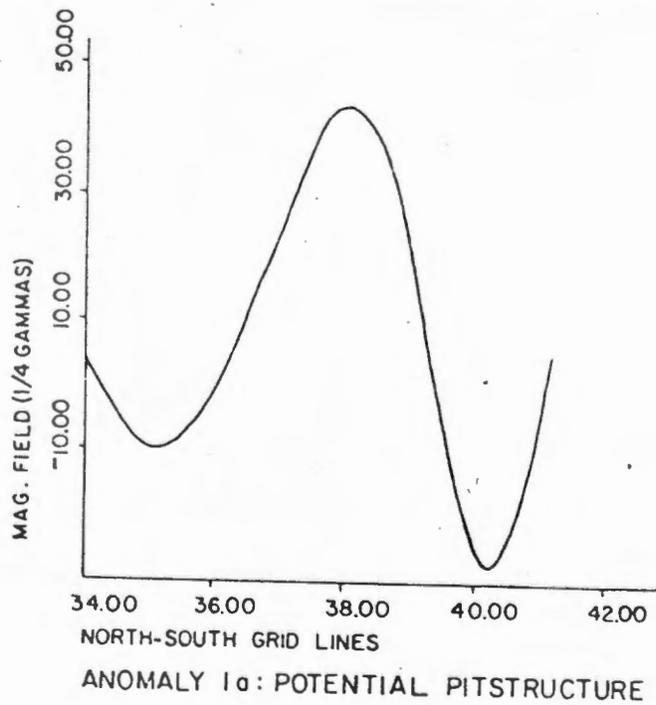
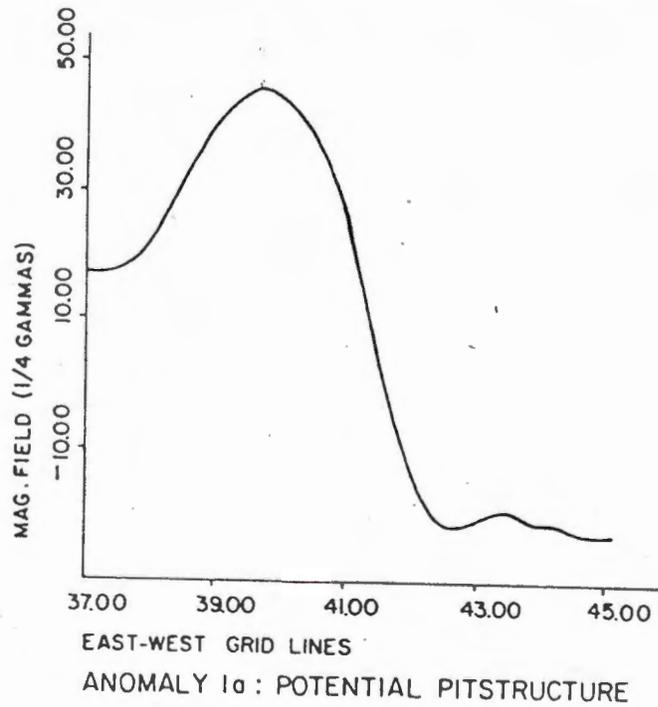


Figure 14.

Figure 7.15: Magnetic profiles of Anomaly 1b, a potential pitstructure in Grid 2, 5MT0023. The top profile (a) is oriented east-west, on Grid Line 29N, while the bottom (b) is north-south, on Grid Line 30E.

PROFILES ACROSS ANOMALIES

5MT0023 GRID 2

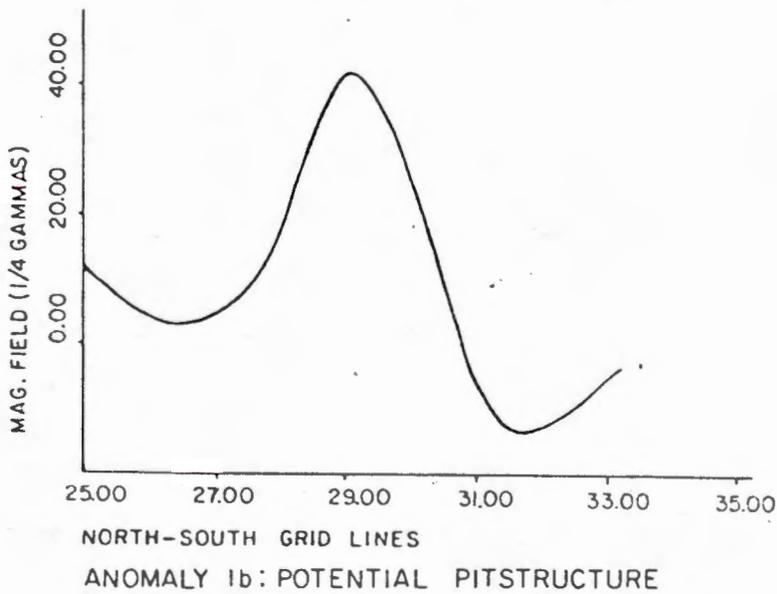
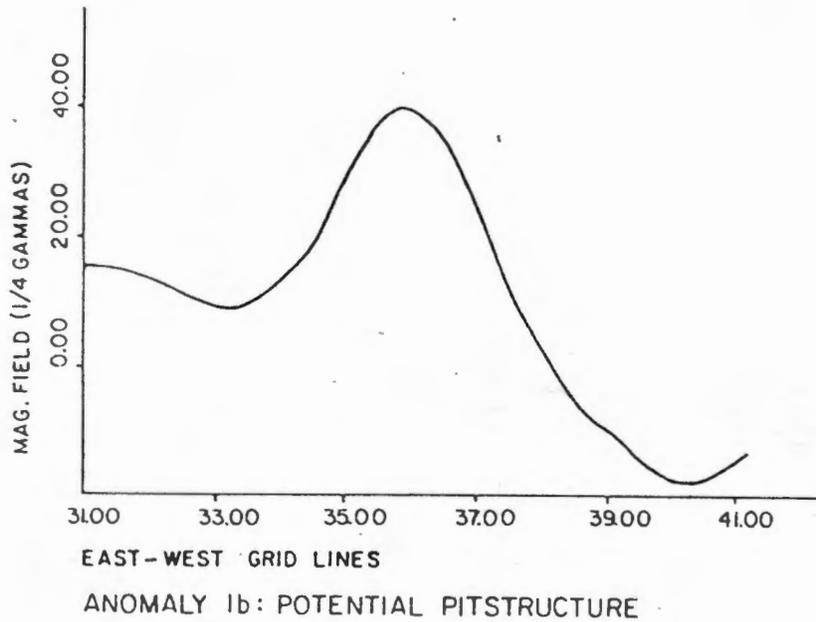


Figure 15.

Figure 7.16: East-west magnetic profile of Anomaly 1c,
an ambiguous feature in Grid 2, 5MT0023.
Profile oriented on Grid Line 23N.

PROFILES ACROSS ANOMALIES

5MT0023 GRID 2

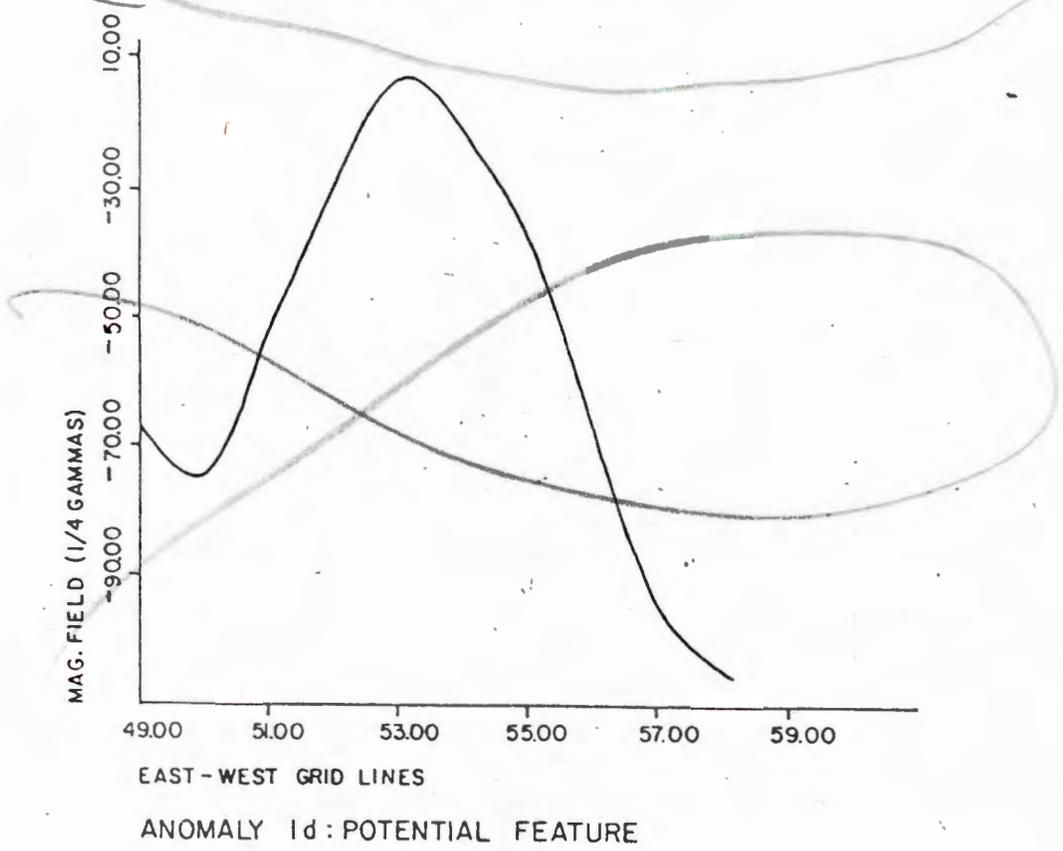
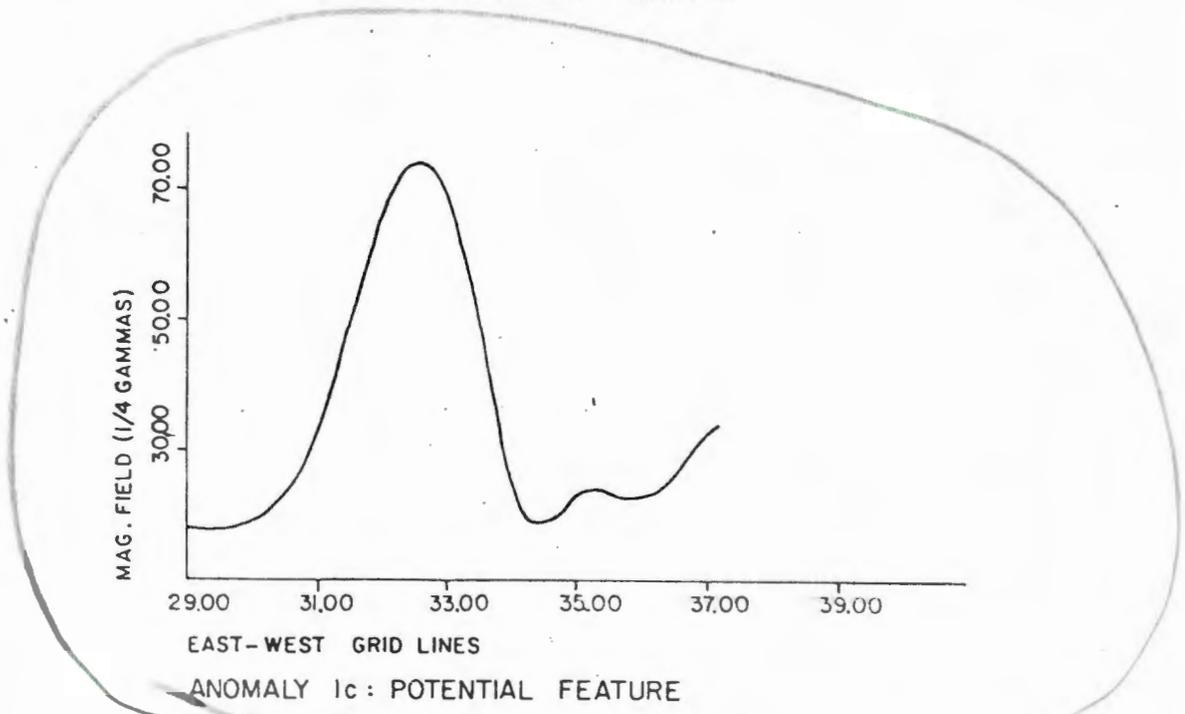


Figure 16.

Anomaly 2a and Anomaly 2b

Two weaker monopole highs, located at the points (38.5N,34.5E) and (41.5N,36E), could represent features associated with the suspected pitstructure shown by Anomaly 1a. They might be activity areas where burned material is present. Profiles are shown in Figures 7.18 and 7.19.

Anomaly 2c

A monopole high is located at point (35.5N,28.5E). This anomaly covers a fairly broad region and is not sufficiently defined to suggest other than a burned region for the source. A profile is shown in Figure 7.20.

Anomaly 2d

The anomaly is a monopole high located about the point (30N,51E). Although this is suggested as a peripheral feature to either Anomaly 1d or 3b, both of which are possible pitstructures, the anomaly itself might represent some burned architectural feature. The anomaly has a similar shape to other pitstructure anomalies but its magnitude is not as large, as shown by Figure 7.21, the west-to-east profile. In summary, it is likely a burned feature, possibly architectural.

Anomaly 2e

A broad monopole high is centered on point (40N,51E). As its magnitude is weak and it has a broad extent, it is possibly a burned or compacted region. Figure 7.22 illustrates the profile.

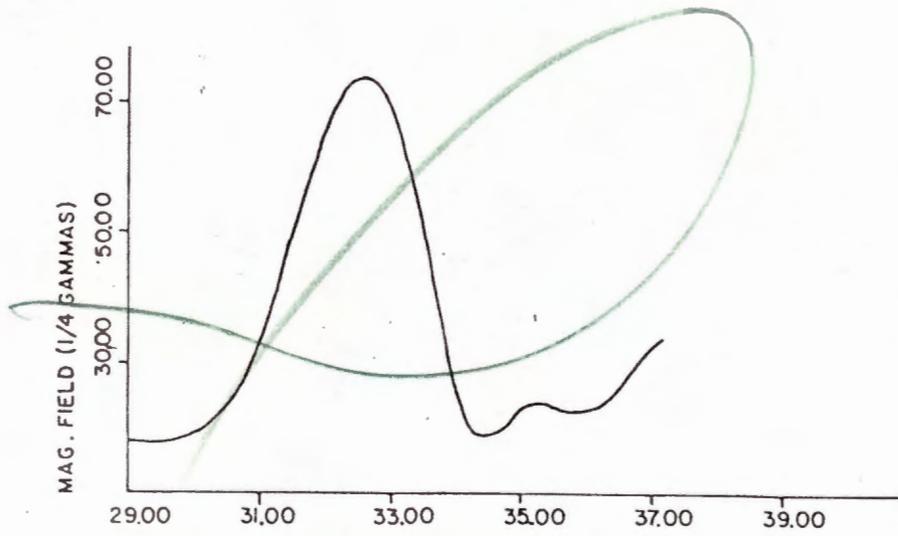
Anomaly 2f

This feature is a small, localized rise in the background at point (33N,52E) whose profile is shown in Figure 7.23. If it is an archaeological feature, it might be a fire hearth.

Figure 7.17: East-west magnetic profile of Anomaly 1d, an ambiguous feature in Grid 2, 5MT0023. Profile positioned on Grid Line 36N.

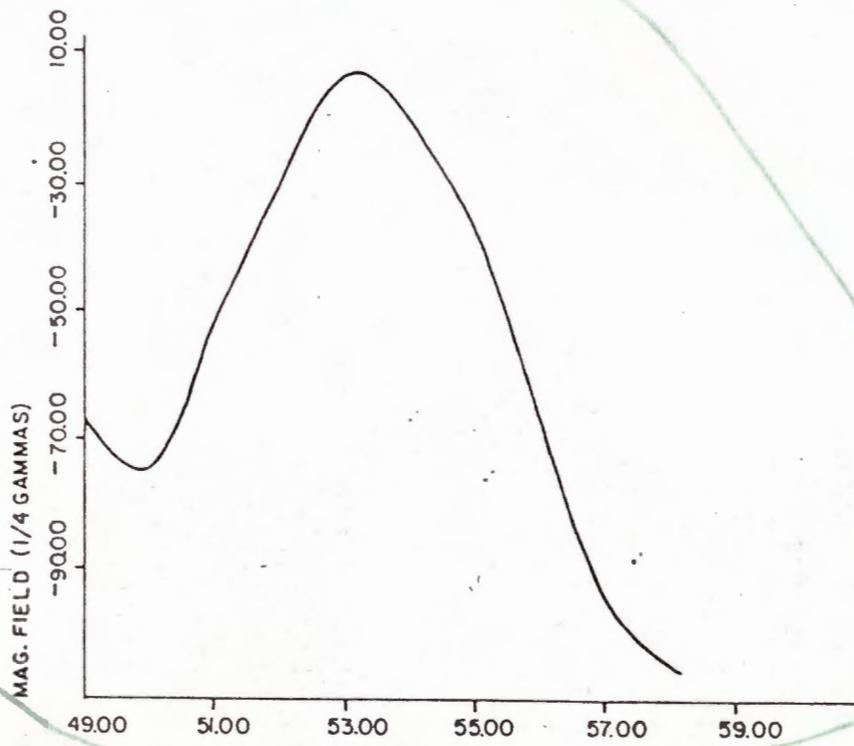
PROFILES ACROSS ANOMALIES

5MT0023 GRID 2



EAST-WEST GRID LINES

ANOMALY Ic: POTENTIAL FEATURE



EAST-WEST GRID LINES

ANOMALY Id: POTENTIAL FEATURE

Figure 17.

Figure 7.18: East-west magnetic profile of Anomaly 2a, a feature possibly associated with Anomaly 1a, in Grid 2, 5MT0023. Profile positioned on Grid Line 39N.

PROFILES ACROSS ANOMALIES

5MT0023 GRID 2

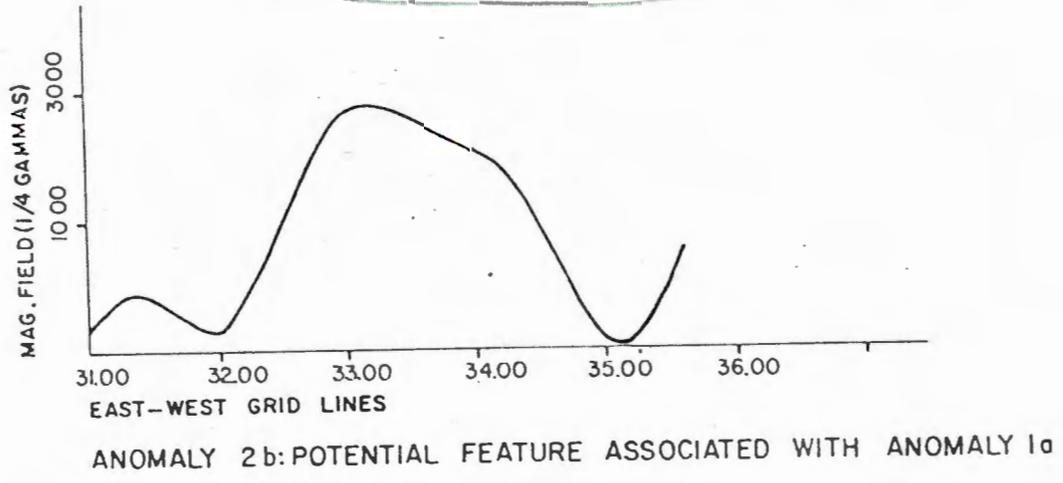
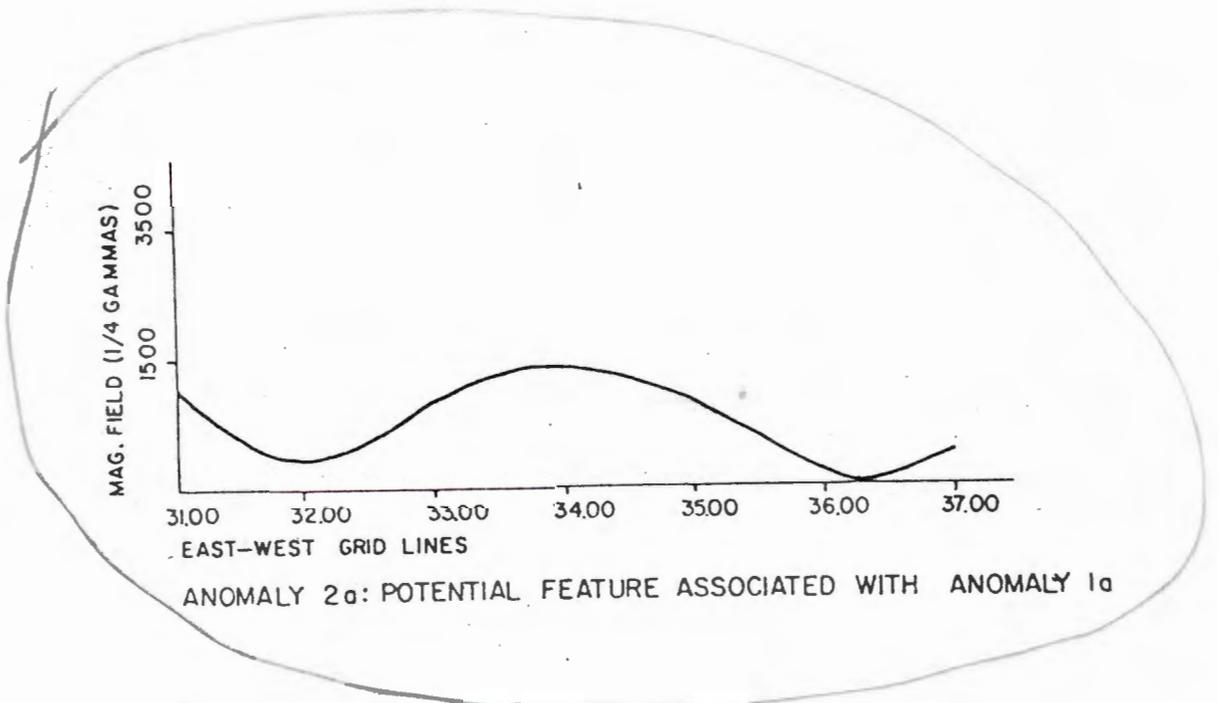
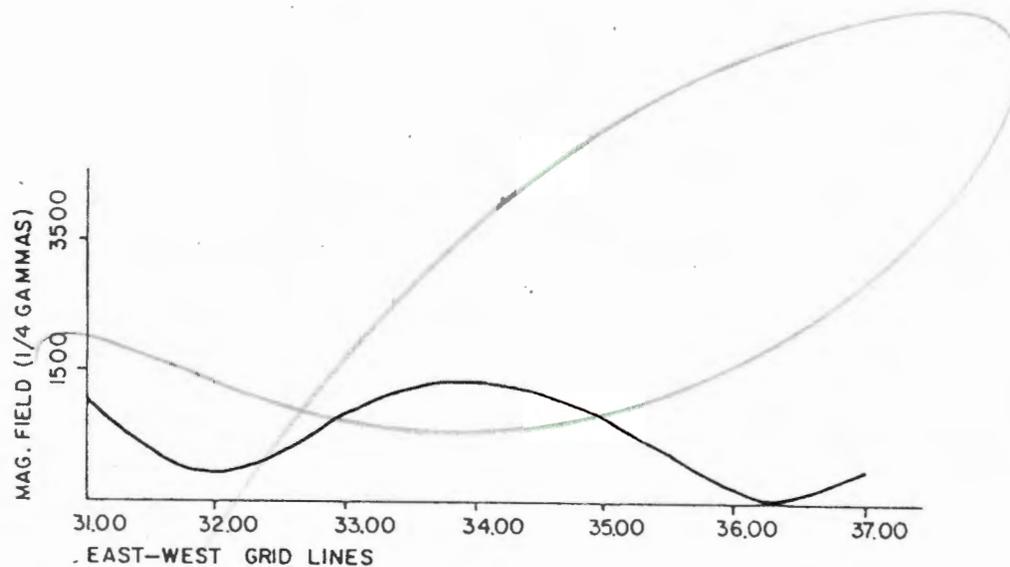


Figure 18.

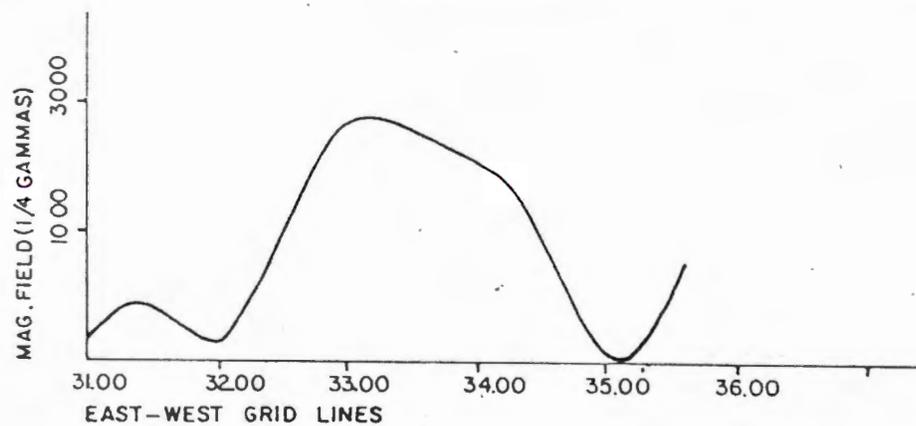
Figure 7.19: East-west magnetic profile of Anomaly 2b, a feature possibly associated with Anomaly 1a, in Grid 2, 5MT0023. Profile positioned on Grid Line 41N.

PROFILES ACROSS ANOMALIES

5MT0023 GRID 2



ANOMALY 2a: POTENTIAL FEATURE ASSOCIATED WITH ANOMALY 1a



ANOMALY 2b: POTENTIAL FEATURE ASSOCIATED WITH ANOMALY 1a

Figure 19.

Figure 7.20: East-west magnetic profile of Anomaly 2c, a burned area, in Grid 2, 5MT0023. Profile positioned on Grid Line 28E.

PROFILES ACROSS ANOMALIES

5MT0023 GRID 2

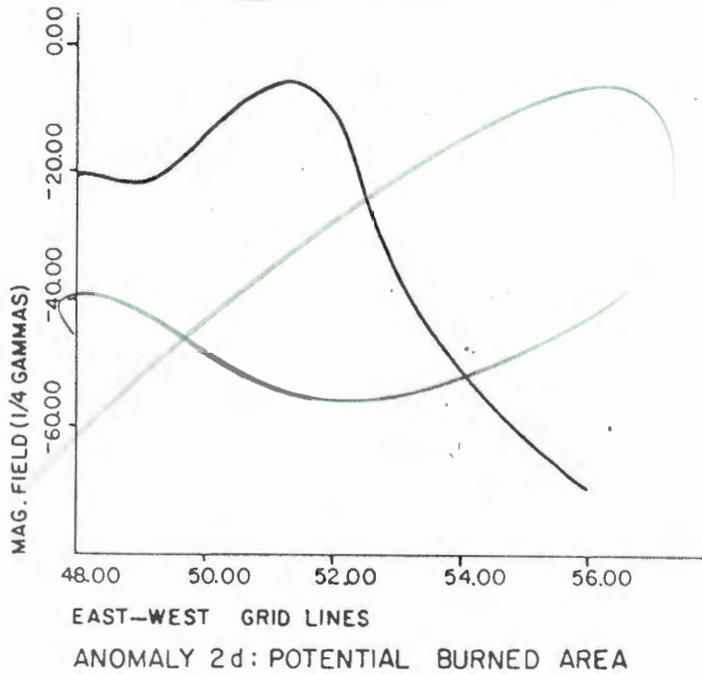
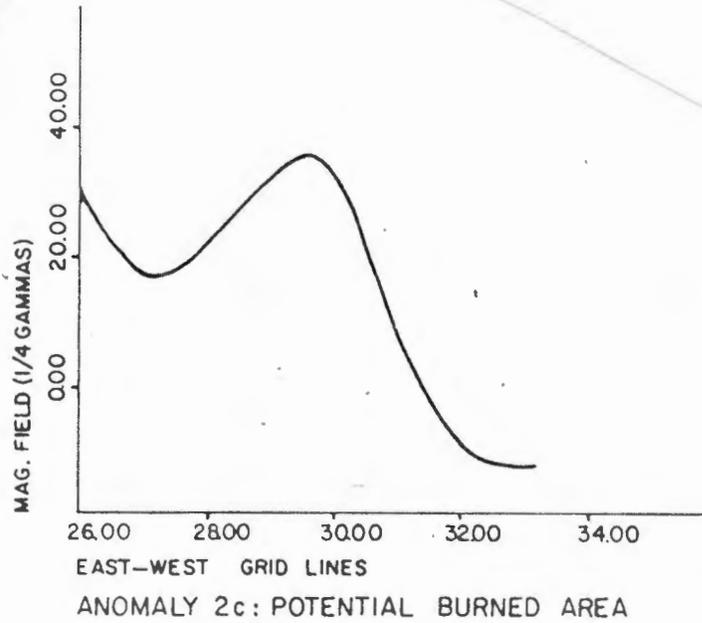


Figure 20.

Figure 7.21: East-west magnetic profile of Anomaly 2d, a possible burned feature, in Grid 2, 5MT0023. Profile positioned on Grid Line 30N.

PROFILES ACROSS ANOMALIES

5MT0023 GRID 2

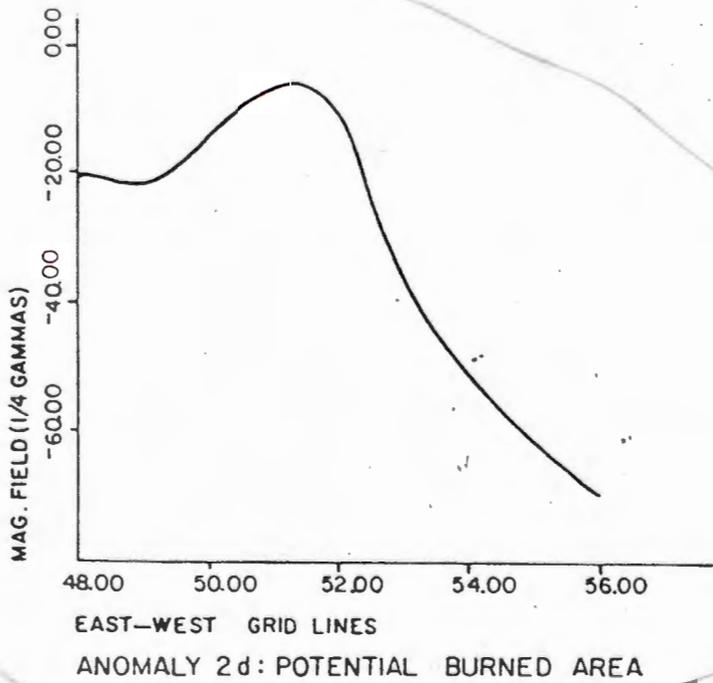
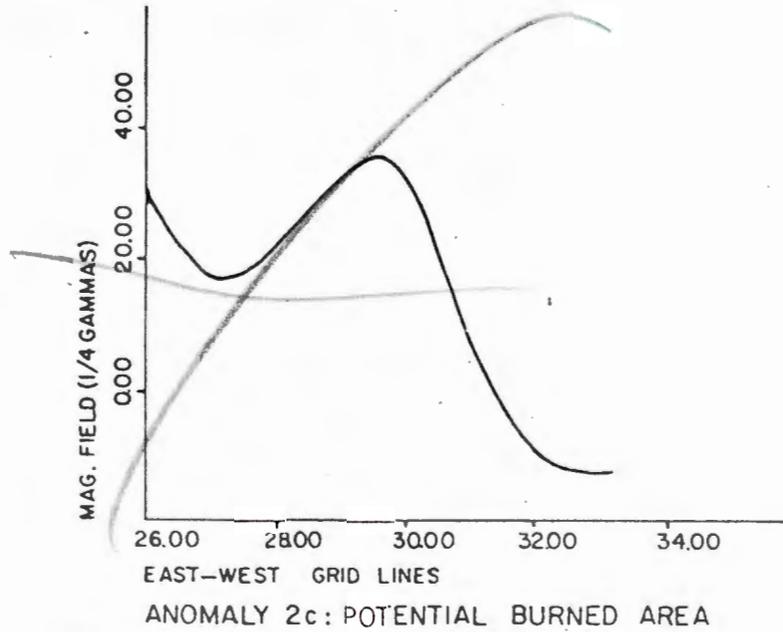


Figure 21.

Figure 7.22: East-west magnetic profile of Anomaly 2^e, a possible burned area, in Grid 2, 5MT0023. Profile positioned on Grid Line 40N.

PROFILES ACROSS ANOMALIES

5MT0023 GRID 2

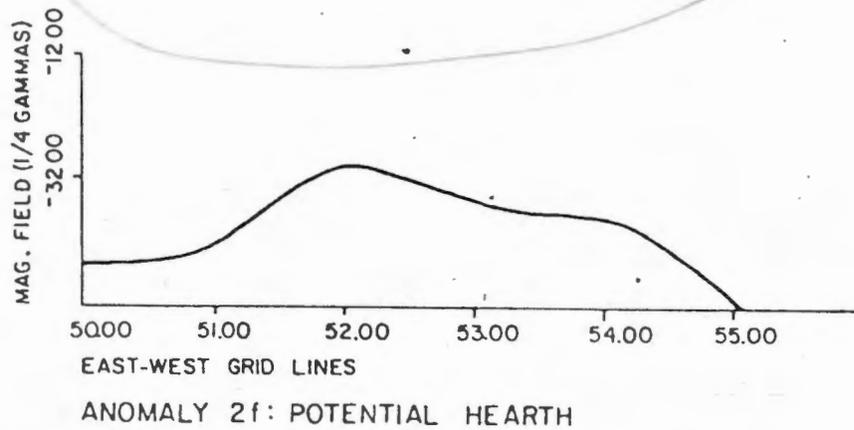
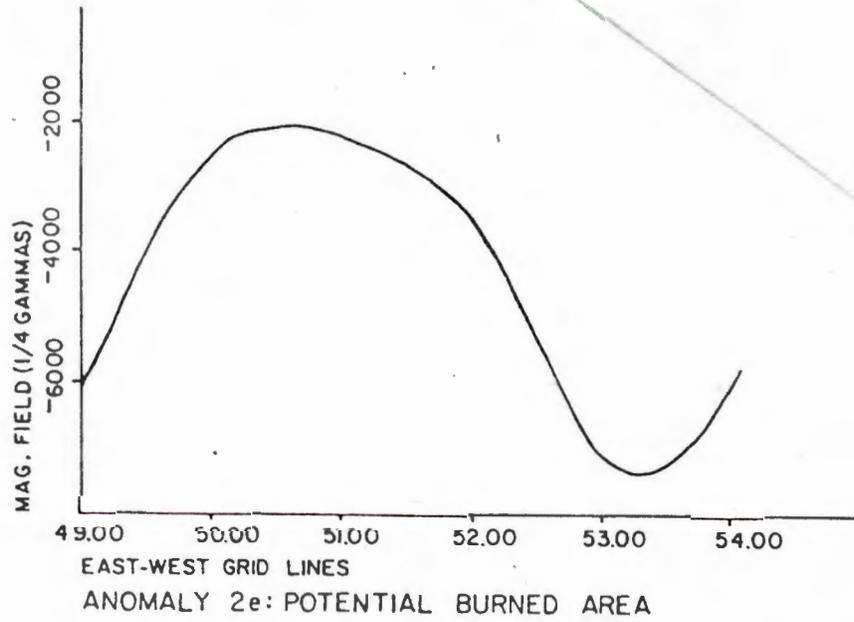


Figure 22.

Anomalies 2g, 2h, 2i, 2j

These small localized monopole highs occur at points (34N,42E), (35N,44E), (37.5N,47.5E), and (39N,46E). They could be small burned features near the surface, perhaps fire hearths. It is estimated that 2g and 2h are associated with the suggested pitstructure represented by Anomaly 1a. Anomalies 2g, 2i, and 2j suggest sources which lie at a maximum of 0.5 m beneath the surface. The profiles of each are shown in Figures 7.24 and 7.25.

Anomaly 3a

A monopole high at point (15.5N,32E) is situated in a region of generally higher susceptibility contrast. If the anomaly represents an archaeological feature, it might be a pitstructure. A profile is shown in Figure 7.26.

Anomaly 3b

This magnetic feature is an elongate monopole high centered at the point (24N,51E). The magnitude of the response suggests that it is an extensive well-burned phenomenon, probably a pitstructure. A profile is shown in Figure 7.27.

Anomaly 3c

Although this anomaly is reduced in magnitude, its shape suggests another pitstructure. It is located at the point (29N,13E) and its profile is shown in Figure 7.28.

Anomaly 3d

This monopole high, situated at the point (29N,22.5E) is the last reasonable choice for a pitstructure. Its magnitude is substantially reduced but the anomaly retains elements of pithouse form; a profile is shown in Figure 7.29.

Figure 7.23: East-west magnetic profile of Anomaly 2f, a possible hearth, in Grid 2, 5MT0023. Profile positions on Grid Line 33N.

PROFILES ACROSS ANOMALIES

5MT0023 GRID 2

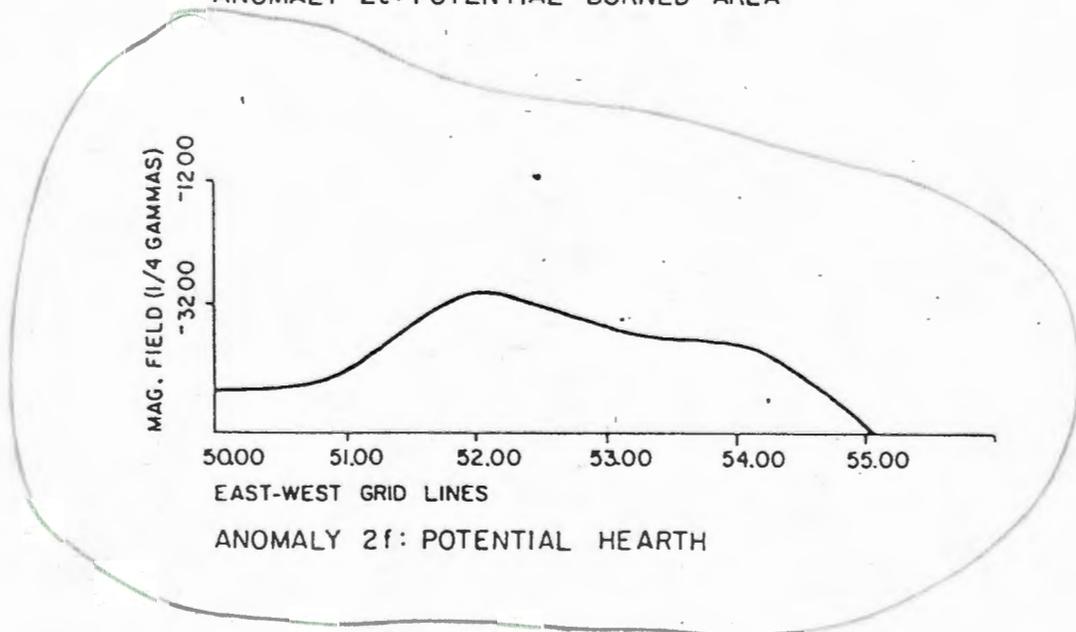
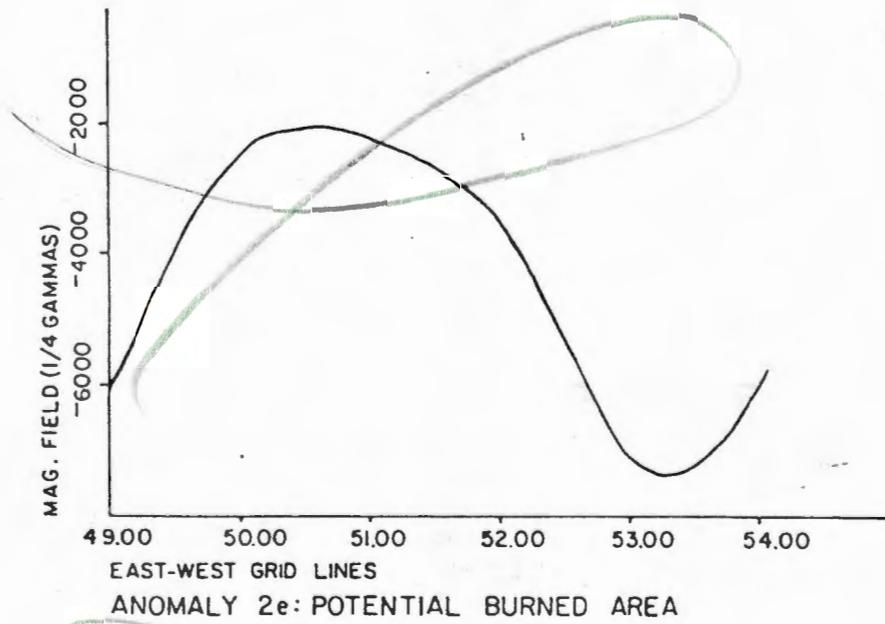


Figure 23.

Figure 7.24: East-west magnetic profiles for anomalies 2g and 2h, possible fire hearths associated with Anomaly 1a, in Grid 2, 5MT0023. The top profile (a) represents Anomaly 2g (profile positioned on Grid Line 34N), the bottom profile (b) is 2h (profile positioned on Grid Line 47N).

PROFILES ACROSS ANOMALIES

5MT0023 GRID 2

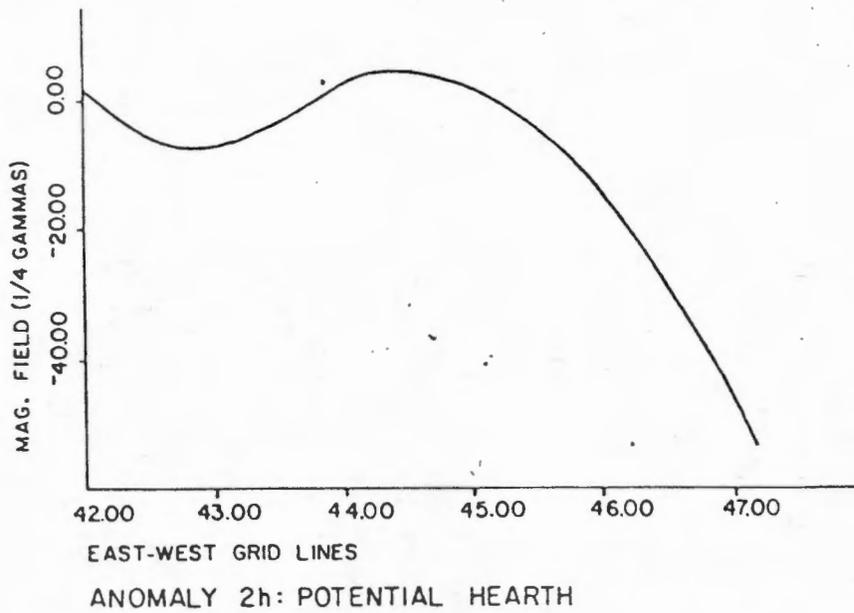
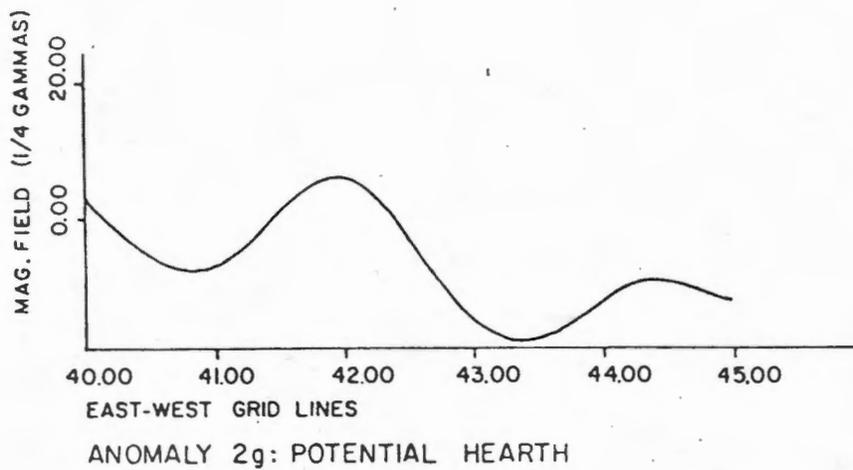


Figure 24.

Figure 7.25: East-west magnetic profiles for Anomalies 2i and 2j, possible fire hearths, in Grid 2, 5MT0023. The top profile (a) represents Anomaly 2i (positioned on Grid Line 47E), the bottom profile is 2j (positioned on Grid Line 39N).

PROFILE ACROSS ANOMALIES

5MT0023 GRID 2

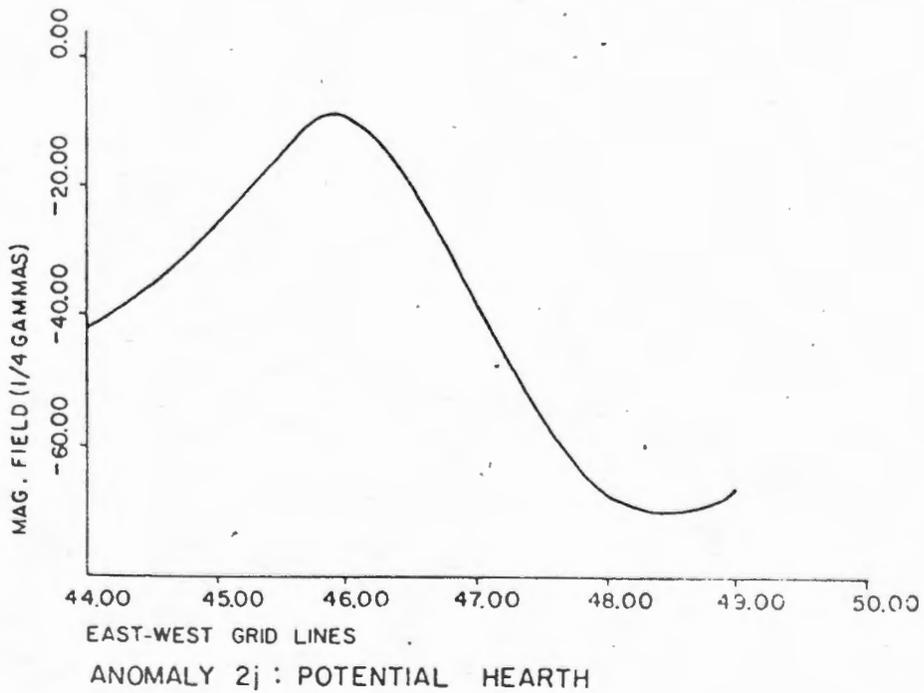
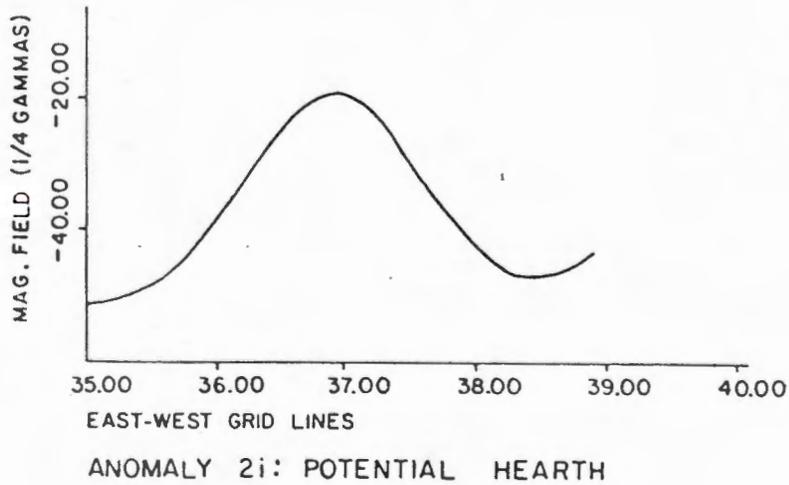


Figure 25.



Figure 7.26: East-west magnetic profile for Anomaly 3a, a possible pitstructure, in Grid 2, 5MT0023. Profile positioned on Grid Line 16N.

PROFILES ACROSS ANOMALIES

5MT0023 GRID 2

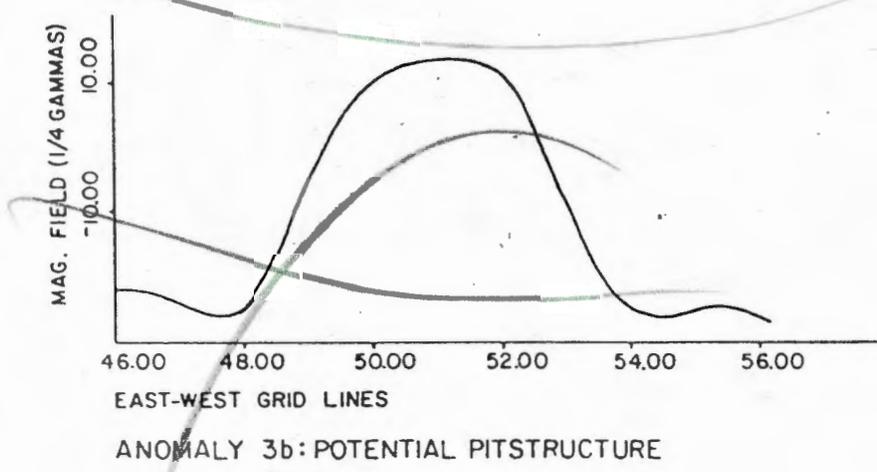
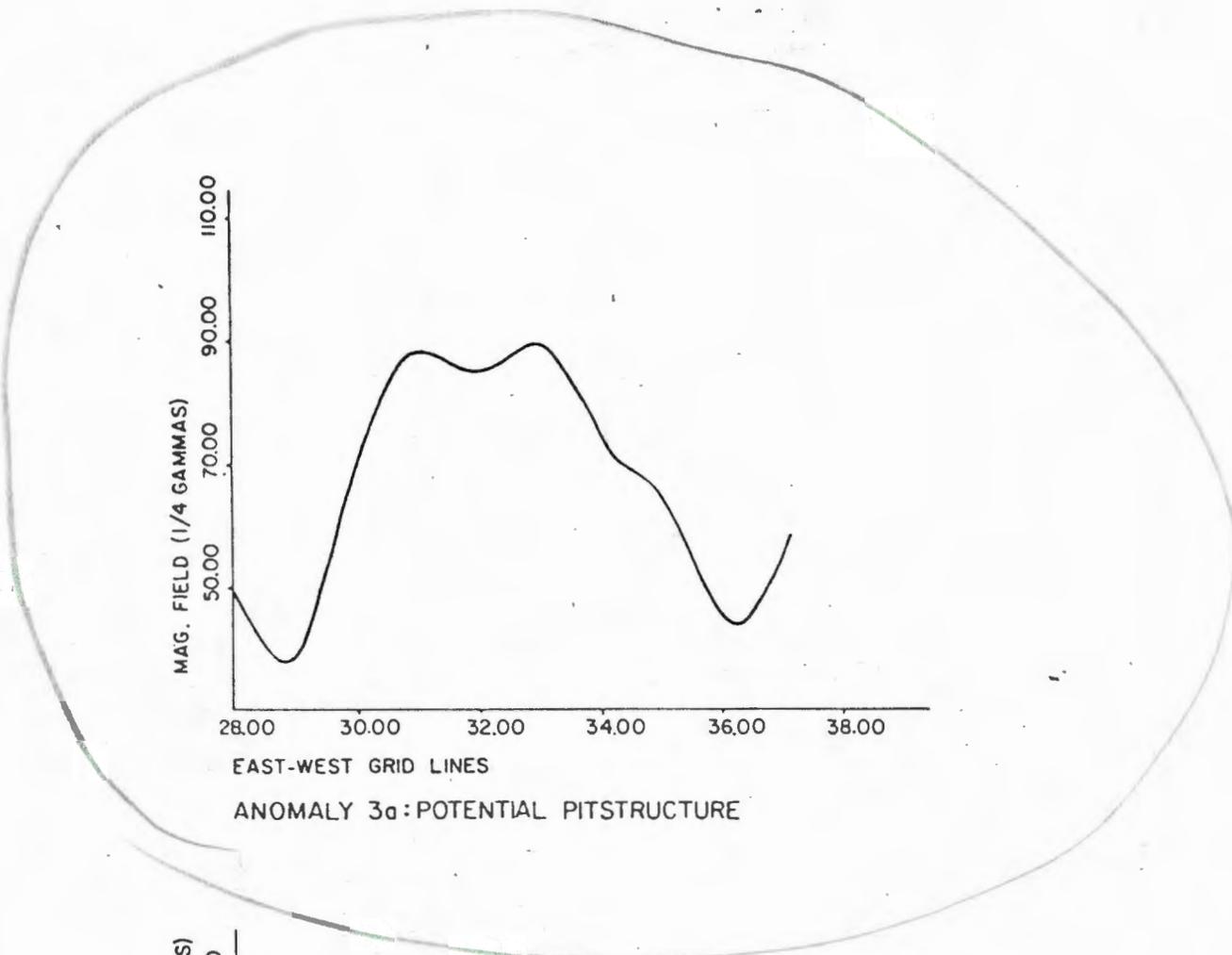
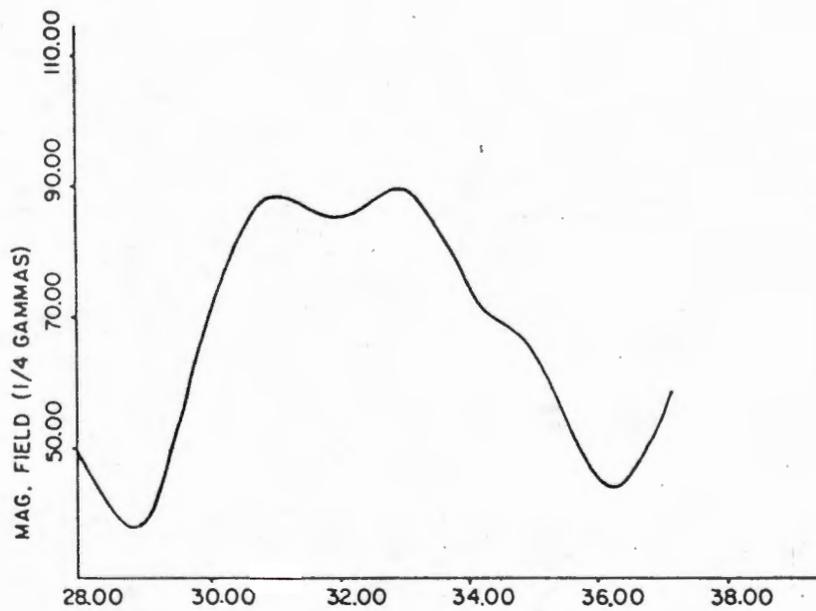


Figure 26.

Figure 7.27: East-west magnetic profile of Anomaly 3b, a possible pitstructure, in Grid 2, 5MT0023. Profile positioned on Grid Line 25N.

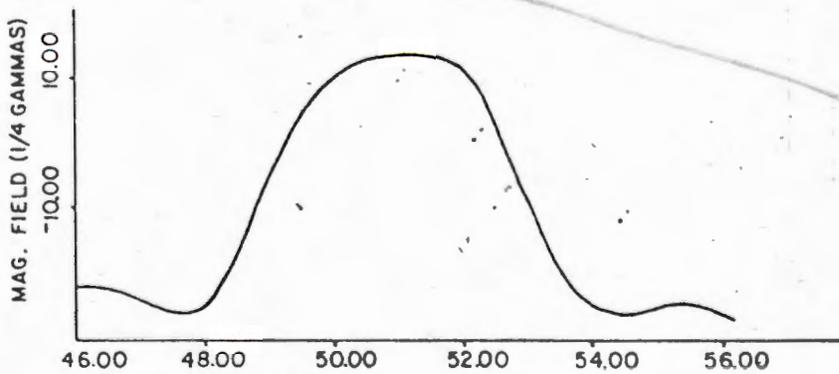
PROFILES ACROSS ANOMALIES

5MT0023 GRID 2



EAST-WEST GRID LINES

ANOMALY 3a: POTENTIAL PITSTRUCTURE



EAST-WEST GRID LINES

ANOMALY 3b: POTENTIAL PITSTRUCTURE

Figure 27.

Figure 7.28: East-west magnetic profile of Anomaly 3c, a possible pitstructure, in Grid 2, Site 5MT0023. Profile positioned on Grid Line 30N.

PROFILES ACROSS ANOMALIES

5MT0023 GRID 2

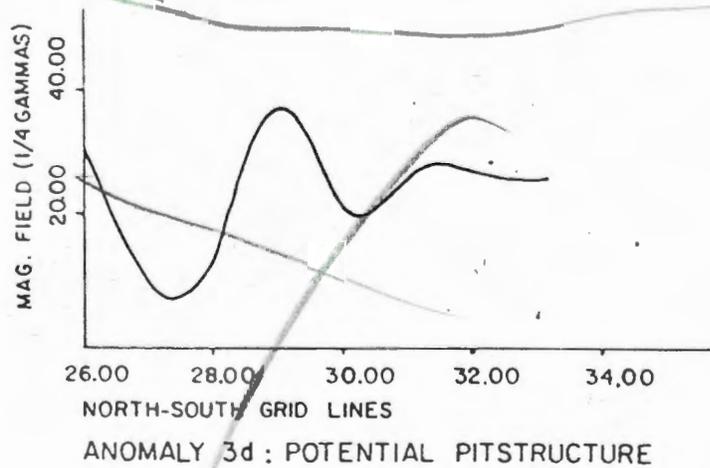
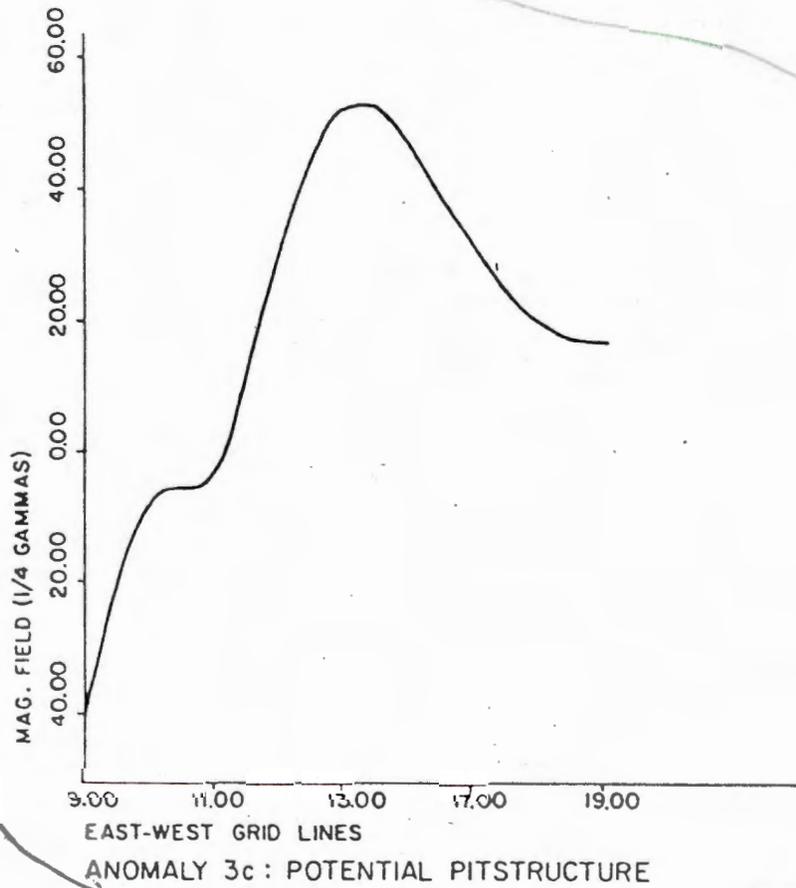


Figure 28.

Anomalies 4a and 4b

If Anomaly 3a represents a pitstructure, then these two anomalies, located at points (14N,36E) and (17N,38E), respectively, are potential peripheral hearths. Contributions from geological phenomena are strong in this region and these anomalies are weak, so there is a good deal of doubt in this assessment. Profiles are shown in Figure 7.30.

Anomaly 4c

The anomaly is a small monopole high at point (18N,53E) which is perhaps a hearth. It is illustrated by the profile shown in Figure 7.31.

Anomaly 4d

A monopole high located at the point (14N,54E) is designated Anomaly 4d. This anomaly is rather puzzling; although the shape and area are suggestive of a pitstructure, the profile (Figure 7.32) suggests it is very close to the surface. As well, the presence of a low to the west might imply contributions from a metal object. Although there is the possibility that the source is nonarchaeological, it is worth investigating.

Other Anomalies

The remaining anomalies have shapes and magnitudes which are too indistinct to suggest specific features; however, they have characteristics which imply an archaeological source. They are as follows:

5a - a small monopole high at point (33N,2.5E)

5b - a monopole high at point (24.5N8E)

5c, 5d - monopole highs in a region of geologic variation at points (23.5N,19.5E) and (22N,22E)

Because of the abundance of potential pitstructure anomalies on this site, a filter was designed to examine the data for suspected archaeological features measuring one to two m wide that might be hidden by high

Figure 7.29: North-south magnetic profile of Anomaly 3d, a possible pitstructure in Grid 2, 5MT0023. Profile is on Grid Line 22E.

PROFILES ACROSS ANOMALIES

5MT0023 GRID 2

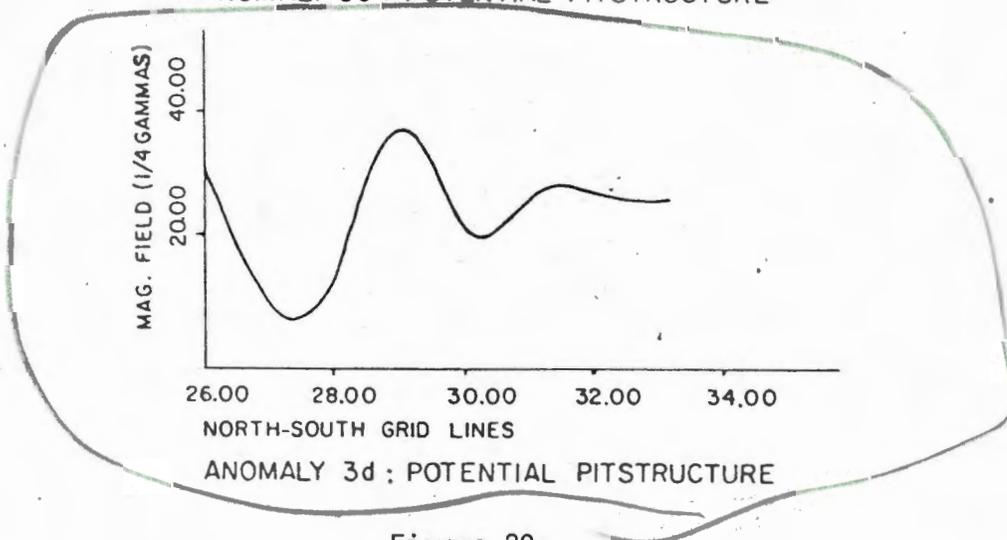
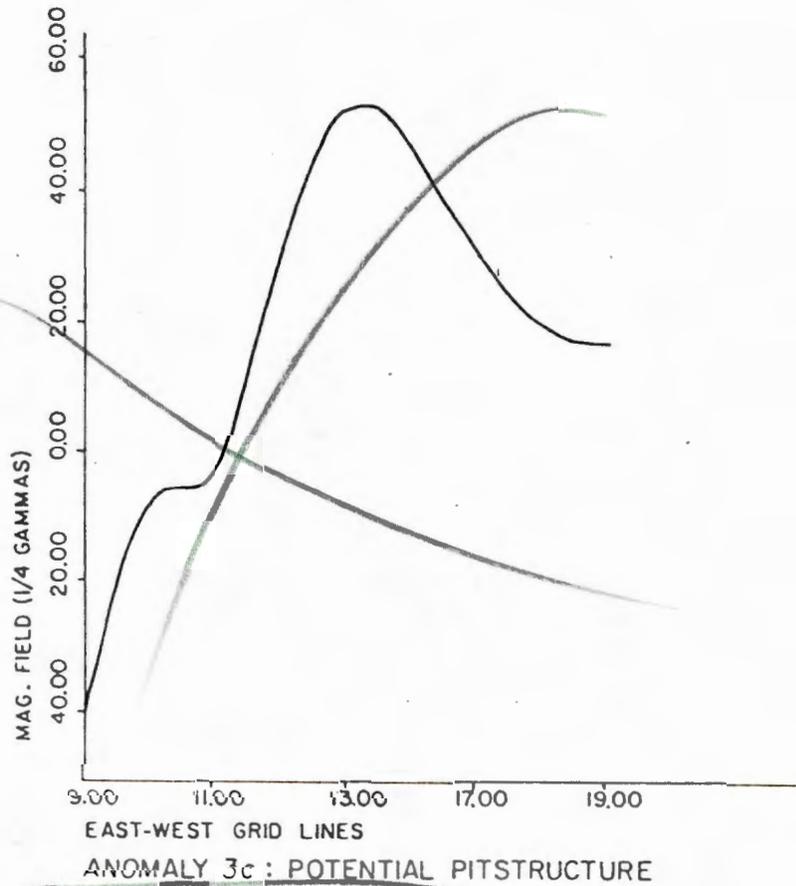


Figure 29.

Figure 7.30: North-south magnetic profiles of Anomalies 4a and 4b, possible peripheral hearths in Grid 2, 5MT0023. The top profile (a) represents Anomaly 4a and is positioned on Grid Line 36E. The bottom profile (b) is Anomaly 4b, positioned on Grid Line 36E.

PROFILES ACROSS ANOMALIES

5MT0023 GRID 2

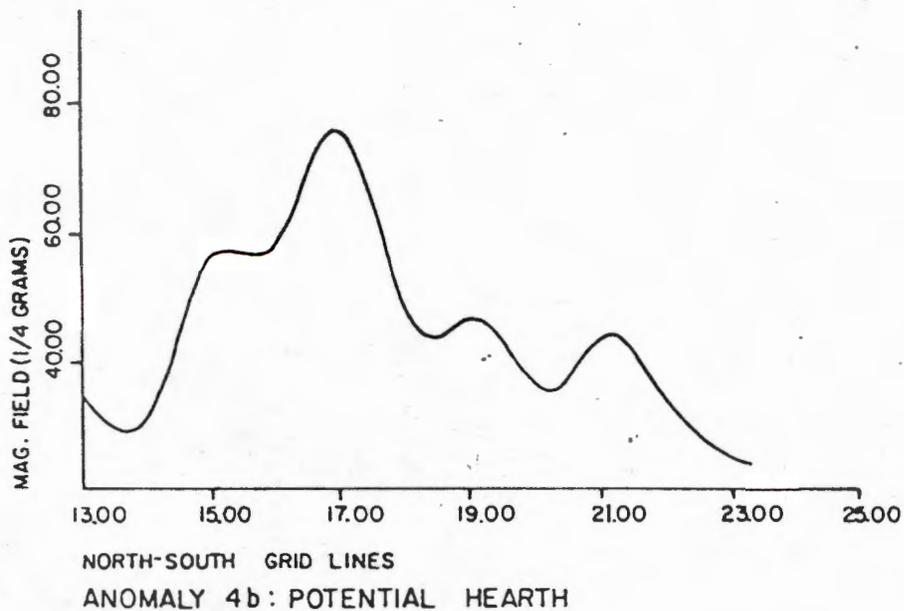
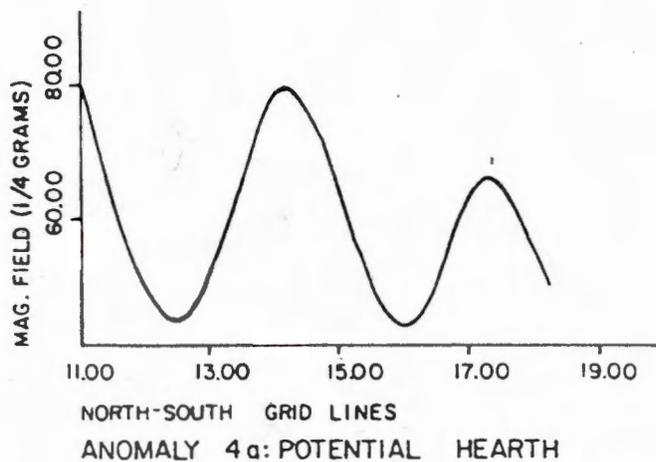


Figure 30.

Figure 7.31: North-south magnetic profile of Anomaly 4c, a possible hearth in Grid 2, 5MT0023. The anomaly is positioned on Grid Line 53E.

PROFILES ACROSS ANOMALIES

5MT0023 GRID 2

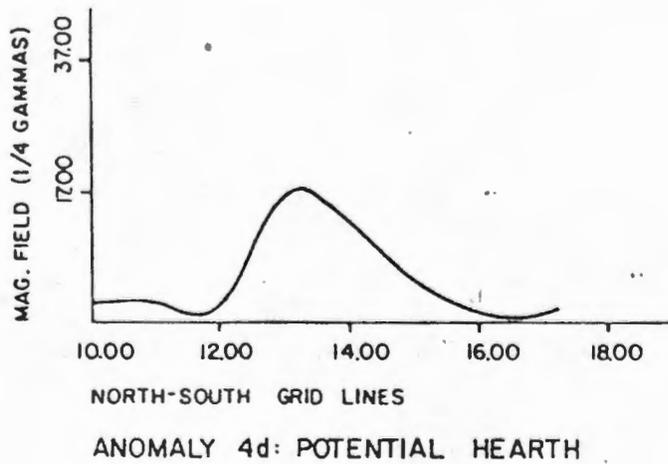
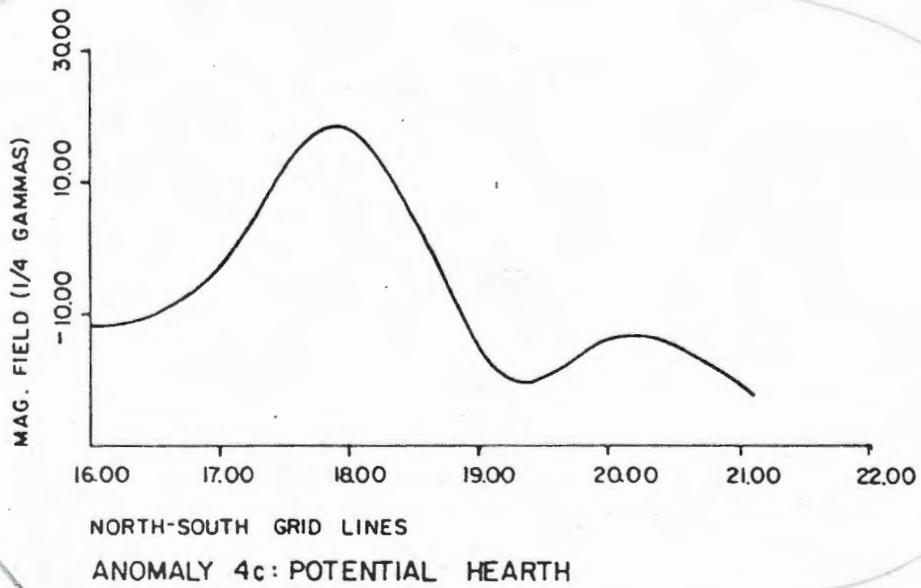


Figure 31.

Figure 7.32: North-south magnetic profile of Anomaly 4d, an ambiguous feature in Grid 2, 5MT0023.

PROFILES ACROSS ANOMALIES

5MT0023 GRID 2

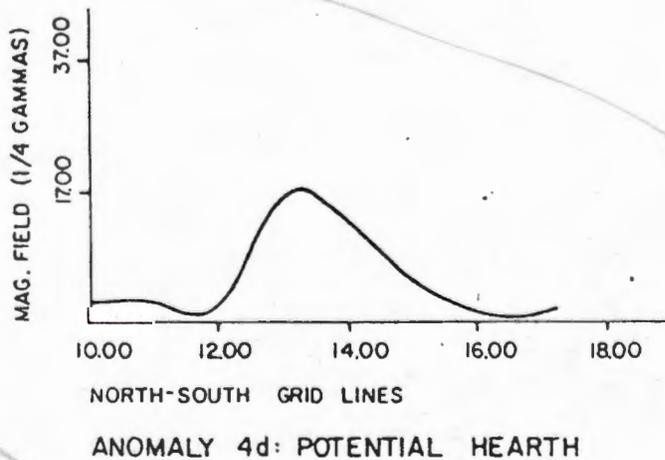
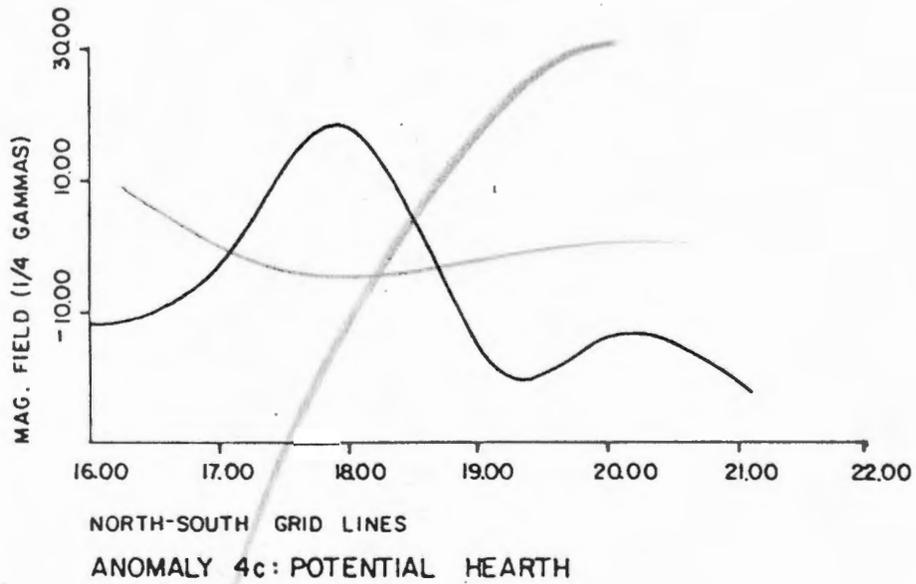


Figure 32.

background levels. Convolution filtering was performed on all the data, and two additional possible pitstructure anomalies were found in the northeast section of the grid in Block E. Figure 7.33 depicts the filtered version of the data, with the anomalies located at points (24N,58E) and 31N,59E).

In summary, several anomalies are present in the data which might represent pitstructures and associated features such as fire hearths. The noise level in the data is higher than in most of the sites in the project area due to undulate terrain, igneous cobbles, and metal debris on site 5MT0023. This introduces a higher degree of ambiguity for this site, but many of the higher priority anomalies look promising.

Location of Test Squares

All previously mentioned anomalies are enclosed in the numbered rectangles shown in Figure 7.13. The numbering system is a priority list with "1" indicating the squares in which there is the highest probability of locating cultural features. Excavation should begin within the rectangle - the feature causing the anomaly is most likely directly below that area. For additional information concerning the test squares and terms used in the description of the anomalies, refer to the Introduction.

Site 5MT2192, Pheasant View Hamlet

Surveying at Site 5MT2192 began on 9 September and continued intermittently until 2 November, in which time a five-block area was covered. When the data were initially examined in 1978, several linear trends were apparent on the map. As the trends were parallel to the direction of the magnetometer traverses, it was suspected that instrument malfunction had caused irregularities in the data; traverses were rerun

Figure 7.33: Magnetic field on Block E, Grid 2, 5MT0023, convolution filtered to enhance possible pitstructure anomalies. Two additional anomalies are visible at (24N,58E) and (31N,59E).

later in the season to ascertain whether these linear features were real. Close correlation was obtained between the two sets of readings, indicating the presence of long linear sources.

There is an abundance of anomalies on these sites which might be interpreted to indicate archaeological features. These anomalies are shown in Figures 7.34 and 7.35 and are discussed as follows:

Anomaly 1a

This anomaly, a monopole high at point (32N,40E), represents a pitstructure. It has a lobe to the south, which might indicate an antechamber or ventilator system, and a continuation of a high ridge extending southwest from the pitstructure, which might indicate some other burned material or activity area. A profile of the anomaly is shown in Figure 7.36.

Anomaly 1b

This monopole high also suggests the presence of a pitstructure centered at the point (25N,13E). Although the anomaly has a reduced magnitude, it has a typical pitstructure shape and has lobes extending to the north for a short distance and to the south, an area of high variance where it is difficult to suggest individual features. A profile is shown in Figure 7.37.

Anomaly 1c

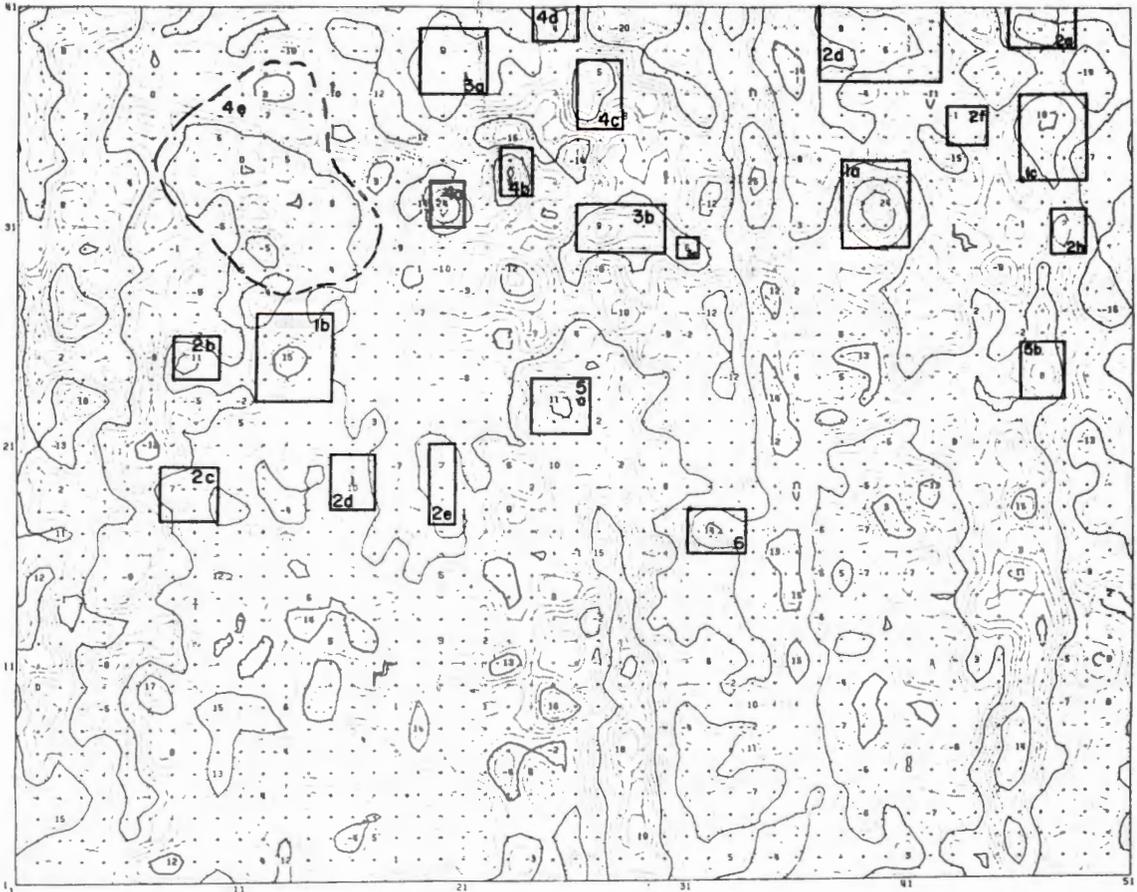
This anomaly, located at point (35N,48E), also has a pitstructure outline. However, it is more irregular in shape and as a consequence might be a burned area; a profile is presented in Figure 7.38.

Anomaly 2a

This larger plateau high surrounding the point (40N,39E) suggests that the source of the anomaly is either slightly burned or compacted or both.

Figure 7.34: Magnetic contour map (SYMAP) of Site 5MT2192 (Pheasant View Hamlet) with contour intervals of 4 quarter gammas.

CONTOUR MAP
DOLINES ARCHAEOLOGICAL PROJECT, SITE 5AT2102, 5 BLOCKS
INTERVAL = 10.0



? SQUARES INDICATE SUGGESTED TEST AREAS. THE NUMBERING SCHEME IS EXPLAINED IN THE INTRODUCTION.



7.35

Figure 7.35: Line contour map of Site 5MT2192 with 10 quarter gamma contour intervals.

Figure 7.36: East-west magnetic profile of Anomaly 1a, a probable pitstructure, 5MT2192. Profile is centered on Grid Line 32N.

PROFILES ACROSS ANOMALIES

5MT2192

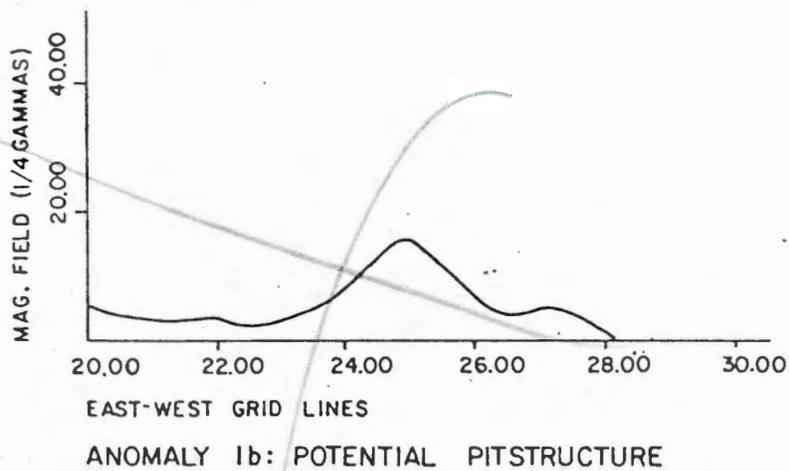
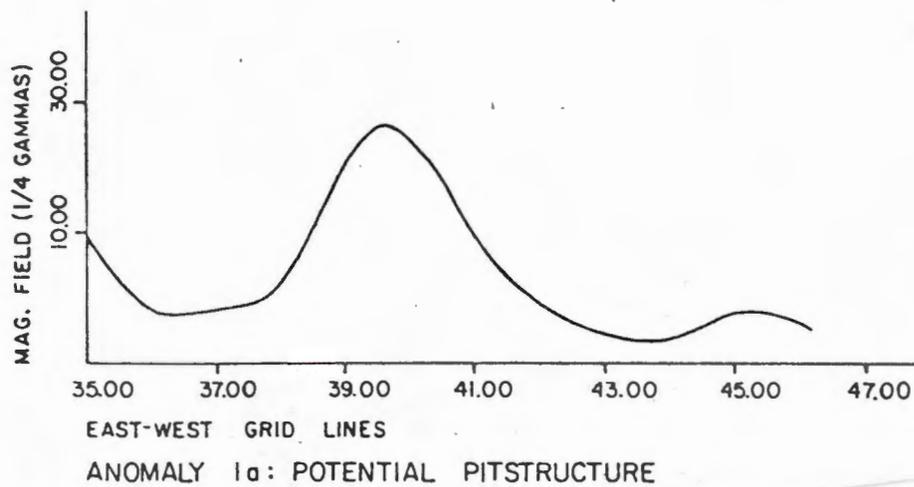


Figure 36.

A large area has been enclosed in 2a because of the size of the anomaly and the presence of a region of high variance to the south, both of which increase the likelihood of finding an archaeological source. Perhaps there are some features there which are associated with the pitstructure. A profile of Anomaly 2a is depicted in Figure 7.39.

Anomaly 2b

The anomaly is a smaller monopole high, located at point (25N,9E), which may be a fire hearth associated with Anomaly 1b. Its profile is shown in Figure 7.40; a maximum depth of 0.5 m was calculated.

Anomalies 2c, 2d, and 2e

All three anomalies are monopole highs located at points (19N,9E), (19N,16E), and (20N,20E), respectively. They were chosen as possible fire hearth features because of their localized size, reduced magnitude, and proximity to Anomaly 1b. Their profiles, shown in Figure 7.41, all indicate moderate depths.

Anomaly 2f

This anomaly is an indistinct monopole high located at the point (36N,43.5E); its profile is illustrated in Figure 7.42.

Anomaly 2g

The anomaly is a monopole high, located to the north of Anomaly 1c, at the point (40N,47E). This is a more extensive anomaly than those caused by either fire hearths or pitstructures and may indicate an architectural feature with compacted or slightly burned fill, similar to Anomaly 2a; the profile is shown in Figure 7.43.

Anomaly 2h

The magnetic feature is defined as an extreme of the monopole lobe

Figure 7.37: East-west magnetic profile of Anomaly 1b, possible pitstructure, 5MT2192. Profile positioned on Grid Line 13E.

PROFILES ACROSS ANOMALIES

5MT2192

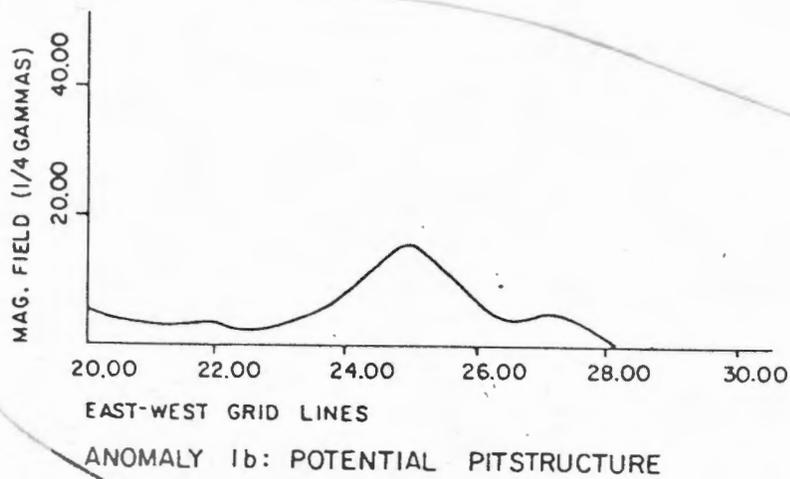
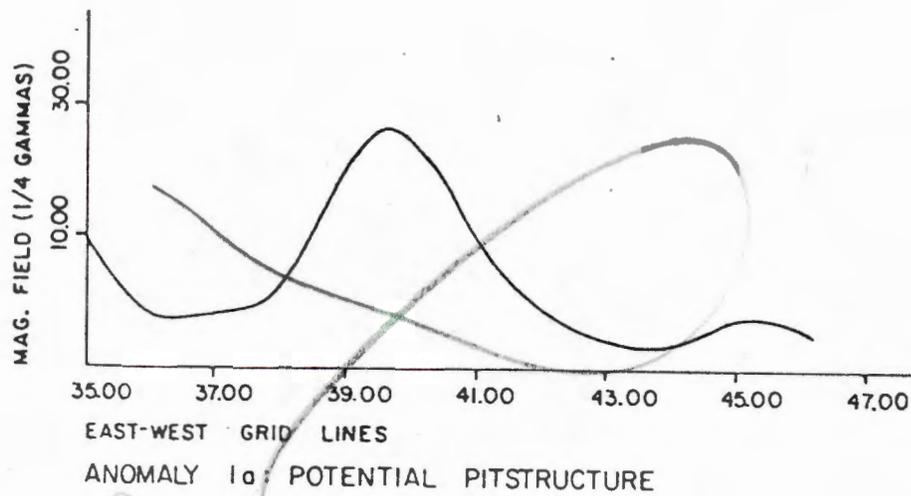


Figure 37

Figure 7.38: East-west magnetic profile of Anomaly 1c, ambiguous feature, 5MT2192. Profile is positioned on Grid Line 35N.

PROFILE ACROSS ANOMALY

5MT 2192

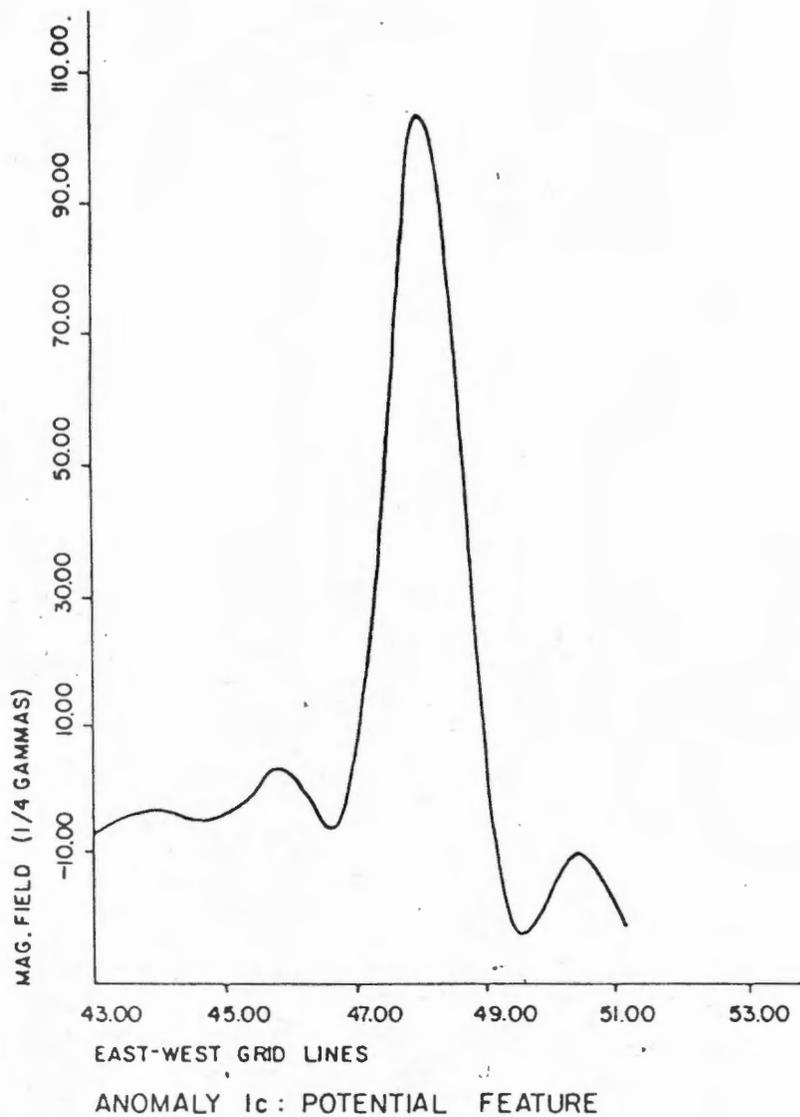


Figure 38.

Figure 7.39: East-west magnetic profile of Anomaly 2a, a possible burned feature, Site 5MT2192. The profile is positioned on Grid Line 40N.

PROFILES ACROSS ANOMALIES

5MT2192

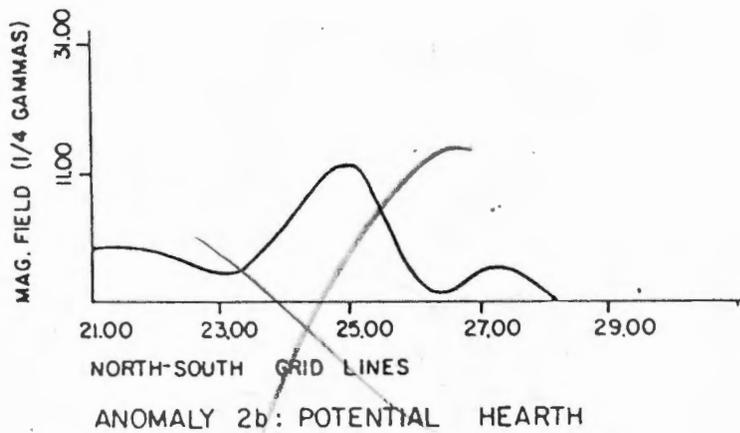
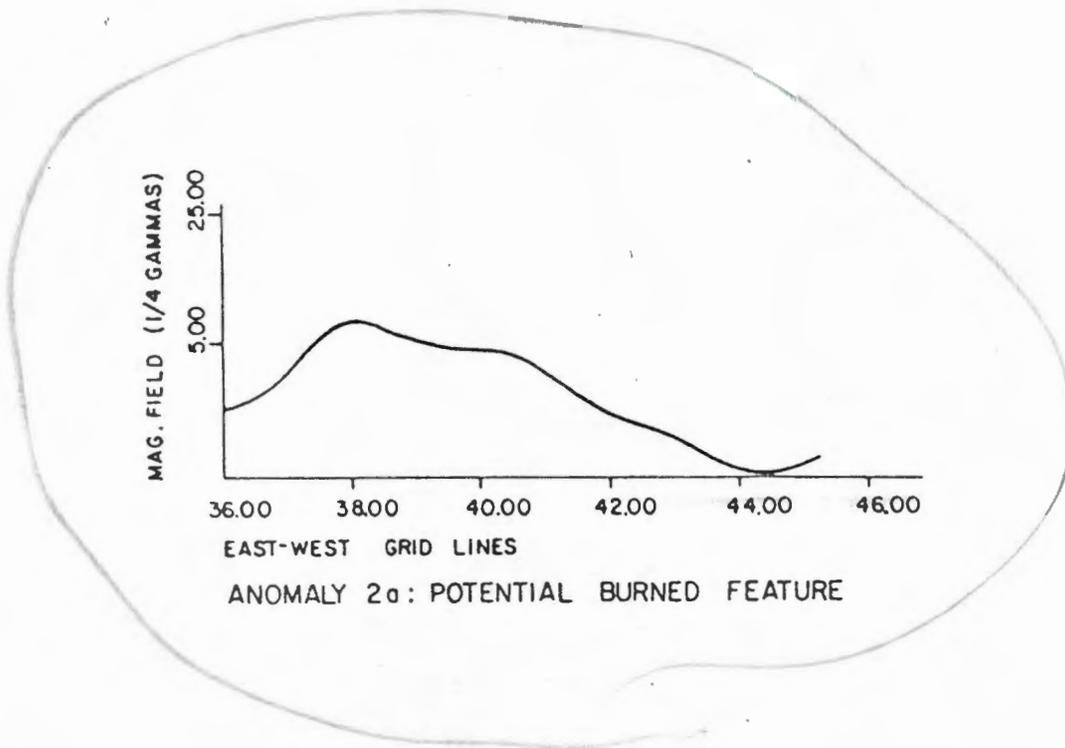


Figure 39.

Figure 7.40: North-south magnetic profile of Anomaly 2b, a potential fire hearth, 5MT2192. The profile is positioned on Grid Line 9E.

PROFILES ACROSS ANOMALIES

5MT2192

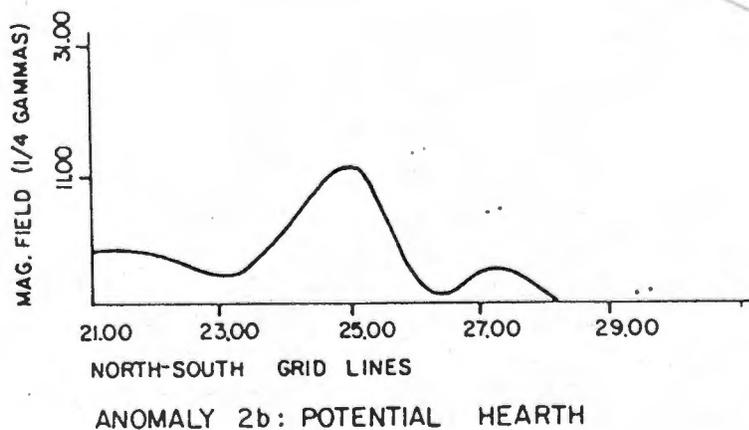
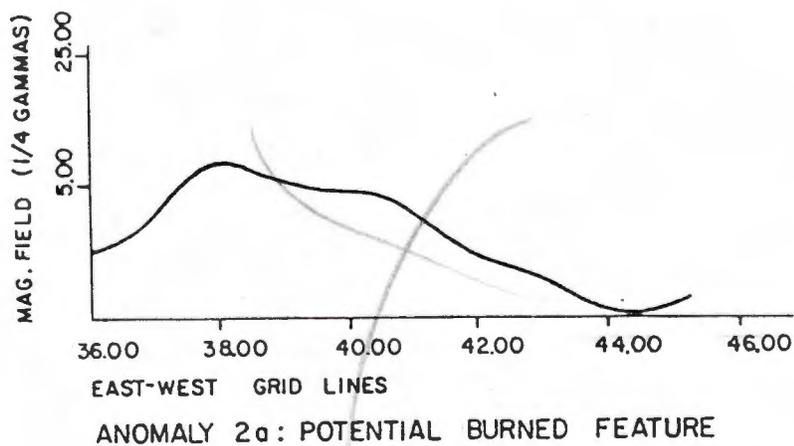


Figure 40.

Figure 7.41: East-west magnetic profiles of Anomalies 2c, 2d, and 2e, possible fire hearths at 5MT2192; (a) is Anomaly 2c positioned on Grid Line 19N, (b) is Anomaly 2d, also positioned on Grid Line 19N, and (c) is Anomaly 2e, positioned on Grid Line 20N.

PROFILES ACROSS ANOMALIES

5MT2192

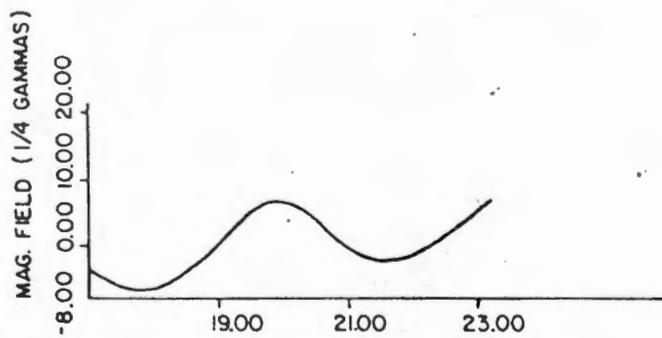
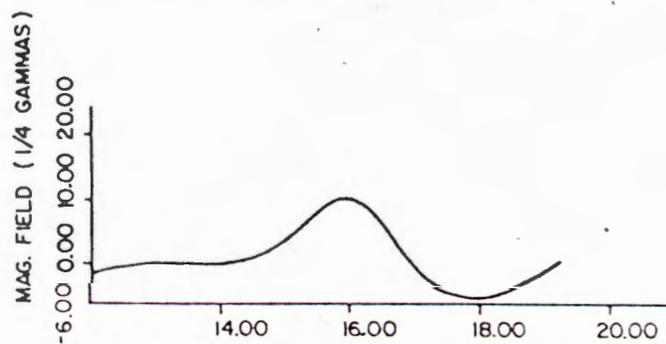
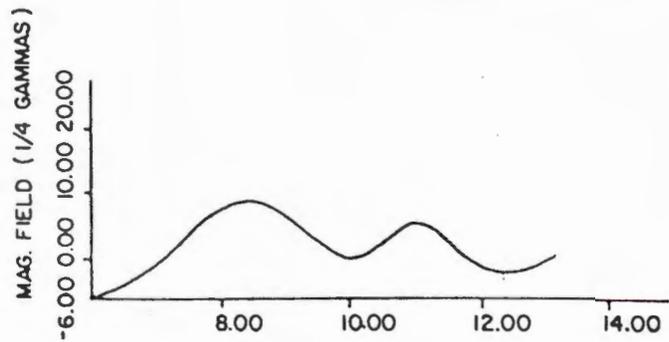


Figure 41.

which extends south of Anomaly 1c. It is difficult to associate a distinct archaeological feature with this anomaly, but considering its proximity to 1c and its magnitude, it is worth investigating. A profile is shown in Figure 7.44.

Anomaly 3a

The anomaly is a monopole high with an irregular shape and reduced magnitude, surrounding the point (39N,20E). It might represent an activity area; the profile is shown in Figure 7.45.

Anomalies 3b and 3c

These anomalies are two extremes of a monopole high situated at point (31N,29E). Again the shape of these anomalies is rather irregular and it is most likely that this represents a burned region with two locations of more intense firing; profiles are illustrated in Figure 7.46.

Anomaly 4a

The anomaly is a strong localized monopole, situated about the point (32N,20E), which covers two points. Analysis suggests that the source is close to the surface. If this is an archaeological feature, it is intensely burned; a profile is shown in Figure 7.47.

Anomaly 4b

This anomaly, located at point (33.5N,23E), is similar to Anomaly 4b. If it is archaeological in nature, it is a burned feature. A shallow depth is indicated by the profile, shown in Figure 7.48.

Anomalies 4c and 4d

Two monopole anomalies of almost inconsequential magnitude are located at points (38N,27E) and (40N,25E). Both are suggestive of small hearths; profiles for these potential features are illustrated in Figure 7.49.

Figure 7.42: East-west magnetic profile of Anomaly 2f, an ambiguous feature, 5MT2192. The profile is positioned on Grid Line 36N.

PROFILES ACROSS ANOMALIES

5MT2192

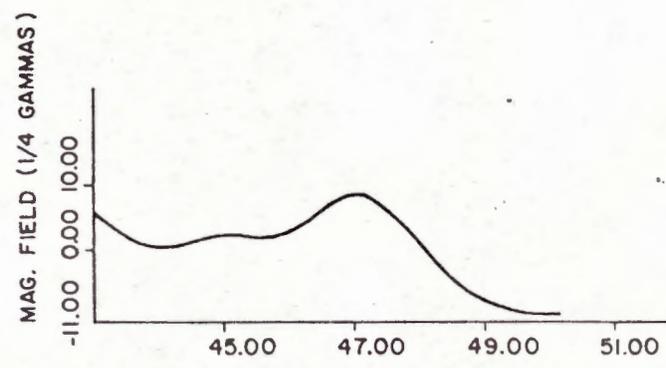
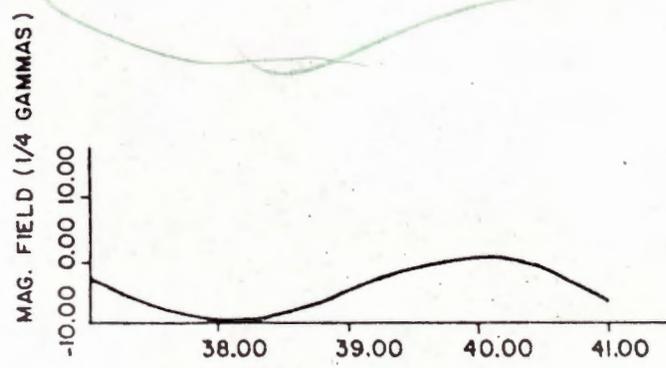
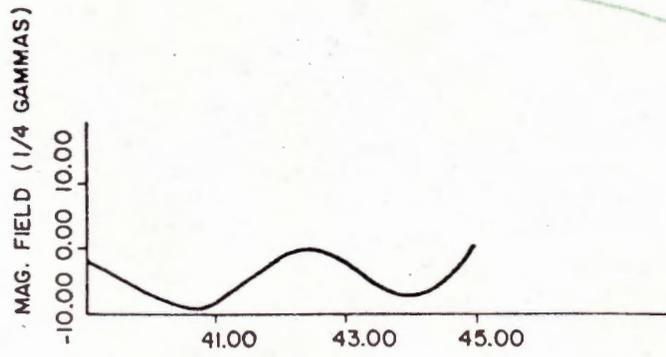
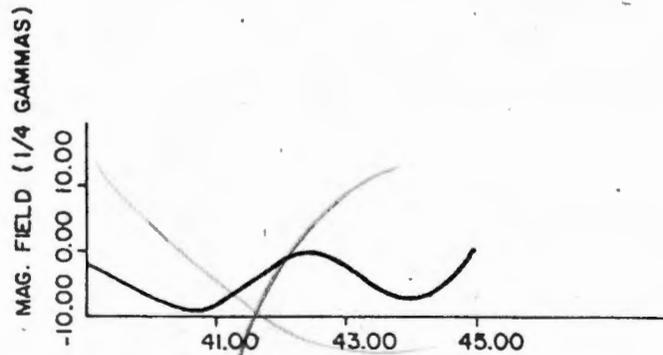


Figure 42.

Figure 7.43: North-south magnetic profile of Anomaly 2g, an ambiguous feature, 5MT2192. The profile is positioned on Grid Line 47E.

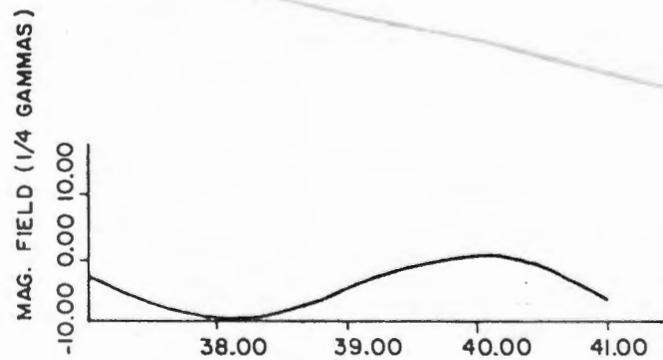
PROFILES ACROSS ANOMALIES

5MT2192



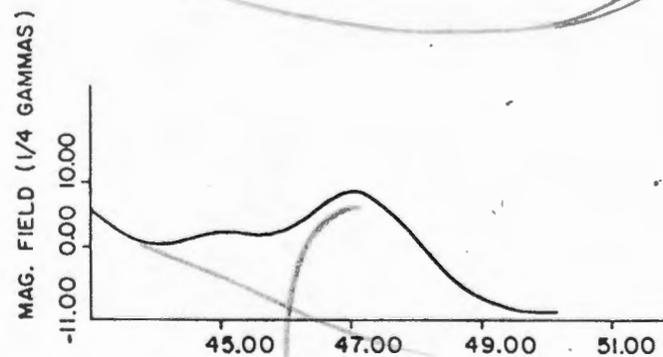
EAST-WEST GRID LINES

ANOMALY 2f: POTENTIAL FEATURE



NORTH-SOUTH GRID LINES

ANOMALY 2g: POTENTIAL FEATURE



EAST-WEST GRID LINES

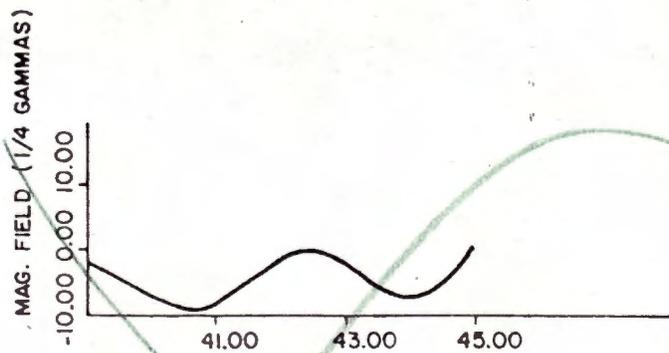
ANOMALY 2h: POTENTIAL FEATURE

Figure 43.

Figure 7.44: East-west magnetic profile of Anomaly 2h, an ambiguous feature, 5MT2192. The profile is positioned on Grid Line 24N.

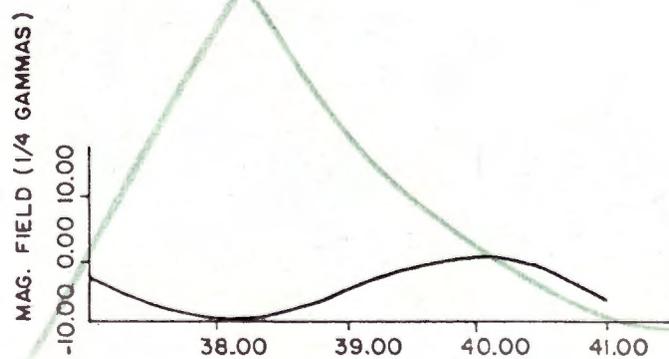
PROFILES ACROSS ANOMALIES

5MT2192



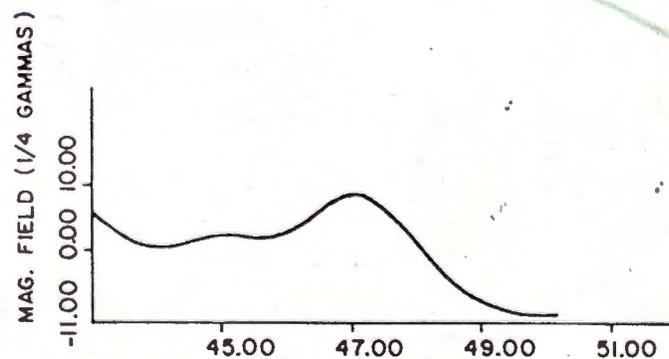
EAST-WEST GRID LINES

ANOMALY 2f: POTENTIAL FEATURE



NORTH-SOUTH GRID LINES

ANOMALY 2g: POTENTIAL FEATURE



EAST-WEST GRID LINES

ANOMALY 2h: POTENTIAL FEATURE

Figure 44.

Figure 7.45: North-south magnetic profile of Anomaly 3a, a potential activity area, 5MT2192. The profile is positioned on Grid Line 20E.

PROFILES ACROSS ANOMALIES

5MT2192

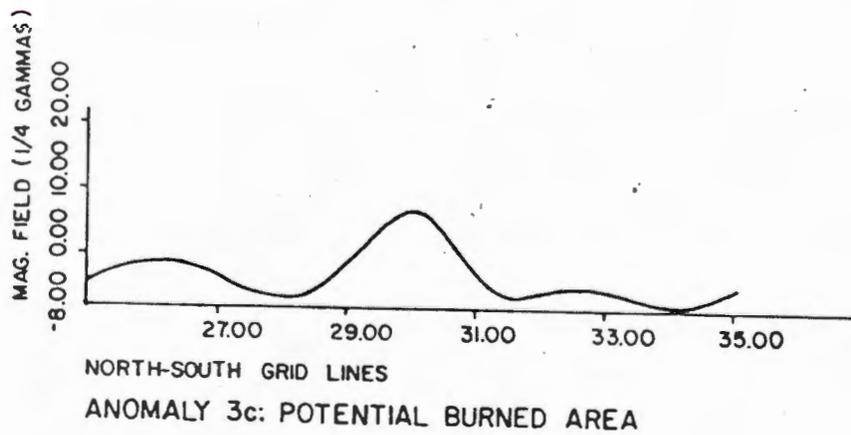
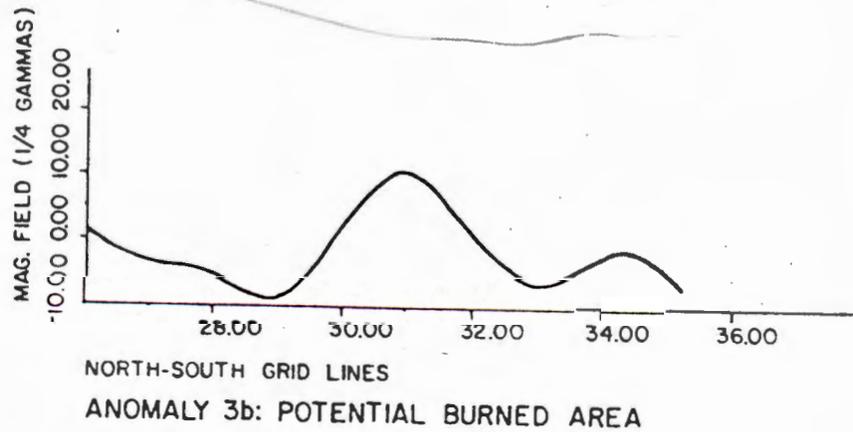
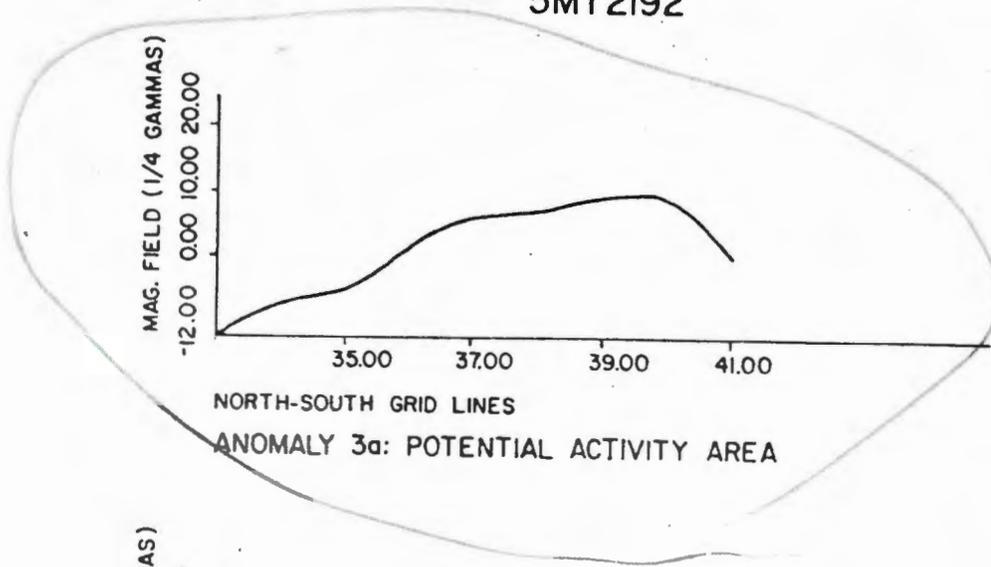
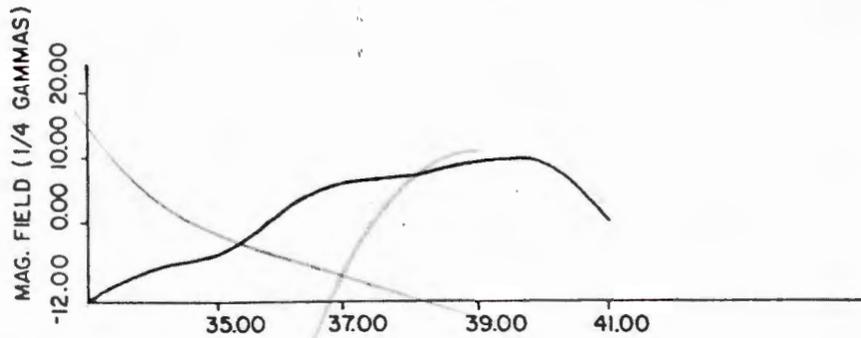


Figure 45.

Figure 7.46: North-south magnetic profiles of anomalies 3b and c, representing a possible burned region, 5MT2192. The top profile (a) is 3b; it is positioned on Grid Line 27E. The bottom (b) is 3c; it is positioned on Grid Line 31E.

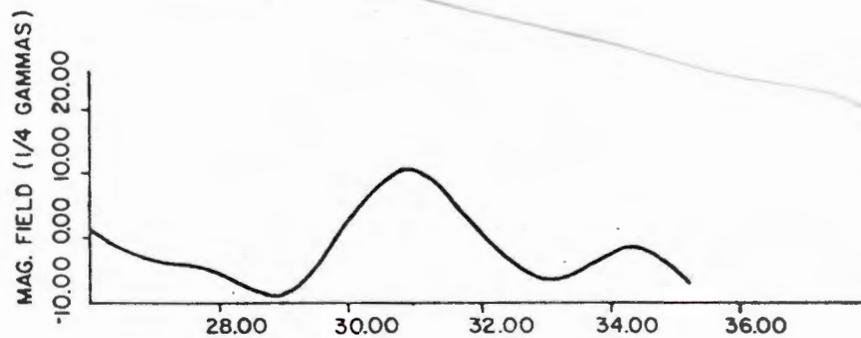
PROFILES ACROSS ANOMALIES

5MT2192



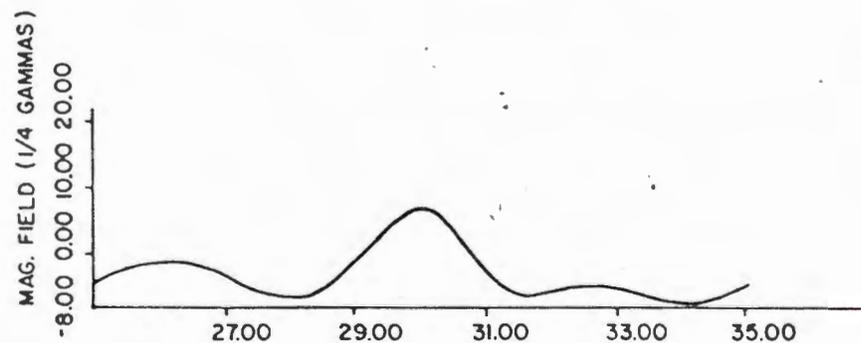
NORTH-SOUTH GRID LINES

ANOMALY 3a: POTENTIAL ACTIVITY AREA



NORTH-SOUTH GRID LINES

ANOMALY 3b: POTENTIAL BURNED AREA



NORTH-SOUTH GRID LINES

ANOMALY 3c: POTENTIAL BURNED AREA

Figure 46.

Anomaly 5a

The anomaly is a monopole high located at the point (23N,25E). This anomaly appears to be associated with the long linear feature running north to south. Although the anomaly could be an extension of the lineation it appears to be sufficiently distinct to consider it separately; again, a profile has been constructed (Figure 7.50).

Anomaly 5b

A monopole high is located at point (24N,47E), and lies on one of the linear geologic trends. It might represent a hearth; the profile is shown in Figure 7.51.

Anomaly 6

A small monopole high, situated at point (18N,32E), looks strikingly like a small hearth. The source is very close to the surface; its profile is shown in Figure 7.52.

Location of Test Squares

All previously mentioned anomalies are enclosed in the numbered rectangles shown in Figure 7.35. The numbering system is a priority list, with "1" indicating the squares in which there is the highest probability of locating cultural features. Excavation should begin within the rectangle - the feature causing the anomaly is most likely directly below that area. For additional information concerning the test squares and terms used in the description of the anomalies, refer to the Introduction.

Site 5MT2193 (Dos Casas Hamlet)

On 12 September 1978 a one-block area was surveyed at Site 5MT2193 and, it became apparent that archaeological features were present, an additional six lines were added to the east side of the grid on 19

Figure 7.47: North-south magnetic profile of Anomaly 4a, a potential burned feature, 5MT2192. The profile is positioned on Grid Line 20E.

PROFILES ACROSS ANOMALIES

5MT2192

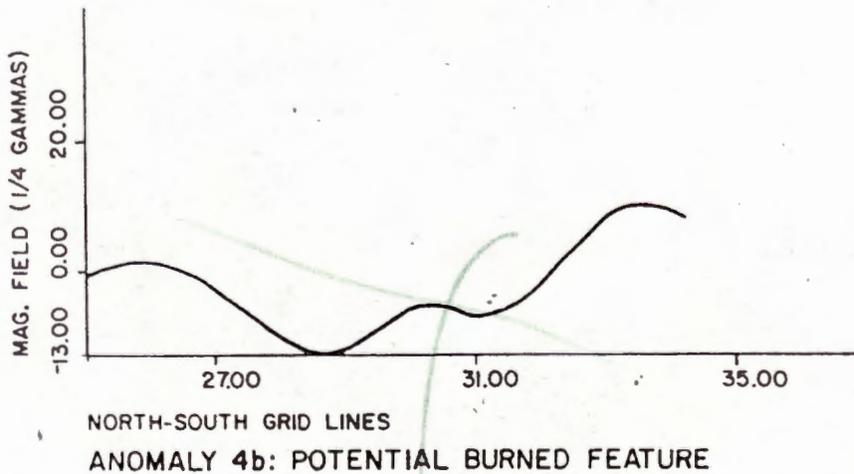
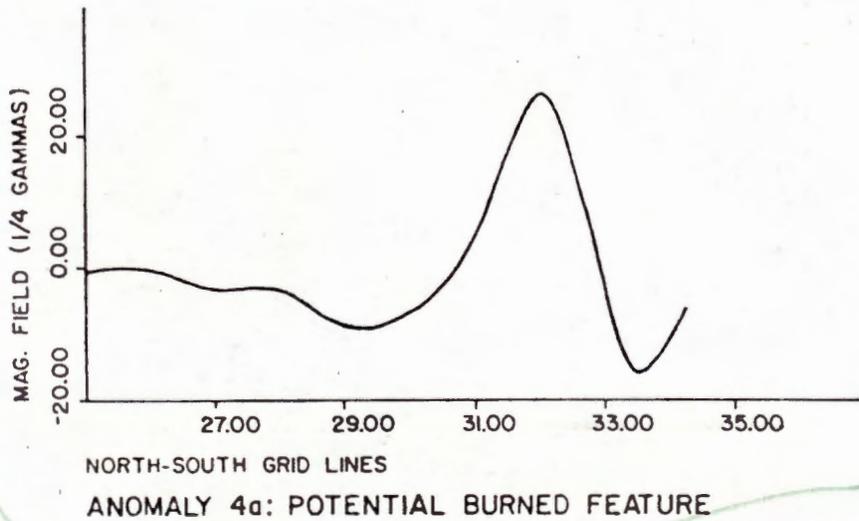
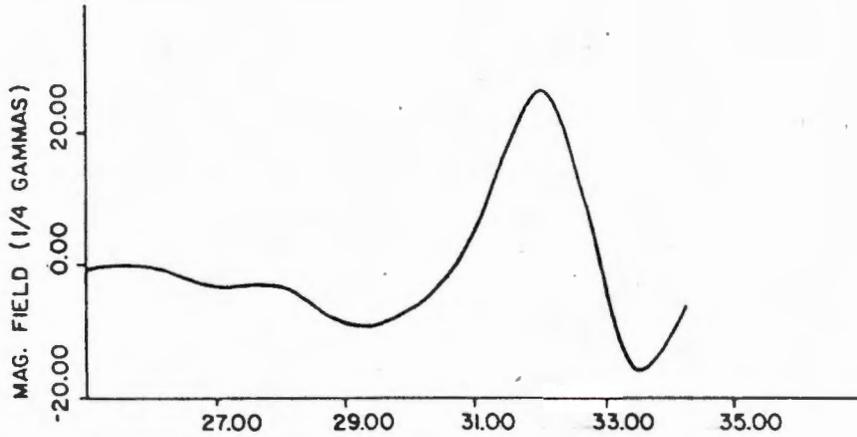


Figure 47.

Figure 7.48: North-south magnetic profile of Anomaly 4b, a potential burned feature, 5MT2192. The profile is positioned on Grid Line 23E.

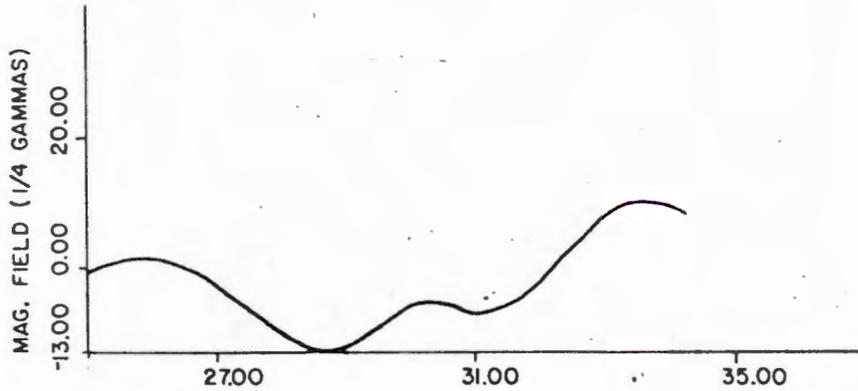
PROFILES ACROSS ANOMALIES

5MT2192



NORTH-SOUTH GRID LINES

ANOMALY 4a: POTENTIAL BURNED FEATURE



NORTH-SOUTH GRID LINES

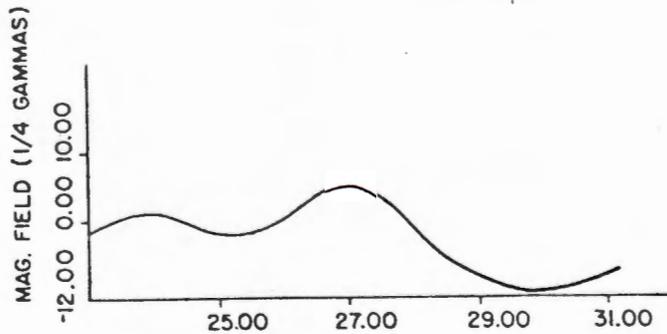
ANOMALY 4b: POTENTIAL BURNED FEATURE

Figure 48.

Figure 7.49: Magnetic profiles of Anomalies 4c and d, 5MT2192: (a) depiction of Anomaly 4c; the profile is on an east-west axis and is positioned on Grid Line 38N; (b) Anomaly 4d; the profile is according to a north-south axis and is positioned on Grid Line 25E. Both anomalies may represent small burned areas or hearths.

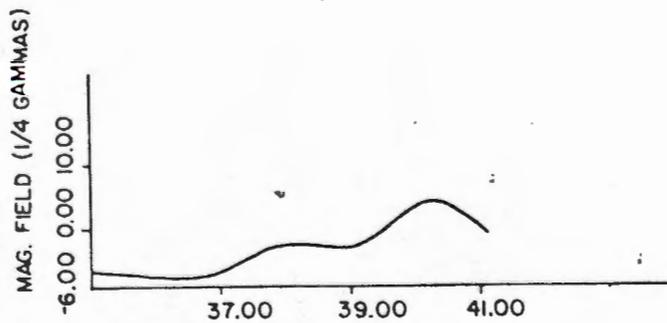
PROFILES ACROSS ANOMALIES

5MT2192



EAST-WEST GRID LINES

ANOMALY 4c: POTENTIAL HEARTH



NORTH-SOUTH GRID LINES

ANOMALY 4d: POTENTIAL HEARTH

Figure 49.

PROFILES ACROSS ANOMALIES

5MT2192

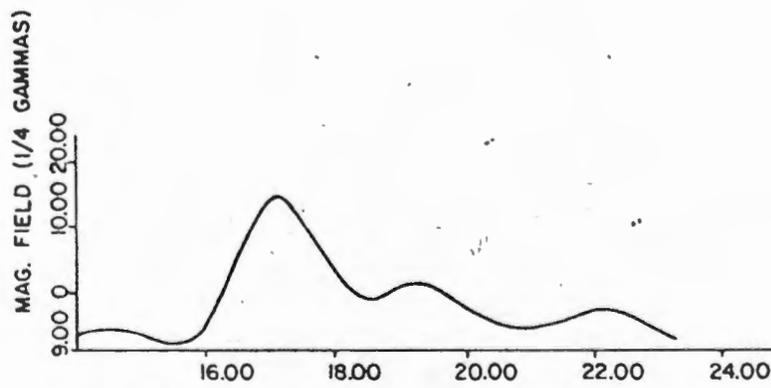
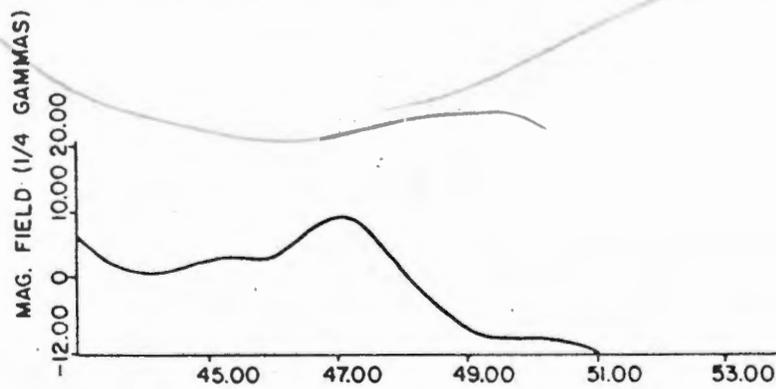
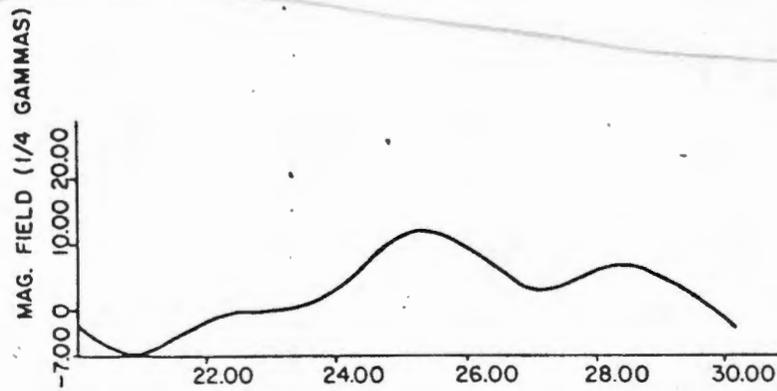


Figure 50.

PROFILES ACROSS ANOMALIES

5MT2192

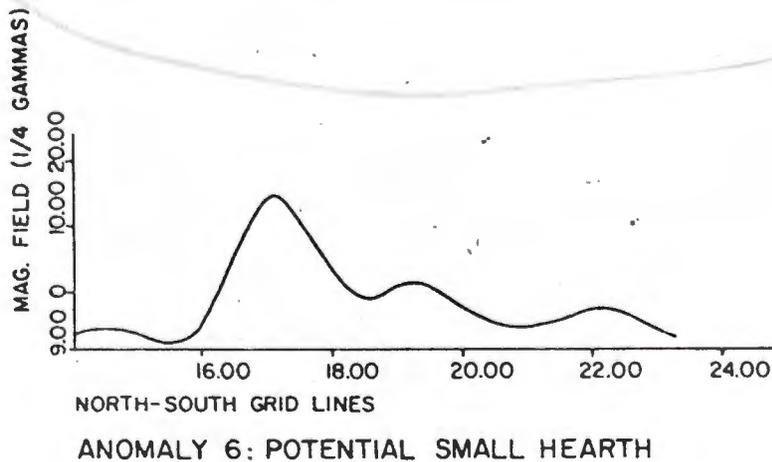
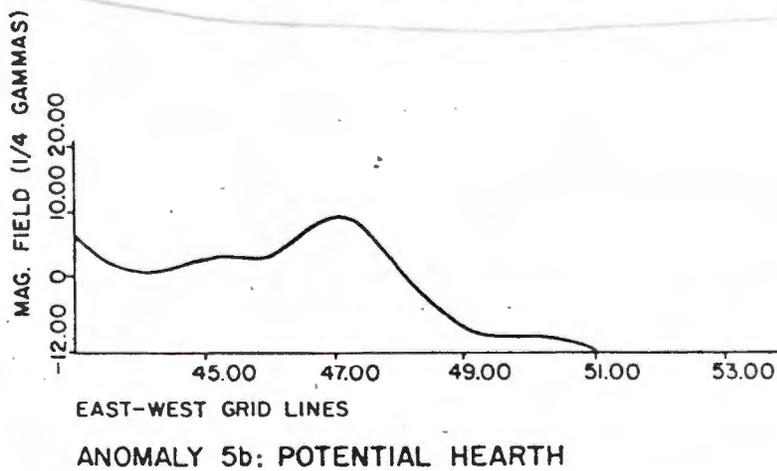
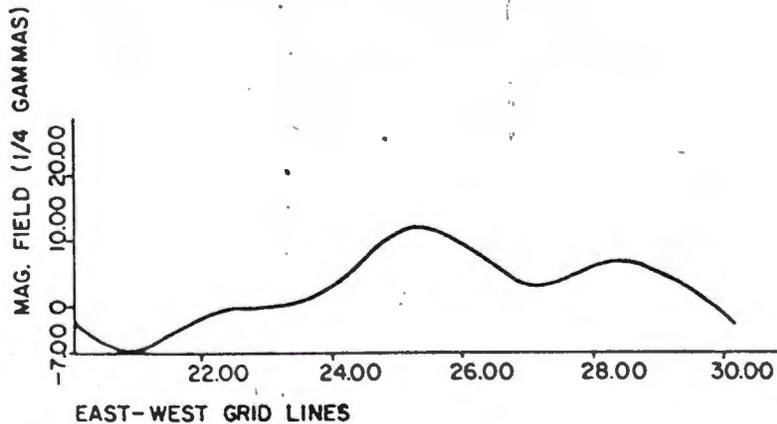


Figure 51.

PROFILES ACROSS ANOMALIES

5MT2192

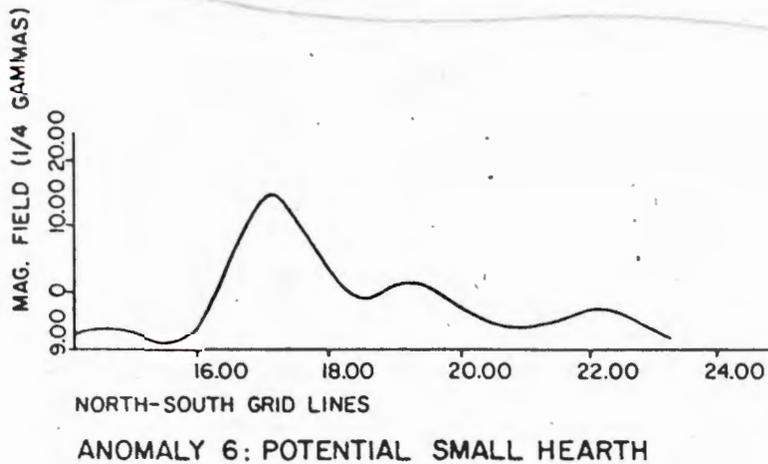
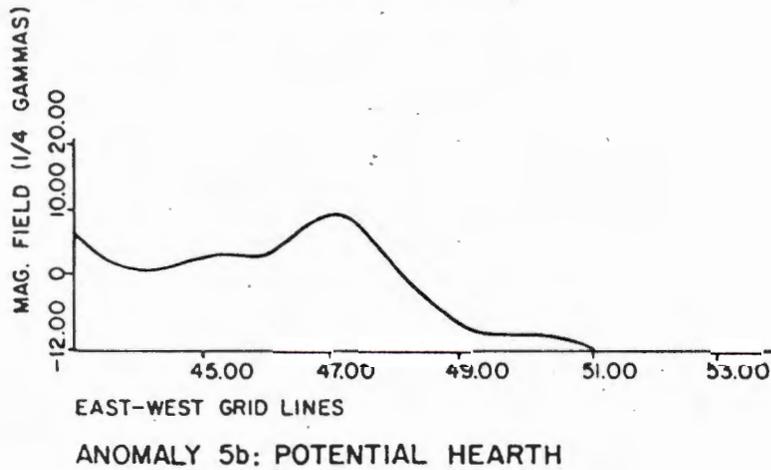
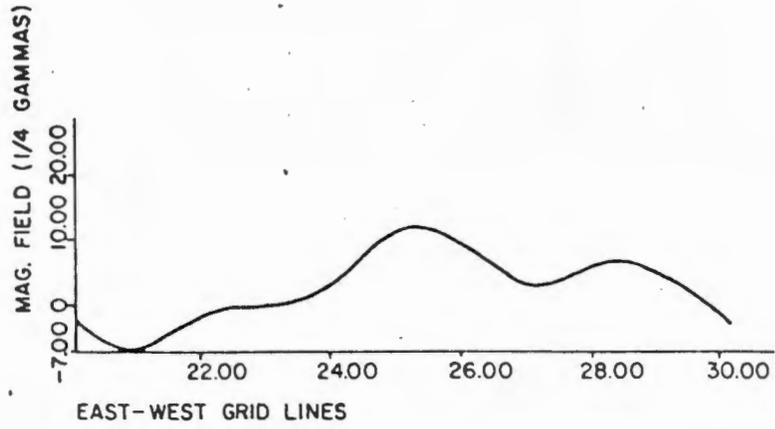


Figure 52.

September. The surveyed area sloped gently to the south and had no small-scale topographic disturbances save for several test squares located around the periphery of the grid. These occurred at points (21N,31E), (1N,31E), (1N,17E), (2N,1E), and (21N,2E) and caused disturbances in the magnetic field close to those points.

Several important anomalies occur on the site as shown in Figure 7.53, the SYMAP representation of the total field, and in Figure 7.54, a contour map with 8 quarter gamma intervals.

Anomaly 1

Two strong monopole highs are centered on points (10N,23E) and (18N,22E). Subsequent excavation revealed two pithouses with an abundance of burned soil and charcoal. The pithouses are good examples of features whose extended geometry allows the detection of only the high contribution to the field. Both anomalies yielded shapes similar to the true outlines of the archaeological features; such a correspondence cannot always be expected, as variations in the magnitude and distribution of the susceptibility contrasts are often present. Several soil samples were collected from in and around the pithouses and susceptibility measurements will be taken for use in computer modeling the field above similar features. This will be done at a later date.

Anomaly 2

A monopole high is situated in the region of (7N,35-36E), the highest point in a localized plateau. Its source appears to be elongated in the east-west direction and could be caused by an oval burned feature. FWMH measurements suggest that the source is at most about 1 m deep.

Figure 7.53: Magnetic contour map (SYMAP) of Site 5MT2193, Dos Casas Hamlet.

Figure 7.54: Line contour map of Site 5MT2193 in 2 gamma contour intervals, showing the suggested location of excavation test squares.

Anomaly 3

A localized plateau high occurs in the area (14-17N,33-35E) and has an extreme of 20 quarter gammas. Because of its extended nature, depth estimates are difficult; but it is suspected to have an archaeological source.

Anomaly 4

A plateau high in the southern portion of the grid is located in the area (1-5N,26-29E), with an extreme of 25 quarter gammas occurring at point (2N,28E). Profiles show that the anomaly has much internal variation and must have a complex source. Again, because of its width, depth estimates are not accurate. However, it warrants examination as it has reasonable magnitude and geometry for an archaeological source.

Anomaly 5

Several small monopole highs, no larger than 2 sq m, occur at points (19N,29E, (15N,30E), 19N,35E), and (10N,30E). These anomalies could be due to small burned features, such as hearths, at a depth of under 1 m. Most of these anomalies are fairly weak compared to the burned pithouse, but this is probably due to the smaller volume of burned material in the suspected hearths.

Anomaly 6

An unusual monopole low anomaly occurs in the north-west corner of the surveyed area, west of the north pithouse. A feature with very loose fill might cause this response, but this seems unlikely to occur. Similar lows can be found on other sites, and excavation here would provide valuable information in interpreting similar responses.

Location of Test Squares

Figure 7.54 shows the suggested location of excavation test squares,

based on the magnetic reconnaissance. The numbering system is explained in the Introduction.

Areas for Future Surveying

Lines (23E) through (31E) might be extended southward if Test Square 3 proves productive.

Site 5MT2194

Site 5MT2194 was first surveyed in September of 1978, but because of data problems, it was redone on 1 June 1979. The ground was free of topographic variations, which might cause disturbances in the magnetic field, and a total of two blocks were surveyed. Six interesting anomalies are present on the site as shown in Figure 7.55, the SYMAP representation of the total field, and Figure 7.56, a line contour map on which is drawn the suggested excavation areas (surrounded by rectangles). The anomalies are as discussed below.

Anomaly 1

A monopole high surrounds the point (12N,10E) and covers about three square meters. It is indicative of a burned area and is either a large fire hearth or a pitstructure. Depth estimations suggest that the feature is at most 1 deep. A profile through its center is shown in Figure 7.57.

Anomaly 2

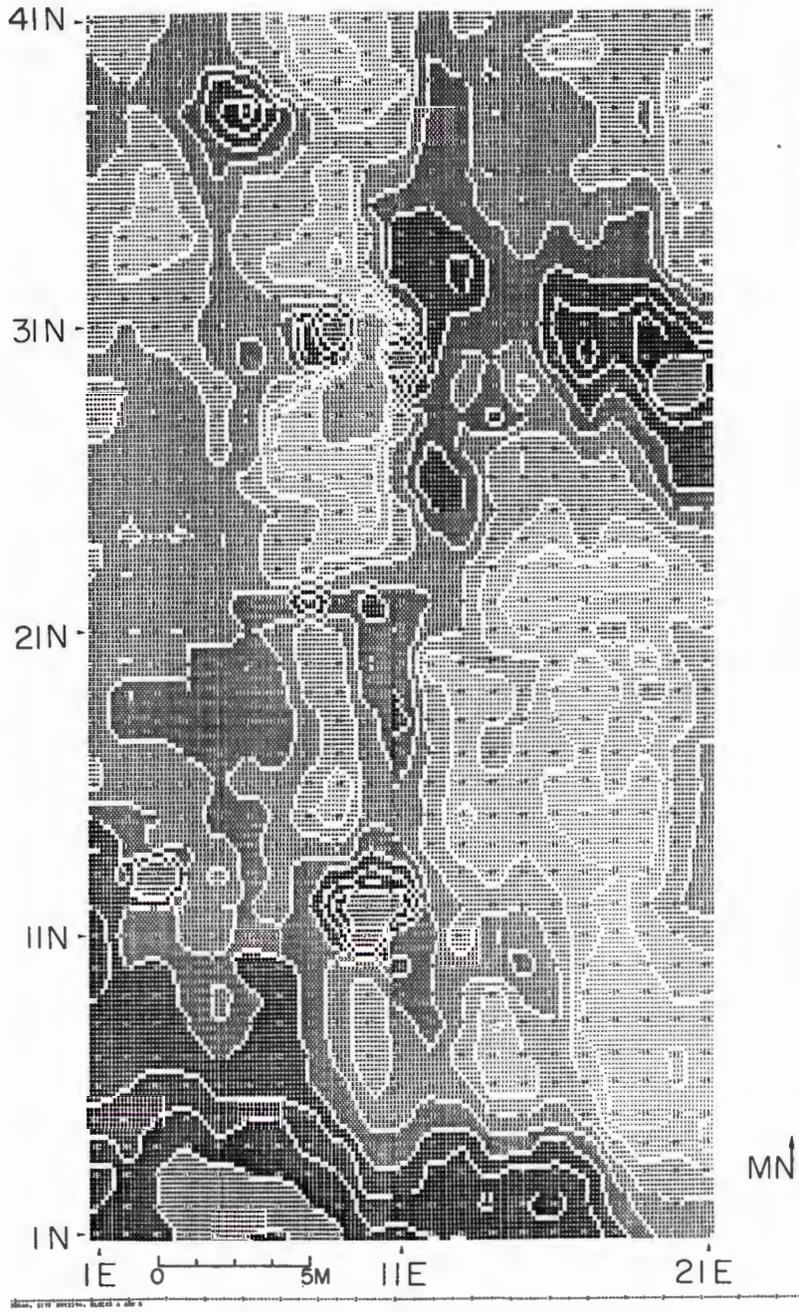
A monopole high is located at point (38N,6E); the anomaly covers several meters and is another likely candidate for a fire hearth. The top of the feature is at a maximum depth of 1 m from the surface. The profile of the anomaly is shown in Figure 7.58.

Anomaly 3

A monopole high is located in the region of point (29N,20E); it

Figure 7.55: Magnetic contour map (SYMAP) of Site 5MT2194 with contour intervals of 8, 4, 4, 4, 4, 4, 4, and 4 quarter gammas.

DOLORES ARCHAEOLOGICAL PROGRAM
 SITE 5MT 2194



UNCLASSIFIED MAP
 FOR REVIEW AND USE BY ORIGINAL MANUFACTURER
 JUNE 1970

DATA VALUE EXTREMES ARE -60.00 60.00

ABSOLUTE LEVELS OF THE QUANTILE LEVELS ARE:

0.00	10.00	20.00	30.00	40.00	50.00	60.00
------	-------	-------	-------	-------	-------	-------

PERCENTAGE OF TOTAL ABSOLUTE VALUE RANGE APPLIED TO EACH LEVEL

0.00	10.00	20.00	30.00	40.00	50.00	60.00
------	-------	-------	-------	-------	-------	-------

FREQUENCY DISTRIBUTION OF DATA POINT VALUES BY EACH LEVEL

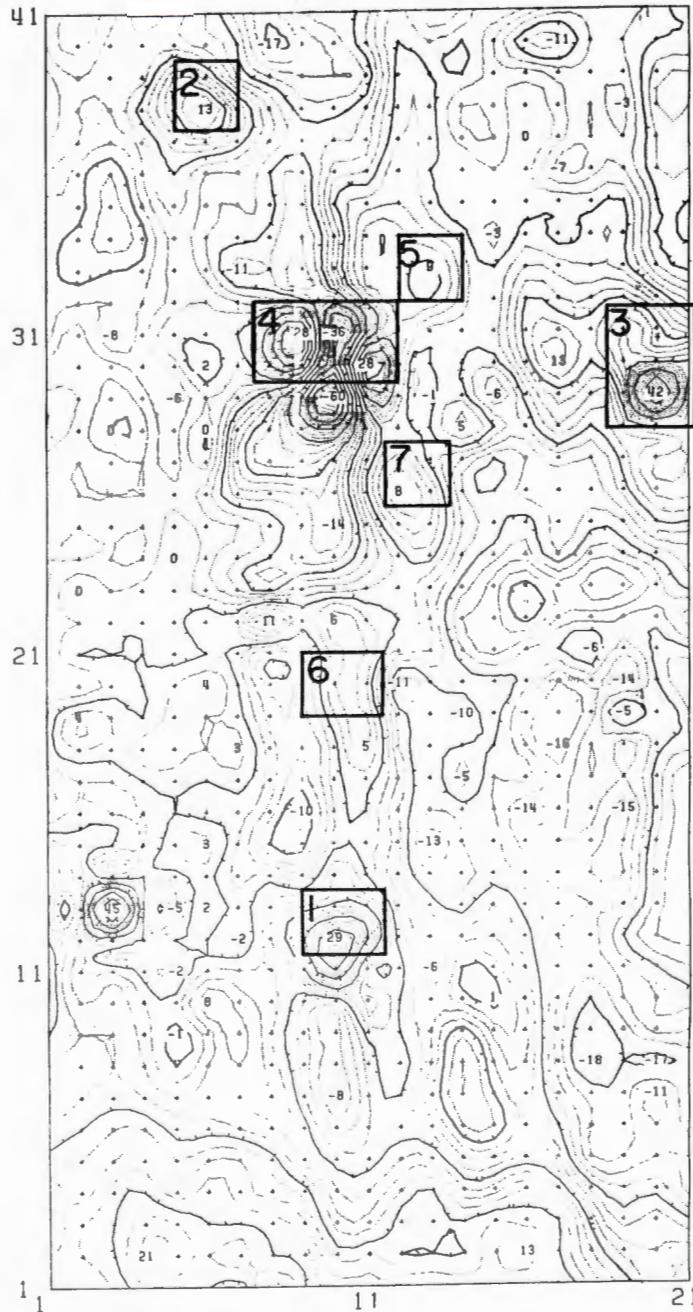
0.00	10.00	20.00	30.00	40.00	50.00	60.00
------	-------	-------	-------	-------	-------	-------

CONTOUR INTERVALS= 8, 4, 4, 4, 4, 4, 4, 4, QUARTER GAMMAS

7.55

Figure 7.56: Line contour map of Site 5MT2194 with 8 quarter gamma contour interval.

DOLORES ARCHAEOLOGICAL PROJECT, SITE 5MT2194, BLOCKS A AND B
CONTOUR MAP
INTERVAL = 8.0



SQUARES INDICATE SUGGESTED TEST AREAS. THE NUMBERING SCHEME IS EXPLAINED IN THE INTRODUCTION.

7.56

extends off the east end of the map and is suggestive of either an activity area or an area with a high ash content. Although a portion of the anomaly is not visible, it is distinct enough to advise that it be investigated. A profile is shown in Figure 7.59.

Anomaly 4

A combination of highs and lows is located at point (31N,10E) and is difficult to interpret as any distinct feature. As suggested by the high gradients in the region, the possibility exists that this anomaly is caused by an iron source, but this is not certain. Excavation here would clear the ambiguity and show whether the source of the anomaly has cultural affiliations. As this magnetic feature is of uncertain origin, a profile is not included.

Anomaly 5

A monopole high at point (33N,13E) is interconnected with one of the highs in anomalous region (4), but it is sufficiently distinct to be viewed as a separate test area. If it is caused by a cultural feature it is likely to be a burned region or an activity area. A profile is shown in Figure 7.60.

Anomaly 6

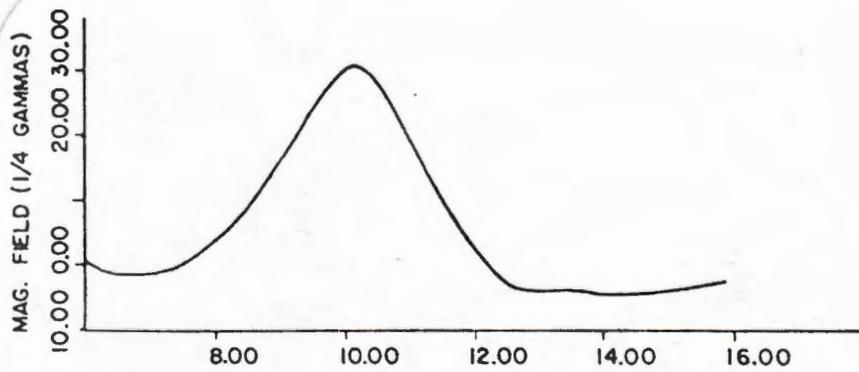
A long, linear high, connected to Anomaly 7. Although it covers a larger region than is suggested for testing, an exploratory excavation square has been located at about the point (20N,11E). It is suspected to represent some form of pathway or compacted feature and might be quite subtle. Understanding its source would be very useful; a profile is not included.



Figure 7.57: Magnetic profile of Anomaly 1, a potential pitstructure, 5MT2194. The profile is oriented east-west and is positioned on Grid Line 12N.

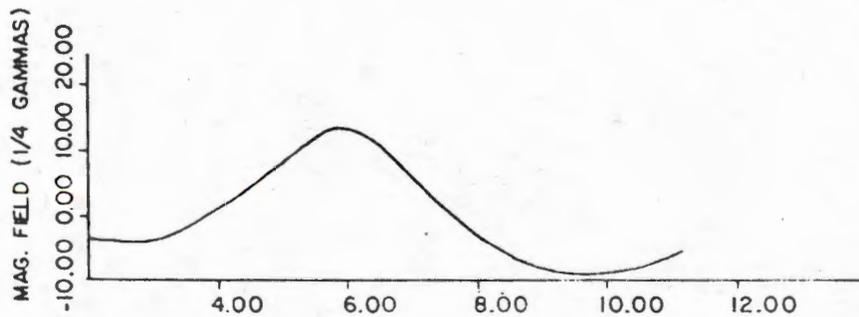
PROFILES ACROSS ANOMALIES

5MT2194



EAST-WEST GRID LINES

ANOMALY 1: POTENTIAL PITSTRUCTURE



EAST-WEST GRID LINES

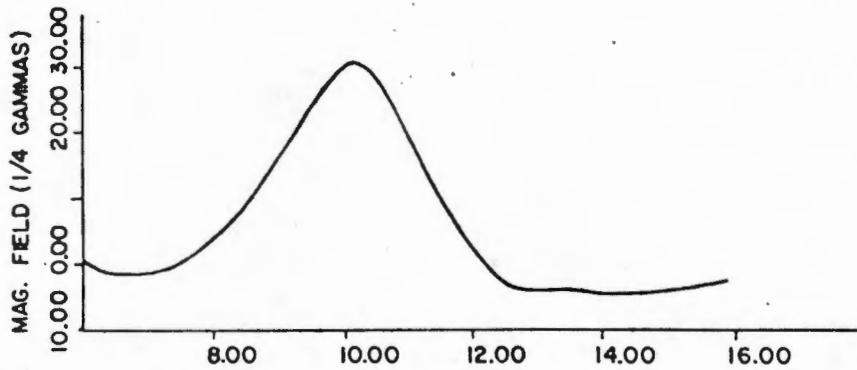
ANOMALY 2: POTENTIAL HEARTH

Figure 57.

Figure 7.58: Magnetic profile of Anomaly 2, a potential fire hearth, 5MT2194. The profile is oriented on an east-west axis and is positioned on Grid Line 38N.

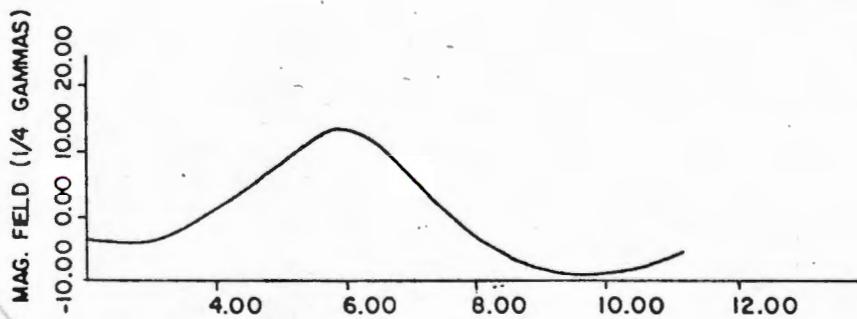
PROFILES ACROSS ANOMALIES

5MT2194



EAST-WEST GRID LINES

ANOMALY 1: POTENTIAL PITSTRUCTURE



EAST-WEST GRID LINES

ANOMALY 2: POTENTIAL HEARTH

Figure 58.

Figure 7.59: Magnetic profile of Anomaly 3, a potential activity area, 5MT2194. The profile is oriented on a north-south axis and is positioned on Grid Line 18E.

PROFILES ACROSS ANOMALIES

5MT2I94

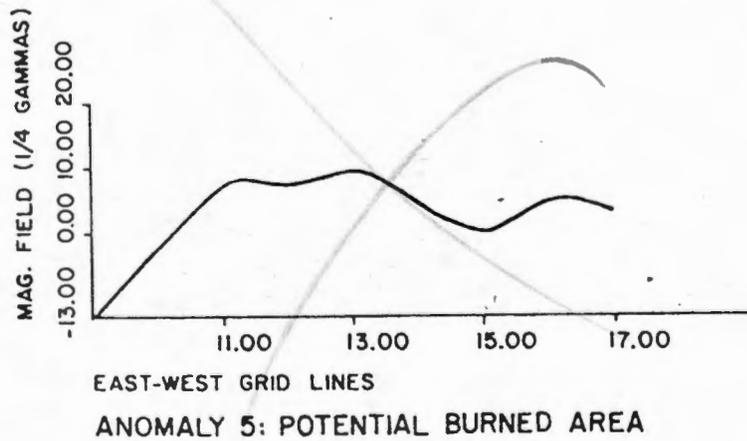
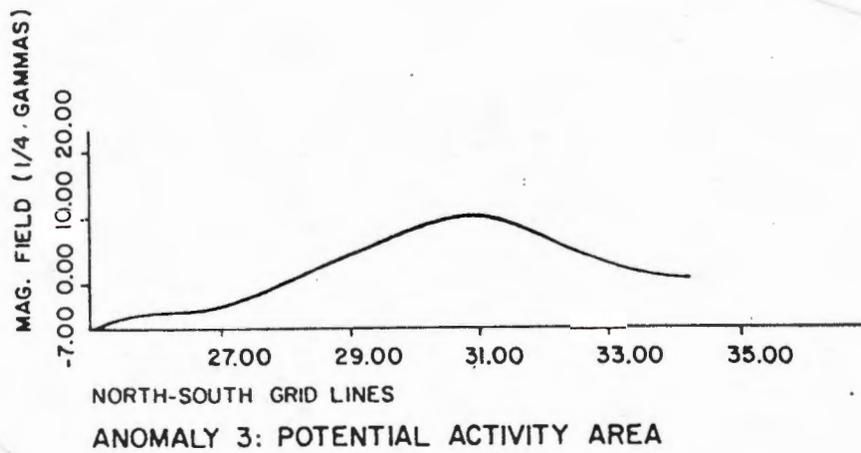


Figure 59.

Anomaly 7

A slightly stronger monopole high is located on the same linear trend as Anomaly 6. As it is more distinct, it might have contributions from a burned feature. A profile is not included.

Location of Test Squares

The locations of recommended excavation test squares, centered on archaeologically interesting anomalies, are indicated in Figure 7.56. The numbering scheme indicates which anomalies are most likely to be caused by archaeological features, "1" indicating the square in which there is the highest probability of locating a cultural feature. Excavation should begin within the rectangle - the feature causing the anomaly is most likely directly below that area. For additional information concerning the test squares or terms used in the description of the anomalies, refer to the Introduction.

Areas for Future Surveying

If the anomaly indicated in Test Square 3 proves interesting, an additional half block should be added to the east side of the grid from Grid Line (21N) to Line (41N).

Site 5MT2198 (Sagehill Hamlet)

Survey operations at Site 5MT2198, Sagehill Hamlet, covered one block and were accomplished on 13 September 1978. As immediate feedback was necessary in order to facilitate the ordering of excavation priorities, the difference values were calculated and line contour maps drawn by hand. An unusual dipole anomaly, for which no adequate explanation exists, dominates the maps (Figures 7.61 and 7.62). The most likely source for this anomaly might lie in a combination of fields from an iron object and a geological

Figure 7.60: Magnetic profile of Anomaly 5, a potential burned region, 5MT2194. The profile is according to an east-west axis and is positioned on Grid Line 33N.

PROFILES ACROSS ANOMALIES

5MT2194

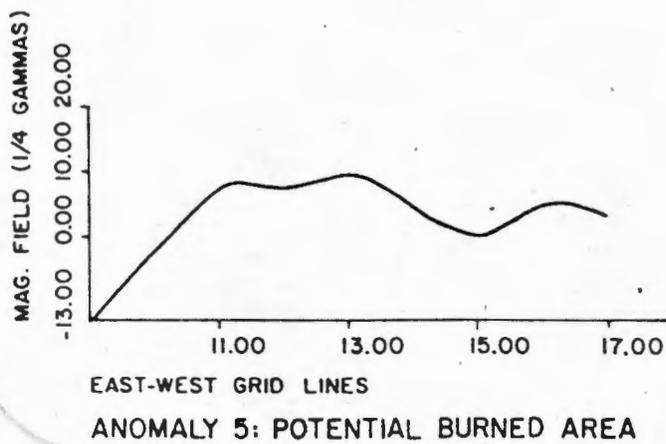
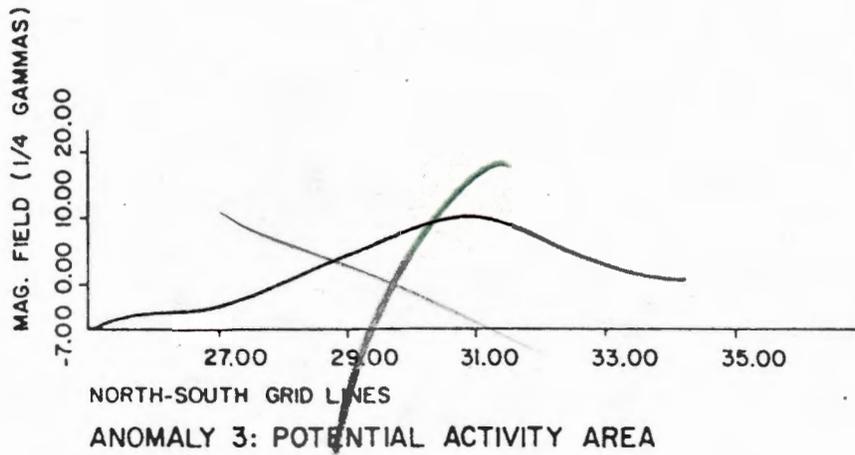


Figure 60.

feature. Additional testing should be done on the site using a metal detector.

As advised, a complete analysis of the remaining features is omitted, as excavation on this site has been completed.

Site 5MT2199 (Horse Bone Camp)

Site 5MT2199 was magnetically surveyed 7 June 1979; operations covered a two-block area. The ground surface slopes towards the south and, although this general trend is unlikely to affect the magnetic field, the two drainages running north to south are magnetically detectable.

Figure 7.63, the SYMAP representation of the total field, and Figure 7.64, the line contour map, show several areas of archaeological interest. There are no large features on the site which definitely indicate a house structure, but there are some smaller anomalies which could be caused by fire hearths or similar localized sources. The north-south drainages are detectable magnetically, but a comparison of the topographic map drawn by the field crew and the magnetometer map shows that the east-most drainage is actually a bit west of its associated anomaly; this suggests the presence of another linear effect, perhaps a paleodrainage. The westernmost drainage lines up fairly well, although the anomaly does not extend as far north as the geological feature.

Preliminary examination of the data took place in early July 1979 and a computer map indicating four anomalies was sent to be used in the field. After re-examination of the data, a more complete description of the anomalies was accomplished. The archaeologically significant anomalies are summarized below.

Figure 7.61: Magnetic contour map (SYMAP) of Site 5MT2198, Sagehill Hamlet. The contour levels include data ranges of 12, 4, 4, 4, 4, 4, 4, 8, 20, and 20 quarter gammas.

2IN

1IN

1IN



DOLORES ARCHAEOLOGICAL PROJECT, SITE 5MT2198

MAP OF TOTAL MAGNETIC FIELD WITH BAGS IN DIFFERENTIAL MODE

--VALUES ARE IN 1/4 GAMMA UNITS

MARCB 1975--ANTONIO IP

IE

IE

MN ↑

DATA VALUE EXTREMES ARE -133.00 121.00

ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL

(*VALUES INCLUDED IN HIGHEST LEVEL ONLY)

MINIMUM	0.00	24.00	-12.00	-8.00	-8.00	0.0	8.00	8.00	12.00	20.00	40.00	ABOVE
MAXIMUM	-24.00	-12.00	-8.00	-8.00	-8.00	8.00	8.00	12.00	20.00	40.00	60.00	

PERCENTAGE OF TOTAL ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL

	14.29	4.76	4.76	4.76	4.76	4.76	4.76	9.52	23.81	23.81	
--	-------	------	------	------	------	------	------	------	-------	-------	--

FREQUENCY DISTRIBUTION OF DATA POINT VALUES IN EACH LEVEL

LEVEL	5	6	7	8	9	10	N
SYMBOLS	IIIIIIII						
FREQ.	11	20	18	45	76	91	62
							37
							33
							16
							12
							6



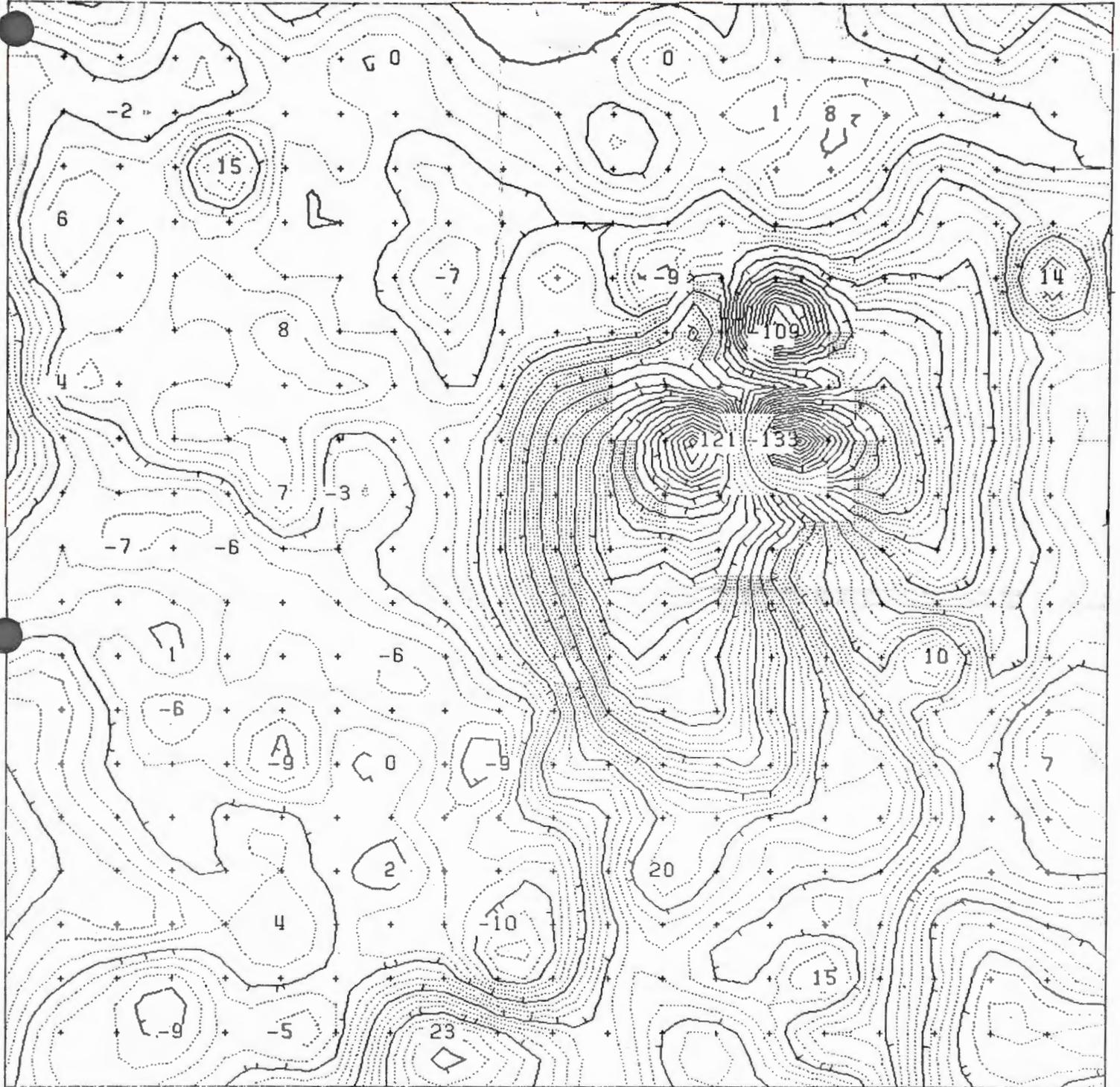
CONTOUR INTERVAL 12, 4, 4, 4, 4, 4, 4, 8, 20, 20

7.67

QUARTER GAMMAS

Figure 7.62: Line contour maps of Site 5MT2198 with 8 quarter gamma contour intervals.

CONTOUR MAP
DOLORES ARCHAEOLOGICAL PROJECT, SITE SMT2198, 1 BLOCK
INTERVAL = 8.0



11

21

0

5

10M

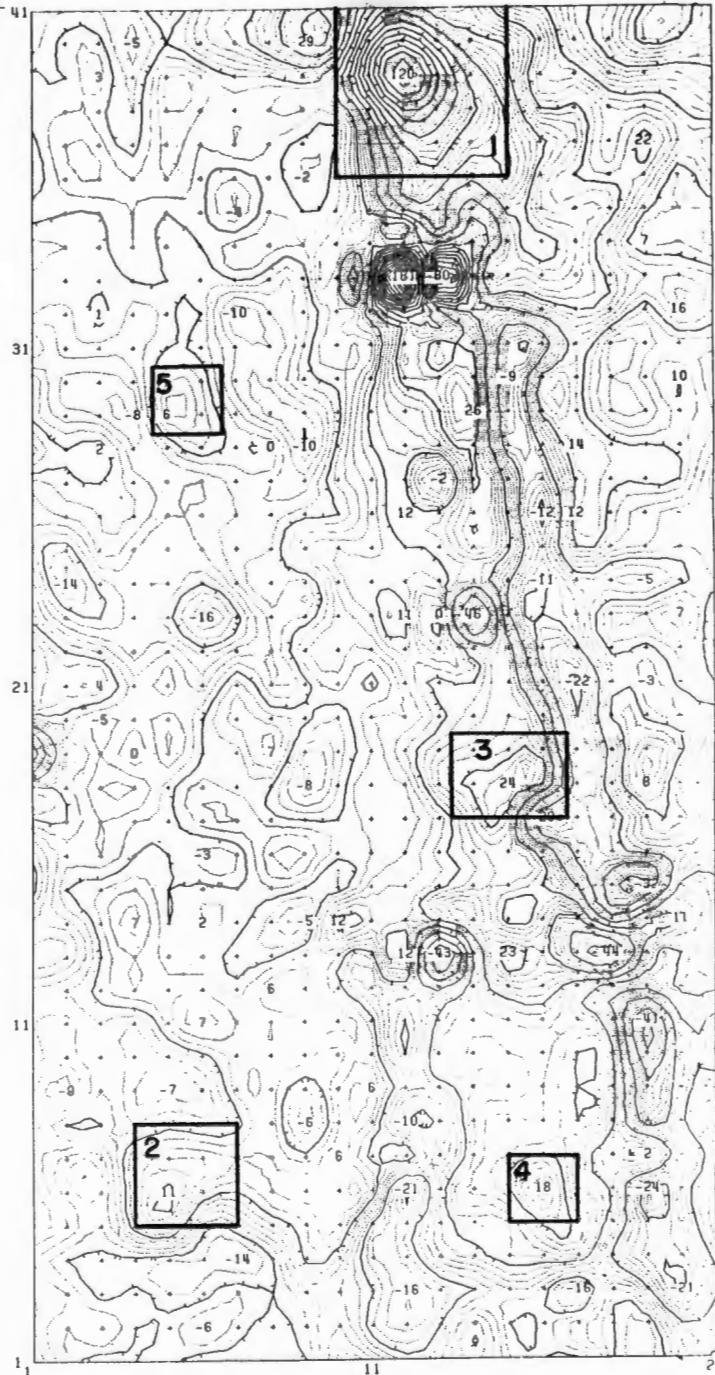


7.62

Figure 7.63: Magnetic contour map (SYMAP) of Site 5MT2199, Horse Bone Camp, with contour intervals of 4, 4, 6, 4, 4, 6, 8, 10, and 22 quarter gammas.

Figure 7.64: Line contour map of Site 5MT2199 with
10 quarter gamma contour intervals.

CONTOUR MAP
DOLORES ARCHAEOLOGICAL PROJECT, SITE 5MT2199, 2 BLOCKS
INTERVAL = 10.0



SQUARES INDICATE SUGGESTED TEST AREAS. THE NUMBERING SCHEME IS EXPLAINED IN THE INTRODUCTION.

7.6B

Anomaly 1

The anomaly is a dipole surrounding the point (40N,11E). This is possibly a large burned area, but the presence of a strong low to the northwest makes the source of the anomaly a likely candidate for a metal object. Because a part of the anomaly is not visible, it is difficult to suggest anything with certainty. Figure 7.65 shows a profile through the anomaly.

Anomaly 2

A monopole high is located at the point (6N,5E). This anomaly is much more localized; although it appears to be connected to the anomaly to the east, the response is similar in shape to a fire hearth. Its profile is shown in Figure 66. Calculations indicate a maximum depth of about 1 m to the feature.

Anomaly 3

A monopole high is centered at the point (18N,15E). This anomaly is a high plateau in the north-south elongated anomaly which runs between the two drainages. It is likely a geological feature but a test square at an extreme would clear up the ambiguity. A profile running west to east through the anomaly is shown in Figure 7.67.

Anomaly 4

The anomaly is a monopole high centered at the point (6N,16E). Again, this is an extreme on the north-south trend but it warrants investigation. A profile is shown in Figure 7.68.

Anomaly 5

After re-examination of the data, another anomaly with possible archaeological implications has been identified; this is a small isolated monopole high situated about the point (29N,5E). It is a candidate for a

Figure 7.65: Magnetic profile of Anomaly 1, a possible metal object, 5MT2199. The profile is according to an east-west axis and is positioned on Grid Line 38N.

PROFILES ACROSS ANOMALIES

5MT2199

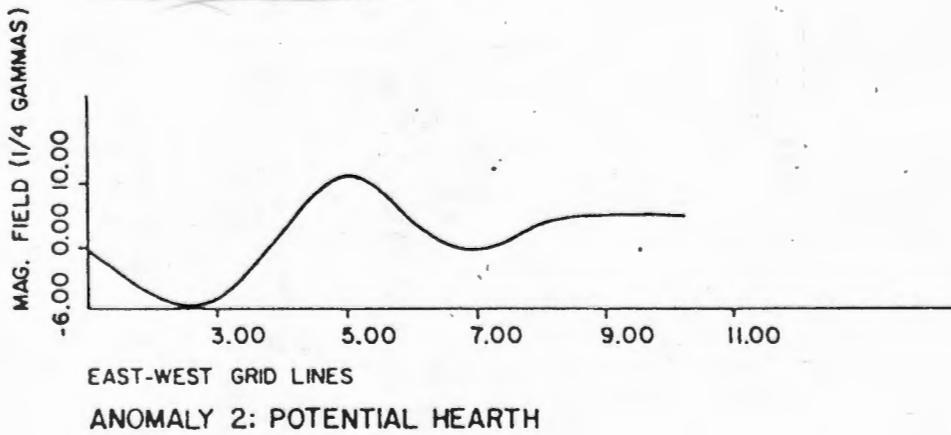
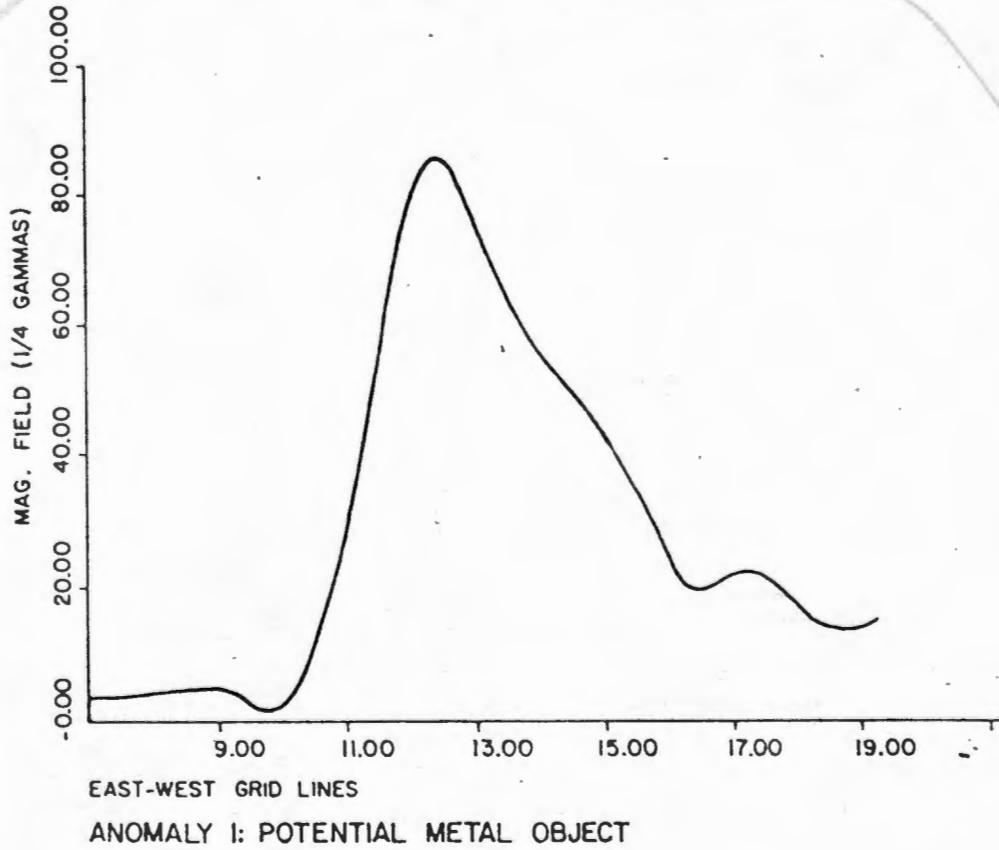


Figure 65.

Figure 7.66: Magnetic profile of Anomaly 2, a potential fire hearth, 5MT2199. The profile is oriented east-west and is positioned on Grid Line 6N.

fire hearth. The anomaly is too broad for an accurate depth calculation, as shown in Figure 7.69.

In summary, this site appears to have few or no features which have detectable magnetic responses. The two "fire hearth" anomalies (2 and 5) appear more likely to have archaeological sources; however, they have been assigned low priority because they are somewhat weak and improperly shaped. It is unlikely that this site has many archaeologically interesting features.

Location of Test Squares

The locations of recommended excavation test squares centered on potentially archaeologically significant anomalies are indicated in Figure 7.62. The numbering system indicates the likelihood of encountering archaeological features, with "1" indicating the square with the highest priority. Excavation should begin within the rectangle - the feature causing the anomaly is most likely directly below that area. For additional information concerning the test squares, refer to the Introduction.

Site 5MT2203 (Casa Roca)

Site 5MT2203 was surveyed on 6 October and operations covered a two-block grid. The site is topographically flat with the exception of a few rodent holes and a pile of stone rubble centered on (16.7N,14.4E) and consisting mostly of unshaped sandstone blocks.

Figure 7.70, the SYMAP representation with contour intervals of 8, 8, 4, 4, 4, 4, and 8 quarter gammas, and Figure 7.71, a line contour map with a 4 quarter gamma contour interval, show the following notable anomalies.

PROFILES ACROSS ANOMALIES

5MT2199

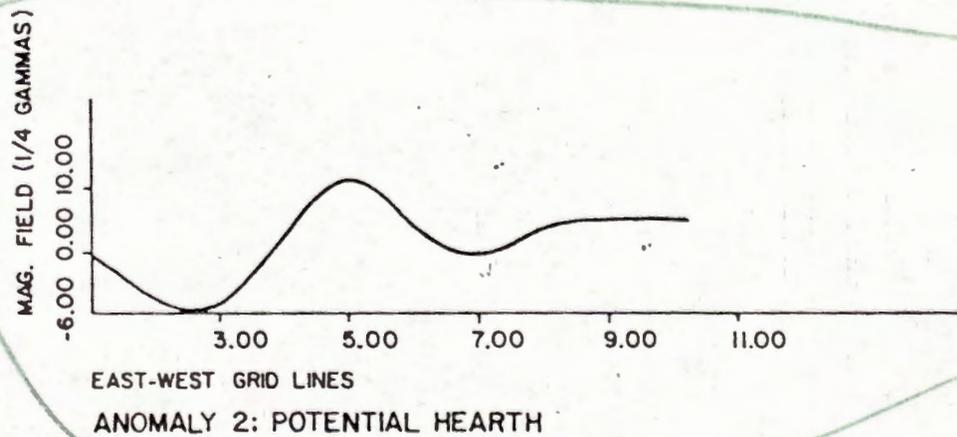
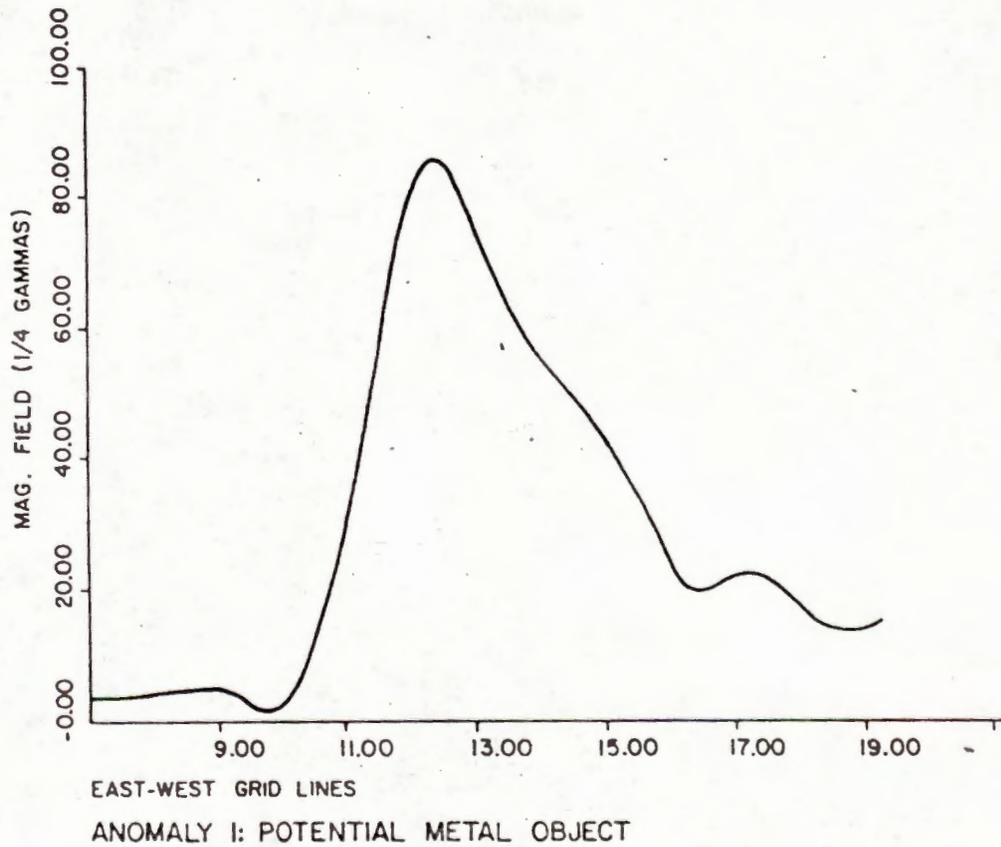
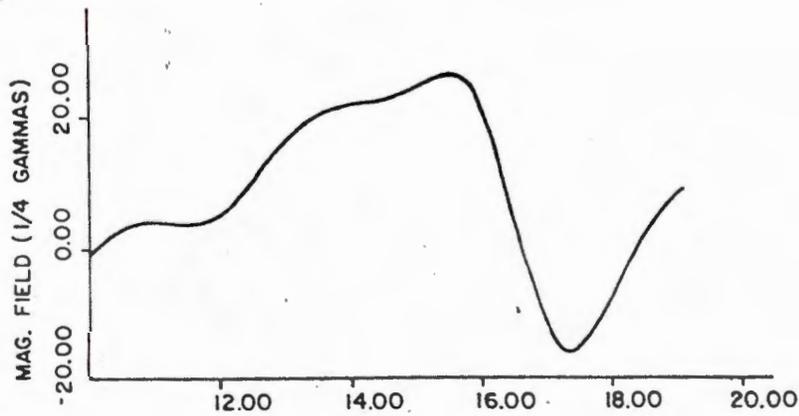


Figure 66.

Figure 7.67: Magnetic profile of Anomaly 3, a possible geological feature, 5MT2199. The profile is oriented on an east-west axis, and is positioned on Grid Line 18N.

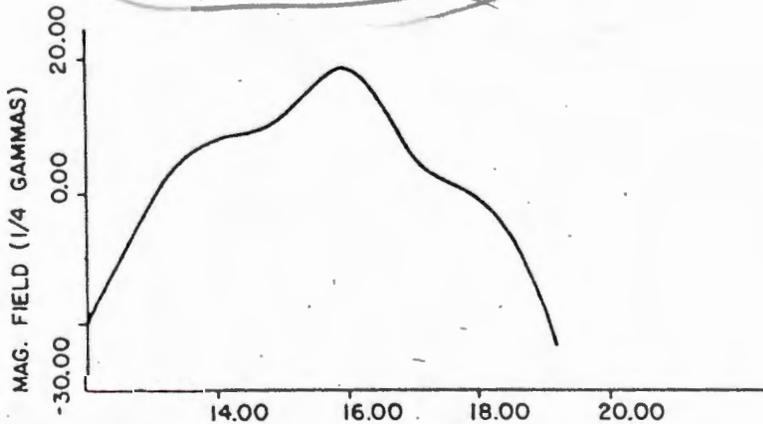
PROFILES ACROSS ANOMALIES

5MT2199



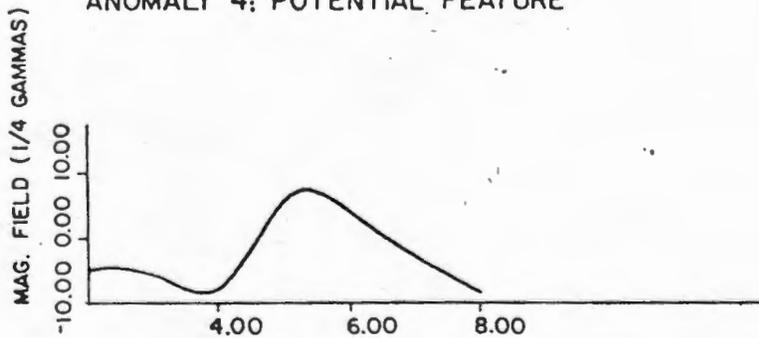
EAST-WEST GRID LINES

ANOMALY 3: POTENTIAL FEATURE



EAST-WEST GRID LINES

ANOMALY 4: POTENTIAL FEATURE



EAST-WEST GRID LINES

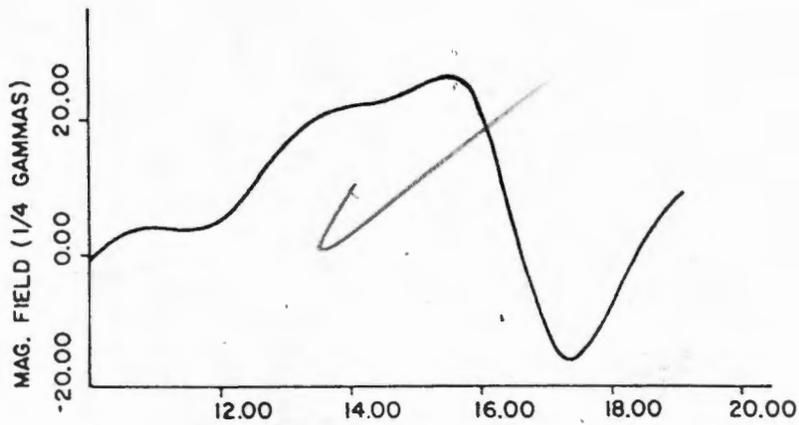
ANOMALY 5: POTENTIAL HEARTH

Figure 67.

Figure 7.68: Magnetic profile of Anomaly 4, an ambiguous feature, 5MT2199. The profile is oriented east-west and is positioned on Grid Line 6N.

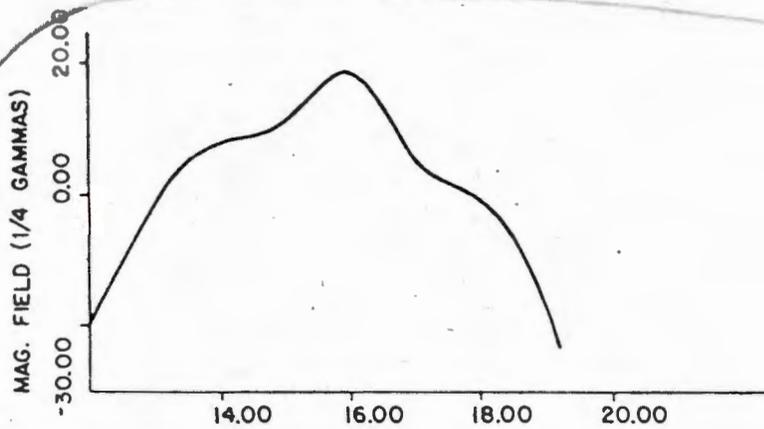
PROFILES ACROSS ANOMALIES

5MT2199



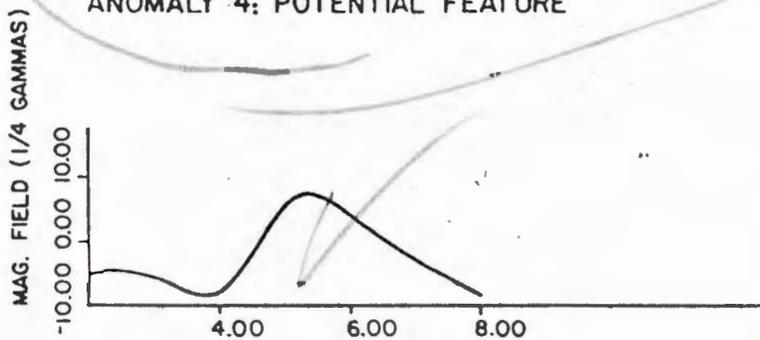
EAST-WEST GRID LINES

ANOMALY 3: POTENTIAL FEATURE



EAST-WEST GRID LINES

ANOMALY 4: POTENTIAL FEATURE



EAST-WEST GRID LINES

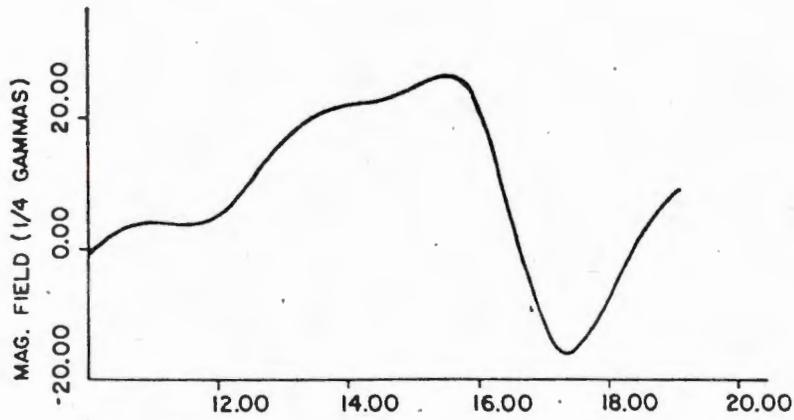
ANOMALY 5: POTENTIAL HEARTH

Figure 68.

Figure 7.69: Magnetic profile of Anomaly 5, a potential fire hearth, 5MT2199. The profile is oriented east-west and is positioned on Grid Line 29N.

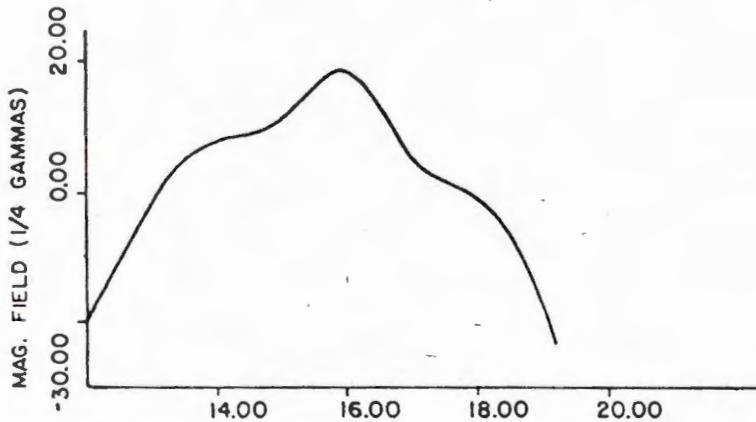
PROFILES ACROSS ANOMALIES

5MT2199



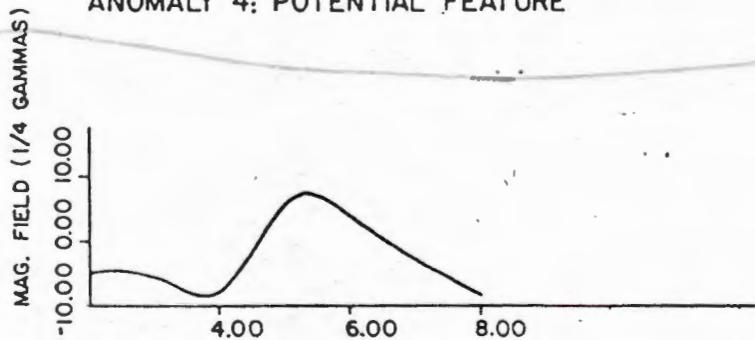
EAST-WEST GRID LINES

ANOMALY 3: POTENTIAL FEATURE



EAST-WEST GRID LINES

ANOMALY 4: POTENTIAL FEATURE



EAST-WEST GRID LINES

ANOMALY 5: POTENTIAL HEARTH

Figure 69.

Anomaly 1

The anomaly is a monopole high around the point (20N,16E) covering a three-cubic-meter area. It is situated to the northeast of the rubble and indicates a burned-region at a maximum depth of 1.5 m.

Anomaly 2

A long linear monopole high runs from point (1N,22E) to point (14N,23E). It is suggestive of a burned region, but its elongated shape and south-trending orientation imply a geologic contribution. A test square would resolve the ambiguity.

Anomaly 3

A circular monopole high, or collection of highs, is present in the southeast section of the grid around point (4N,36E). The undulate nature of the high suggests a complex source and makes depth estimations difficult. Several test pits are recommended here, as the magnitude of the anomalies indicate archaeological features are present.

Anomaly 4

Towards the north, at point (15N,31E), another plateau high occurs with a maximum of 16 quarter gammas. Again, it is interesting as a potential archaeological feature.

Anomaly 5

In the northeast corner are several one- or two-point anomalies at (17N,37E), (15N,40E), and 12N,37E). FWHM measurements indicate a maximum depth of 0.9 m for all of them. One of these should be examined, as the anomalies are suggestive of small hearths. Further to the north, about the points (19N,39E) to (21N,39E), is an elongated high which runs off the map. An excavation test pit should be located here.

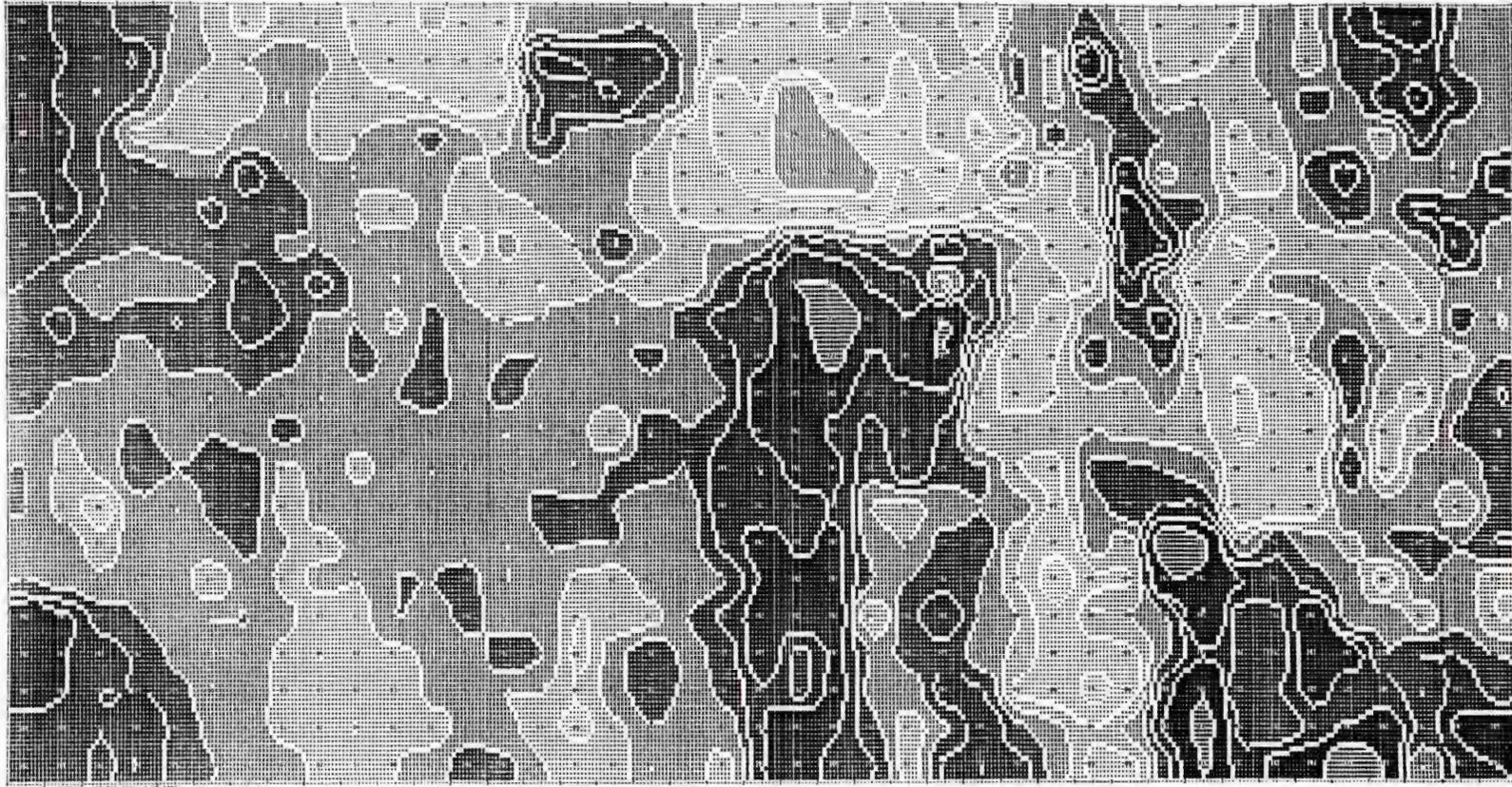
Figure 7.70: Magnetic contour map (SYMAP) of Site 5MT2203, Casa Roca. The contour levels include data ranges 8, 8, 4, 4, 4, 4, and 8 quarter gammas.

DOLORS ARCHAEOLOGICAL PROJECT

SITE 5MT2203

cut

2IN
1IN
IN

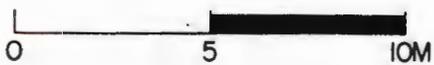


1E

11E

21E

41E



MAP OF DIGITAL HEIGHTS FIELD DERIVED FROM DATA IN SURVEILLANCE AREA
--VALUES ARE IN LTA BOUND UNITS
PERFORMED 12/10/88--GIB BONES

DATA VALUE EXTREMES ARE -33.00 33.00

PERCENTAGE DISTRIBUTION OF DATA POINTS BY QUANTILE LEVEL

QUANTILE -05.00 -15.00 -25.00 -35.00 0.00 1.00 2.00 3.00 4.00 5.00

PERCENTAGE OF TOTAL ABSOLUTE VALUE POINTS APPLIED TO EACH LEVEL

05.00 15.00 25.00 35.00 05.00 15.00 25.00 35.00

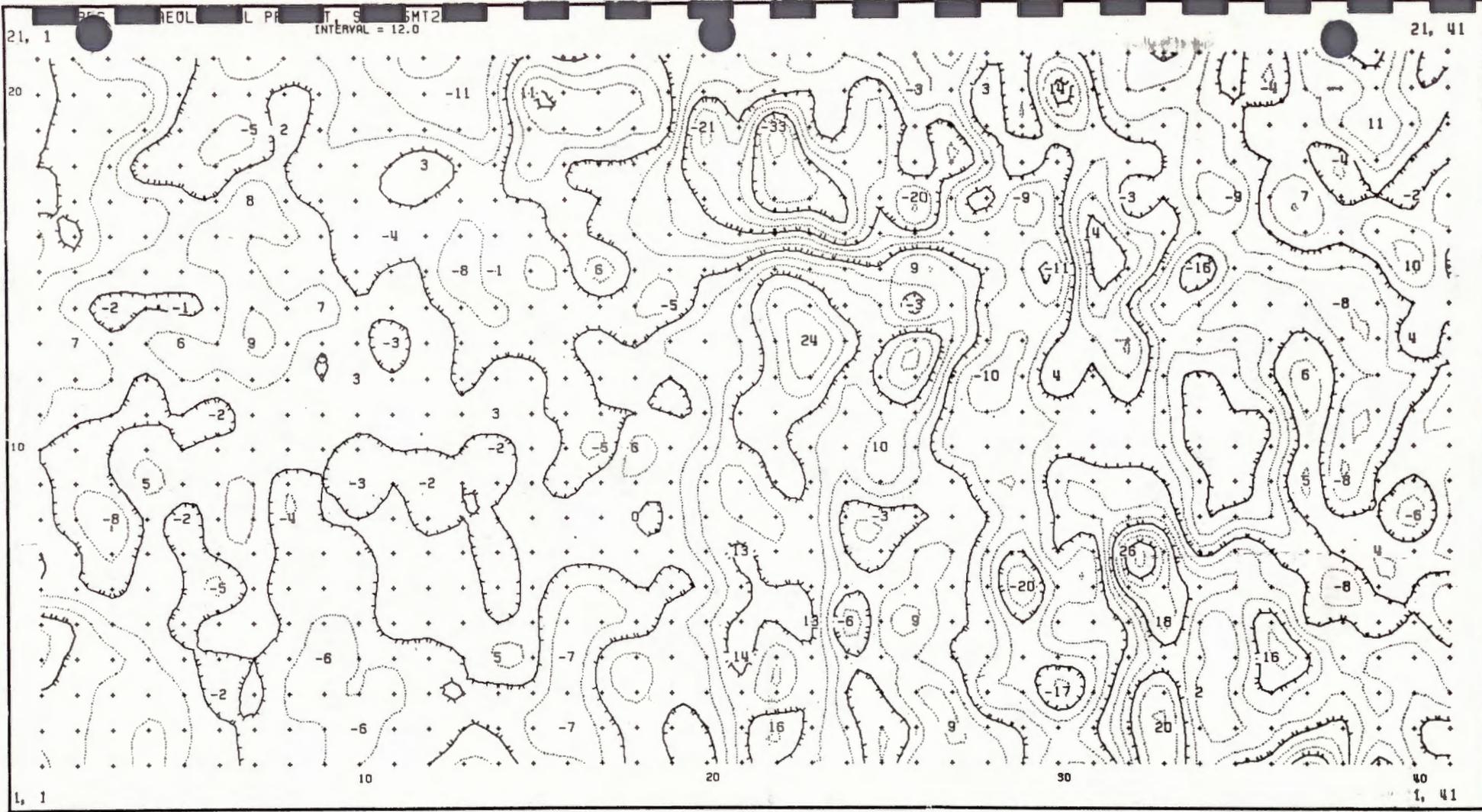
PERCENT DISTRIBUTION OF DATA POINTS BY QUANTILE LEVEL

QUANTILE 0 1 2 3 4 5 6 7 8 9

PERCENT 0 10 20 30 40 50 60 70 80 90 100

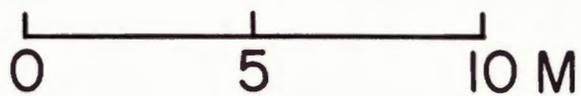
CONTOUR INTERVAL - 8, 8, 4, 4, 4, 4, 8 QUARTER GAMMAS

Figure 7.71: Line contour map of Site 5MT2203 with a 4 quarter gamma contour interval, showing the suggested location of test squares.



TEST FIGURE--SITE 5MT2203

DOLORES ARCHAEOLOGICAL PROJECT SITE 5MT2203



C.I. = 10

Anomaly 6

A pronounced monopole low is centered at point (18N,22E). This is typical of low anomalies which have occurred on other sites and it is very important that its cause be ascertained. A test pit might be assigned at the discretion of the archaeologist.

Anomaly 7

Pronounced plateau highs are present in the northwest and southwest corners of the survey grid. Although these extend outside the limits of the survey area, they have appropriate characteristics to be considered as possible archaeological features.

Location of Test Squares

Figure 71, the line contour map for the site, also indicates the suggested location of excavation test squares derived from the magnetic reconnaissance. The numbering system is explained in the Introduction.

Areas for Future Surveying

If the southwest and northeast corners of the grid prove to be of archaeological interest, north running lines can be added to the western edge. The linear anomaly trending south at point (1N,22E) and the plateau high in the region of point (1N,36E) indicate that additional east-running lines from (18N) to (41N) might provide additional information.

Site 5MT2236

Site 5MT2236 was surveyed 2, 10, and 11 October; the operations covered six blocks, the largest contiguous area examined to date for the Dolores Archaeological Program. The site was relatively flat save for a 0.15 m high knoll which covers five to six square meters surrounding the point (34N,49E) where there appears to be a reoriented dipole. The

southern and western edges of the site slope gently downwards, but this apparently has no affect on the magnetic field.

The site has a variety of anomalies which includes some apparent geologic trends. These are shown on the SYMAP representations (Figures. 7.72 and 7.73) and the line contour map (Figure 7.74), and are described as follows.

Anomaly 1

A wide prominent monopole high is located at about the point (21N,31E). All signs indicate a possible pithouse.

Anomaly 2

Another less prominent monopole high is located to the southeast of the previous anomaly, at point (18N,40E). The high is too wide to make accurate depth estimations, but its shape and intensity suggest an associated burned feature such as a fire hearth. At point (14N,30E) a subtle dipole with normal orientation can be discerned. This implies a feature which has a near surface contribution as shown by the existence of the low pole to the north. FWHM estimates show a maximum depth of 1 m.

If these two anomalies prove to have archaeological sources, the other, smaller monopoles in the immediate vicinity should be investigated in the event that they are also caused by burning.

Anomaly 3

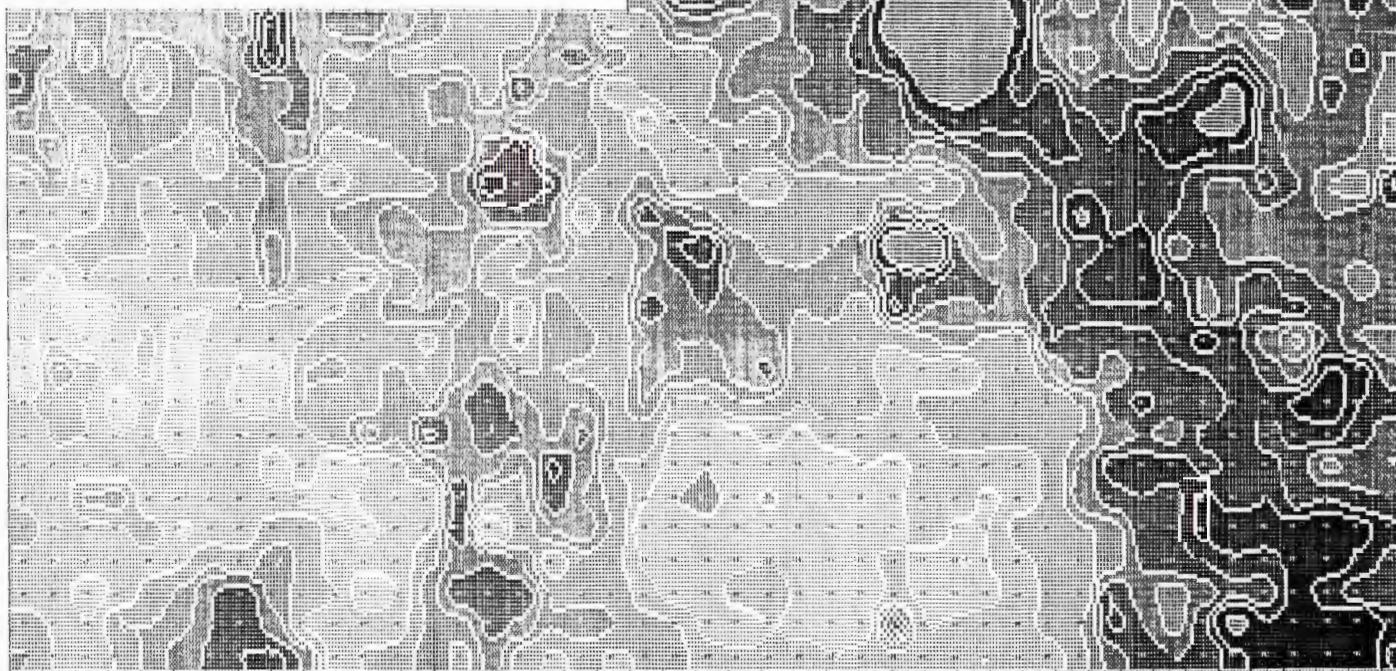
A region in which there are several monopoles within the confines of the rectangle is defined by the points (3N,53E), (16N,43E), 19N,53E), and 5N,53E). It is difficult to pinpoint any individual anomaly which might represent an architectural feature, but the region may be an area of prehistoric activity, providing there is no geological contribution.

Figure 7.72: SYMAP of the west section of Site 5MT2236
with contour levels of 8, 6, 6, 4, 4, 4, 4,
and 8 quarter gammas.

DOLORES ARCHAEOLOGICAL PROJECT
 SITE 5MT2236 (WEST SECTION)



772



1E

2E

3E

4E

5E

6E

1IN

2IN

3IN



CONTOUR INTERVAL - 8, 6, 6, 4, 4, 4, 4, 8
 QUARTER GAMMAS

Figure 7.73: SYMAP of the east section of
Site 5MT2236.

DOLORES ARCHAEOLOGICAL PROJECT
 SITE 5MT2236 (EAST SECTION)

1.13

3IN

2IN

1IN

IN



37E

41E

51E

61E

81E

Map of Total Magnetic Field with lines of equal magnetic field intensity and of lineament units.

Scale: 1:25,000

Intensity (Gauss)	10.0	10.5	11.0	11.5	12.0	12.5	13.0	13.5	14.0	14.5
Color	White	Light Gray	Medium Gray	Dark Gray	Black	Dark Gray	Medium Gray	Light Gray	White	White

CONTOUR INTERVAL = 8, 6, 6, 4, 4, 4, 4, 8
 QUARTER GAMMAS

Figure 7.74: Line contour map of Site 5MT2236 showing
8 quarter gamma contour intervals.

Excavation test squares have been assigned to three positions and might prove interesting.

Anomaly 4

A similar monopole high is situated in the area of point (16N,60E). It is of the same extended nature as the other highs; this makes depth estimates impractical and suggests a feature which has an extended vertical dimension. This anomaly should be tested.

Anomaly 5

A high monopole extends off the northern edge of the map at point (41N,46E). It has sufficient magnitude to be a burned region, but, because the entire shape of the anomaly is not known, it is difficult to estimate the likelihood of the anomaly being attributable to an archaeological source. Although a test pit is indicated, it would be advisable to magnetically survey a small region farther to the north before excavating.

Anomaly 6

The anomaly is a region of high magnetic field variance where it is difficult to pinpoint individual areas which might suggest the location of a feature; this appears to be a region that might warrant investigation as an activity area. Two excavation test squares have been assigned in the vicinity of point (2N,40E).

Anomaly 7

A localized monopole high is situated around the point (16N,16E) and shows promise of having an archaeological source. There is no apparent low pole associated with the anomaly, which suggests a feature of extended vertical geometry.

Anomaly 8

A monopole high is centered at the point (14N,23E) has a magnitude of only 3.5 gammas. It is suggestive of a burned region.

Anomaly 9

Two monopole highs at point (2N,68E) and (3N,75E) are extremes of a broader plateau. The first anomaly extends off the southern edge of the survey grid, but has an angular shape which is indicative of a low contrast architectural feature. The second anomaly, although possibly a reoriented dipole with a weak low pole, is also worth investigating as a potential archaeological feature.

Anomaly 10

The final anomaly of interest is located in the northern portions of the grid at point (40N,37E) and is circled in Figure 7.74. It has an unusual "H" shape, atypical of geologic features and more like an architectural form. The region is indicated by a dotted line and assignment of test pits left to the discretion of the archaeologist.

Location of Test Squares

Suggested areas for test excavations are indicated in Figure 7.74. The numbering scheme is explained in the Introduction.

Areas for Future Surveying

Evaluation of excavated test pits which are on the periphery of the grid will dictate whether it is advisable to continue to survey additional small regions. It is advised in particular that a small section be tacked on to the north of Test Square 5.

Site 5MT2844

Site 5MT2284, which is located in a southwest-sloping plowed field, was surveyed 20 October. A total of two blocks were examined and the field crew reported that there were no irregularities in the surface which might contribute to the magnetic field. The total magnetic field over the site is shown in Figure 7.75, the SYMAP representation with contour intervals of 8, 4, 4, 4, 4, 4, 4, and 8 quarter gammas, and in Figure 7.76, a line contour map with 8 quarter gamma intervals. Attention is drawn to the following magnetic anomalies.

Anomaly 1

A monopole high is located at point (33N,5E). FWHM measurements suggest an unreasonable depth; the source cannot be approximated by a point dipole if it is archaeological in nature. The source is likely longer in the north-south dimension implied by the south extending lobe; a pithouse is suspected.

Anomaly 2

A high lobe extends from point (1N,8E) to point (8N,7E). Although the anomaly is of sufficient size to merit consideration that its source might be geological, the magnitude suggests that it is worth investigating. Again, it is too wide for FWHM measurements.

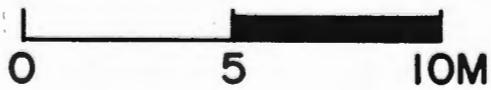
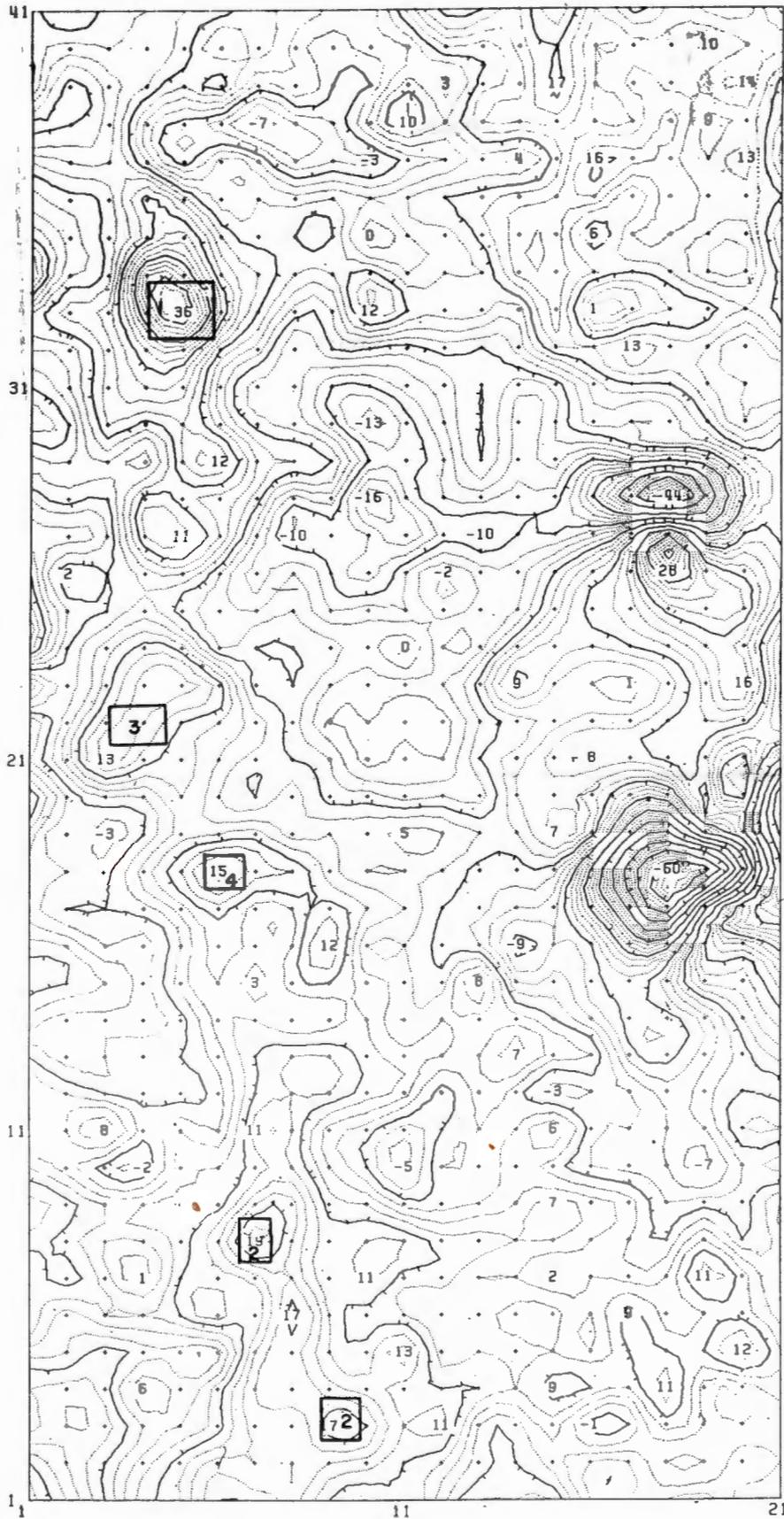
Anomaly 3

A small monopole high is located at point (23N,5E) and appears to be one of the extremes in a long northwest-southeast trend on the map. It is suggestive of a burned region, and an excavation test pit has been assigned here.

Figure 7.75: Magnetic contour map (SYMAP) of Site 5MT2844. The contour levels include data ranges of 8, 4, 4, 4, 4, 4, 4, and 8 quarter gammas.

Figure 7.76: Line contour map of Site 5MT2844 with
8 quarter gamma intervals.

CONTOUR MAP
DOLORES ARCHAEOLOGICAL PROJECT, SITE 5MF2844, 2 BLOCKS
INTERVAL = 8.0



7.16



Anomaly 4

Another small monopole high has an extreme on the point (18N,6E). It is also located on the long northwest-southeast high incorporating Anomaly 3, but the high is suggestive of a shallow source elongated in the east-west direction.

Anomaly 5

A normally oriented dipole is centered at point (26N,18E). The strong gradient between the poles and the magnitude of the low strongly suggest the presence of an iron object.

Anomaly 6

Directly south of the anomaly mentioned previously is a strong low with a high directly to the east that appears to be associated with it. This anomaly is typical of those found on other sites: a large extensive low region with a strong high forming a reoriented dipole. This region should be further investigated by excavation of test pits situated to locate the source of the response. Because the grid covers only part of the high, a greater chance for positioning inaccuracies exists.

Location of Test Squares

Figure 7.76 shows the suggested location of excavation test squares based on the magnetic reconnaissance. The numbering system is explained in the Introduction.

Areas for Future Surveying

Should the test pits centered on Anomaly 5 prove interesting, the grid should be extended eastward to line (30E) from (5N) to (15N).

Site 5MT2848

Site 5MT2848 was initially surveyed on 20 October 1978, and when the data were examined it became apparent that faulty equipment necessitated re-establishment of the data in Block A. In total, a four-block area was surveyed over a gently sloping plowed field. The field crew suggested that some metal objects might be present on the site, and these caused several localized dipoles apparent on the maps. No small scale topographic features which disturb the magnetic field are apparent on the site.

As shown in Figure 7.77, a SYMAP representation of the total field, and in Figure 7.78, a line contour map indicating the suggested excavation areas, there are several anomalies of interest.

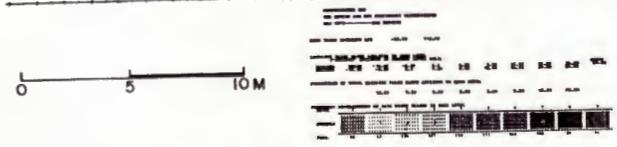
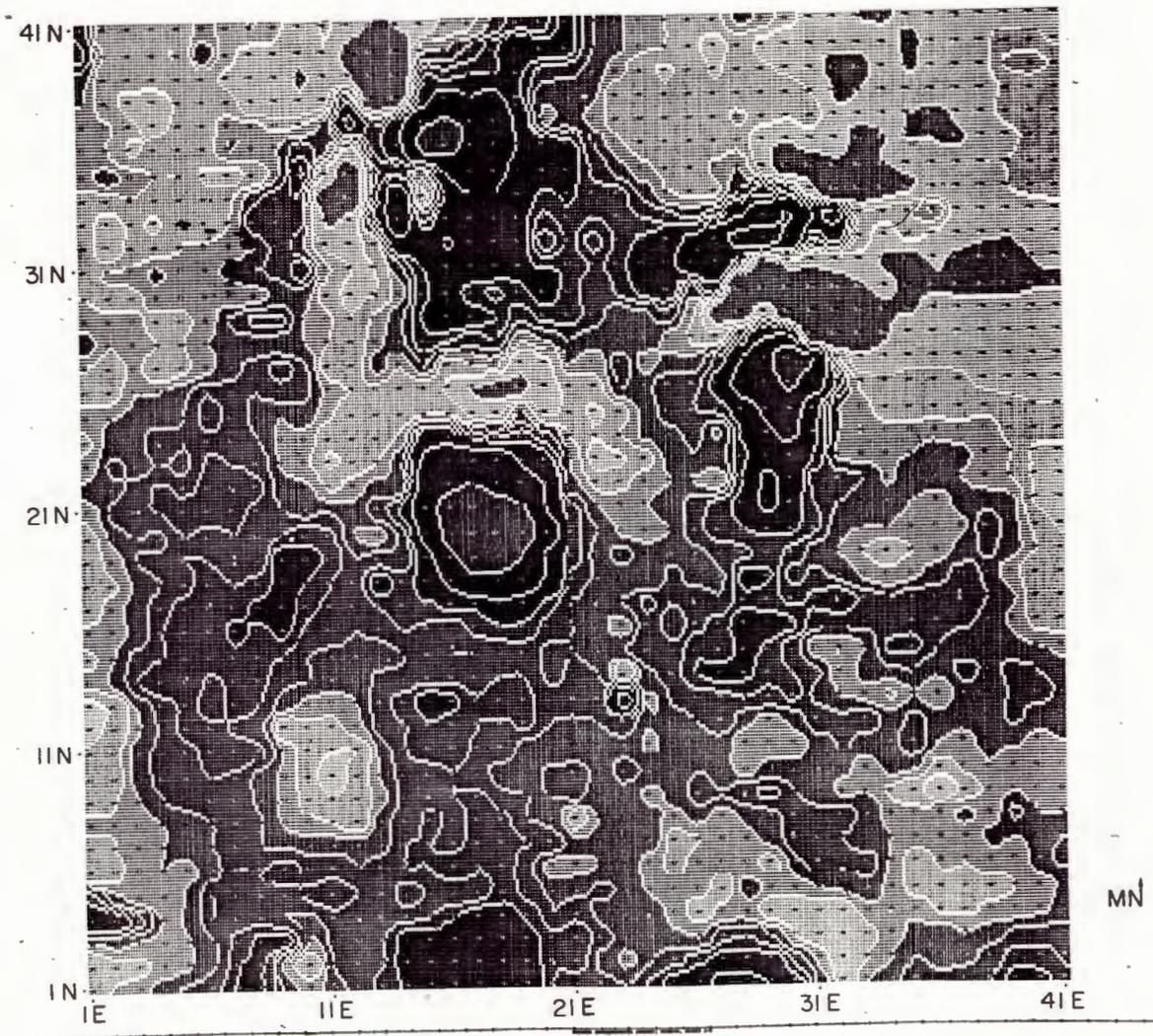
Anomaly 1

A strong dipole is located about the point (20N,17E) and covers several square meters. Because of the classic shape of this anomaly, several things about its source can be suggested. The feature is likely to have a rectangular outline, and a layer of intensely burned material is concentrated at a depth of approximately 1.4 m. The sides of the rectangle are likely in the order of four m in length, and there is an antechamber or a burned region on the south side of the feature. There is a small lobe which extends from the main anomaly to the point (18N,13E) and may be a peripheral burned feature such as a fire hearth. Figures 7.79a and 7.79b shows east-west and north-south profiles through the anomaly.

A comparison with a theoretical anomaly from a magnetized rectangular feature shows a very similar response, both in profile and in plan view. Figure 7.80 shows a line contour map over a stylized house structure with dimensions similar to the pitstructure expected on Site 5MT2848. The magnitude of the high and low poles for Anomaly 1 and the distance

Figure 7.77: Magnetic contour map (SYMAP) of Site 5MT2848 with contour intervals of 10, 6, 4, 4, 4, 12, and 36 quarter gammas.

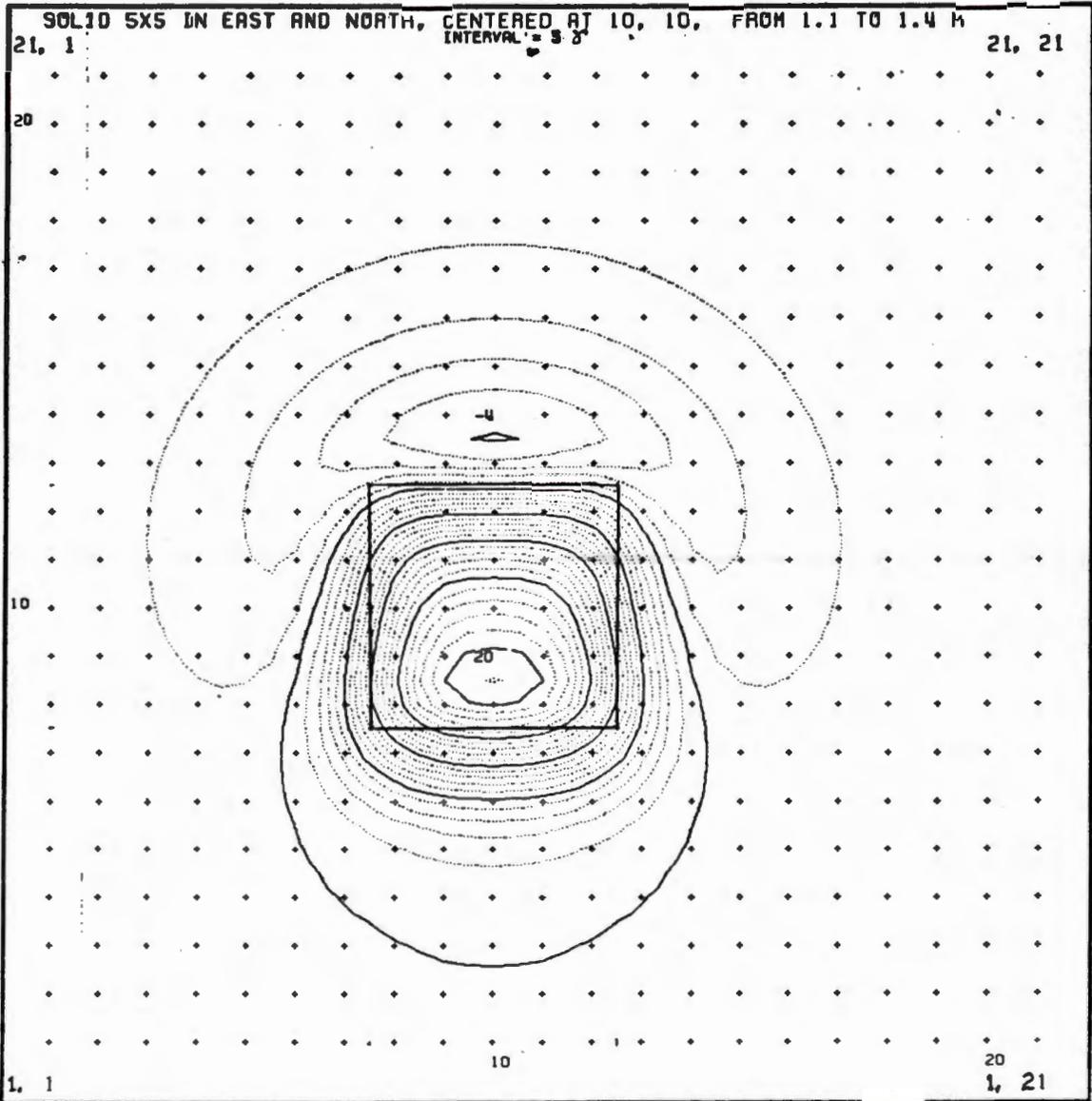
DOLORES ARCHAEOLOGICAL PROGRAM
 SITE 5MT 2848



CONTOUR INTERVALS = 10, 6, 4, 4, 4, 4, 12, 36, QUARTER GAMMAS

7.78

figure 7.80: Theoretical anomaly over buried rectangular structure.



SIMULATED ANOMALY, JOMON 'HOUSE'

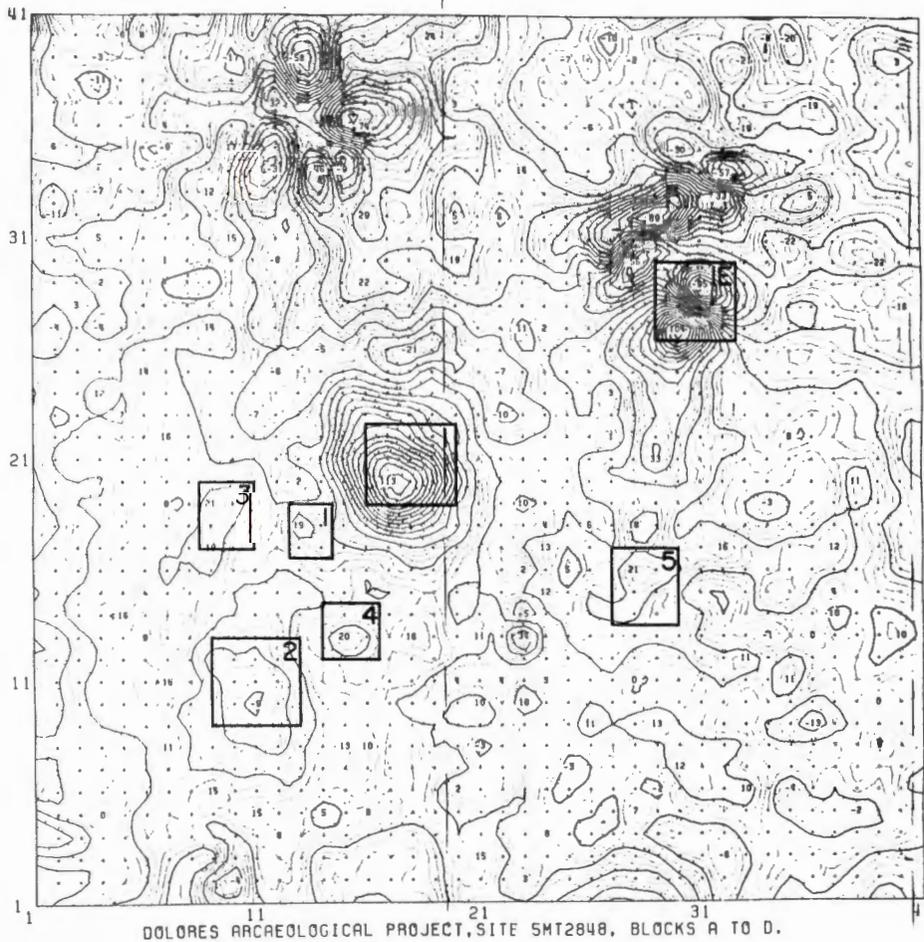
RECTANGULAR 'HOUSE', 5m x 5m x 0.3m THICK
 FLOOR AT A DEPTH OF 1.4m
 MAGNETIC SUSCEPTIBILITY CONTRAST 10^{-3} emu/cm³

7.80

Figure 7.81: Magnetic profile of Anomaly 2, a possible borrow or activity area, 5MT2848. The profile is oriented north-south and is positioned on Grid Line 11E.

Figure 7.78: Line contour map of Site 5MT2848 with
8 quarter gamma contour intervals.

CONTOUR MAP
DOLORES' ARCHAEOLOGICAL PROJECT, SITE 5MT2848, BLOCKS A-D
INTERVAL = 8.0



SQUARES INDICATE SUGGESTED
TEST AREAS. THE NUMBERING
SCHEME IS EXPLAINED IN THE
INTRODUCTION.



MN ↑

separating them are similar to this theoretical model. This comparison suggests that similar modeling might be done with other pitstructures once more information concerning the distribution and geometry of burned material is known.

Anomaly 2

A monopole low is centered on point (10N,11E); it extends over several square meters and is perhaps a soft fill feature such as a borrow area or even an unburned pitstructure. Its profile is shown in Figure 7.81.

Anomaly 3

A relatively weak monopole high is situated about the point (18N,9E); it might indicate an area of high ash or localized burning. The profile is shown in Figure 7.82; it is worth investigating.

Anomaly 4

Another monopole high, similar to Anomaly 3 but with less horizontal extent, is found in the vicinity of point (13N,15E). Excavation is also suggested here and a small hearth is suspected. Figure 7.83 depicts a magnetic profile.

Anomaly 5

A monopole high, located well away from the pitstructure anomaly, may be another activity area; it is centered at the point (15N,29E).

Anomaly 1e

A rather confusing combination of highs and lows in the northeast quadrant of the survey grid may have archaeological associations. It is similar to unknown anomalies found in other sites and might be investigated to permit correlation studies. If the anomaly is due to geologic effects, the source might be distinguished by subtle variations in compaction and grain size, rather than by more distinct culture variations. It has been

Figures 7.79a 7.79b: Magnetic profiles of Anomaly 1, potential pitstructure, Site 5MT2848. The east-west oriented profile (79a) is positioned on Grid Line 21N. The north-south profile (79b) is positioned on Grid Line 17E.

PROFILE ACROSS ANOMALY

5MT2848

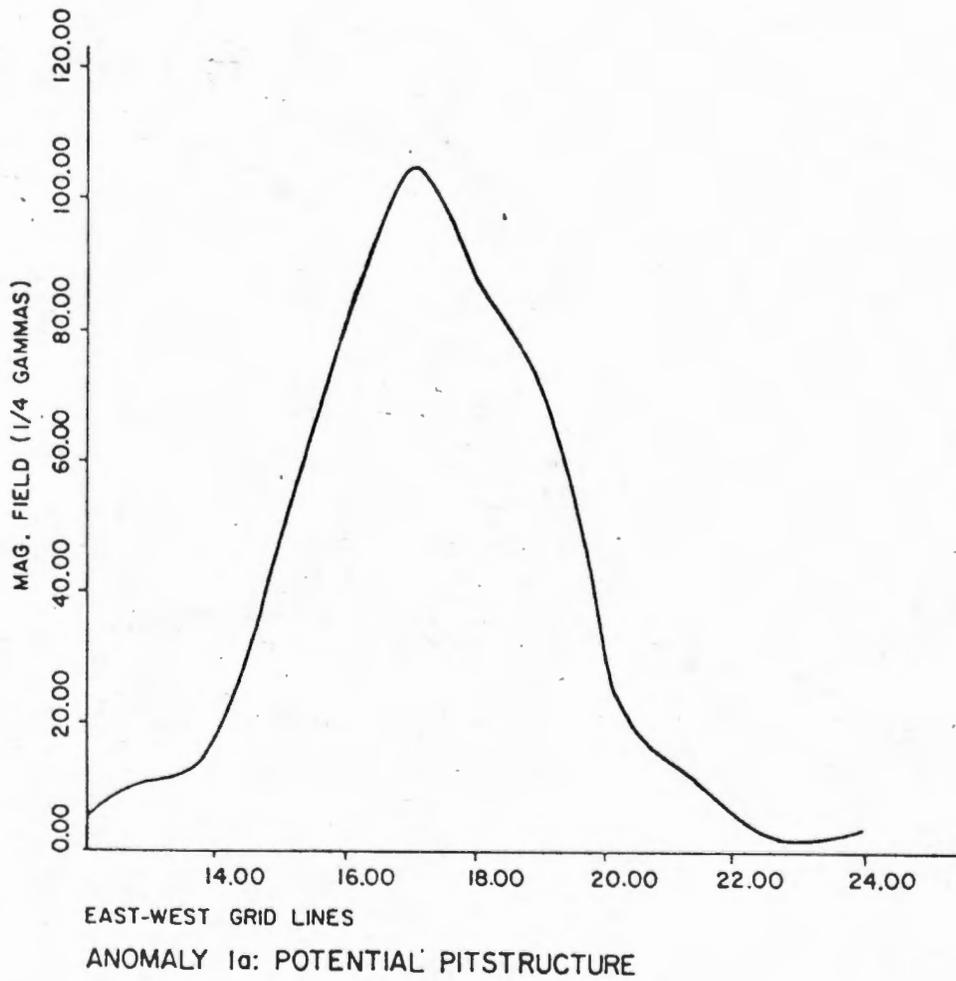


Figure 79a.

PROFILE ACROSS ANOMALY

5MT2848

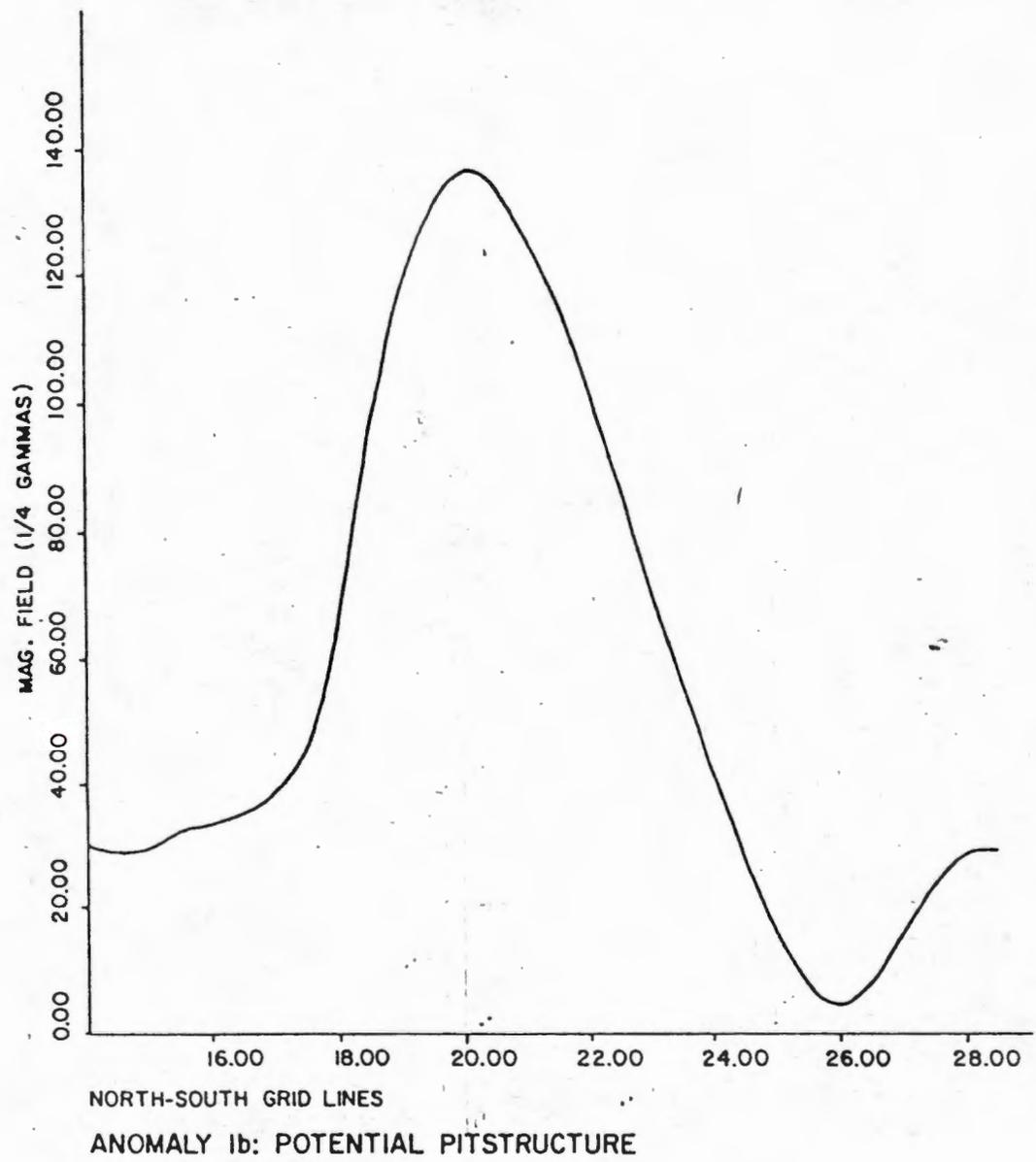
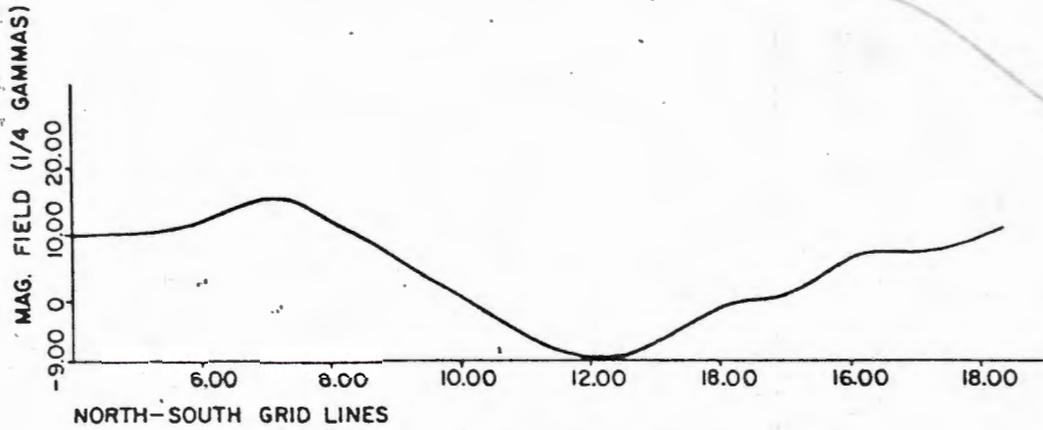


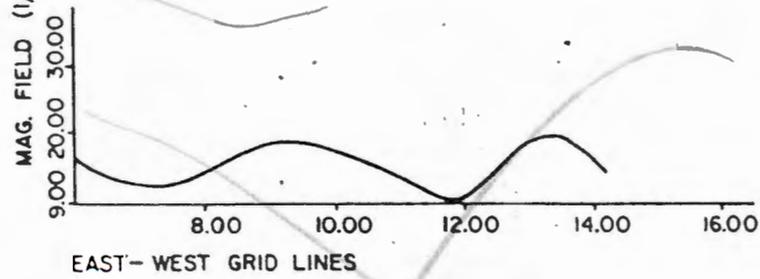
Figure 79b.

PROFILES ACROSS ANOMALIES

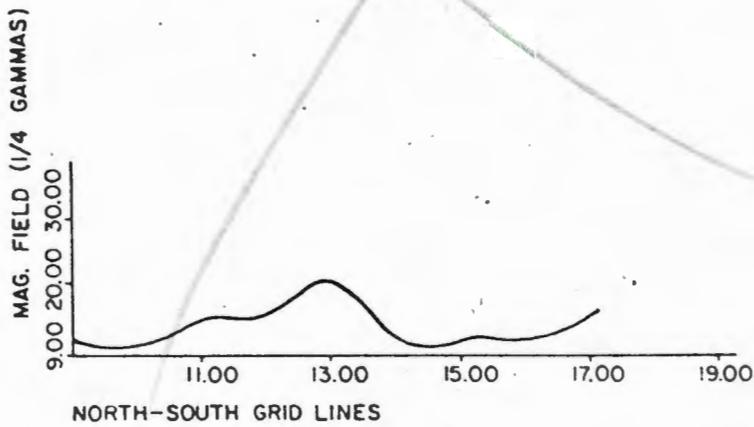
5MT2848



ANOMALY 2: POTENTIAL BORROW OR ACTIVITY AREA



ANOMALY 3: POTENTIAL HEARTH



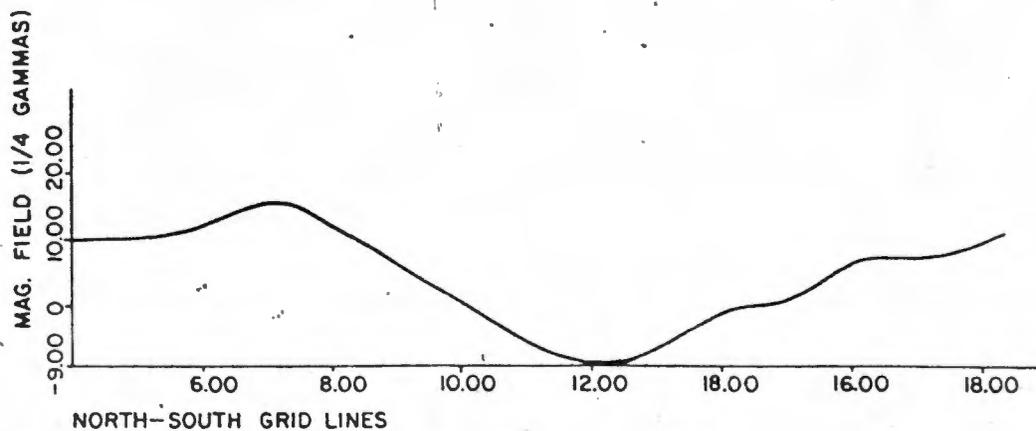
ANOMALY 4: POTENTIAL HEARTH

Figure 81.

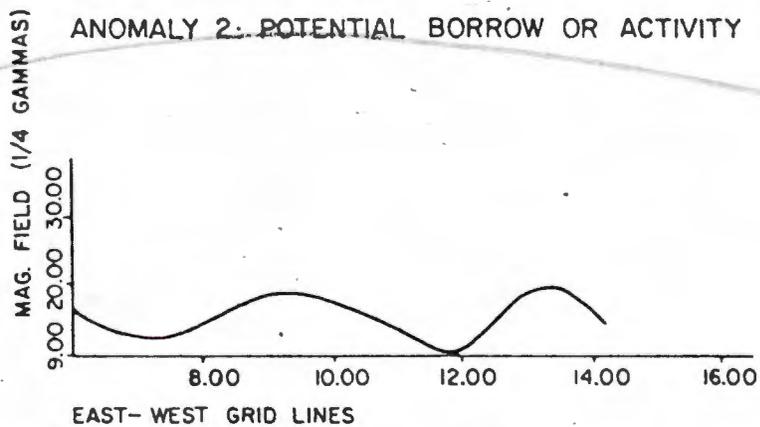
Figure 7.82: Magnetic profile of Anomaly 3, a potential fire hearth, 54T2818. The profile is oriented east-west and is positioned on Grid Line 18N.

PROFILES ACROSS ANOMALIES

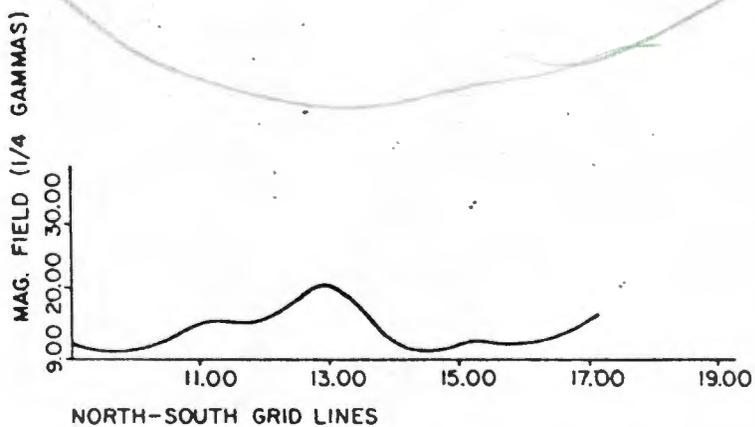
5MT2848



ANOMALY 2: POTENTIAL BORROW OR ACTIVITY AREA



ANOMALY 3: POTENTIAL HEARTH



ANOMALY 4: POTENTIAL HEARTH

Figure 82.

labeled as an "e" square as it is less likely to contain culture features, but its excavation would provide useful information for interpretation of future survey data.

The other anomalies visible on the maps are most likely caused by geologic or iron sources and do not warrant excavation. However, this does not suggest that archaeological features do not exist in these vicinities, just that they are not easily recognizable in the magnetic record.

Location of Test Squares

On Figure 7.78 are several rectangles indicating recommended excavation test squares which enclose the anomalies described in the previous discussion. The numbering system is a priority list, with "1" indicating the square in which there is the highest probability of locating cultural features. Excavation should begin within the rectangle; the feature causing the anomaly is most likely directly below that area. For additional information concerning the test squares and terms used in the description of the anomalies, refer to the Introduction.

Areas for Future Surveying

Before this site is subjected to intensive work, it is highly recommended that two blocks be added to the south of the site. There are two anomalies present near the south limit of the survey grid, points (1N,16E) and (1N,27E), which imply the presence of other large-scale cultural features.

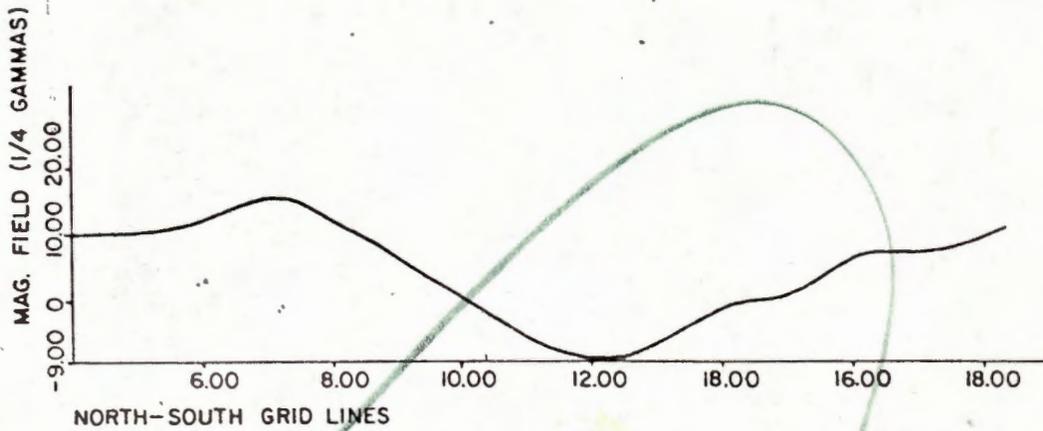
Site 5MT2853

Site 5MT2853 is located in a uniformly plowed field which slopes gently to the southeast. Two blocks were surveyed on 12 October 1979. Besides the typical anomalies caused by iron objects, there are some

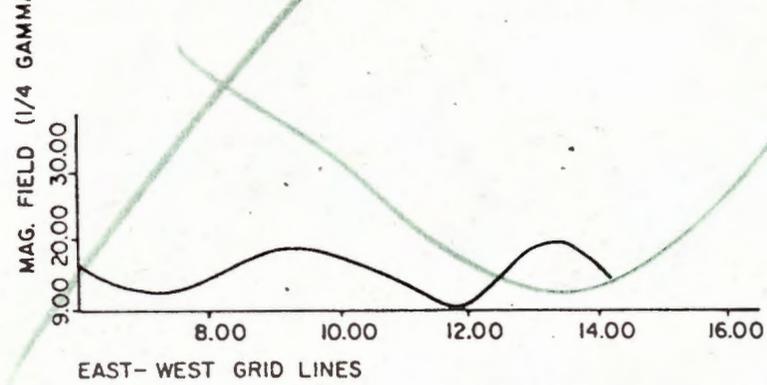
Figure 7.83: Magnetic profile of Anomaly 4, a potential hearth, 5MT2848. The profile is oriented north-south and is positioned on Grid Line 15E.

PROFILES ACROSS ANOMALIES

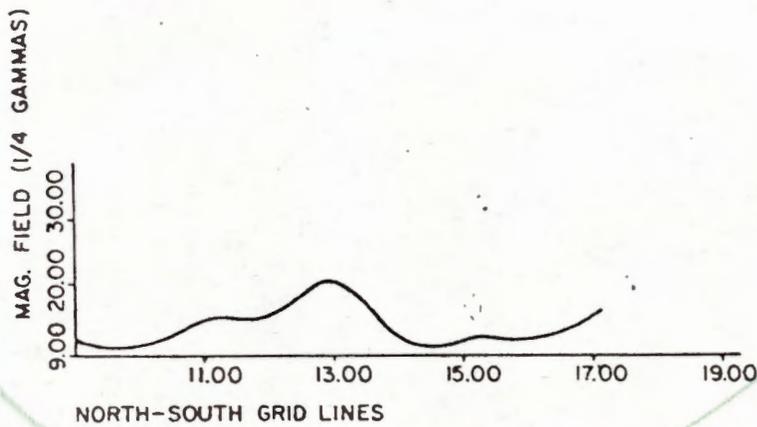
5MT2848



ANOMALY 2: POTENTIAL BORROW OR ACTIVITY AREA



ANOMALY 3: POTENTIAL HEARTH



ANOMALY 4: POTENTIAL HEARTH

Figure 83.

anomalies of potential archaeological interest, as shown in Figure 7.84, a SYMAP with 3, 4, 4, 4, 4, 4, 4, 8, and 10 quarter gamma intervals.

Anomaly 1

A large monopole high with a maximum magnitude of 48 quarter gammas is located about the point (7N,17E). The anomaly has magnitude and geometry similar to a burned region and might be a pithouse-like structure. Although the two anomalies mentioned next are connected to this large high by magnetically high lobes, there is sufficient distance between the anomalies to consider them separately.

Anomaly 2a

A monopole high is located at point (10N,9E). FWHM measurements done using a north-south profile suggest a depth of less than 1.2 m.

Anomaly 2b

A monopole high is situated directly west of the previous anomaly at point (10N,6E). Its profile suggests a shallow source which is lengthened in the vertical direction. A burned region is suspected.

Anomaly 3

A monopole high is centered on point (5N,9E), just south of the previous anomaly. Potentially, its source is linked to the anomaly to the north but is probably sufficiently removed to warrant a separate excavation test pit. The anomaly is too broad to try an FWHM depth estimation.

Anomaly 4

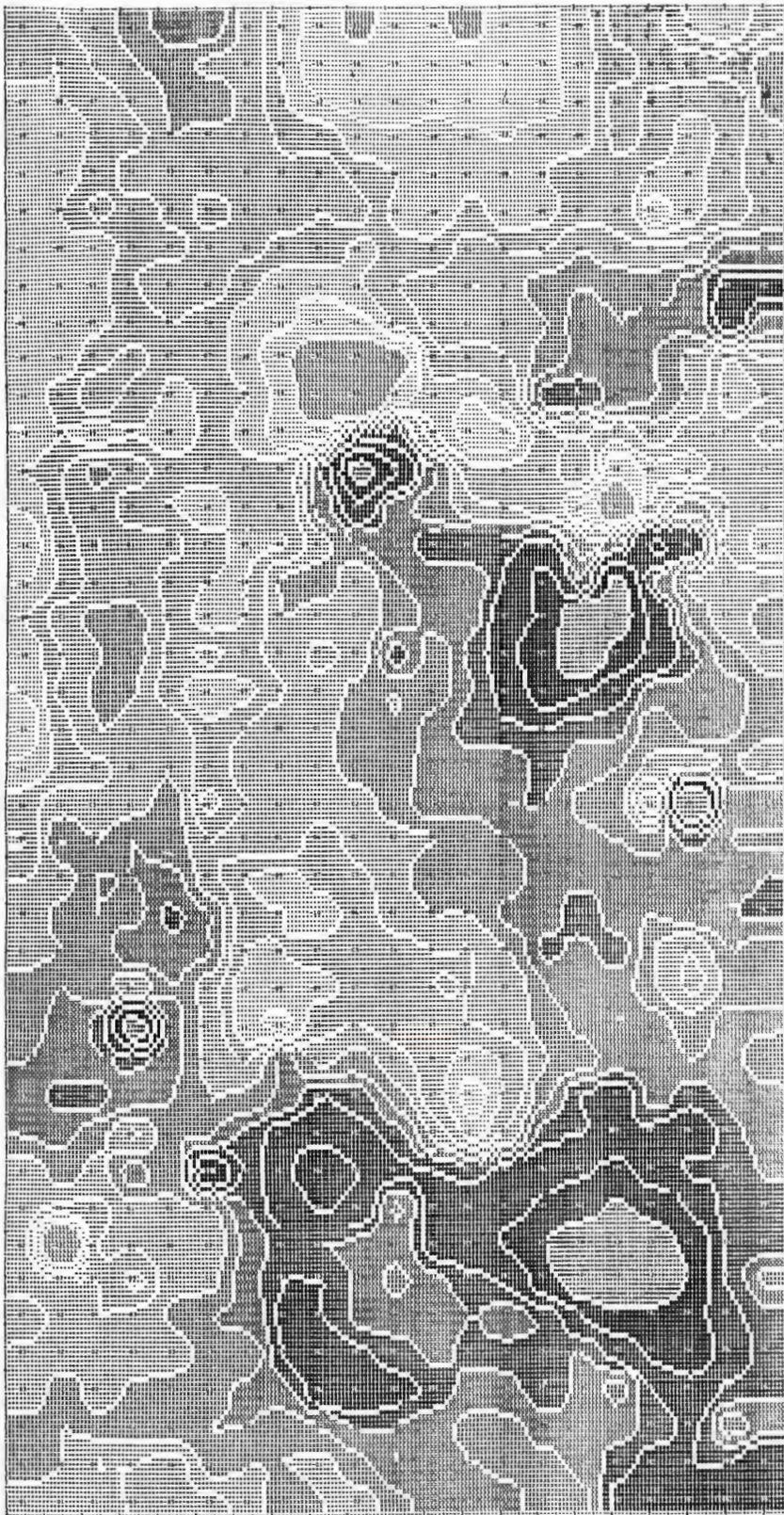
A monopole high is located at point (25N,16E) and is suggestive of another burned region. It has been given a somewhat lower priority in the numbering scheme because of an associated low region to the north which increases the probability of a nonarchaeological source. However, if the

Figure 7.84: Magnetic contour map (SYMAP) of Site 5MT2853. The contour levels include data ranges of 8, 4, 4, 4, 4, 4, 8, and 10 quarter gammas.

DOLORES ARCHAEOLOGICAL PROJECT

SITE 5MT2853

4IN
3IN
2IN
1IN
IN



40x60 32c



CONTOUR INTERVAL = 8, 4, 4, 4, 4, 4, 4, 8, 10
QUARTER GAMMAS

7.85

low and the high are unrelated, this would be a good area for testing by excavation.

Anomaly 5

A broad monopole high in the vicinity of point (33N,18E) is a region of interest. A specific test square has not been assigned, but the region is indicated with a dotted line in Figure 7.85. Investigations here are left to the discretion of the archaeologist.

Anomaly 6

A monopole low is located at point (12N,13E). Although this might be part of the larger-scale low trending to the northwest, it is slightly greater in magnitude and might be an architectural feature filled with less compact soil. It is worth investigating and has been numbered in Figure 7.85 accordingly.

Anomaly 7

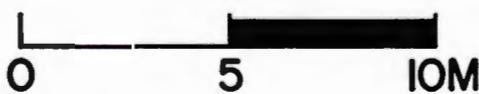
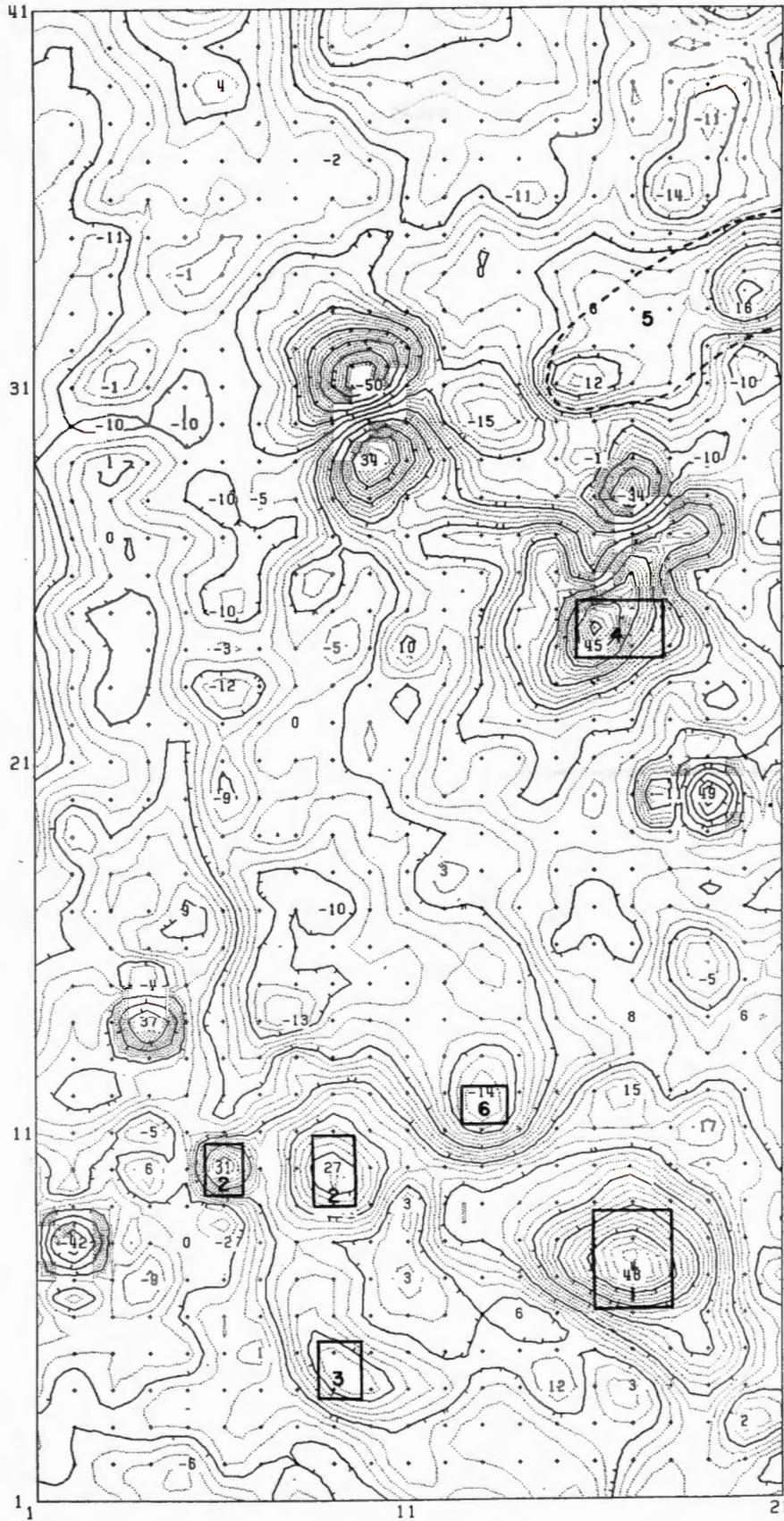
Several dipoles are present on the site. The first is a reoriented dipole of considerable extent at point (30N,10E). It is unlikely to be of archaeological importance. The second is located at point (20N,19E) and is oriented directly east-west; it is probably a piece of iron on the surface. The third is a normally oriented dipole located at point (14N,4E). If the background surrounding the region is considered to be about 5 quarter gammas, the minus pole is about 30 percent (9/32) of the high, suggesting that despite the normal orientation that the source of this anomaly is ferrous rather than archaeological.

Location of Test Squares

Figure 7.85 shows the location of test squares, based on magnetic reconnaissance. The numbering scheme is explained in the Introduction.

Figure 7.85: Line contour map of Site 5MT2853 with
8 quarter gamma contour intervals.

CONTOUR MAP
DOLORES ARCHAEOLOGICAL PROJECT, SITE 5-MT-2853, 2 BLOCKS, 10/12/78
INTERVAL = 8.0



7.84

Tim,

1

Site SMT 4478 in this report is actually SMT 4480. 4478 was magged in 1980.

All the headings for the figures (on the synaps themselves) are incorrect also. If you want we can probably change them to 4480

Add Footnote Page 213

Areas for Future Surveying

Most of the anomalies on 5MT2853 are fairly isolated. Block B might be extended westward, should Test Square 5 prove interesting.

Site 5MT4478¹

Site 5MT4478 was surveyed on 22 and 25 October and operations encompassed a two-block section on a small knoll. The site had been used as pasture, and several metal objects, including long strands of barbed wire, were removed from the grid. It is inevitable that the odd piece of iron went unnoticed and is responsible for some of the strong dipole anomalies shown on the total field maps. Besides the southeast-sloping topographic trend, localized sandstone rubble mounds occurred at points (13N,11E) covering a 20 sq m area, and (19N,18E) covering an 18 sq m area. A refilled excavation of undetermined depth, noticed at point (16N,12E), disturbed about six sq m of the surface.

Several anomalies present in the surveyed areas may have archaeological sources, as shown in Figure 7.86 (a SYMAP with 15, 10, 10, 8, 8, 8, 10, 10, 12, and 11 quarter gamma intervals) and Figure 7.87, a line contour map in 8 quarter gamma intervals.

Anomaly 1

An extended high region, with several local extremes, is surrounded by a line joining the points (21N,6E), (13N,9E), (12N,16E), and 21N,16E). Because of the undulate nature of the high it is difficult to assign an exact location for a single excavation test pit. The extreme at point (19N,16E) and the dipole at point (15N,13E) suggest ferrous contributions to the magnetic field but the anomaly is much too broad and of too low a

¹ see add

magnitude to be entirely caused by metals. Locations for two test pits have been suggested.

Anomaly 2

Another large extended high occurs directly to the east of the first. Roughly, the high would be enclosed by a line joining the points (21N,21E), (9N,21E), (9N,26E), and (21N,29E). The extremes, which are found at points (19N,23E), (17N,25E), and (11N,24E), would be feasible locations for test pits, but the dipole anomaly centered on points (16N,19E) is undoubtedly caused by an iron object very close to the surface. Part of the extended high is an arm which trends to the southwest. A test here is indicated in Figure 7.78 as it might be an area of higher compaction.

Anomaly 3

A monopole high at point (1N,18E) lies on an extended arm of the two previous highs. Because one edge of the anomaly is truncated, the depth to source is difficult to estimate.

Anomaly 4

A monopole high is located at point (14N,33E). Again the anomaly is too broad for an accurate depth estimation, but, as the high covers a four sq m area and has a maximum amplitude of 10 gammas with no associated low pole, it appears that the geometry of the source is extended in the vertical direction. The location of a potential excavation test pit is indicated in Figure 7.87.

Anomaly 5

A monopole high at point (15N,41E) extends off the eastern edge of the grid. Because one edge is truncated, it is unclear whether this is a true monopole or whether it is the high pole of a reoriented dipole

Figure 7.86: Magnetic contour map (SYMAP) of Site 5MT4478. The contour levels include data ranges of 15, 10, 10, 8, 8, 8, 10, 12, 12, and 12 quarter gammas.



Figure 7.87: Line contour map of Site 5MT4478 with 16 quarter gamma contour intervals.

resulting from an iron object. A few additional lines on the east edge would clear up the ambiguity. The location of a potential test pit is indicated in Figure 7.87.

Anomaly 6

Two reoriented dipoles at points (2N,39E) and (12N,8E) are likely to have ferrous sources.

Location of Test Squares

Figure 7.87 indicates the suggested location of test squares, based on the magnetic reconnaissance. The numbering system is explained in the Introduction.

Areas for Future Surveying

If the anomaly at point (15N,41E) has an archaeological source, it would be worthwhile to add six m to the east edge of the grid from lines (10N) to (20N). As well, lines (4E) through (31E) might be extended northwards if the two large monopole highs have cultural sources. It is also suggested that the spoil from excavations be located other than north of the grid if future surveying is to be done in this region.

Site 5MT4512, Cascade Hamlet

Site 5MT4512, Cascade Hamlet, was surveyed on 6 October 1978; the operations covered a rectangular block grid whose long axis runs magnetic west-east. Magnetometer traverses were run south to north. The following topographic features occur on or near the grid: (1) a steep-sided arroyo which borders the south edge of the grid; (2) an area with stone rubble, about 10 sq m in area, centered on point (15N,4E); and (3) a circular depression at point (19N,3.5E) about 0.75 m wide and 0.25 m deep. All of these features might cause minor variations in the field.

Several anomalies are of interest as shown in Figure 7.88, a SYMAP representation of the total field, and in Figure 7.89, a line contour map of the same data with 4 quarter gamma intervals.

Anomaly 1

A monopole high is centered on point (17N,6E). It is the highest value on an elevated plateau and could indicate a burned area about 0.6 m in depth, if it is caused by a localized source.

Anomaly 2

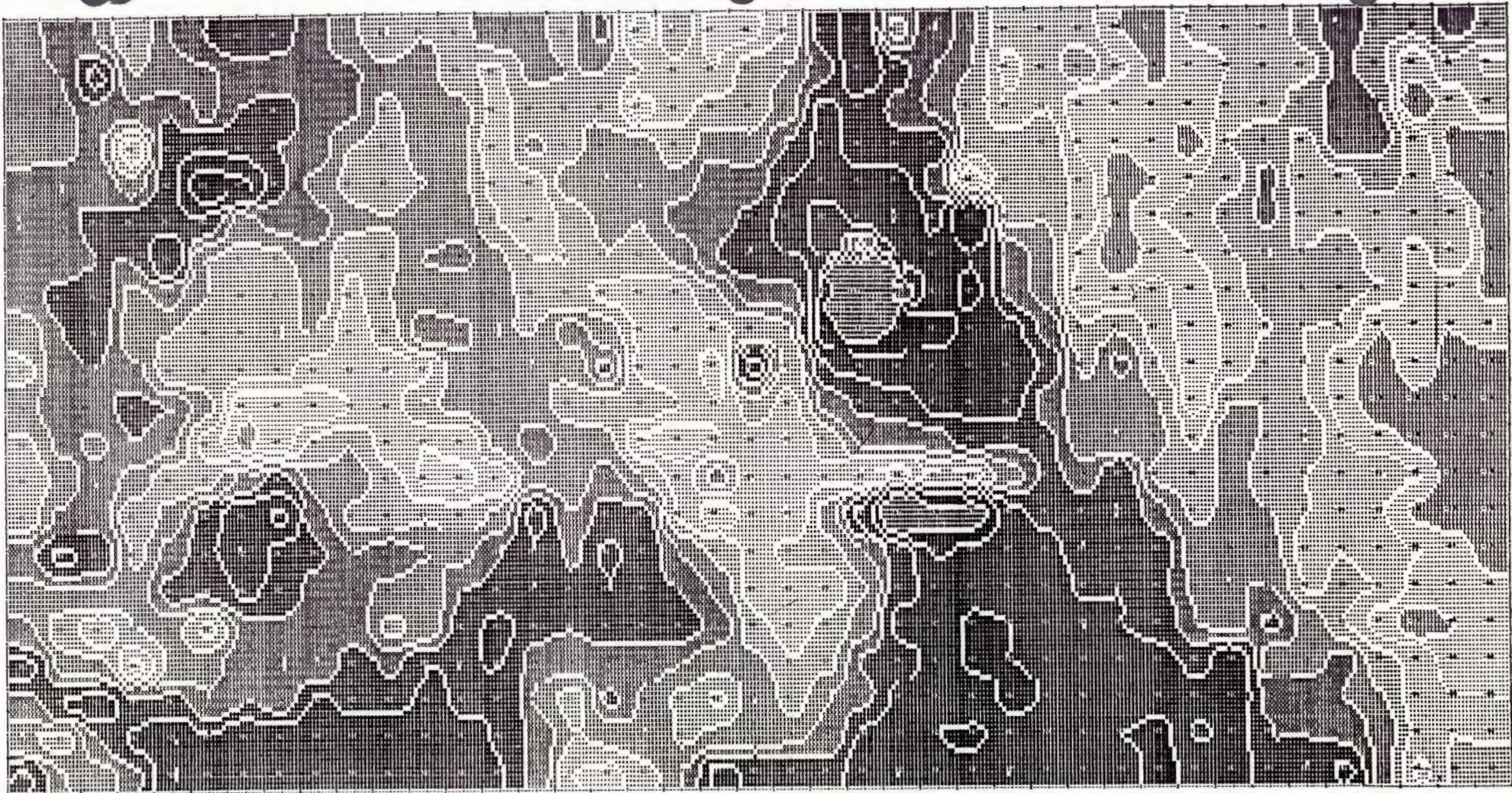
A monopole high extends from point (7N,7W) to point (8N,8W). Although there is a low situated to the north of the feature, it is suspected that the two anomalies are not related. The high is again possibly due to a burned feature at a depth of roughly 1.3 m. Also of interest is the extended low which circles the high, perhaps suggestive of some larger-scale archaeological feature.

Anomaly 3

An extended high region, consisting of several dipole and monopole anomalies, is located in the north central section of the grid. The dominant feature here is a strong dipole at point (14N,24E) with normal orientation and a high of 1179 gammas. Because of the magnitude of the high, the source of this anomaly must be an iron implement; but it is unlikely that the iron is entirely responsible for the high region surrounding it. There is a high extension which runs from point (13N,26E) to another "normal" dipole located at point (16N,27E); it is unrelated to the dipoles and appears to be of archaeological interest. Although the small dipole has the correct orientation for a cultural feature, the relative magnitudes of the high and low increase the possibility of a near-surface ferrous source. If the high area in which this smaller dipole

Figure 7.88: Magnetic contour map (SYMAP) of Site 5MT4512, Cascade Hamlet.

7.89



MAP OF TOTAL MAGNETIC FIELD TAKEN WITH MAG. IN DIFFERENTIAL MODE---VALUES IN SPA GAMMAS. SEPTEMBER 1970---DCE NUMBER.

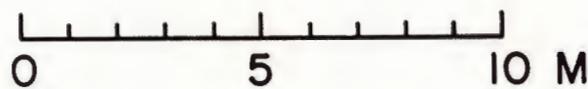
DATA VALUE EXTREMES ARE -22.00 3179.00

MAP DIVISIONS ARE 10 METER SQUARES (ONLY) 100% 95% 90% 85% 80% 75% 70% 65% 60% 55% 50% 45% 40% 35% 30% 25% 20% 15% 10% 5% 0% 5% 10% 15% 20% 25% 30% 35% 40% 45% 50% 55% 60% 65% 70% 75% 80% 85% 90% 95% 100%

PERCENTAGE OF TOTAL ABSOLUTE VALUE RANGE APPLYING TO EACH LEVEL 0.13 0.33 0.33 0.33 0.33 10.42 16.67 31.25



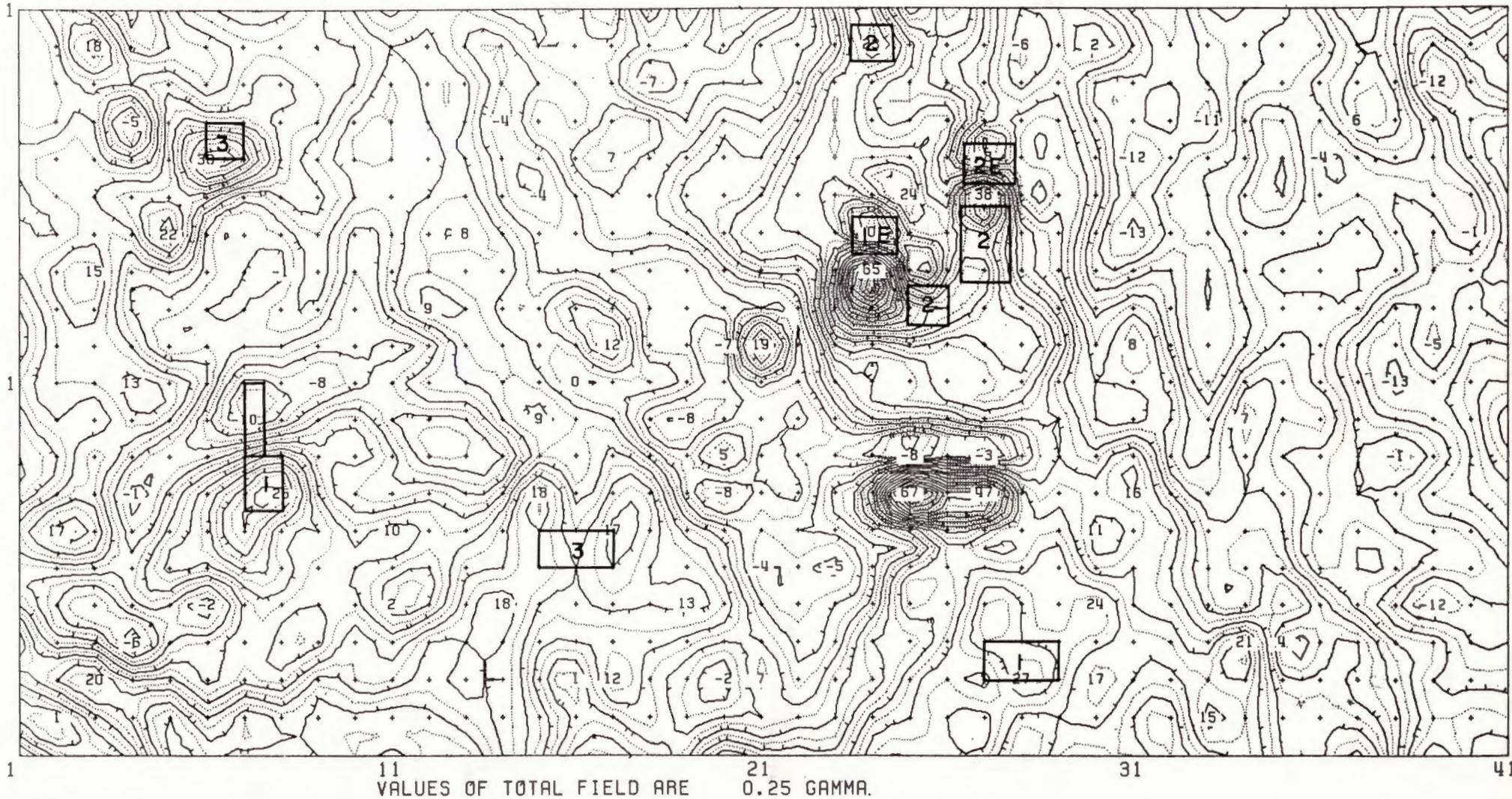
DOLORES ARCHAEOLOGICAL PROJECT SITE 5MT4512



C.I. = 1,1,1,1,1,2,4

Figure 7.89: Line contour map of Site 5MT4512, Cascade Hamlet, in 1 gamma intervals, showing suggested location of test squares.

CONTOUR MAP
DOLORES PROJECT-SITE 4512 WITH SPIKE AT 14,24E REPLACED BY INTERPOLATION.;
INTERVAL = 4.0



anomaly is located proves to be of cultural interest, a test over the dipole should be considered.

The general high region continues northward off the map, with a monopole peak at point (20N,24E). Although this high area is not excessively strong (6 gammas except for isolated dipoles), it suggests a region of some form of activity and should be tested, as indicated in Figure 7.89. Because of the extended nature of the high, depth estimations are difficult.

Anomaly 4

A large "normal" dipole anomaly is located at point (8N,26E). It is obviously not from a point source, as both the high and low are elongated in the east-west direction. Comparison with a theoretical curve suggests that this is a likely possibility for a linear burned feature such as a wall or an elongated fire hearth. FWHM measurements indicate a depth of about 0.5 m.

Anomaly 5

A subtle monopole at point (3N,28E) marks the extreme of another high plateau in the central south of the survey area. Because of the extended nature of the high and its lack of variation, it is suggested that this region could be an area of prehistoric activity; it has a higher possibility of containing cultural features than other areas on the map.

Anomaly 6

Another plateau high is located in the vicinity of point (6N,16E). A test pit might be assigned to this location to determine whether the source of the anomaly is archaeological or geological.

Location of Test Squares

Figure 7.89 shows the suggested location of test squares, based on

the magnetic reconnaissance. The numbering system is explained in the Introduction.

Area of Future Surveying

Lines (23E) through (27E) might be extended north, should the region covered by Test Square 2 prove productive.

Site 5MT4545, Tres Bobos Hamlet

Site 5MT4545 was surveyed on 19, 20, 21 September; survey operations covered a four-block area. The site is situated on a flat-topped knoll and, except for an occasional rodent hole, no topographic discontinuities are present which might affect the magnetic field.

The total magnetic field on the site is generally more undulate than other surveyed sites and this implies magnetic field contributions from a variety of archaeological and nonarchaeological sources. Figures 7.90, and 7.91, the SYMAP and line contour maps, show the following anomalies.

Anomaly 1

A monopole high is centered on the point (30N,22E) and is elongated in a north-south direction. The anomaly is of sufficient size and magnitude to be caused by a burned region, but the low situated just to the east implies the possibility that the source of the anomaly is an iron object. However, the existence of other lows to the east of the high, in what appears to be a reduced susceptibility geologic feature, lends support to the argument that the low and high are unrelated. If the source is archaeological in nature, it is at least 1.5 by 2.5 m in size.

Anomaly 2

A monopole high is centered about the point (33N,14E). This anomaly

also has a closely associated low towards the north, but again it appears that they are two separate entities. Both this high and this low should be investigated, as they might have archaeological sources.

Anomaly 3

A monopole high is located in the eastern section of the map at point (26N,39E). It is suggestive of a complex source as there are two extreme data values within the high, located at points (26N,37E) and (26N,41E). This might be a burned region and should be investigated.

Anomaly 4

A monopole low occupies about 12 sq m in the region of point (31N,37E). It is the extreme low of another southwest-northeast-running large-scale trend. Although it is difficult to imagine an archaeological source with a geometry to producing such a large-scale anomaly, this region should be tested as it might represent a feature filled with soft sediment such as a borrow area.

Anomaly 5

A monopole high is located at point (37N,5E) and has a signature similar to a burned region. It is rather subtle and has an extreme of only 4 gammas, but the SYMAP (Figure 7.90) shows it as a rather distinct anomaly.

Anomaly 6

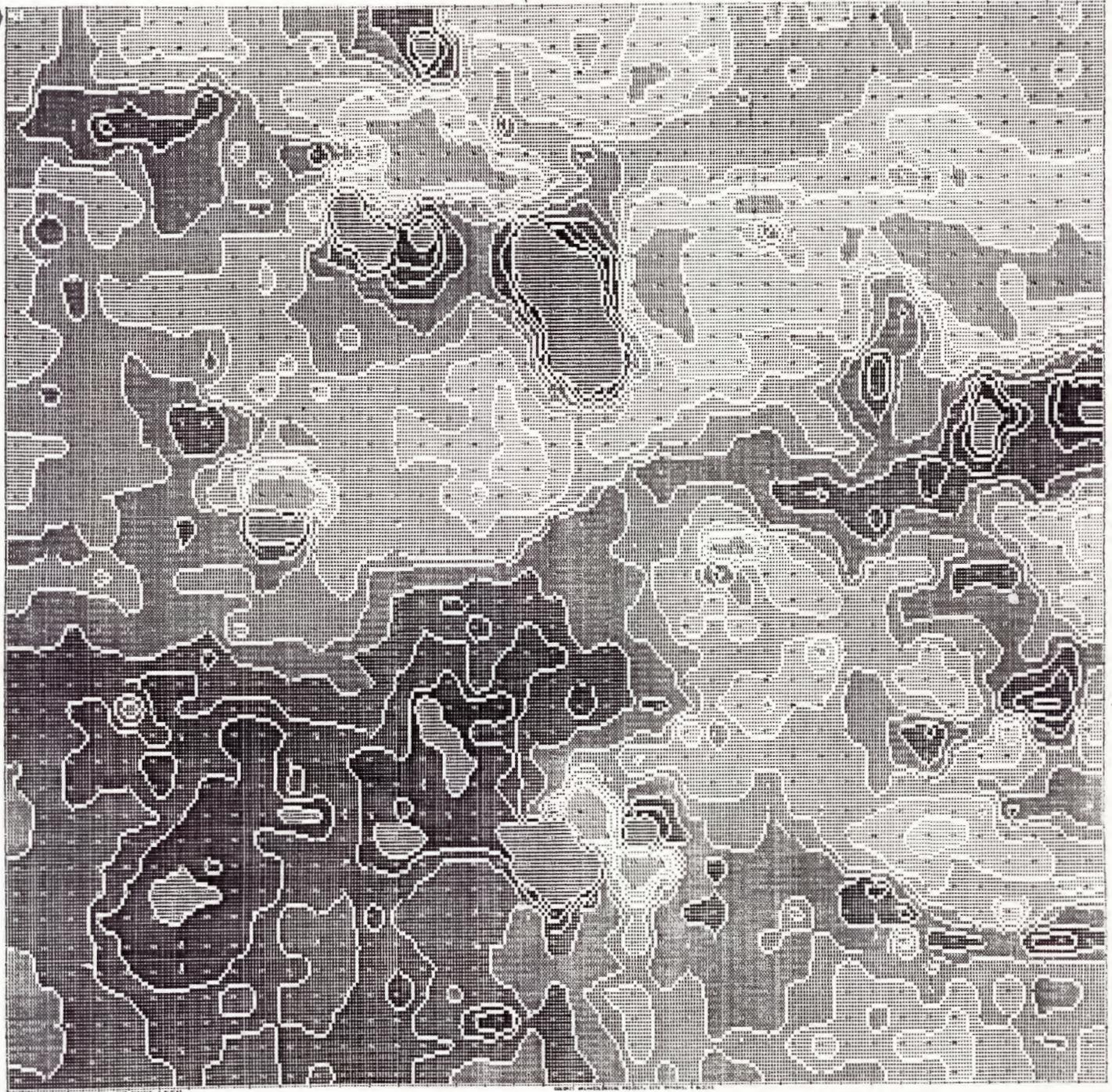
A monopole high is situated at point (8N,7E) and appears to lie on a larger scale geologic feature. It is too wide to calculate accurate depth estimations but the shape and magnitude of the anomaly indicate that assignment of a test pit here might be valuable.

Anomaly 7

A monopole high at point (14N,17E) is located on the same larger

Figure 7.90: Magnetic contour map (SYMAP) of Site 5MT4545, Tres Bobos Hamlet. The contour levels include data ranges of 8, 6, 6, 4, 6, 6, 4, 4 quarter gammas.

4
3IN
IN
N
IN



IE IIE 2IE 4IE

MAP OF TOPIC MAGNETIC FIELD DATA FROM 12 SEPTEMBER 1968
 **VALUES ARE IN GAUSS UNITS
 SOURCE: UNIVERSITY OF MICHIGAN

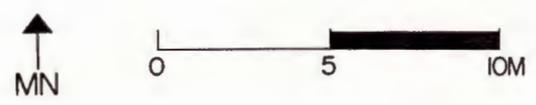
DATA VALUE EXTREMES: MIN -40.00 120.00

***10% LEVELS: 10% 20% 30% 40% 50% 60% 70% 80% 90%
 10.00 20.00 30.00 40.00 50.00 60.00 70.00 80.00 90.00

PERCENTAGE OF TOTAL ABSOLUTE VALUE RANGE APPLIED TO EACH LEVEL

10.00	15.00	20.00	25.00	30.00	35.00	40.00	45.00	50.00
10.00	15.00	20.00	25.00	30.00	35.00	40.00	45.00	50.00

STANDARD

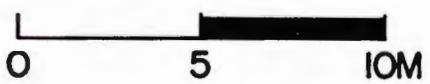
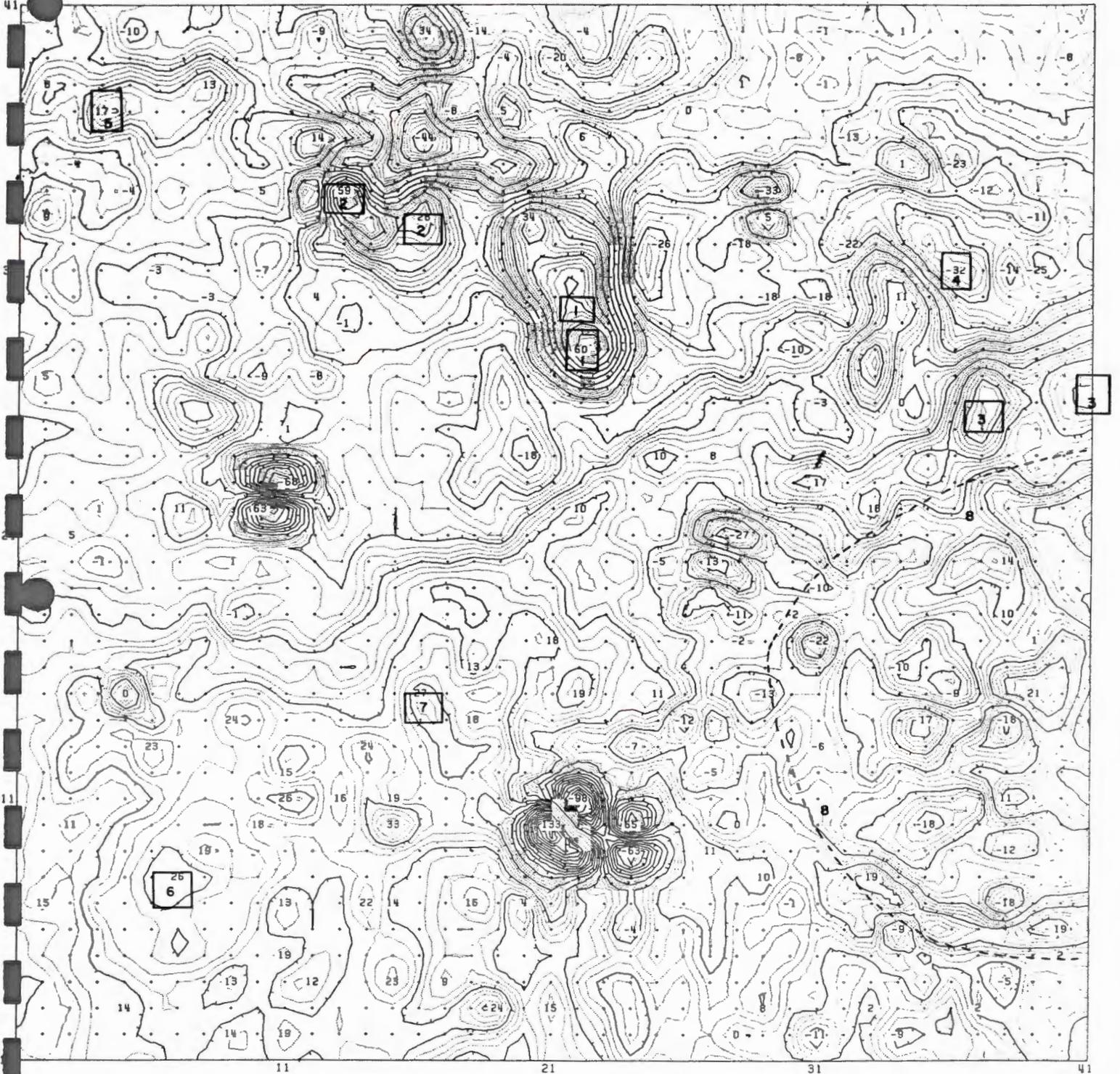


CONTOUR INTERVAL - 8, 6, 6, 4, 6, 6, 4, 4
QUARTER GAMMAS

7.90

Figure 7.91: Line contour map of Site 5MT4545 with
8 quarter gamma intervals.

CONTOUR MAP
DOLORES ARCHAEOLOGICAL PROJECT, SITE SMT4545, 4 BLOCKS
INTERVAL = 8.0



7.91

southwest-northeast geologic trend. The anomaly is not dramatically higher than the trend on which it is situated but the amount of magnetic contrast present suggests the possibility of an archaeological source.

Anomaly 8

A large-scale circular feature is located in the southeastern section of the grid. The dotted line (Figure 7.91) outlines its periphery, and although it is probably caused by a combination of geologic effects, it is described here in the event that an archaeological feature with these characteristics might exist. Test pits might be conducted on an experimental basis in this region, at the discretion of the archaeologist.

Anomaly 9

A number of dipoles are likely caused by metal objects and should not be confused with archaeological sources. They are located at points (22N,11E), (10N,22E), (9N,24E), (20N,27E), and (33N,29E).

Anomaly 10

In addition, there is a monopole low, located at point (36N,16E), close to Anomalies 1 and 2, which might indicate a soft-fill feature. The strong gradients in the area lessen the likelihood of this possibility, but the anomaly warrants testing by excavation. A test square has not been located on the map.

Location of Test Pits

Figure 7.91 shows the suggested location of the test pits. The numbering scheme is explained in the Introduction.

Areas for Future Survey

The southeast section of the grid has interesting anomalies which

continue beyond the limits of the surveyed area. Lines (1N) to (31N) may be extended eastward after the initial testing, so prudence should be exercised in locating spoil disposal areas.

Site 5MT4614

Site 5MT4614 was surveyed on 14, 15, and 19 October 1978; survey operations covered a four-block square section oriented magnetic north-south. The magnetometer traverse lines for the survey were run west to east. No field disturbances are expected from topography and no ferrous materials were encountered on the surface.

Several features on the grid are of interest, as illustrated in Figure 7.92, generated using the graphics routine SYMAP, and in Figure 7.93, a line contour map with 8 quarter gamma intervals.

Anomaly 1

A strong monopole high extends from the southeast to the northwest of the survey area, starting about point (1N,30E) through point (21N,17E) to point (31N,1E). This anomaly might be caused by either (1) a row of house blocks which has been thoroughly burned, although it might be expected that burned houses produce a less continuous anomaly. However, this might be a reasonable interpretation if the volume of burned soil was large, or (2) a geologic feature such as an arroyo or creek bed which has been resedimented to ground level. The sediment would most likely be derived from an upstream source, higher in iron oxides, which would increase the susceptibility contrast. Other contributing sources might be: nearby areas high in burned material, perhaps derived from the surrounding village; in situ compacted fill, resulting in an increase in oxides per

unit volume, and thus raising the susceptibility contrast; or any combination of these.

Anomaly 2

An equally strong anomaly occurs in the southwest corner of the survey area. Its limits are not discernible but its magnitude is 12 or 13 gammas, comparable to the elongated high. Its extent will have to be determined before making any suggestions as to its source.

Anomaly 3

A monopole high is located about the point (20N,36E). It is an extended source and is roughly rectangular with a lobe out the southwest side. It has great similarities to anomalies produced by pithouses.

Anomaly 4

A roughly perpendicular extension of the central elongated monopole high originates near point (23N,21E) and fades out towards the north-east corner of the survey area. Its source could be linked to the central high, suggesting that it might be either an extension of an archaeological feature (for instance, a pathway) or a tributary feature, depending on whether the central high is cultural or geologic in nature.

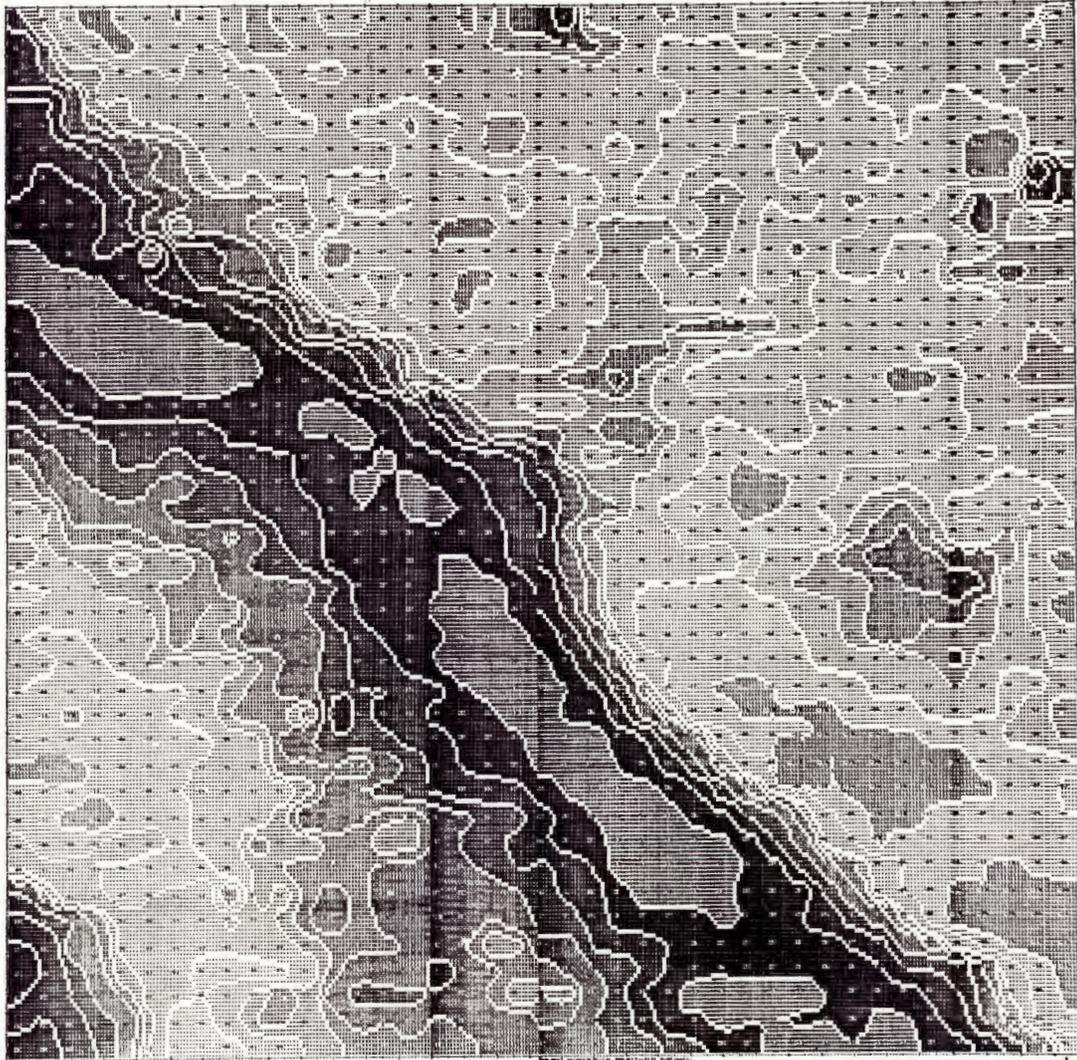
Anomaly 5

A high peaks in the area of point (3N,16E). Its source is extended and covers a relatively broad region.

Anomaly 6

A monopole high runs off the survey grid and originates at point (41N,22E). Although it is difficult to postulate a source without seeing the entire anomaly, it seems unlikely to be due to a ferrous source because of its extended nature.

Figure 7.92: Magnetic contour map (SYMAP) of Site 5MT4614.



E1

E2

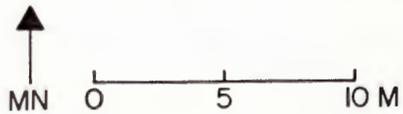
E4

N4

N2

N1

DOLORES ARCHAEOLOGICAL PROJECT
 SITE 5MT4614 C.I. = 2,2,1,1,2,2,2,5,3



7.92

Figure 7.93: Line contour map of Site 5MT4614 in 2 gamma contour intervals, showing the suggested location of test squares.

Anomaly 7

Three dipolar anomalies occur at points (33N,7E), (35N,39E), and (14N,13E). All have reoriented dipole directions so it is likely they are due to ferrous sources. One of these might be worth excavating as a control on the type of iron we might expect to find on the sites.

Location of Test Squares

Figure 7.93 shows the suggested location of test squares, based on the magnetic reconnaissance, and these have been positioned to minimize unproductive excavation. The numbering system, as explained in the Introduction, indicates the priorities for excavation.

Areas for Future Surveying

As there are anomalies which continue outside the area of survey, it might be advantageous to extend lines (1E) to (4E) to the north and south, as well as adding lines to the east of the grid. Lines (20N) through (23N) should be extended northwards if Test Pit 5 proves productive. Finally, the lines to the south of the large elongated anomaly might be done if this area is cultural in origin.

SUMMARY OF THE 1978 PROGRAM

With the conclusion of the analysis on the data collected for the Dolores Archaeological Program, a few general comments are in order.

Physical Suitability of Sites for Magnetic Surveying

First, it appears that the soils in the Dolores Valley have sufficient amounts of hematite (Fe_2O_3) to allow increased susceptibility contrasts when burning takes place during the occupation of an archaeological site. Organic decay and soil disturbance are also suspected of causing notable magnetic anomalies, but this will not be confirmed until examination of the excavation information takes place. The topographic relief of most of the sites is insufficient to cause unwanted disturbance in the magnetic field although some sites, such as 5MT0023 and 5MT2320, have higher noise levels caused by irregularities from looting activity.

Magnetic contributions from soil irregularities due to uneven sedimentation (e.g., soil lenses, coarse grained deposits, etc.) appear to have magnetic signatures which can either be visually distinguished from those features of potential archaeological interest or can be removed from the magnetic record using convolution filtering or a trend analysis. However, these methods were ineffectual when applied to the geologic noise caused by the igneous cobbles on Site 5MT0023, where the noise signature is similar in frequency and magnitude to that of archaeological sources.

Historic trash, specifically that of a ferrous nature, appears occasionally on these sites. In most cases it is easy to distinguish these contributions from archaeological sources, but occasionally, as with the

confusing effects from geological noise, ambiguity in interpretation arises.

In most cases the sites are all suitable for magnetic surveying and most have anomalous signatures which are typical of archaeological features.

Data Collection

The instruments utilized for measuring the magnetic field (two Geometric G826) have proven fairly reliable and have a typical failure rate for geophysical equipment; it appears that unusual stress was placed on the electrical connection between the sensor and the counting instrumentation. This has been reinforced, but more care should be taken. Only 5 percent of the data had to be retaken because of instrument malfunction. One of the inherent disadvantages of these instruments is the large number of batteries used in the process of exciting the protons in the sensor. Some of these costs can be alleviated by purchasing rechargeable "D" cells, if it is suspected that data collection will continue.

The crew, assembled to collect data under the direction of a field crew chief, worked thoroughly and efficiently during the field season. Instruction and supervision was necessary for only one month before the crew was able to operate on its own. The legibility of the data and the mailing system for sending the data to NEBCAR appear adequate.

Processing, Interpretation, and Dissemination of the Magnetic Data

After the data were received at the University of Nebraska, the processing procedure, in which the data are worked into an intelligible form, took a minimum of three days. Interpretation of the data takes

somewhat longer, depending on the complexity and size of the data set. As it is very advantageous during the field season to have quick information turn-around, suggestions on the locations of archaeological features were either phoned to Dolores from NEBCAR, after three days of processing, or a brief summary of the more obvious anomalies were mailed about a week after the data were received. Occasionally, because of backlog, longer periods of time elapsed before information could be passed along. To avoid this problem, it is recommended that the magnetometer field crew be advised well in advance of any excavation schedule so that the data can be shipped to NEBCAR well before excavation begins.

Because no standardization procedure was established for the dissemination of the magnetic information after it was mailed to Dolores, some confusion arose in getting maps and their descriptions to the field crew chiefs before excavation. It was suggested that a central file be created at the project laboratory where the information for each site could be stored. The field crew chiefs could consult this data bank when deciding on the sampling design for their site; they could also reference a general information section which would include the folder of papers with the theory and methodology of magnetic surveying, the field manuals for the magnetometer crew, and the introduction and finalized descriptions of each site in this report. This procedure was implemented in August 1979.

In conclusion, it appears that the magnetic field measurements recorded during survey operations in the Dolores Project area contain a significant amount of information. From the study done under the auspices of the 1978 purchase order, it is apparent that many features have anomalous magnetic responses. The larger architectural features, such as pitstructures, are easily discernible (such large structures were

potentially present at Sites 5MT2193, 5MT2848, 5MT2236, 5MT4545, 5MT2194, 5MT2203, and 5MT2192), and it may be possible to extract more information about the size, shape, and content of these features. Smaller features with localized burning, such as fire hearths, are also detectable (such features were recorded at Sites 5MT2193, 5MT2192, 5MT2848, and 5MT4545), and areas with higher ash content and disseminated burning, such as room blocks or activity areas, appear visible in some cases (at Sites 5MT2203, 5MT2192, and 5MT4545). With the implementation of a correlation study to examine the excavation results and to compare their spatial positioning with the anomalous magnetic signatures, it is hoped that the success rate of magnetic surveying can be assessed more quantitatively. This should yield information on what features were undetectable and on the geometry and content of the features that were located. Although at present the utility of magnetic surveying is intuitively obvious, the correlation study should help the improvement of the resolution of this prospective technique; it will also contribute to the formulation of more effective sampling strategies.

REFERENCES CITED

- [1] Hathaway, J. Holly, Archaeomagnetism, Chapter 12, In Field Investigations - 1978, Volume I, Dolores Archaeological Program Technical Reports, David A. Breternitz, Senior Principal Investigator. Reports from the Dolores Project, Cultural Resources Series, Bureau of Reclamation, Upper Colorado Region: Salt Lake City. 1978