# Geophysical Survey Report

## BULLOCK DOWN, SUSSEX

### Outline

Bullock Down is situated on Beachy Head near Eastbourne. It constitutes a multiperiod settlement site on chalk downland and a five-year research project is currently being undertaken by the Sussex Archaeological Field Unit. A number of sites which were to be excavated, have been surveyed during Easter and Summer of 1976 at the request of Mr P.L. Drewett, who is directing the project.

The following sites were surveyed:

(1) Romano-British site at TV 578 963 (Map 1) and thought to be situated on a double lynchet trackway. A large scatter of pottery had been found by the farmer over a long period of time. Also three large coinhoards were disclosed in the vicinity of the suggested site. This is situated on the slope of a hill running perpendicular to the sea and consisting of a clay soil of flinty nature. Some of the objects found conceded the idea of a specialised site, possibly a temple.

The actual position of the site was obscure and required clarification.

(2) Medieval farmstead at TV 573 964 (Map 1). Situated in a valley on Upper Chalk - a mixture of white chalk with flint nodules - this site was characterized by large chunks of building material which had been ploughed up. T he survey was intended to bring light on the structure and layout of the farmstead.

(3) Bronze Age (= supposed) Round Barrows at TV 592 963 (Map 2). Ploughing had shown up a change in soil texture, indicating a possible ditch. This ran from the road in an easterly direction for approximately 20 m in a slight curve, passing the nearest barrow within 10 m. Crop marks underlined the plough marks.

The three barrows were thought to be connected with another barrow sited in the vicinity. This raised the question whether the supposed ditch encompassed a possible causewayed camp. It was though that a survey could produce evidence concerning the position of the supposed ditch and outline it. Also the fourth barrow, not mentioned on any of the Ordnance Survey maps, needed to be localised, and identification as a round barrow confirmed.

(4) Neolithic settlement at TV 592 970 (Map 2). The soil consisted of chalkless clay with flints. A substantial surface scatter of Neolithic flint tools indicated the possibility of a settlement. The nature of the finds did not warrant a detailed survey but a scan could prove to be useful.

## General Survey Procedure

As the various sites showed a great diversity in character and the required information differed from site to site, various geophysical surveying methods were used. Large area scans were undertaken with a flux-gate gradiometer (Plessey). For the grids of 30 x 30 m a semi-automatic recording system was connected to the gradiometer. Due to its higher sensitivity, a proton magnetometer (Elsec) provided a useful, but slow and tedious, recording instrument for part of the survey. Where necessary, resistivity surveys were also undertaken, although it was though the unusual

dryness, created by the prevailing drought, would mask any evidence. With the absolute magnetometer, sonde height was kept at 35 cm above the ground.

## Results

### 1 - Romano-British site

The amin part of the survey was undertaken with the fluxgate gradiometer and the proton magnetometer.

A preliminary scan with the gradiometer indicated a low magnetic susceptibility of the soil, a phenomenon generally found on chalky soil. Measurement of the soil in a susceptiblity meter (Scollar, 1968) confirmed this.

TABLE 1

| Sample | Scale Readings (not sieved) $\times 10^{-6}$ emu.gm | Mean | Scale Readings (sieved)* $\times 10^{-6}$ emu.gm | Mean |
|---|---|---|---|---|
| 1 | 26 - 26,5 - 26,5 | 26 | 27.5 - 28 - 27 | 27,5 |
| 2 | 20,5 - 22 - 20 | 20 8 | 27 - 26,5 - 25 | 26,2 |

Both samples were taken from square A. Sample 1 represents the topsoil reading and smaple 2 that of the subsoil. Of sample 1, approximately 20% of the soil consisted of lumps and stones whereas sample 2 contained approximately 70%.

Phosphate analysis of sample 1 was negative. Sample 2 gave a trace reading (~ 0,08% - 0,15%).

Although wider sampling would have augmented the above measurements, the consistency of the topsoil seemed fairly constant and the fluxgate scan underlined this. Augering indicated a topsoil thickness in the region of 12 cm (square A).

All in all, not a hopeful basis for a successful survey. Squares A B C D (A = 30 x 30 cm; rest each 15 x 15 m) were surveyed with an absolute magnetometer (ELSEC). Readings were taken every 45 minutes at a

base station. During this period readings varied by approximately three units. Therefore 45 minutes was deemed a suitable time period and not reduced. Traverse and spacing distance were each 1 m. The unfiltered and uncorrected plot of squares A B C D indicates the effects of diurnal variation. AS the readings are inversely proportional to the magnetic intensity, shaded areas correspond to negative or reverse anomalies and blank areas to positive or normal ones. The filtered plot of squares A B C D brought to light some curious linear and rectangular features which could either be geomorphological in character or of genuine archaeological interest. The survey int erpretation diagram underlines the more prominent features.

A linear irregularity at the bottom of square A has not been included as it was caused by a run-down magnetometer battery.

To enable comparison, square A was also surveyed with the fluxgate, the results of which have been included. It clearly shows the large pos positive anomaly marked A which is most probably caused by clay with flints. Iron indicated by a characteristic spike (marked B). The less sensitive fluxgate misses out on many of the results obtained with the magnetometer.

Square E (100 x 30 m) was surveyed with the magnetometer using traverses 2 m apart and measurement points spaced at 2 m intervals. This was deemed justifiable as the area involved was quite substantial and a preliminary scan had not been very successful. A 2 m measurement spacing would only locate sizeable anomalies. During the survey, measurements were not related to a common base station. The traverses would be interpreted as individual units. This provided inconclusive results and it was decided to use various filtering techniques on the data to determine their use in matching non-diurnal corrected readings. All readings are (again) inversely proportional to the magnetic field.

anomalies have been outlined (those most frequently appearing in 2, 3, 4).

A fluxgate survey was undertaken of part of square E (30 x 30 m, denoted F) to ascertain whether a more detailed survey of that area would be justifiable. The flat response - as seen - denied this.

A fluxgate survey (30 x 30 m, denoted G) of the lower field did not provide evidence of any anomalies either. It was then decided to pursue resistivity as the magnetic surveys had been rather unresponsive.

Square H (60 x 20 m) was surveyed with search traverses 5 m apart and 60 m long. Both Wenner and Double Dipole were used with a probe spacing of 1 m (results indicated from north to south, starting west).

The plotted graphs show up very little. The most responsive area - between $T_5$ and $T_{10}$ - was subjected to a closer survey (square I; 30 x 5 m), using a traverse distance and probe spacing of 1 m. Again the filtered data remain unresponsive with no clear anomalies showing (= regular patterns).

## Conclusion

As expected, the results did not indicate substantial anomalies which could be related to a settlement site. A number of techniques were tried, all more or less drawing blank. The very minor susceptibility contrast of the soil would make detection of the remains of a settlement site in the surveyed area a rather unlikely event. (use of fire → magnetic enhancement soil).

Looking out over Bullock Down, one becomes aware of the problem in locating a site in such a vast area. Aerial photographs did not indicate anything on which to base a survey. The only evidence was presented by archaeological finds.

At best a coring programme coupled with susceptibility measurement and phosphate analysis (if the area has not been fertilised too heavily) may produce some evidence on which any future survey could be based.

Another possibility would be a systematic large area scan with the fluxgate, a rather daunting prospect.

2 - Medieval Farmstead

As various pieces of rubble had been found, resistivity seemed the most suitable technique. Search traverses were used at first. Traverse $t_2$ was placed at 1 m distance from $t_1$. The other traverses were situated 5 m from each other. In all cases the probe spacing equalled 1 m. Total surveyed area was 30 x 50 m with a Twin electrode configuration. The resultant graphs (results indicated from east to west, starting south proceeding northwards) indicated various anomalies. Most probably the pronounced peaks are caused by walls, the troughs probably indicating gaps in rubble or pits. Prior to excavation, a close area survey (denoted K; 10 x 20 m) was undertaken to the south of square J. Wenner and Double Dipole were used. The results clearly indicated an anomaly, probably walls. Filtering provided no additional information.

Excavation also confirmed some of the results of the traversed areas as evidenced in the enclosed diagram. A close survey of the traversed area (square J) would be advisable. This would then enable the compilation of a dot density plot involving less guesswork.

Preliminary excavation results of the 1977 season supplied by Mr P.L. Drewett underlined the resistivity results of square K.

Conclusion

Resistivity proved to be extremely useful in delineating walls and associated anomalous structures. The dry conditions did not have any noticeable effect on the readings. Resistivity has shown to be highly suitable in the detection of building remains.

3 - Bronze Age Round Barrows

| Sample | Scale Readings (not sieved) | Mean | Scale Readings (sieved) | Mean |
|---|---|---|---|---|
| 3 | 9,5 - 7,5 - 8,5 | 8,5 | 8,5 - 9 - 10 | 9,2 |
| 4 | 10 - 10 - 10 | 10 | 10 - 11 - 10,5 | 10,5 |

Sample 3 was taken from the bank of the presumed ditch whereas sample 4 came from the ditch (?) itself. Phosphate analysis of sample 3 produced a weak (0,15% - 0, 4") response. Sample 4 gave a trace result (∿ 0,0 5% - 0,15%). Auger profiles gave identical results for both presumed ditch and bank.

As susceptibility differences proved to be negligible, it was decided to use resitivity. Square A (30 x 15 m) and square B (30 x 14 m) were laid out so as to encompass the supposed ditch and both banks. The Twin electrode configuration with a spacing of 1 m was used.

Various filtering techniques were used on the data:

(1) Unfiltered data ranged from mean to mean plus two standard deviations. Although the result indicates some curious curvilinear features which could be associated wit h a ditch, this seems unlikely (too diffuse in character). Most probably these features have been caused by perturbations in the underlying subsoil.

Owing to the dry conditions a ditch could show up as a positive anomaly but when referred to the graphs of area A, one will note that banks and ditches appear subsequently as positive and negative.

(2) Filter radius 4, ranged from mean - ½ standard deviation to mean + ½ standard deviation.

Any overall drift in the readings should be removed as this

filter subtracts each reading from the mean of its eight neighbours at the stated radius 4. It also emphasises features narrower than the filter. Here it has the effect of scattering the readings and evening off value differences. No clear picture emerges.

(3) Unfiltered, mean to mean + ½ standard deviation. The saturation level has been lowered from + 2 (plot 1) to + ½, the resultant plot being less marked than plot 1. Overall the picture remains the same as plot 1.

(4) This forms an enlargement of square A of the previous plot to test for features within the plot. Some rounded features appear which could be solution holes.

(5) Here an enlargement of square B of plot 3. Rounded features, identical to the ones in the previous plot, appear.

(6) Unfiltered, mean - 1 standard deviation to mean + 2 standard deviations, of square B (previous plot).

The minimum plotting level has been lowered to match the low readings (especially evident in the lower part of plot 5) thus enabling similar values to show up more clearly, possibly forming a pattern. Here, it has the effect of evening the readings and no features can be recognised.

Traverses were then run across the area of differing soil texture. Where the soil marks petered out, the traverses were positioned such that if the supposed ditch went round the barrows, it could be located. The plotted results of area A clearly indicate the barrows and their corresponding ditches. A feature, at first thought to be the ditch, turned out to be a waterpipe after consultation with the farmer. A fruitless hour was spent searching amongst the nearby gorse bushes for the assumed fourth barrow but to no avail. In all probability it does not exist. In view of

the previous results, it would therefore seem unlikely that the three barrows are part of a causewayed camp.

4 - Neolithic Settlement.

A fluxgate scan of the surrounding area indicated some metal in an otherwise very quiet field. No soil susceptibility measurements were made. Such would be useful to warrant consideration of a fuller survey.

# BULLOCK DOWN

## Locations of surveys: Map 1

**TV** 578 963

**TV** 573 964

TV 573 964

TV 578 963

J

K

A

B

C

D

E

F

G

H

trench

Kiln Combe

Stone

Pond

Cart Track

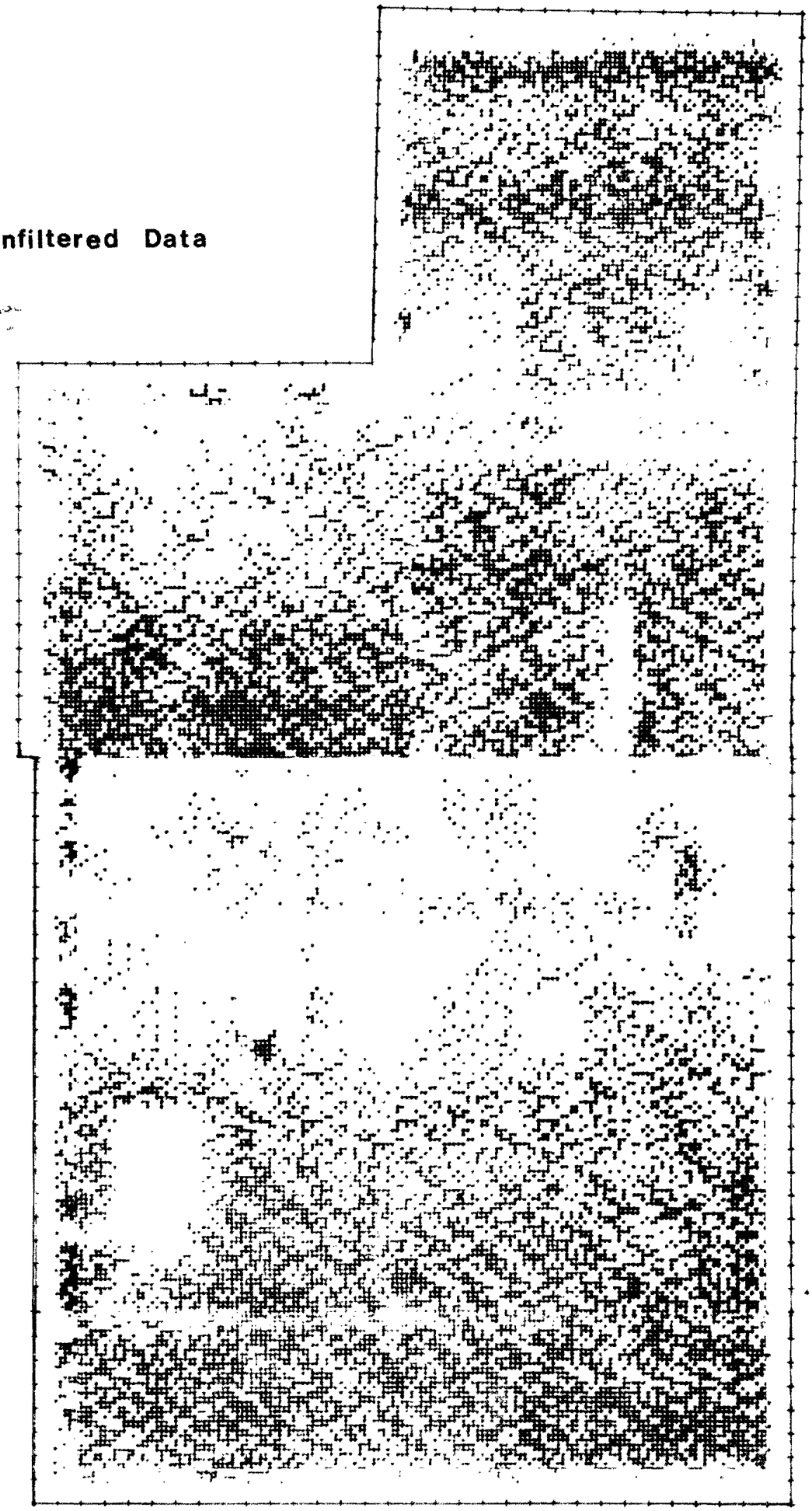
Field System

Track

FP

1:2500

Unfiltered Data



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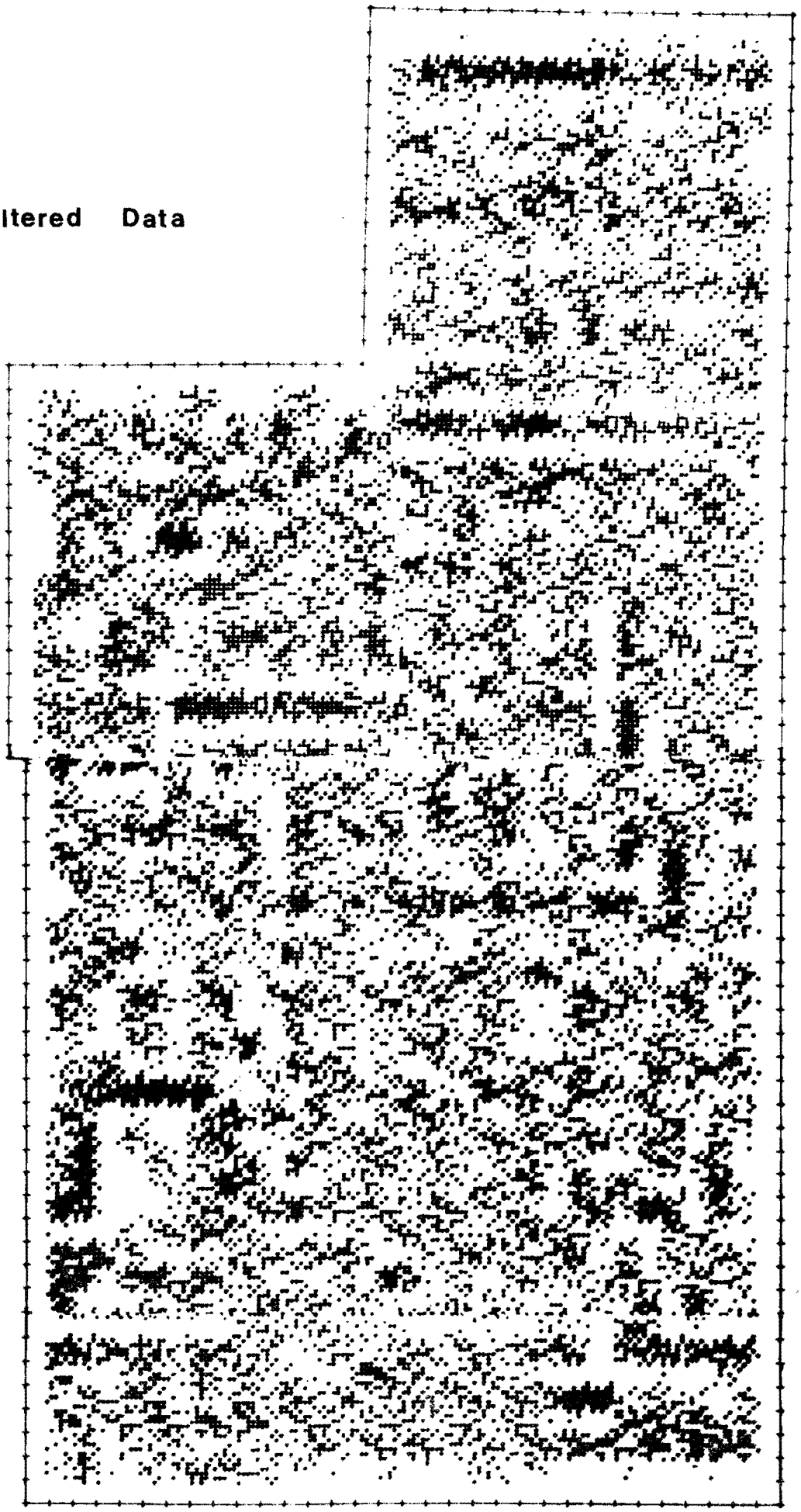
# BULLOCK DOWN

## Proton Magnetometer survey

1976

Filtered Data



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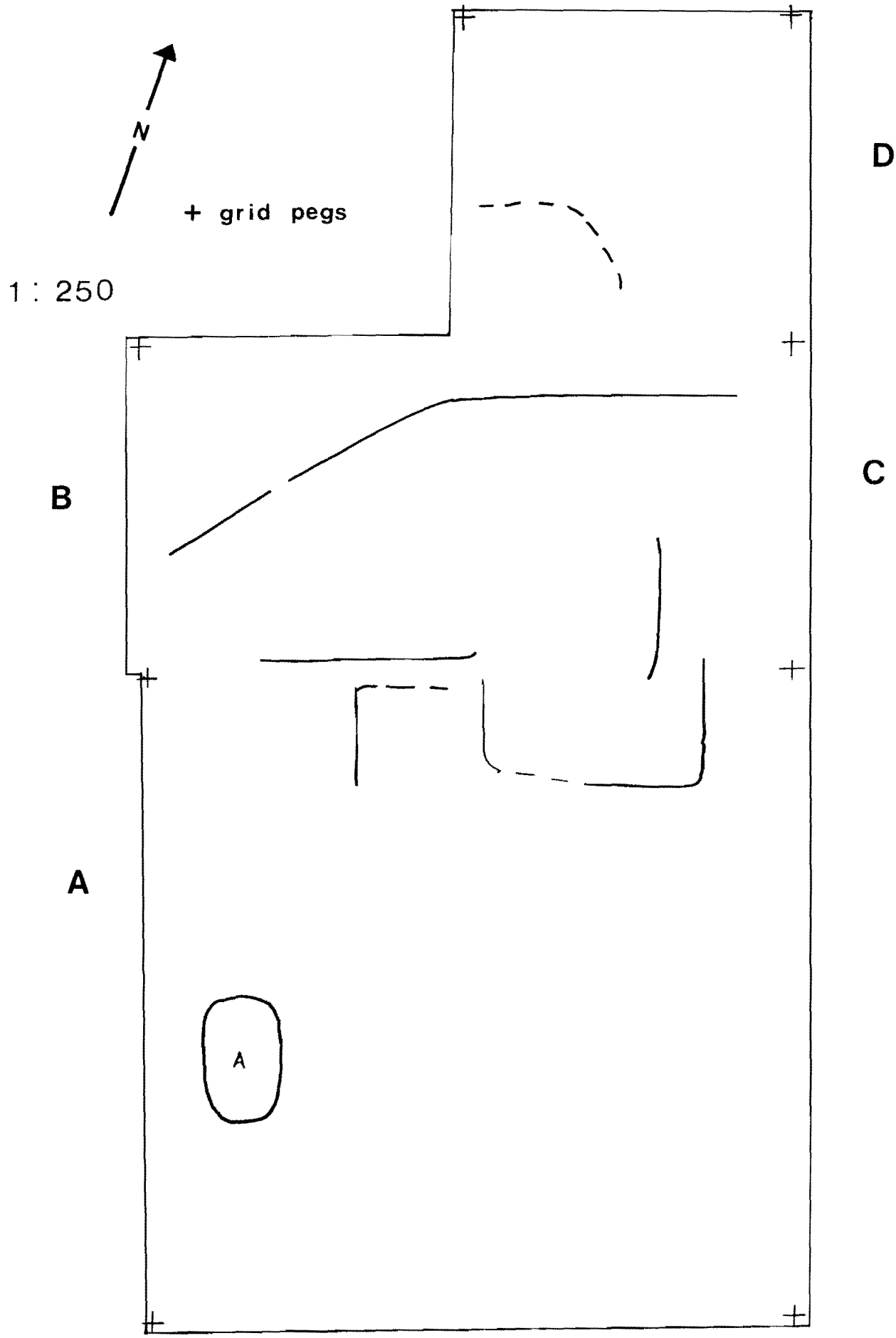
# BULLOCK DOWN

## Proton Magnetometer survey

1976



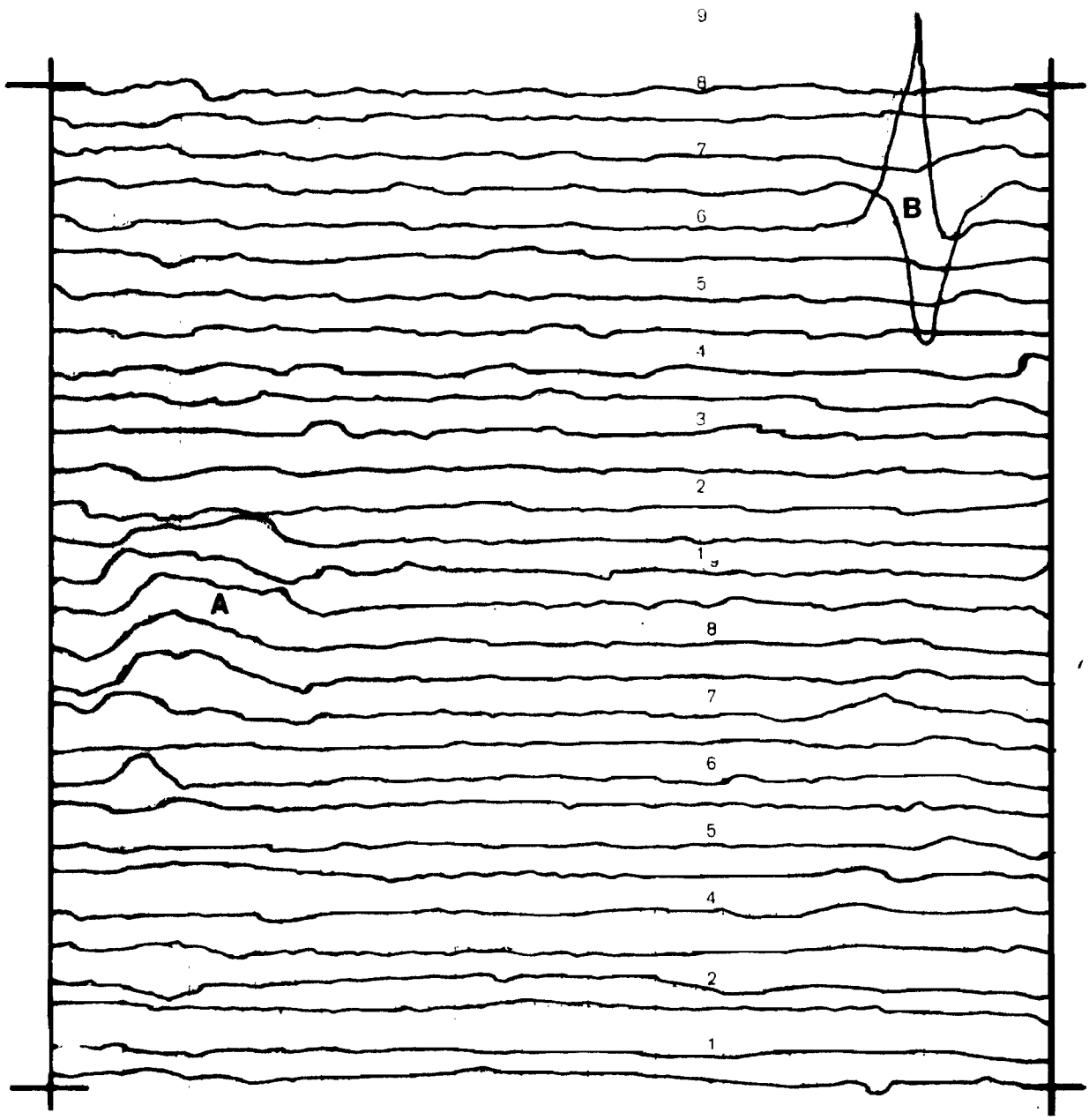

BULLOCK DOWN, Areas A - D

Proton magnetometer survey interpretation

1976

# BULLOCK DOWN

## FLUXGATE SURVEY SQUARE A

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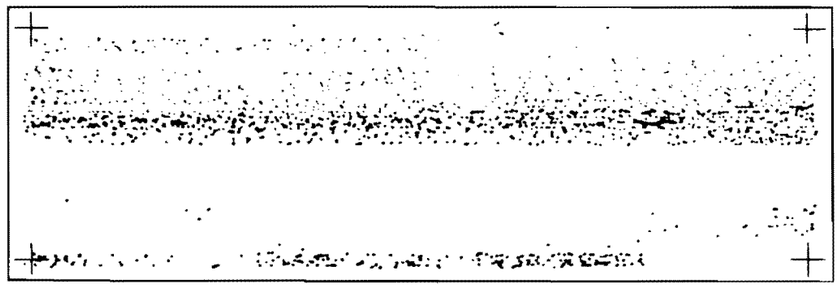
## PROTON MAGNETOMETER SURVEY SQUARE E



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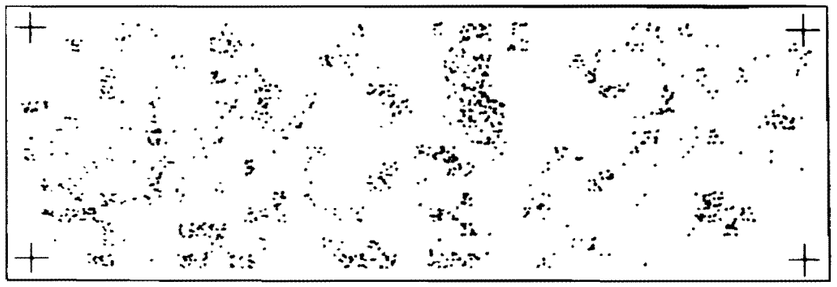

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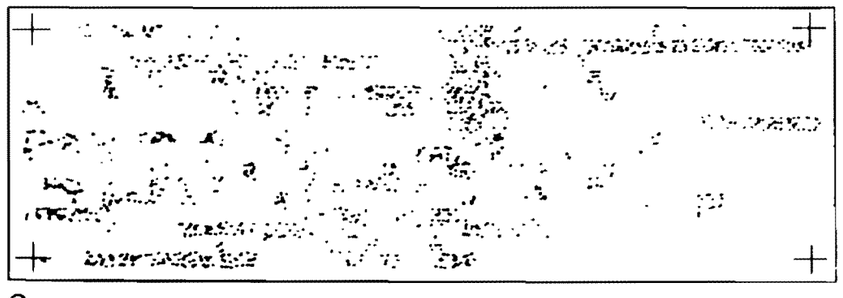

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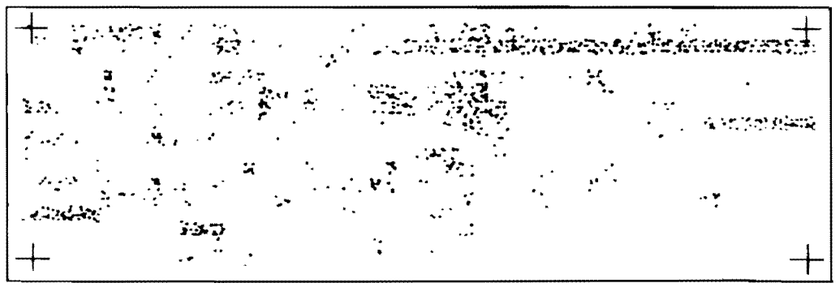

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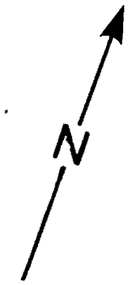


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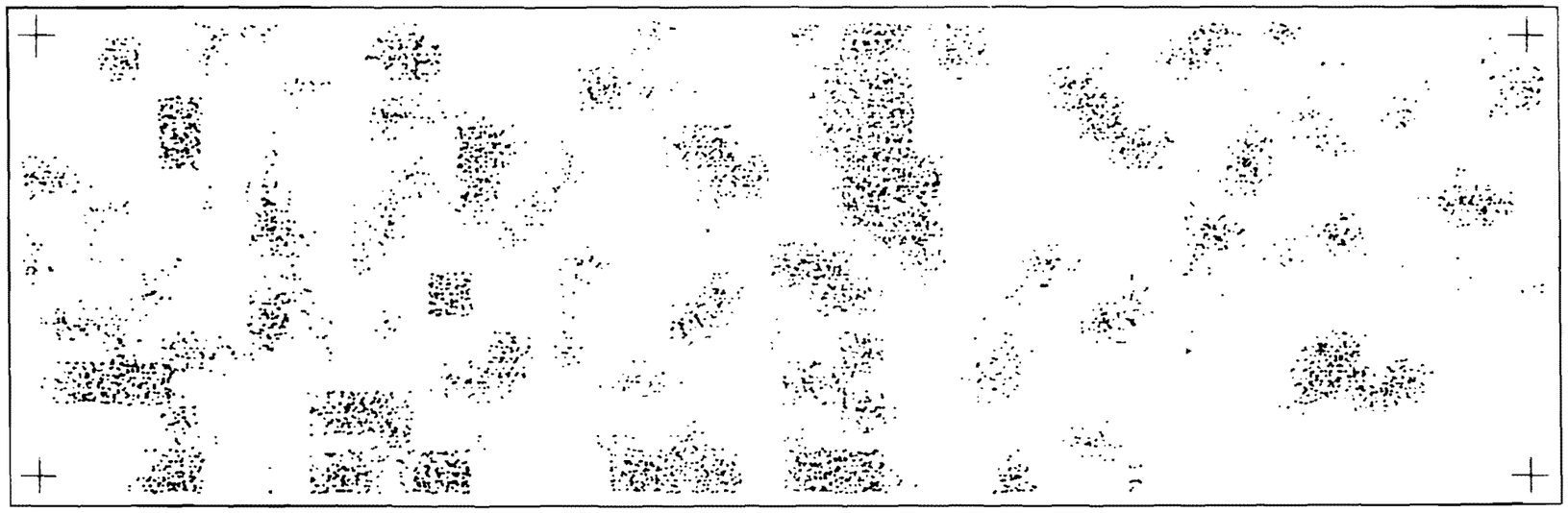
# BULLOCK DOWN

PROTON MAGNETOMETER SURVEY SQUARE E



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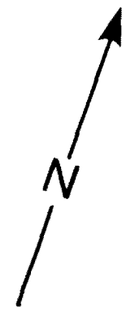


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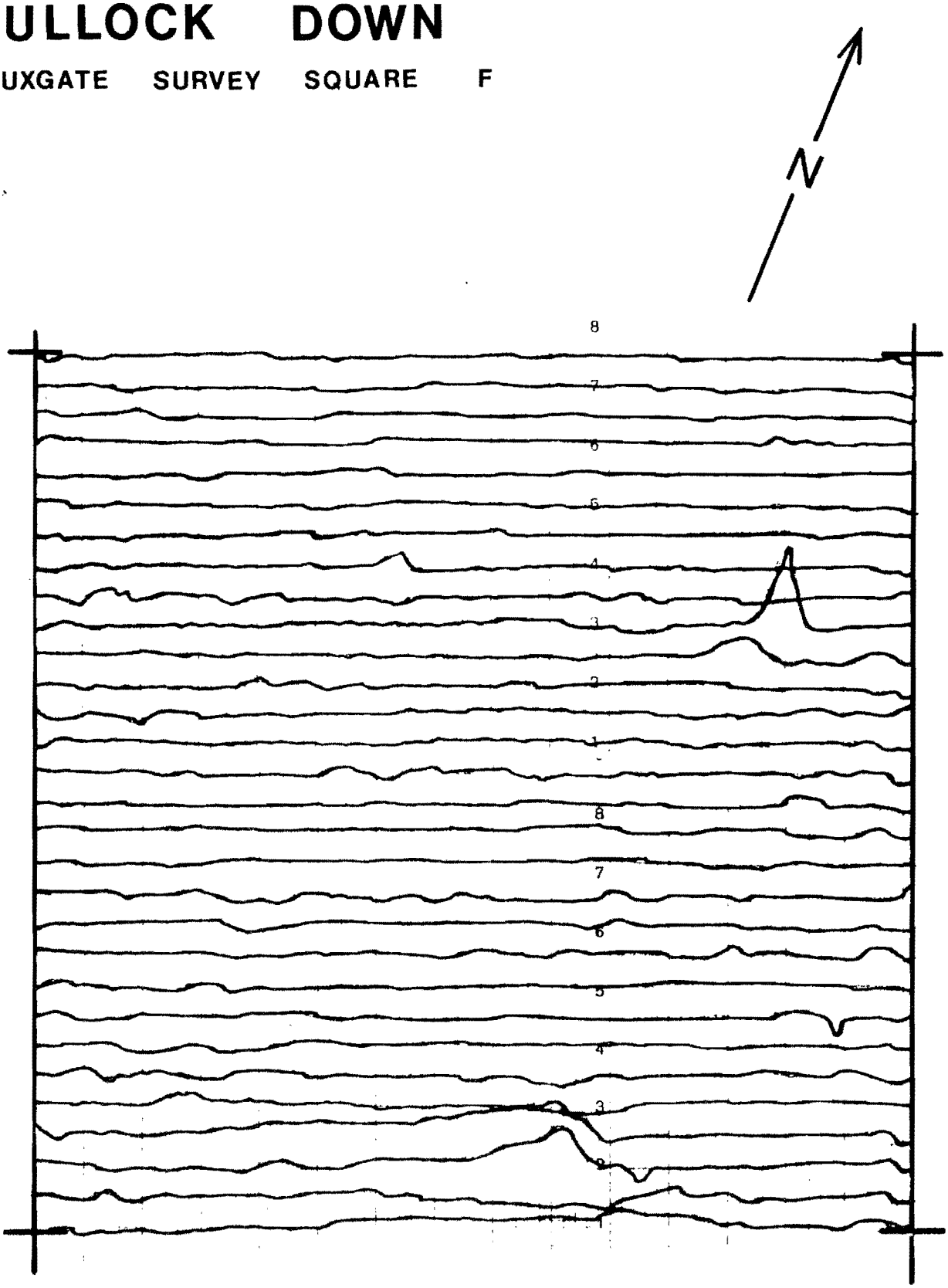
# BULLOCK DOWN

## FLUXGATE SURVEY SQUARE F

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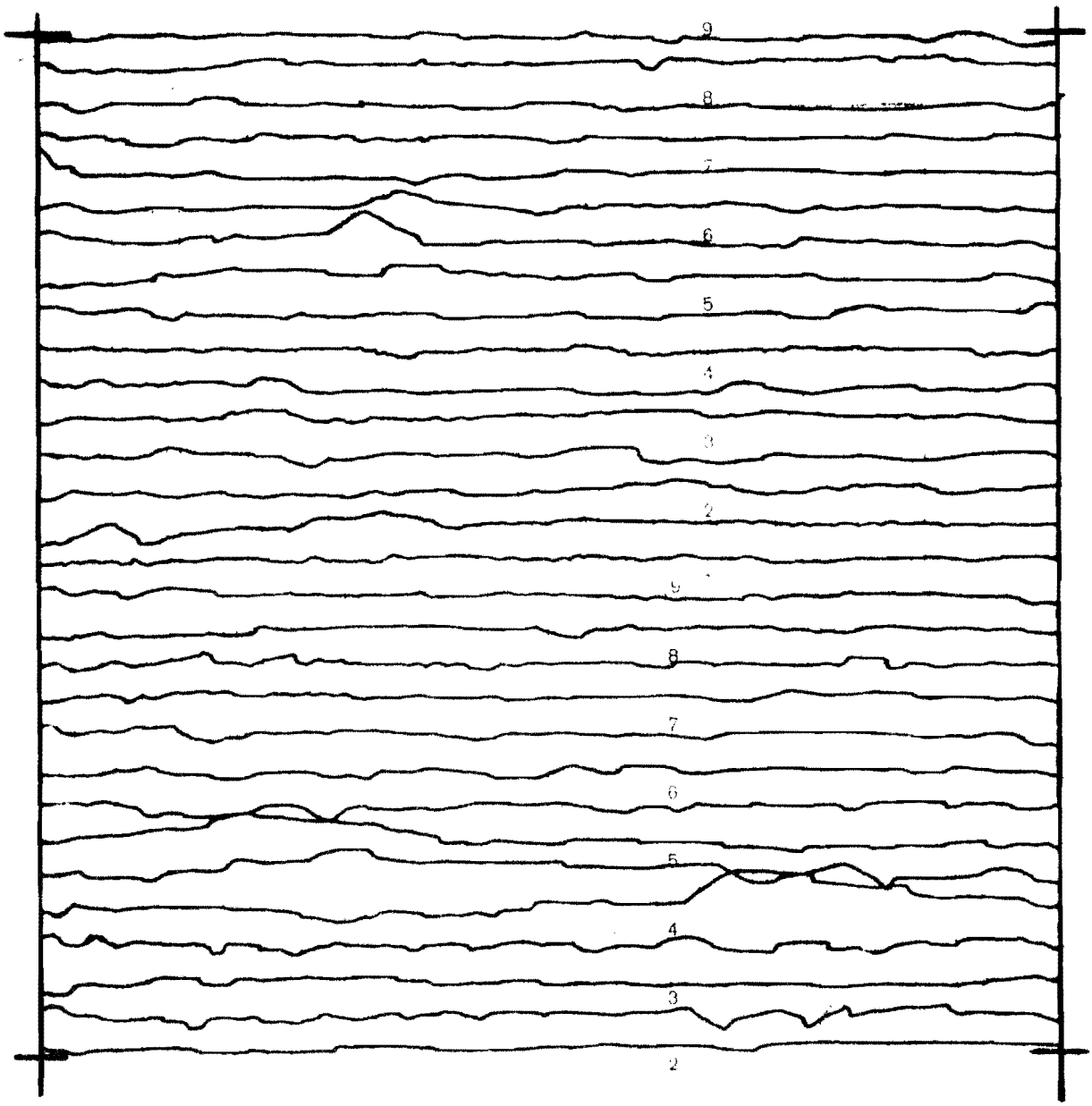
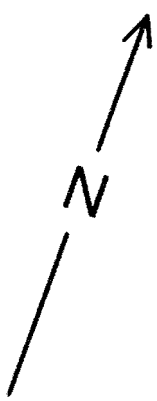
# BULLOCK DOWN

## FLUXGATE SURVEY SQUARE G

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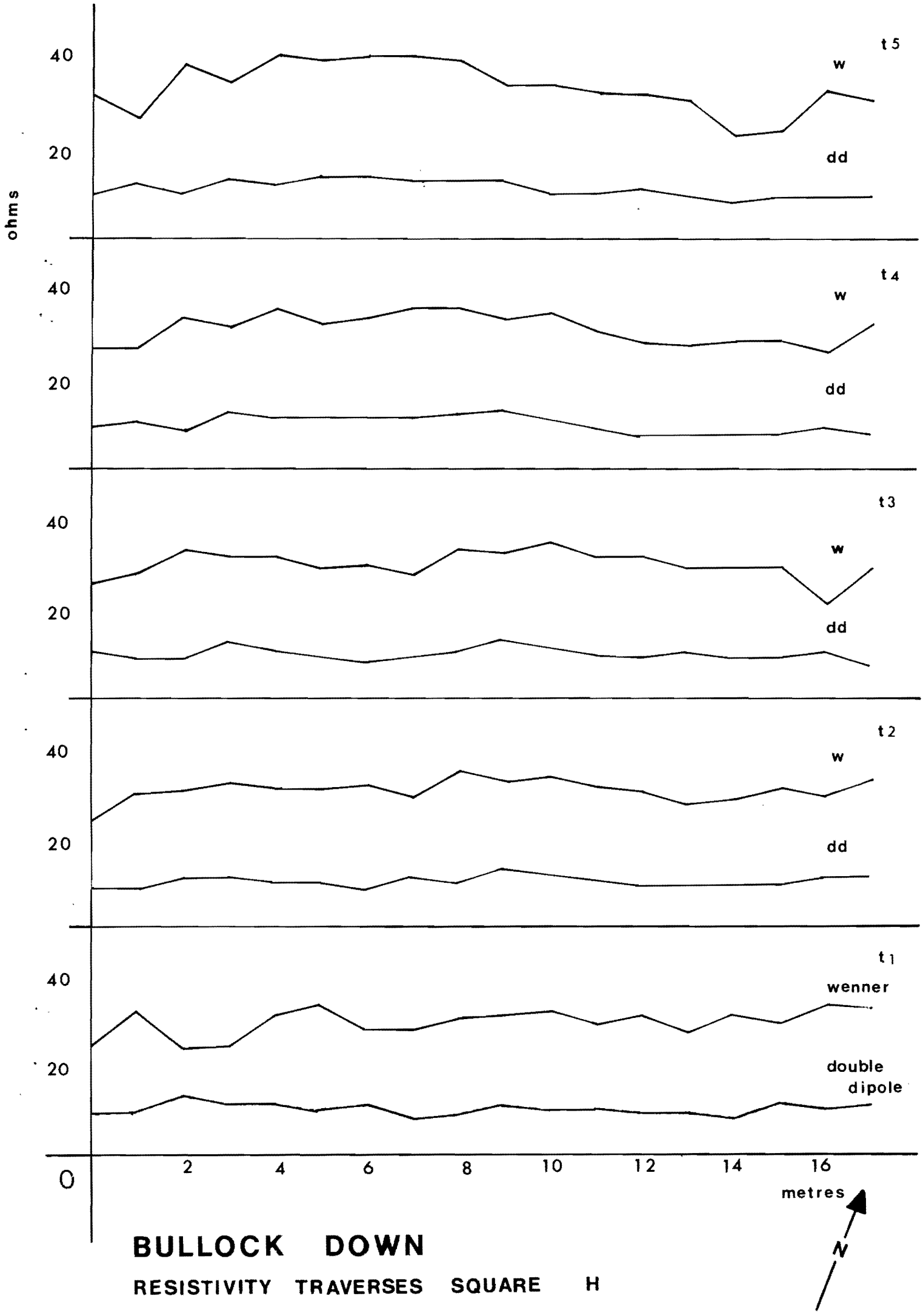


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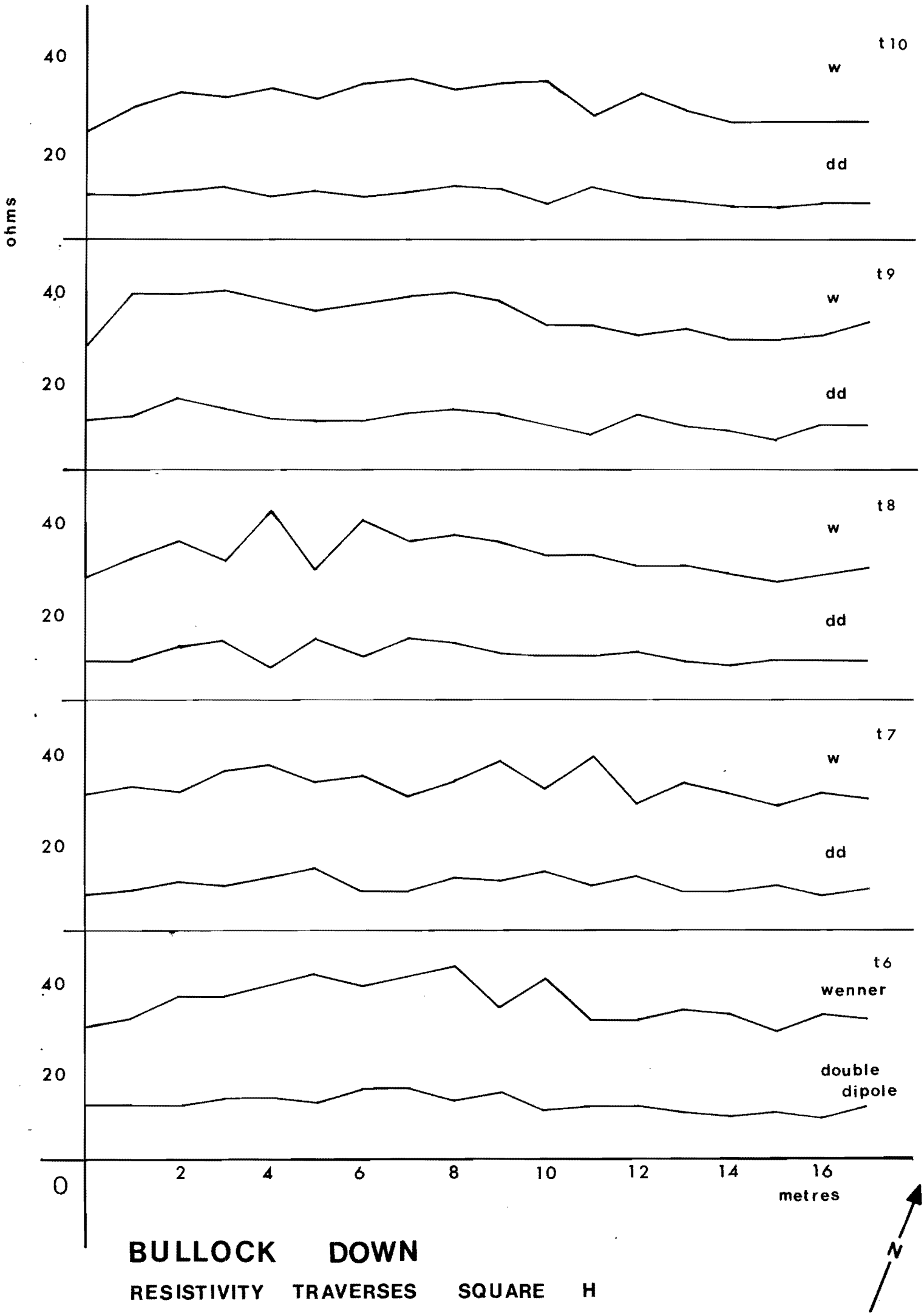
## RESISTIVITY TRAVERSES SQUARE H

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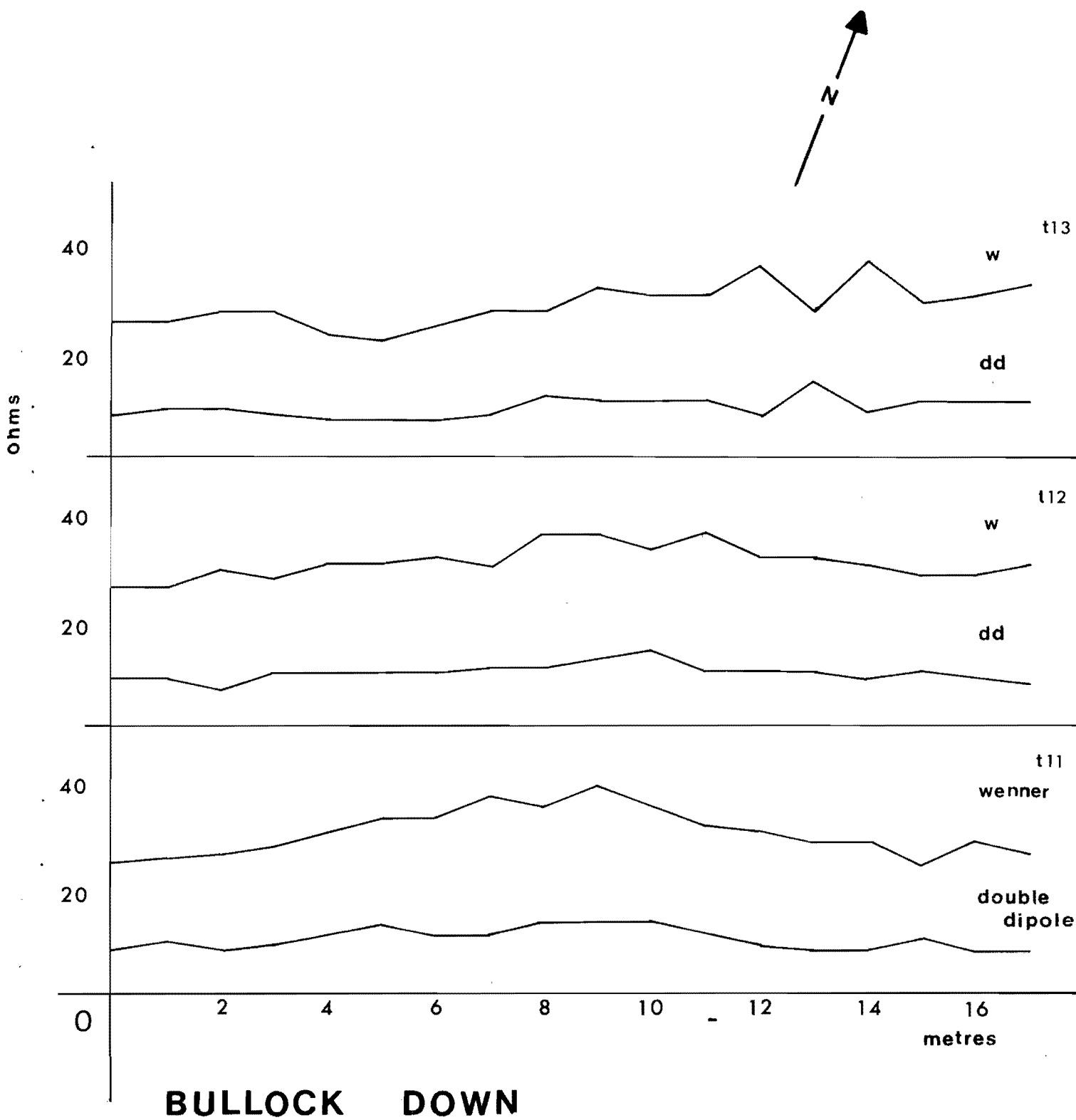
**RESISTIVITY TRAVERSES SQUARE H**

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## RESISTIVITY TRAVERSES SQUARE H

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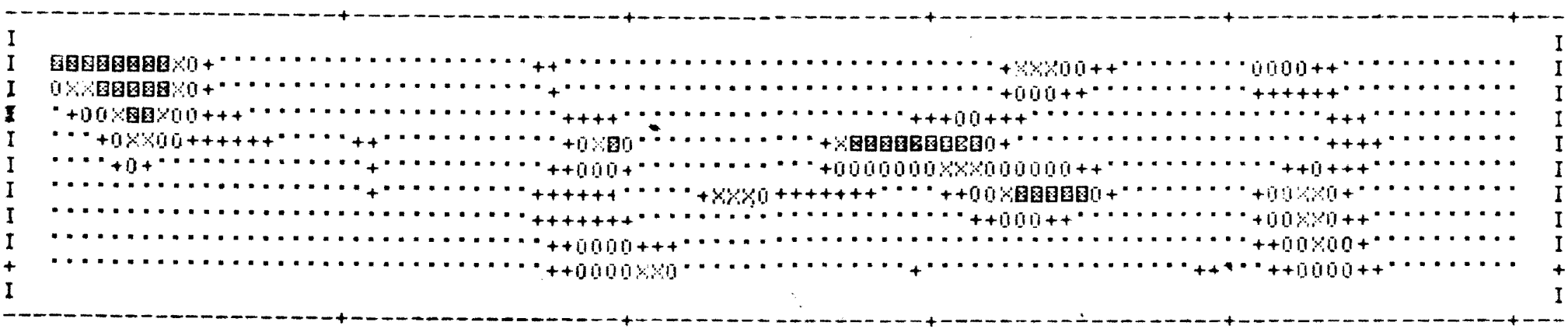
## RESISTIVITY SURVEY SQUARE I



Filtered Data

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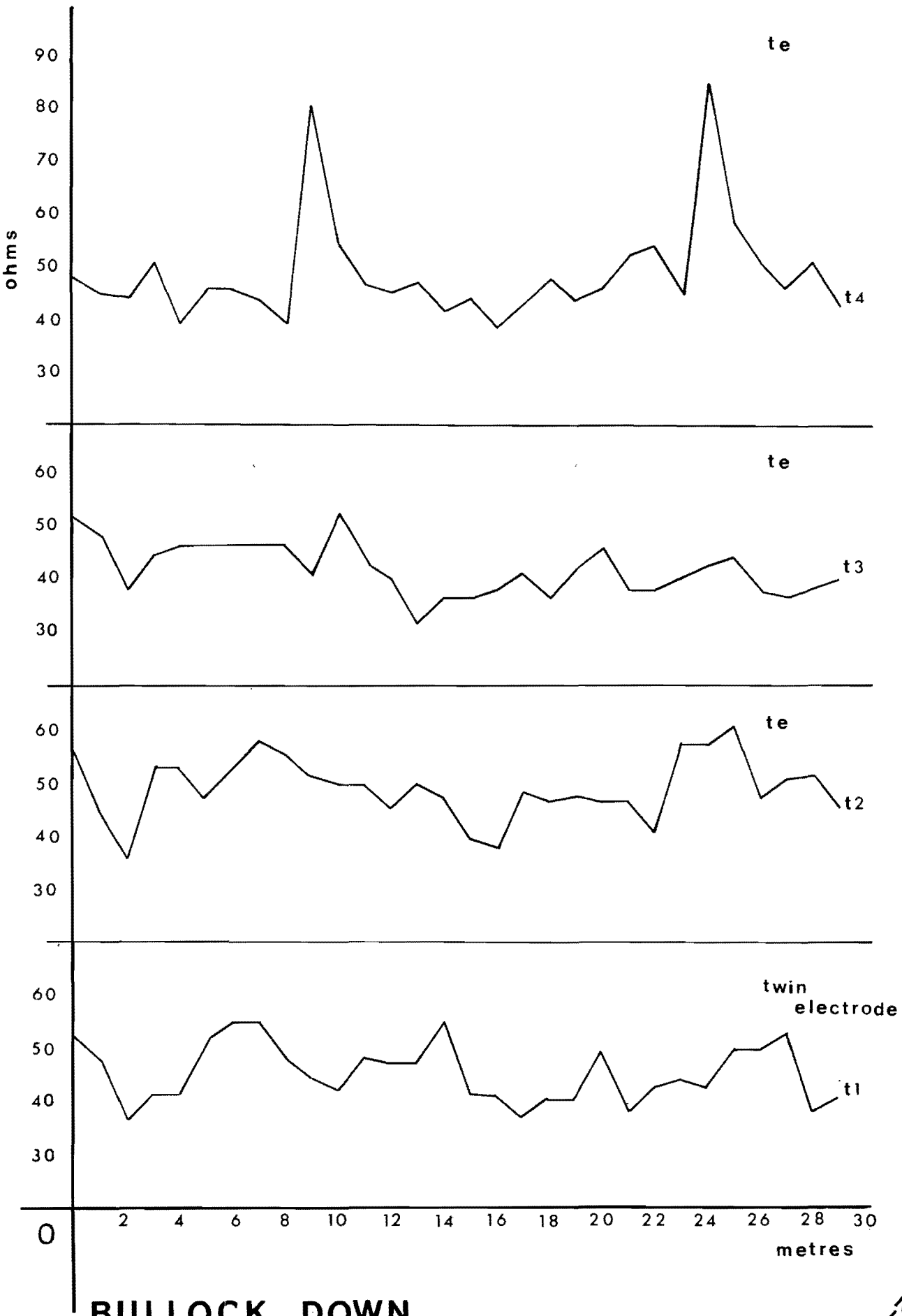


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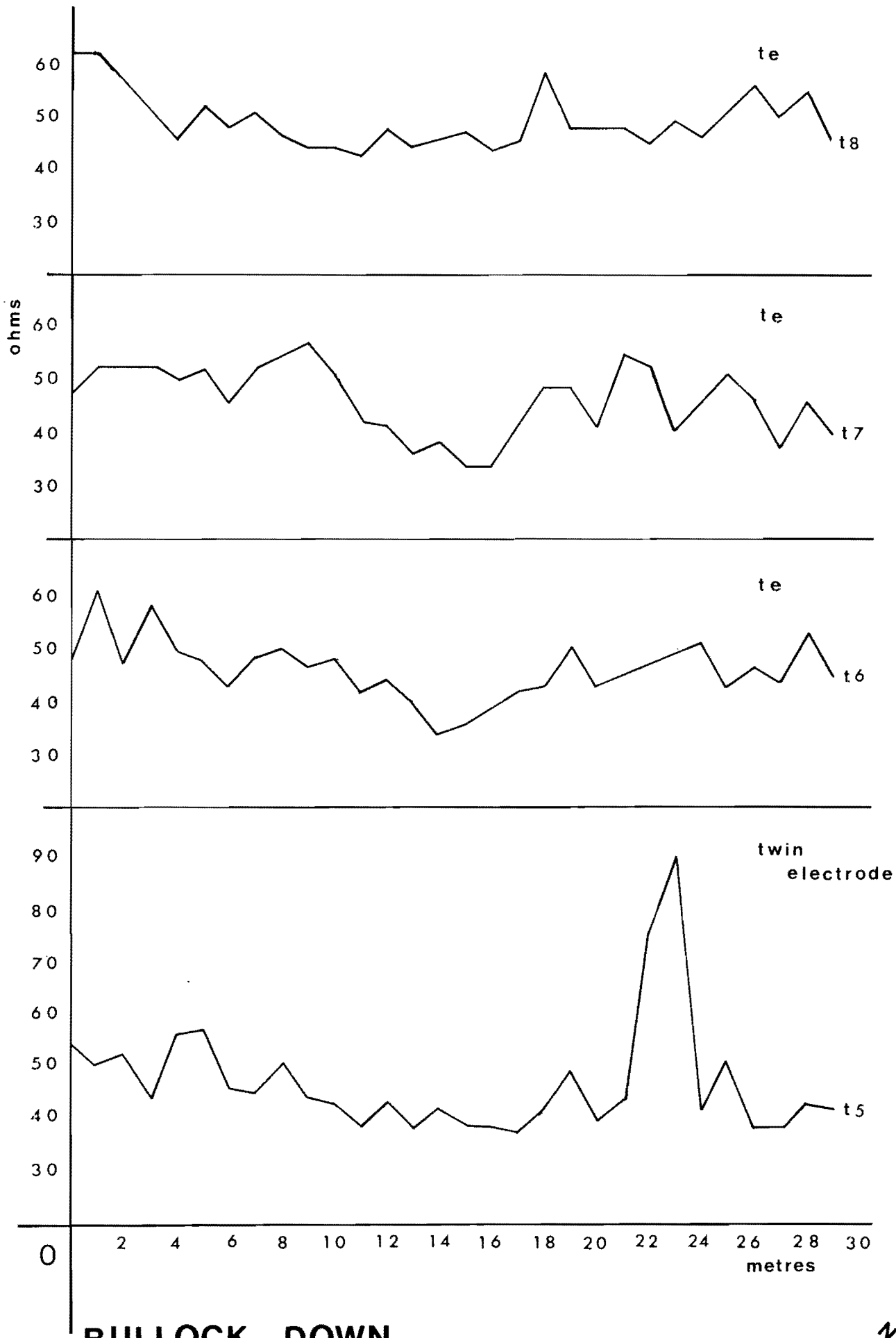


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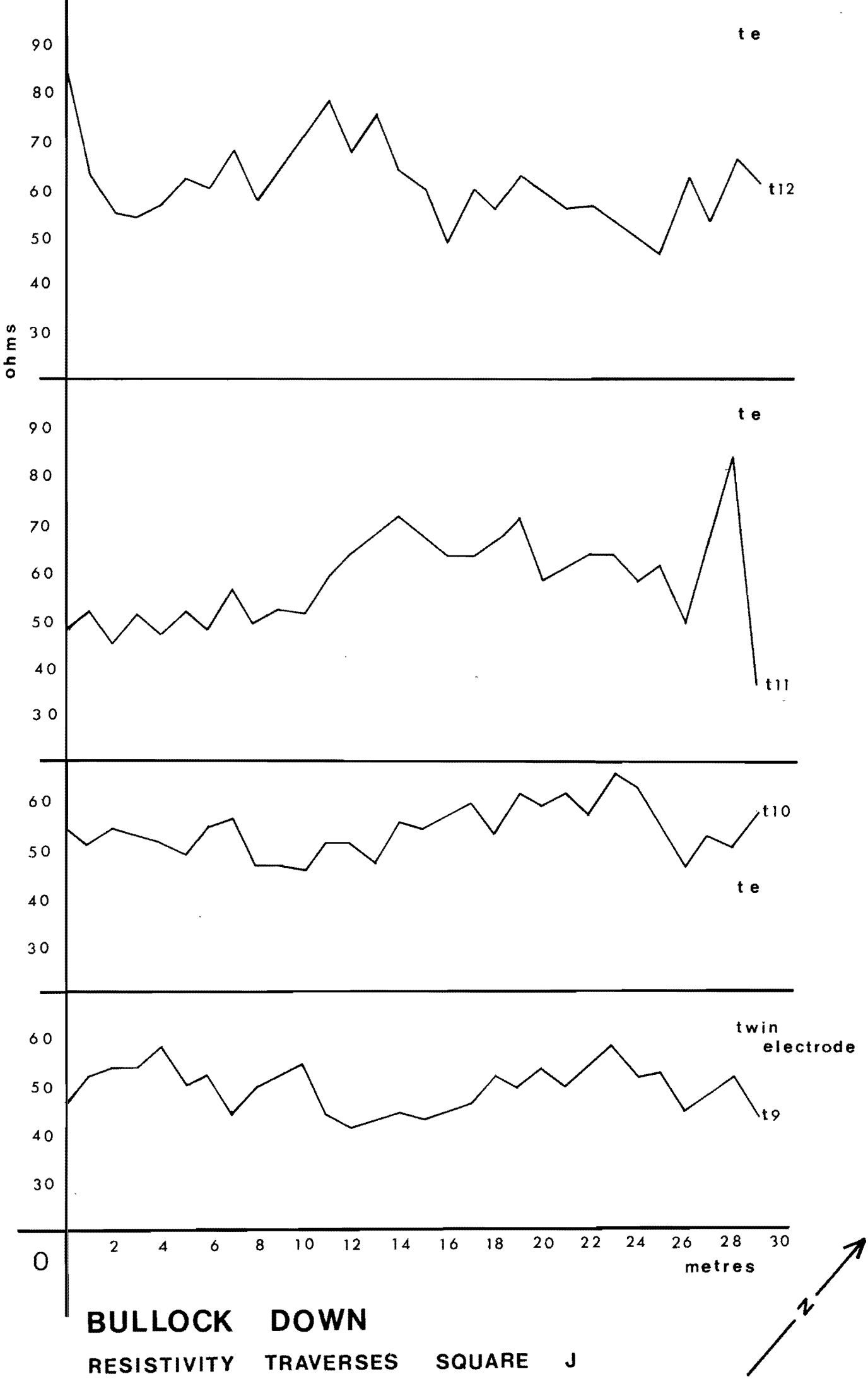


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## RESISTIVITY TRAVERSES SQUARE J

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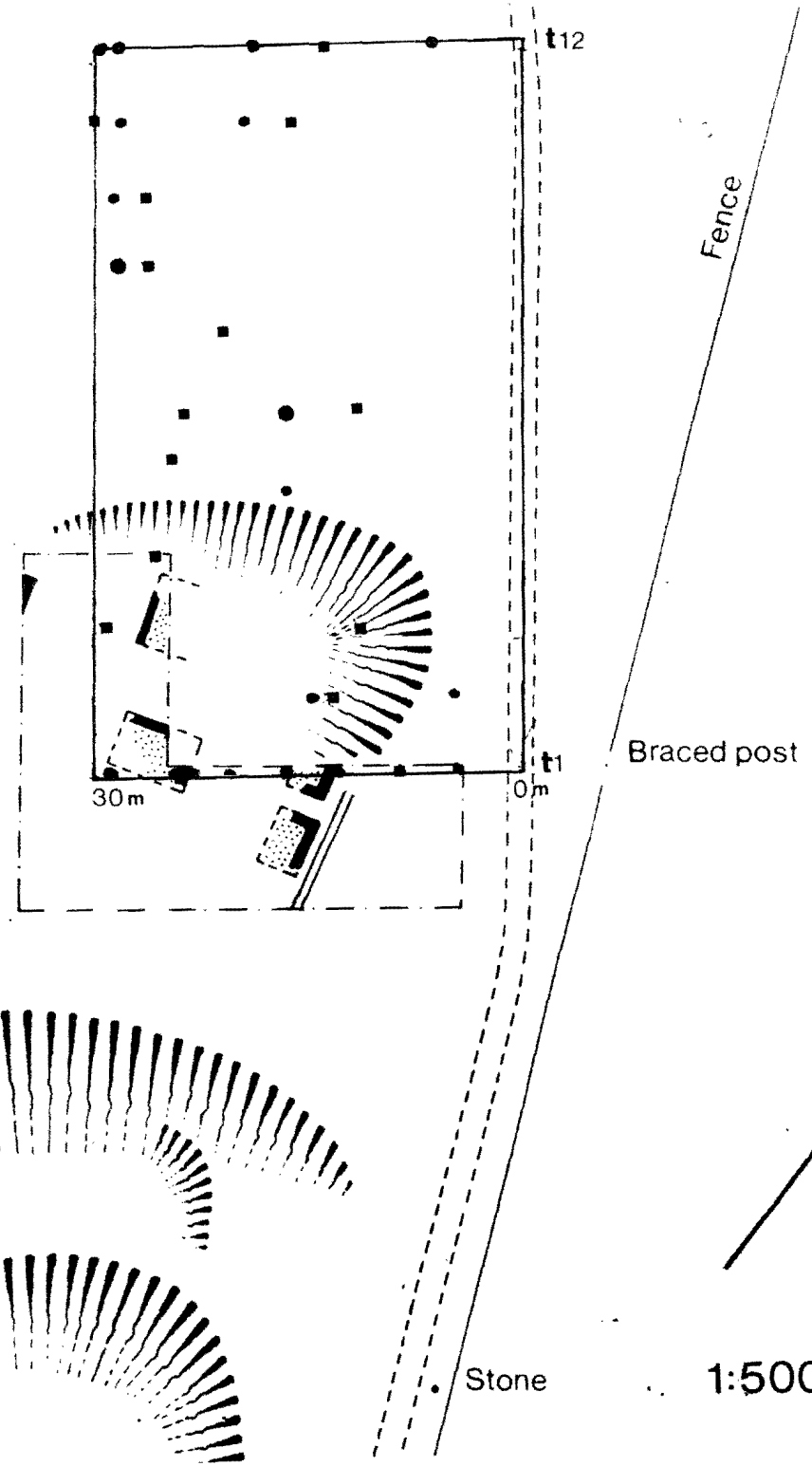
PLOTTED RESISTIVITY RESULTS

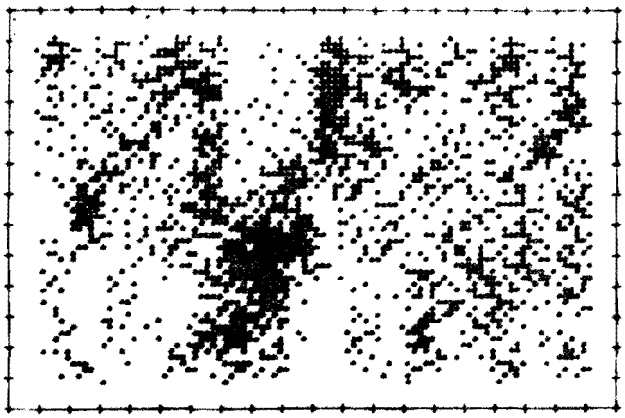
SQUARE J




**1976 Excavation ▶**

Anomalies

- ● low
- ▪ high



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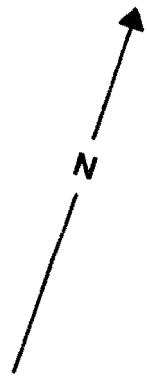


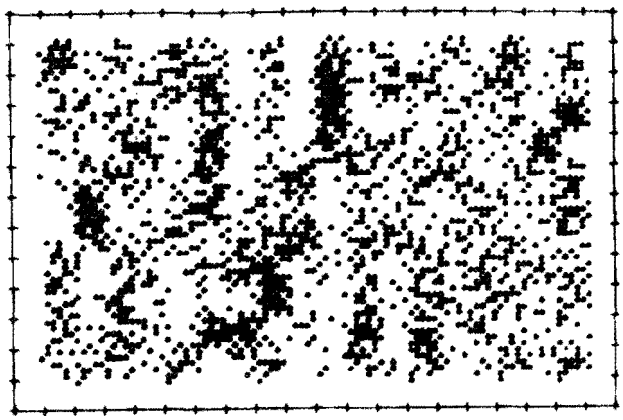

Filtered Data

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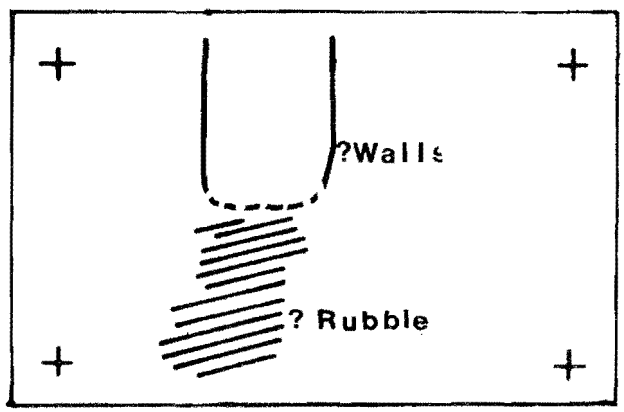


Interpretation

1:250

+ grid pegs

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RESISTIVITY SURVEY SQUARE K

1976

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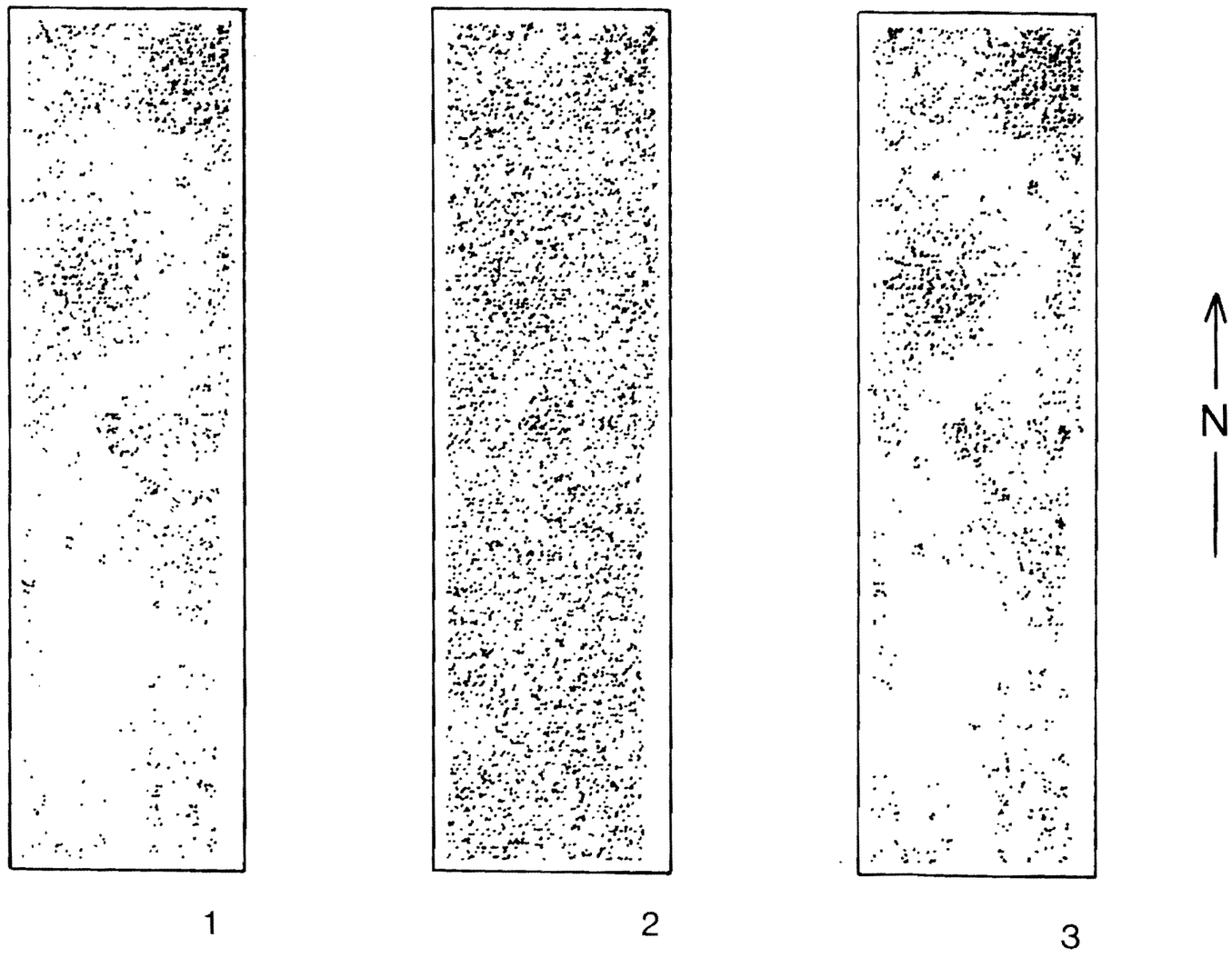
## RESISTIVITY SURVEY SQUARE A+B

Computer dot density plots




1 2 3

1:400

TV 592 970

TV 592 963

Area A

A B

t1 t2 t3 t4 t5

Tumuli

Heathy Brow

Sheep Wash

Tanks

Pond

Pond

Pond

Bullockdown Farm House

Pond

Shelter

Track

N

EASTBOURNE CO CONST

# BULLOCK DOWN

## Locations of surveys: Map 2

**TV** 592 963

**TV** 592 970

1:2500

TV 592 970

TV 592 963

A B

Area A

t1 t2 t3 t4 t5

Tumuli

Tanks

Sheep Wash

Shelter

Pond

Heathy Brow

Bullockdown Farm House

Track

N

EASTBOURNE CO CONST

# BULLOCK DOWN

## Locations of surveys: Map 2

**TV** 592 963

**TV** 592 970

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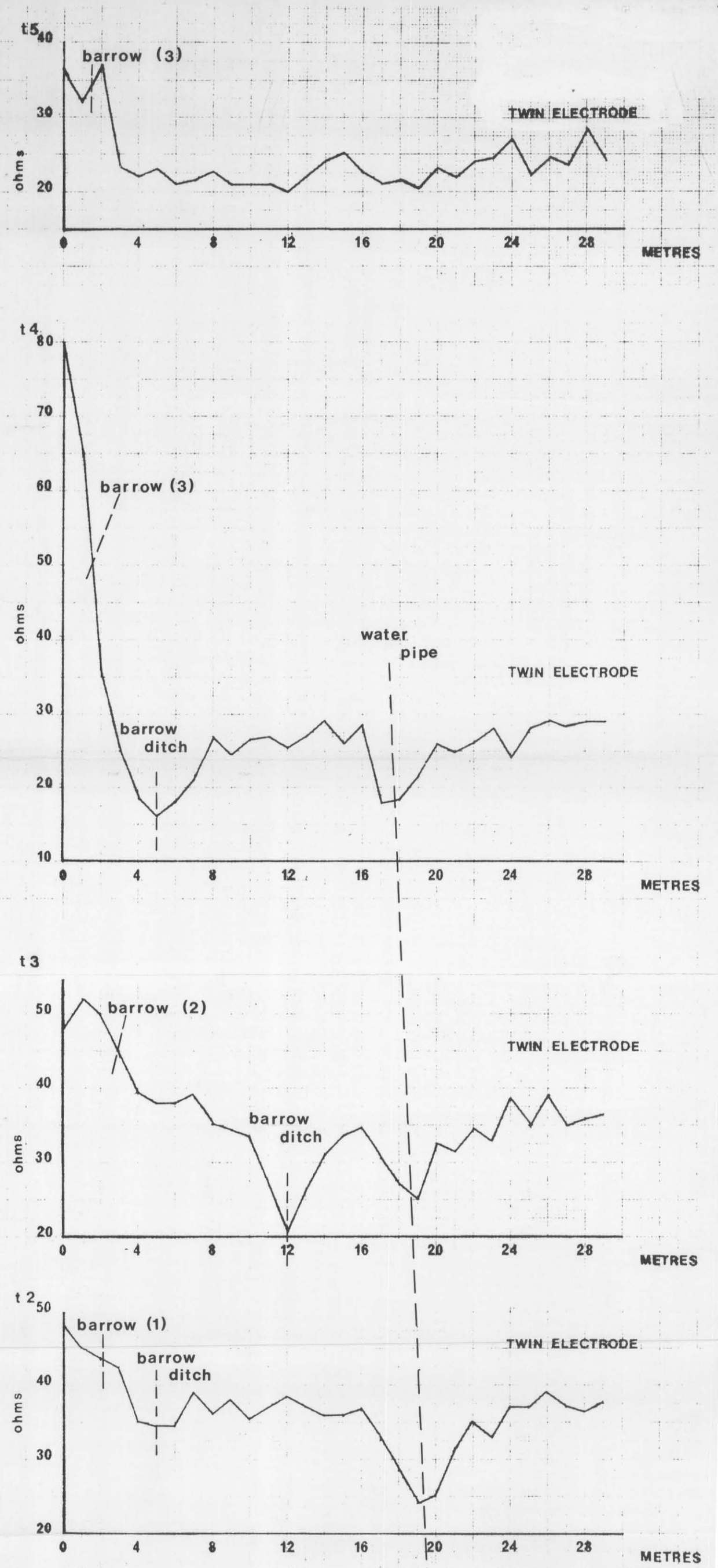
# BULLOCK DOWN

## Resistivity Traverses

## Area A



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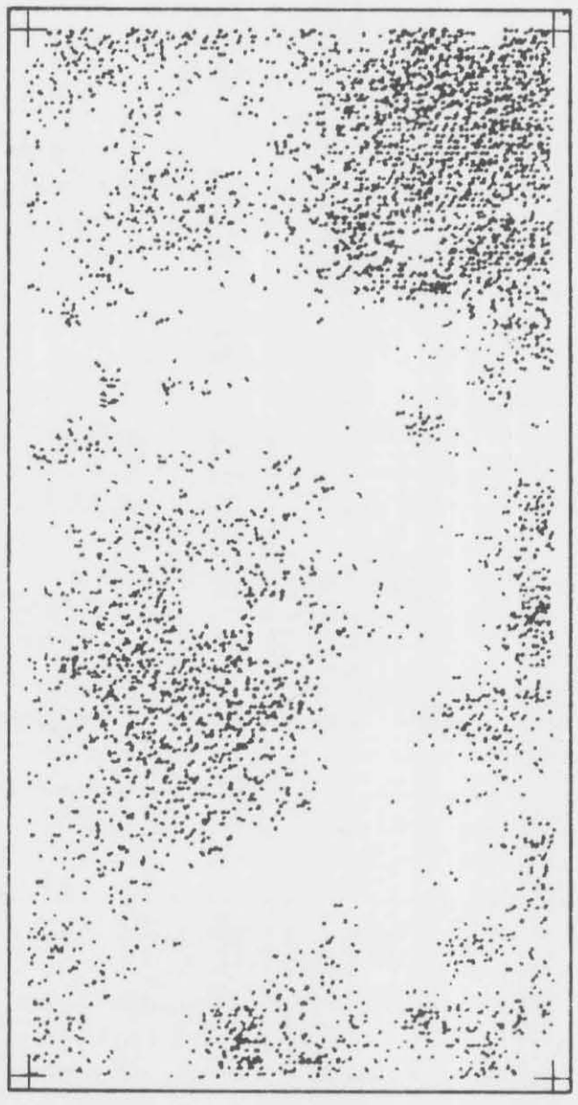
## RESISTIVITY SURVEY SQUARE A+B

Computer dot density plots



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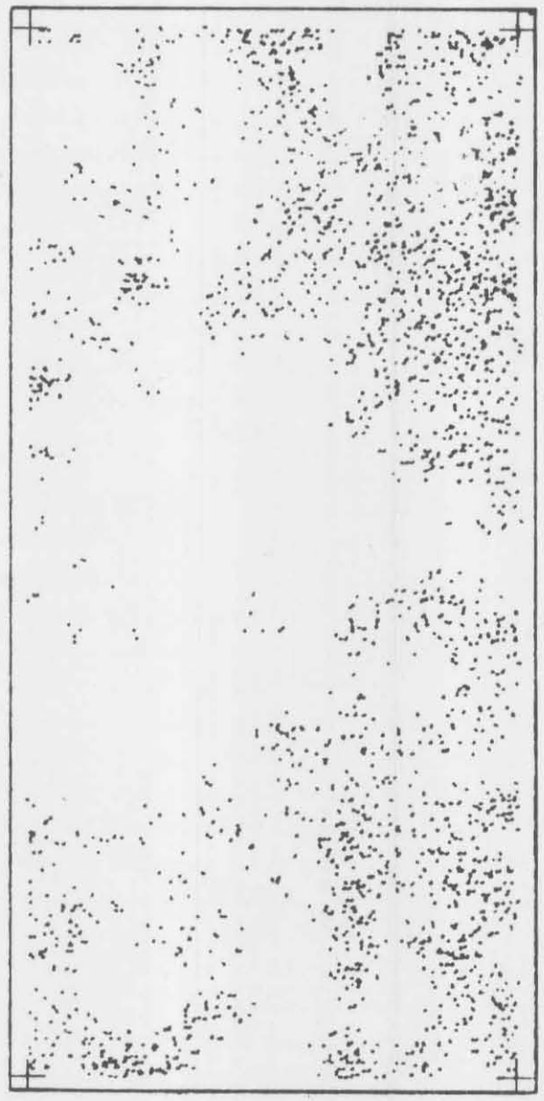

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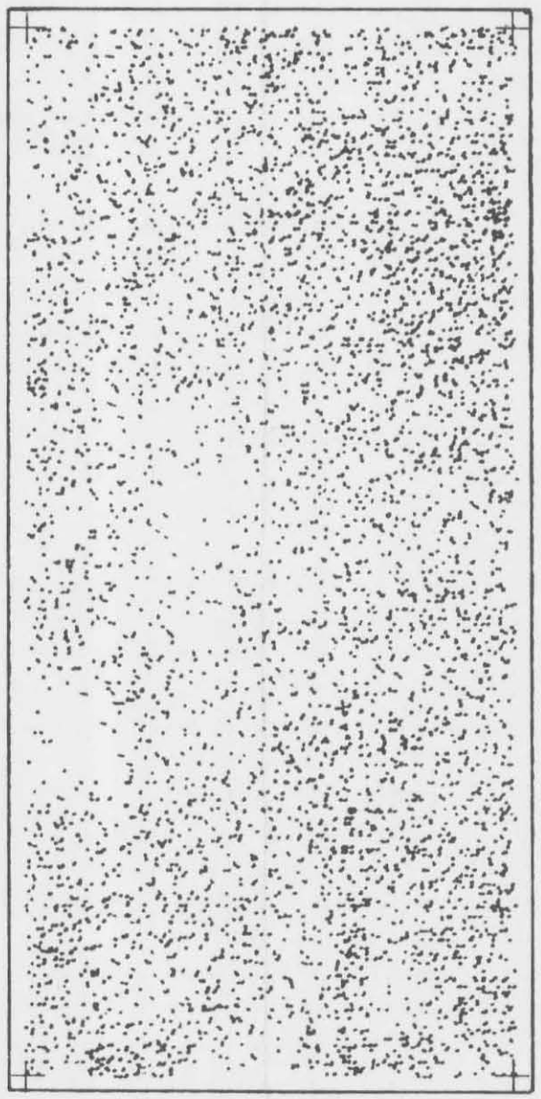

6

N

1:200