GEOPHYSICAL ANALYSIS OF FIELD AND LABORATORY MEASUREMENTS AT THE EASTVILLE LEAD-ZINC DEPOSIT COLCHESTER COUNTY, NOVA SCOTIA

By

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ABSTRACT

A large part of the mineralization of the Meguma Group is associated with the Goldenville - Halifax Transition. This Transition zone produces geophysical anomalies. Horizontal loop E.M. surveys show a strong conductive response in the area of contact between the slates of the Halifax Formation and the Goldenville quartzites. The Transition zone also shows a sharp magnetic linear anomaly. On the bases of these anomalies from reconnaissance geophysical surveys, St. Joseph Explorations Ltd. carried out an extensive drilling program to test for mineralization at Eastville.

This project will concentrate on demonstrating the composition and shape of the structures producing the anomalies using data from drill core and the measured parameters, resistivity and susceptibility. Analysis of observed profiles using characteristic curves and theoretical values will be compared to the assumed models.

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INTRODUCTION

The Eastville lead-zinc deposit is located from 45°15'30"N to 45°17'45"N latitude and 62°44'30"W to 62°52'30"W longitude. The area is accessible by gravel road from Eastville, N.S. (Fig. 1)

In 1976, St. Joseph Explorations Limited began investigation of a prominent aeromagnetic anomaly on a Geological Survey of Canada map (762G). Reconnaissance geophysics and geochemical surveys lead to the drilling of three holes on geochemical anomalies. Two of the holes showed interesting mineralization. In 1977, detailed horizontal loop electromagnetic, magnetometer, and geochemical surveys were carried out to provide direction for an extensive drilling program. The electromagnetic and magnetic anomalies are associated with the contact between the Goldenville and Halifax Formations of the Meguma Group.

The purpose of this thesis was to determine the extent to which the interpretation of horizontal loop electromagnetic (H.L.E.M.) and magnetometer profiles compare with the physical parameters measured from drill core and other drill core data. This study was limited to the House Grid of the Eastville area. (Fig. 2) Drill core from drill holes 224-12 and 224-23 were used for susceptibility and resistivity measurements. Copies of H.L.E.M. and magnetometer survey notes were provided by Sulpetro Minerals Limited.

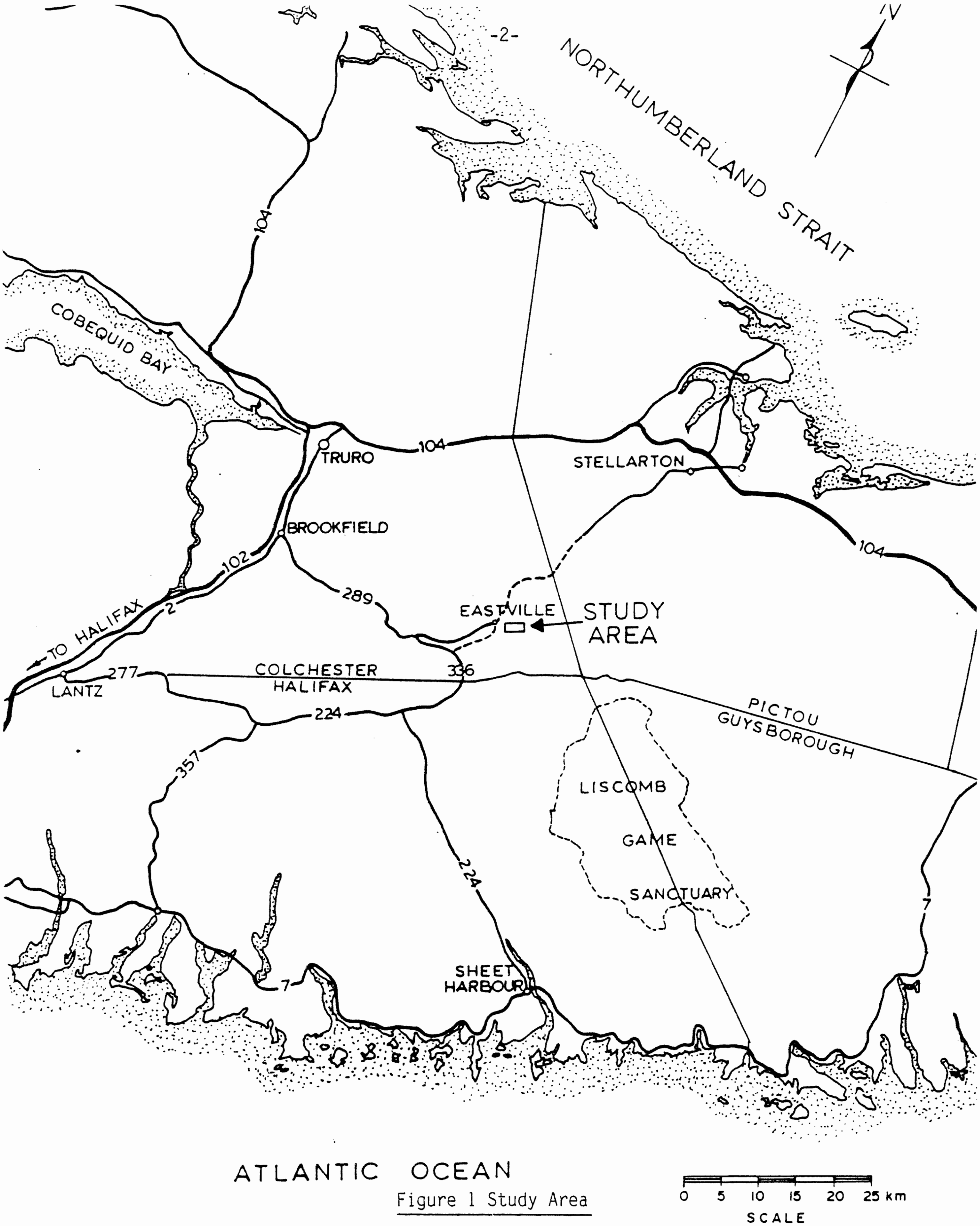


Figure 1 Study Area

GENERAL GEOLOGY

The area was originally mapped by H.F. Fletcher and E.R. Faribault (1903) with additional mapping by Bensen (1958). Mapping at 1:10,000 was done by Binney (1985) using diamond drilling and geophysical surveys to determine the extent of the Goldenville and Halifax Formations. (Fig.2)

The study area is located on the boundary between the Halifax Formation and the Goldenville Formation of the Meguma Group. (House Grid Fig.2) The basal member of the Meguma Group is the Goldenville Formation. This formaiton is a massive quartz metawacke and minor interbedded slates. A transition zone forms the upper Goldenville composed of structureless quartz metawacke and interbedded black slate. Sulphide minerals are associated with the black slate interbeds.

The Goldenville Formation is overlain by the Halifax Formation with an approximate dip 60° to the south in the study area. The Halifax Formation is formed of slate, argillite and interbedded metawacke and metasiltstone. At the base of the Halifax Formation there is a black graphitic pyrrhotitic slate. The principle sulphide minerals, pyrrhotite and pyrite are concentrated in the slate interbeds. The upper Halifax slate is fine grain dark-grey to black argillite. There is interbedding of pyrrhotite and pyrite. (Binney et al 1985) Figure 3 is a generalized stratigraphy of the meguma sediments. (Jenner 1982)

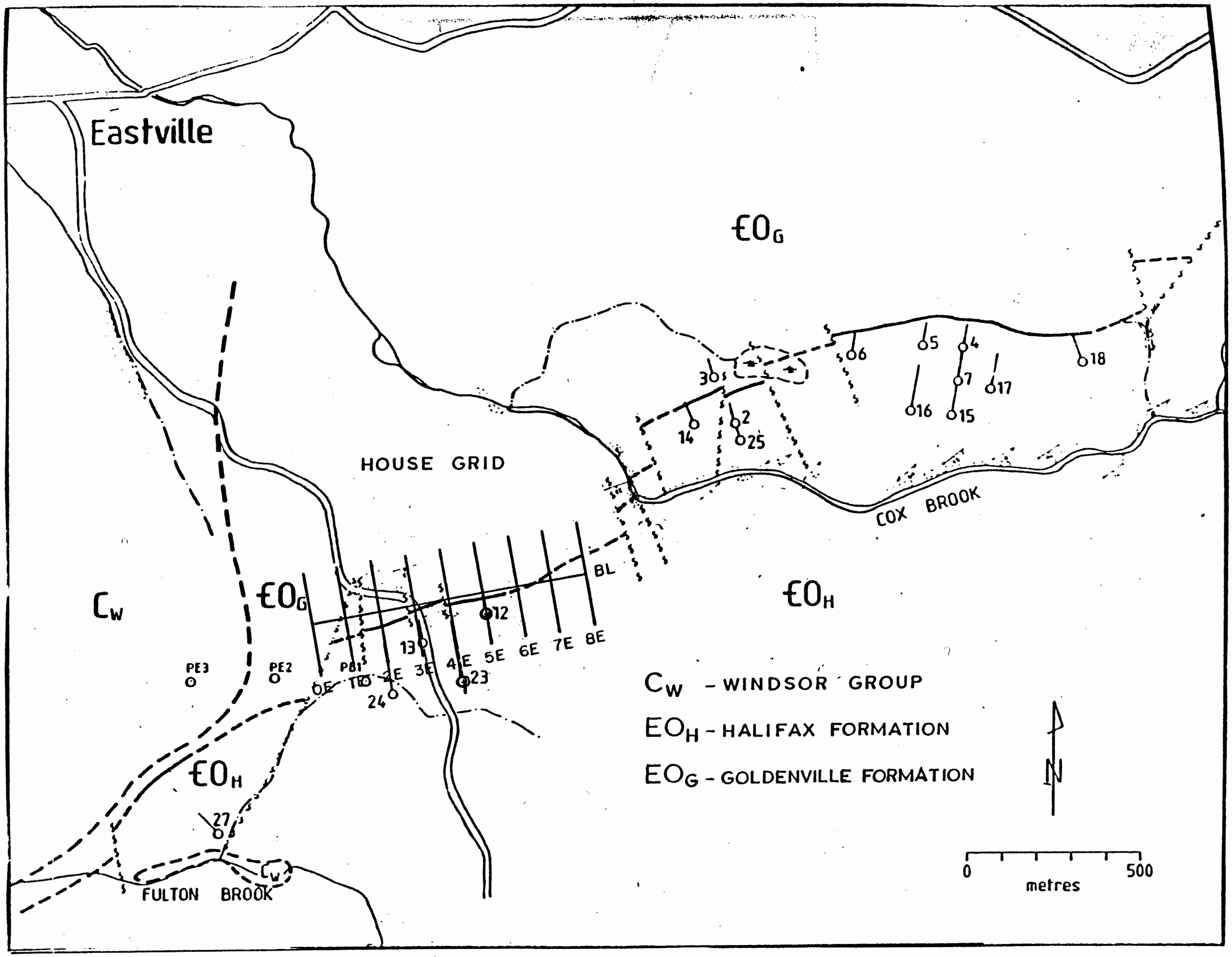
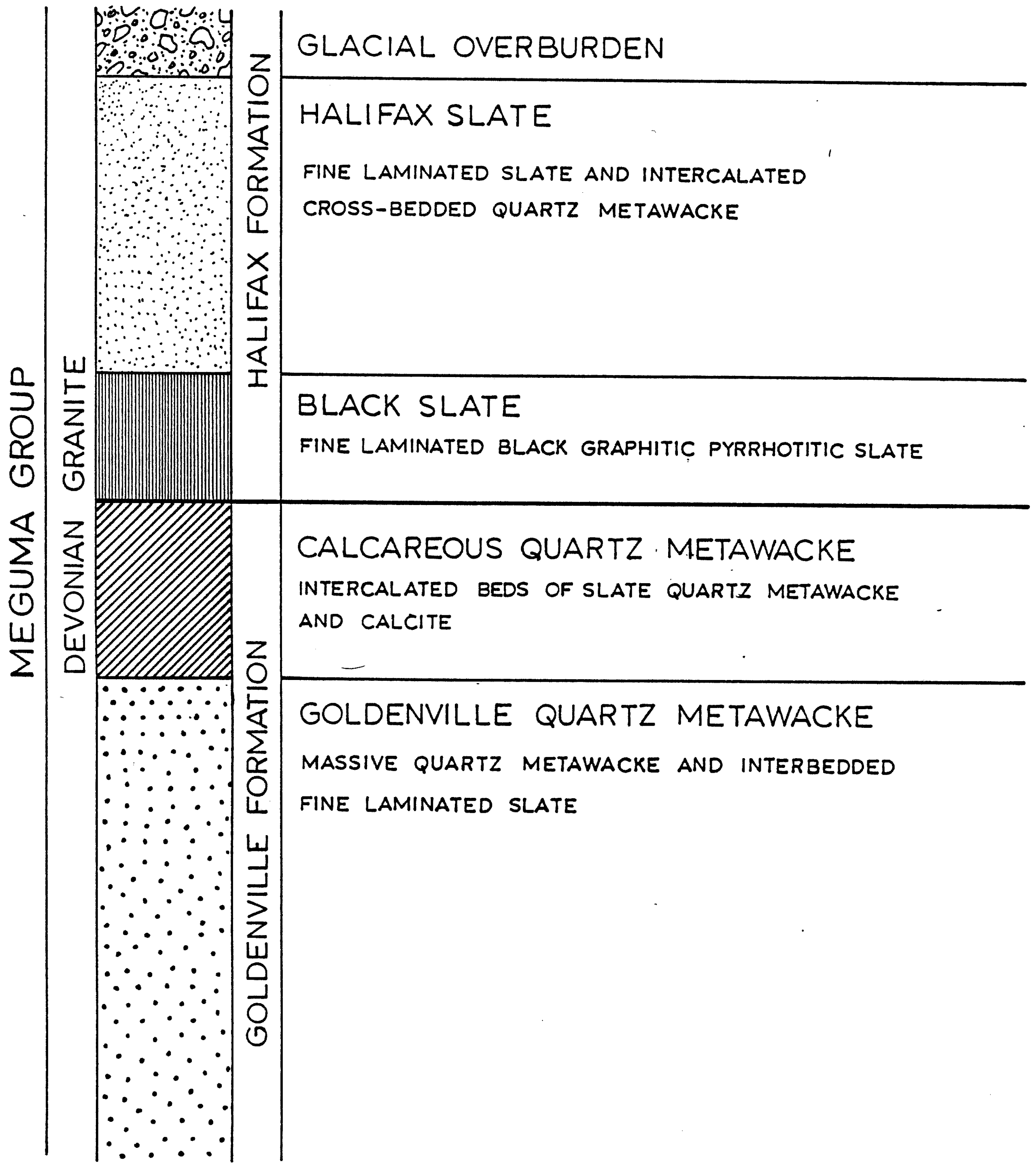


Figure 2

GENERAL GEOLOGY (HOUSE GRID)



GENERALIZED STRATIGRAPHY OF THE MEGUMA SEDIMENTS

Figure 3

JENNER (1982)

GEOPHYSICAL METHODS

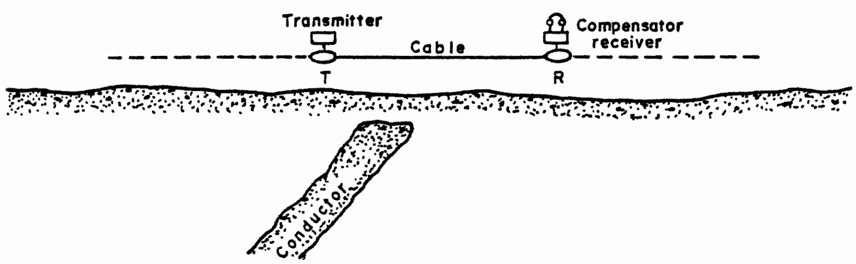
In 1978, a detailed magnetic survey and a horizontal loop electromagnetic survey was conducted on cut grids in the areas of the major geochemical anomalies. These surveys, along with the geochemical surveys provided control for an additional drilling program.

Horizontal Loop Electromagnetic

Horizontal loop electromagnetics (H.L.E.M.) is a moving source method. Both the transmitter and the receiver move over the ground with a fixed spacing between them. (Fig.4) The system is low power (1-10 watts) with the transmitting and receiving coil of the same size. A reference signal is transmitted to the receiver coil/compensator where the amplitude and phase may be adjusted. The receiver is nulled when the compensator circuit is adjusted to cancel the signal from the transmitting coil. This is done away from an inground conductor. Then, in the presence of a conductor, the in-phase and quadrature components of the primary field are measured. (Telford et al. 1976)

Survey lines are run perpendicular to strike with care to maintain both the spacing and orientation of the coils.

A Maxmin EM II system with a frequency of 1777 Hz and a coil separation of 50 meters was used for the Eastville survey area. The station spacing was 25 metres and the line spacing was 100 metres. Figure 2 shows the most eastern grid of the prospect, House Grid.



HORIZONTAL - LOOP SYSTEM

Figure 4

Magnetometer

The proton precession magnetometer is based on the principle of nuclear magnetic resonance. When a strong magnetic field is applied to a liquid with a large number of protons these dipoles become aligned in the direction of the field. If the polarizing field is removed, the protons precess for a short time around the direction of the earth's magnetic field. If the spin angular momentum of the proton is L and magnetic moment is μ the angular velocity of precession in a field is

$$\omega = \frac{\mu F}{L}$$

Since the values of μ and L are known, the unknown magnetic field can be measured if the angular precession velocity (ω) can be determined. The motion of the precessing nuclear magnets induces a signal in the coil and the measurement of this frequency gives the required angular precession velocity. This field is:

$$F \text{ (gammas)} = 23.4874F$$

where F is the measured frequency in Hz. The proton precession magnetometer measures the total field and the measurement is absolute. (Garland 1971)

A Barrenger model GM 122 was used for the survey at Eastville with a station spacing of 25 metres.

PHYSICAL MEASUREMENTS

Resistivity

Ohm's law is the physical principle behind d-c conduction in almost all electrical methods. Resistance (R) is the ratio of the potential drop across the element to the direct current flowing through it. The ratio is a constant for any particular element.

$$R = \frac{\Delta V}{I}$$

From Ohm's law, if we can consider a uniform electrical current flowing through a homogeneous cylinder in direction of the axis the resistance of the cylinder will be related to length (l) and inversely proportional to the cross-section area (A):

$$R = \frac{\rho l}{A}$$

Where ρ is the constant of proportionality. Resistivity (ρ) is considered to be the specific resistance of a material and has the units of ohm metre in the mks system. Conductivity (σ) of a material, rather than its resistivity is more often used. These are reciprocal quantities and related by

$$\sigma = \frac{1}{\rho}$$

Conductivity has the units mhos/m.(Grant and West, 1966)

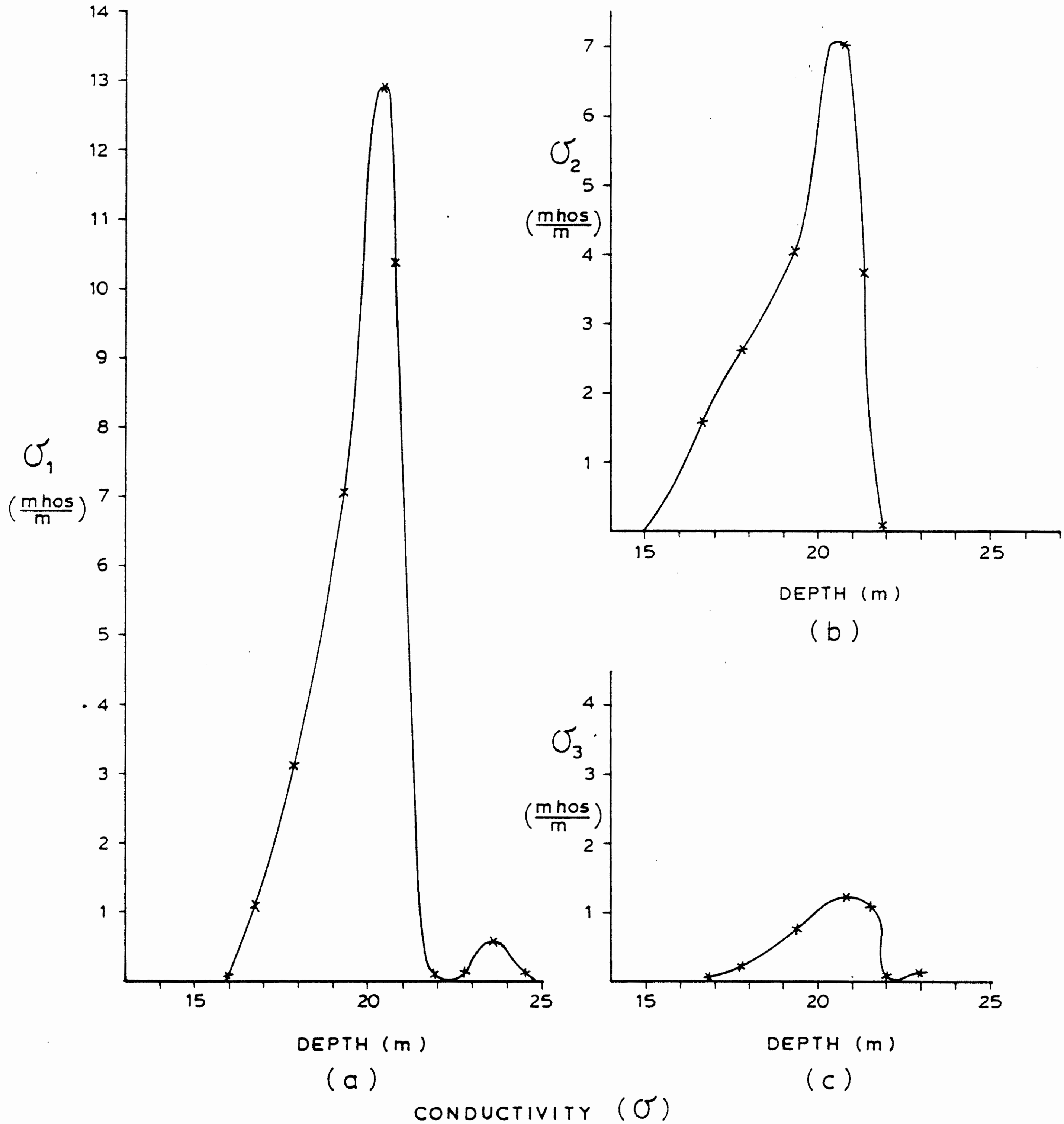
The term anisotropic resistivity means the resistivity depends on the direction in which it is measured. The anisotropic characteristic in rock may be a result of bedding planes or the shapes of conducting components. For example, the platy structure of shale imparts a strong anisotropy to a conducting medium. (Grant and West, 1966)

Thirty-six samples were selected from drill hole 224-12 for resistivity measurements (Table I). The core had been split so the samples had an end area of part of a circle (A) and a length (L). The resistance (R) was measured directly using a Fluke 8840A multimeter capable of measuring up to 20 x 10^6 ohms. Indium was used to make a good contact at the ends of the samples. The conductivity σ_3 is plotted in Fig. 5c. In order to test for anisotropy, a number of samples with a high σ_3 were cut into cubic shapes in order to make measurements in the other two directions. (Fig. 1) The result of the measurement of σ_1 and σ_2 are plotted in Figures 5a and 5b. For any particular sample, if σ_3 was high then σ_1 and σ_2 would also be proportionally higher.

Conductivity (σ_3) was measured across the bedding in the direction of the drill core. σ_1 and σ_2 were measured at right angles to each other and at right angles to σ_3. (Fig. 6) As expected, the conductivity was larger by a factor of 5, along the bedding plane. A ratio as high as four is not uncommon for slates where platy or conductive material tends to be arranged parallel to bedding planes. (Grant 1965)

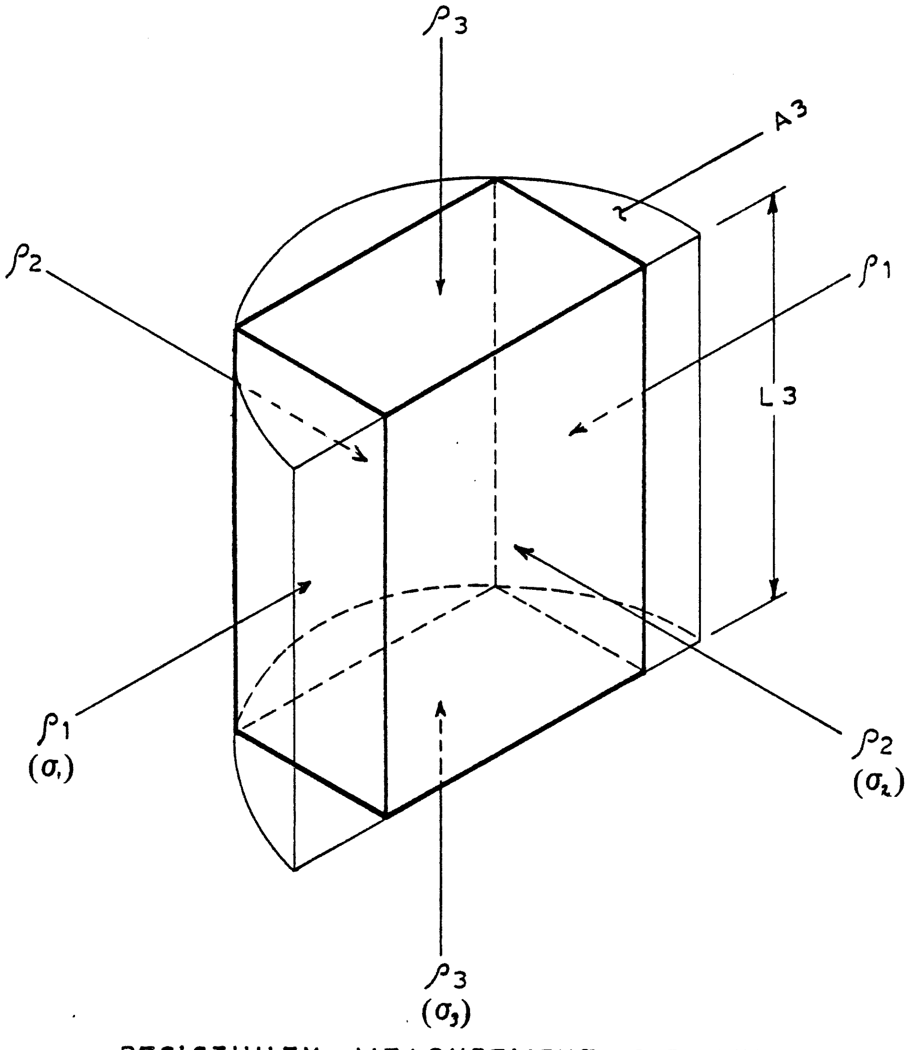
Unexpected was the difference between σ_1 and σ_2 by a factor of two. Sample # 304 shows an elongated distribution of conductive material in the direction of σ_1 (Fig. 7a) and a tubular distribution in the direction of σ_2 (Fig. 7b)

Binney et al (1985) note the most common mode of sulphide occurences is in small blebs 1 to 2 mm thick by 5 mm long elongated parallel to bedding. There appears to be a better conduction in the



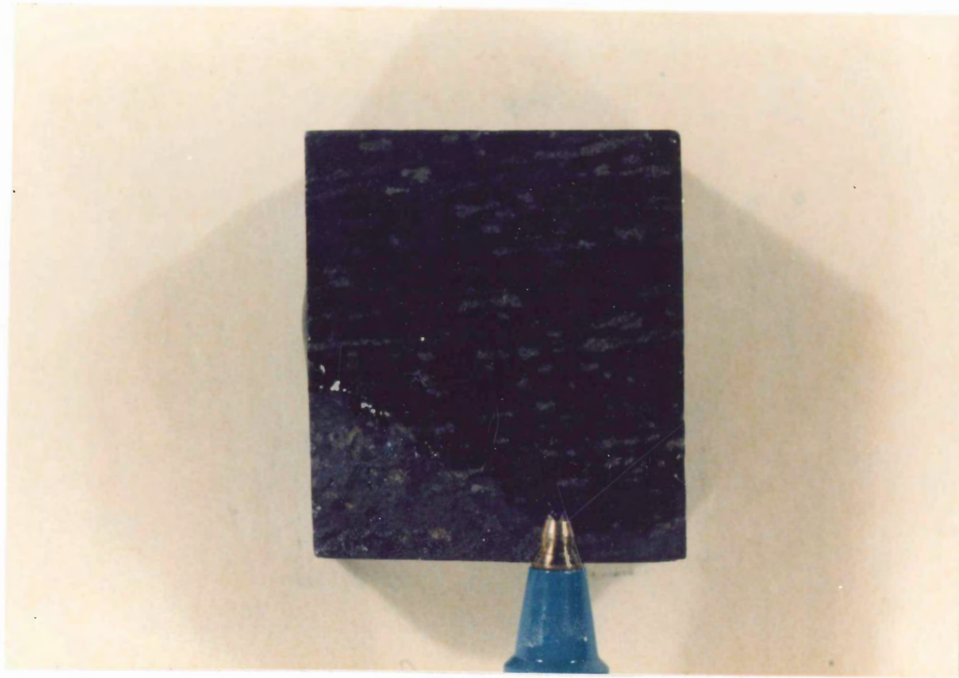
DRILL HOLE 224-12

Fig. 5 Conductivity (σ) measured in 3 directions

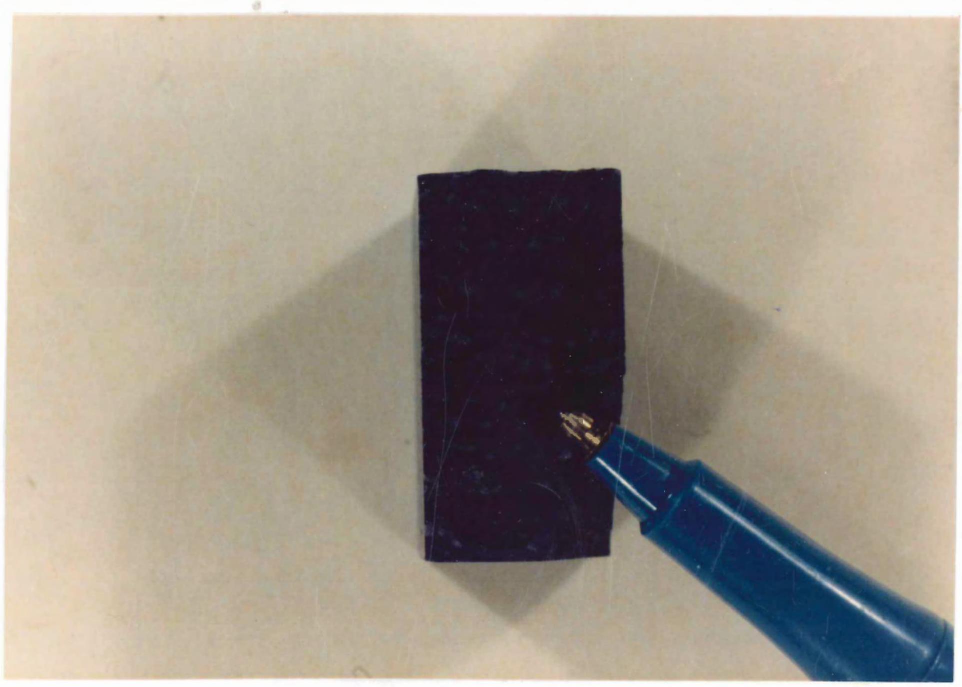


RESISTIVITY MEASUREMENT DIRECTIONS

Figure 6



7a σ_1 direction



7b σ_2 direction

Figure 7. Elongated Conductor Distribution

elongated direction of the sulphides.

The conductive zone as measured in drill hole 224-12 correlates with the black graphitic slate at the base of the Halifax Formation. Sulphides include bedded pyrrhotite and minor pyrite in veinlets; galena and sphalerite, are observed throughout the section.

Susceptibility

Magnetic susceptibility (K) is the significant variable in magnetics. Magnetic anomalies are entirely caused by the amount of magnetic minerals contained in the rocks. In every case the susceptibility depends only upon the amount of ferrimagnetic minerals present, mainly magnetite, sometimes ilmenite or pyrrhotite. Magnetization is not constant for a magnetic substance but increases as the magnetic field increases up to a maximum. It is important in making K determinations to use a magnetic field equivalent to the earth's magnetic field. (Telford et al. 1976) There is no distinction between permanent magnetization and induced magnetization in the magnetic field produced by a material. But for most rock, the permanent magnetization can be neglected in comparison with induced magnetism, so that magnetic susceptibility is the quantity which describes its magnetic properties.

Twenty chip samples from drill hole 224-12 and eighteen samples from drill hole 224-23 were measured for susceptibility (Table 2). The samples for the measurement were selected from the chip samples collected over a section of drill core, part of which had been used for assay analysis.

The MS-3 Magnetic Susceptibility Bridge was used to make the measurements. The MS-3 has a relative accuracy of about 1% and an absolute accuracy of 5 to 10%. The bridge has three coaxial coils of wire spaced vertically along a cylindrical form. Alternating current at an audio frequency flows through coils A and C in series in a direction such that the magnetic fields produced will be cancelled out at the position of coil B (Fig. 8). When a sample is inserted in the sample holder, the coupling between coils A and B will increase but the coupling between coils C and B will be relatively unchanged. The amount of unbalance will depend on the magnetic susceptibility of the sample and is measured by means of an alternating current bridge. The instrument is balanced without the sample and then with the sample which will then give a difference R in ohms. If R is small, the susceptibility K may be computed by the formula given on the calibration curve.

$$K = 3.57 \times R \times 10.^{-6} \text{ cgs.}$$

This gives an apparent K to which several corrections must be applied;

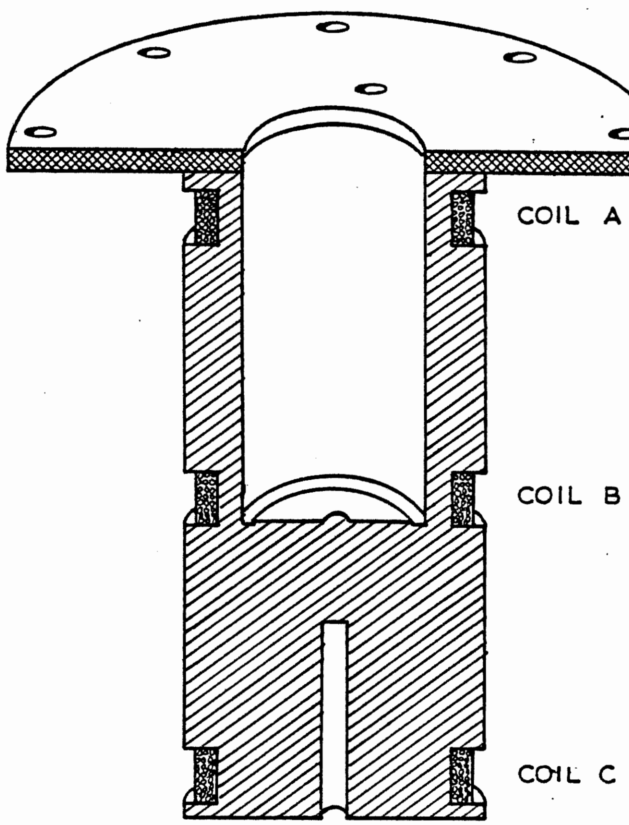
(1) deviation from a calibrated sample diameter of (1 3/16") 3.016 cm.,

(2) a correction for air spaces in the sample volume if rock chips, fragments or powder is used then:

$$K = 3.57 \times \Delta R \times 10^{-6} \times \frac{9.10 \text{ cm}^2}{d^2} \times \frac{\text{true density}}{\text{apparent density}}$$

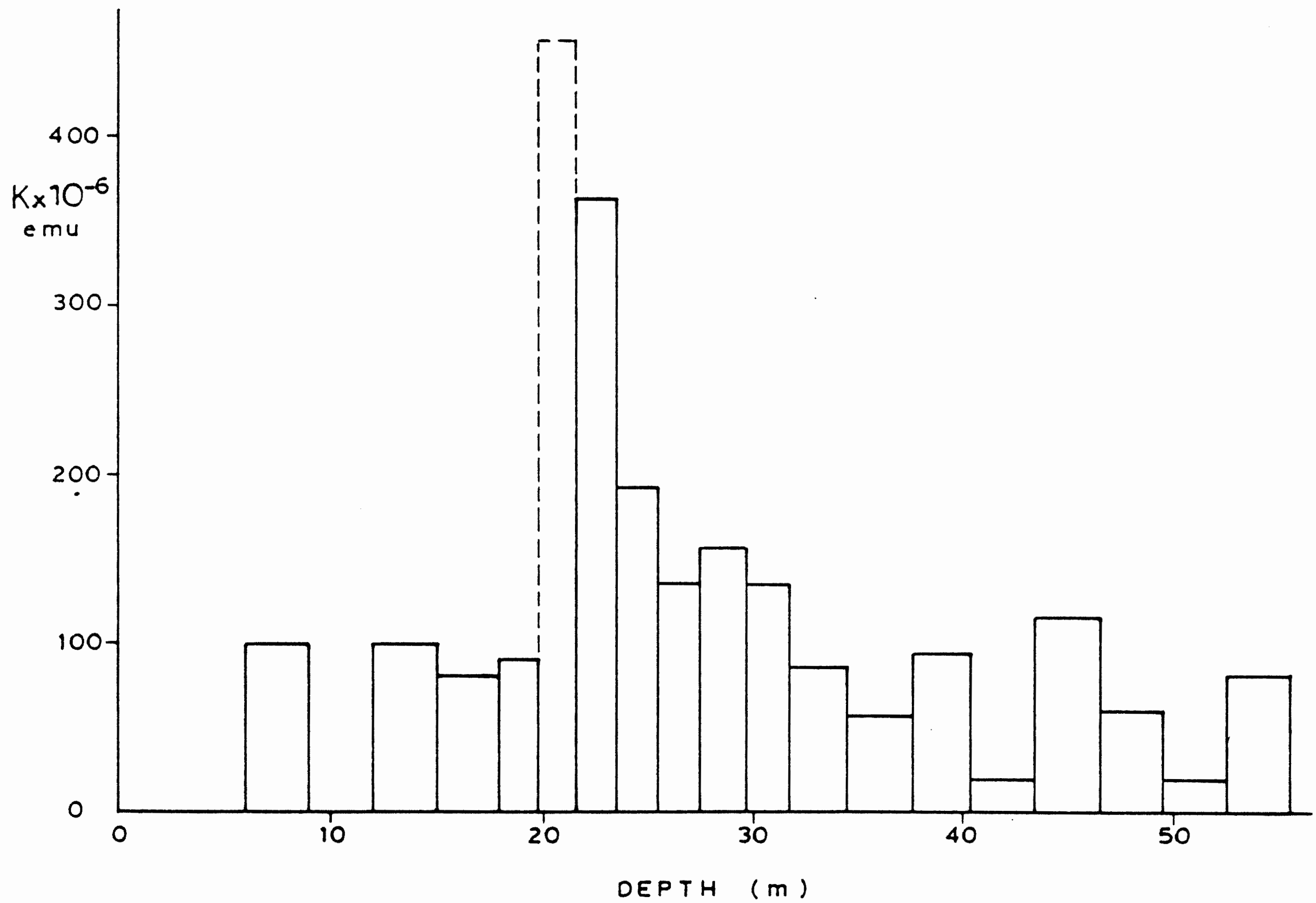
d in cm.

See Figures 9 and 10 for the plots of susceptibility values.



SAMPLE HOLDER (MS-3)

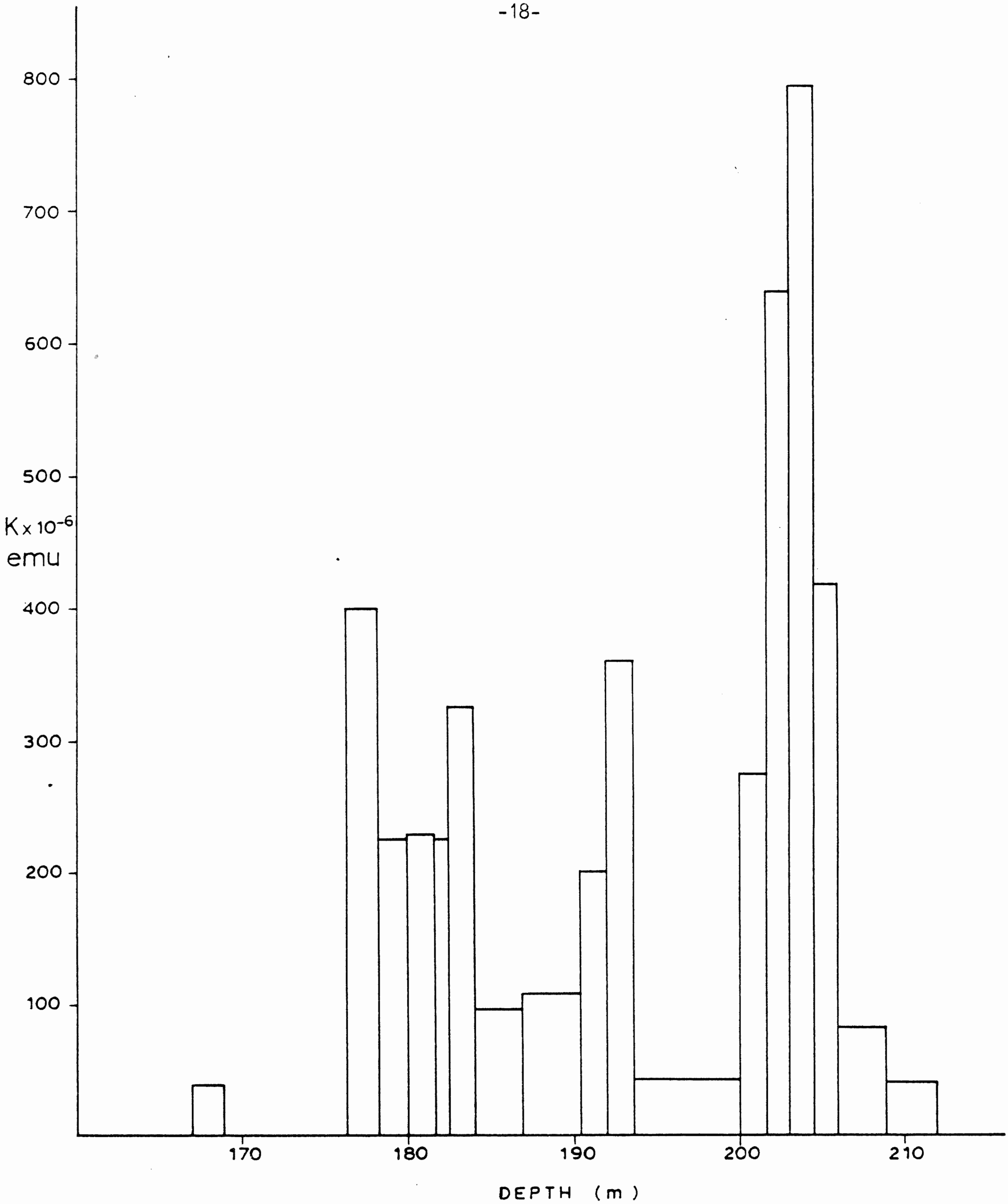
Figure 8



SUSCEPTIBILITY

DRILL HOLE 224-12

Figure 9



SUSCEPTIBILITY

DRILL HOLE 224-23

Figure 10

INTERPRETATION

Horizontal Loop Electromagnetics

Line 5E of the House Grid was chosen for detailed analysis. Because Drill Hole 224-12 is located on this line (Fig. 2), a direct comparison could be made with the measured conductivity from the core. The H.L.E.M. profile is plotted in Fig. 11.

The interpretation of EM anomalies is done by comparison with theoretical anomalies or by comparison with the measured response of various simple shapes and conductivities. For this study the conducting zone between the Halifax and Goldenville formation is assumed to be a dipping semi-infinite sheet of finite conductivity. Asymmetry of the in-phase and quadrature components of the secondary field is an indication of a dipping sheet. The asymmetry is not pronounced for dip angles greater than 45°. The in-phase negative peak is displaced toward the hanging wall and the quadrature negative peak is displaced toward the foot wall. Close station spacing along the profile is required before the asymmetry becomes obvious with deeply dipping sheets. (Telford et al, 1976)

An estimate of the conductor width can be obtained from zero crossovers. For a thin sheet the crossovers occur at $x = \pm \ell/2$. The distance between the crossovers that is greater than ℓ is an indication of the conductor width (Telford et al. 1976). (See Fig. 11) The distance between the crossovers is 60 metres which gives a thickness for the conductive layer of 10 metres. With a station spacing of 25 metres and the shape of the profile in Fig. 11, ten metres is probably a maximum. With a minor change in shape of the south crossover location an estimated minimum distance between the crossovers could be six metres suggesting a thickness for the conductive layer of 8 ± 2 metres. In order to determine an accurate conductor width, it is necessary to have more observed values near the zero crossovers. Binney et al. (1985) suggest the black slate at the base of Halifax Formation in the Eastville area is 5 to 15 metres thick. The conductive zone is associated with the black slates.

The ratio of maximum in phase to maximum quadrature response is a qualitative indication of conductivity. If the ratio is greater than one, it is an indication of a good conductor. (Telford et al 1976) The ratio for profile 5E is two, indicating a good conductor.

Characteristic curves used in EM interpretation combine theoretical and model data which emphasize certain features of EM profiles such as maximum in phase and quadrature responses for phase component systems. Fig. 12 is one example of a characteristic curve for H.L.E.M. systems. The example is for a dipping sheet of 60°. This curve relates the relationship between percent in phase and quadrature components to the response parameter (α) and depth ratio (d). The response parameter is

$$\alpha = \sigma \mu \omega s \ell$$

where σ = conductivity

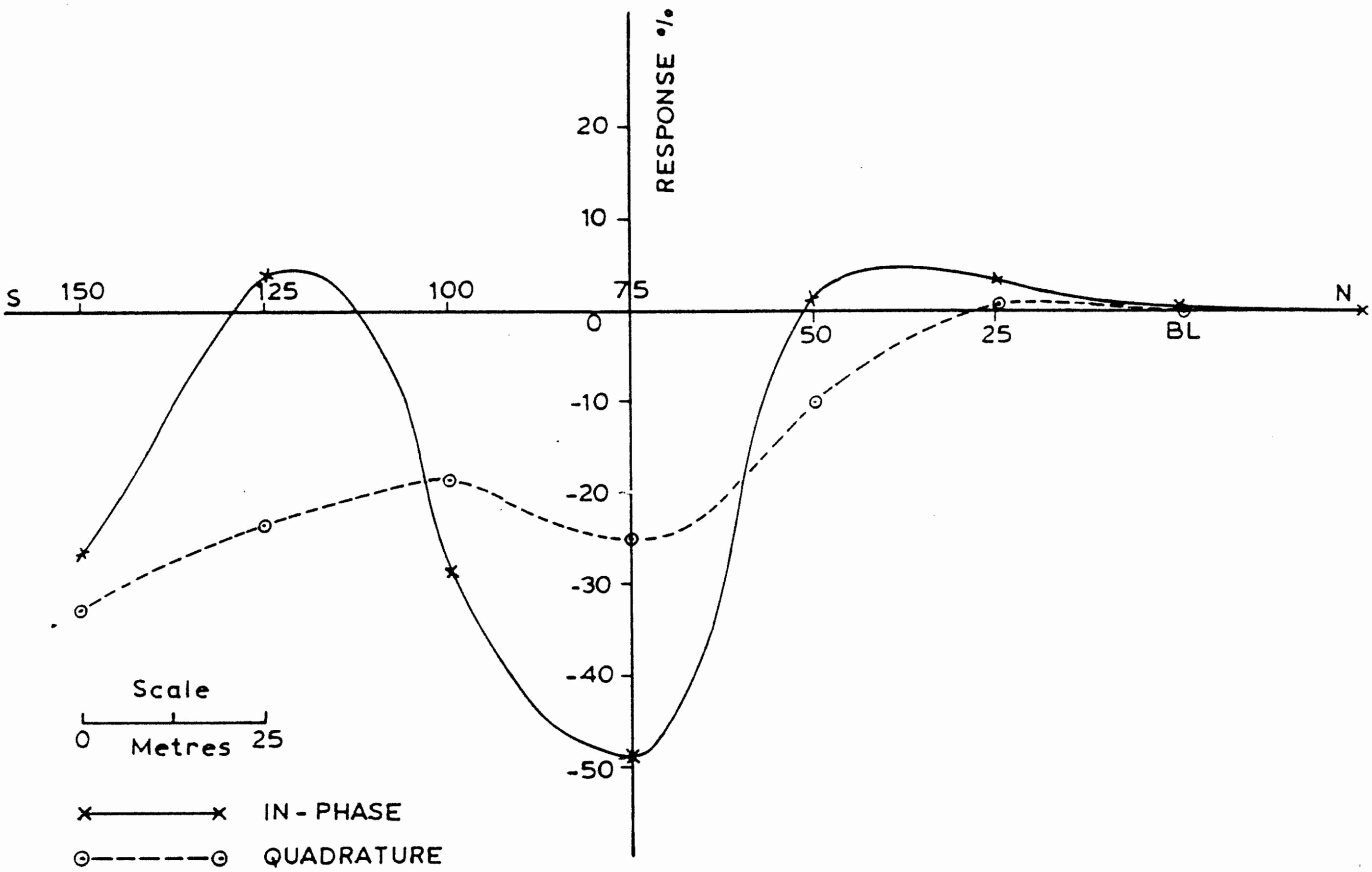
$\mu = 4 \quad x\ 10^{-7}$ (permeability of free space)

s = conductor thickness

$\omega = 2\pi f$ (f is frequency of system)

ℓ' = coil separation

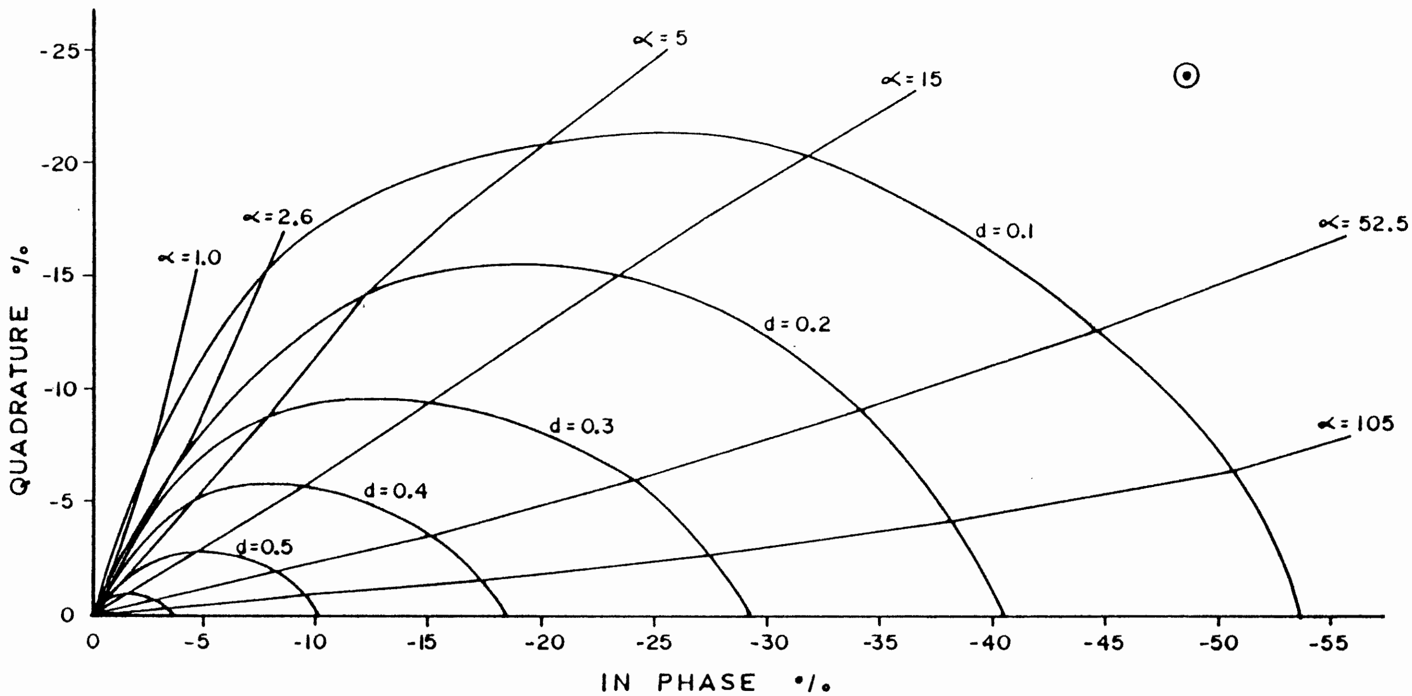
The depth ratio is the ratio of the depth to the top of the conducting body to the coil separation of the H.L.E.M. system.



HOUSE GRID PROFILE 5E
H.L.E.M.

Figure 11

DIP = 60°
α = RESPONSE PARAMETER
d = DEPTH IN TERMS OF COIL SEPARATION



RESPONSE PARAMETER AND DEPTH OF TABULAR CONDUCTORS
H.L.E.M. SYSTEM

Figure 12

STRANGWAY (1966)

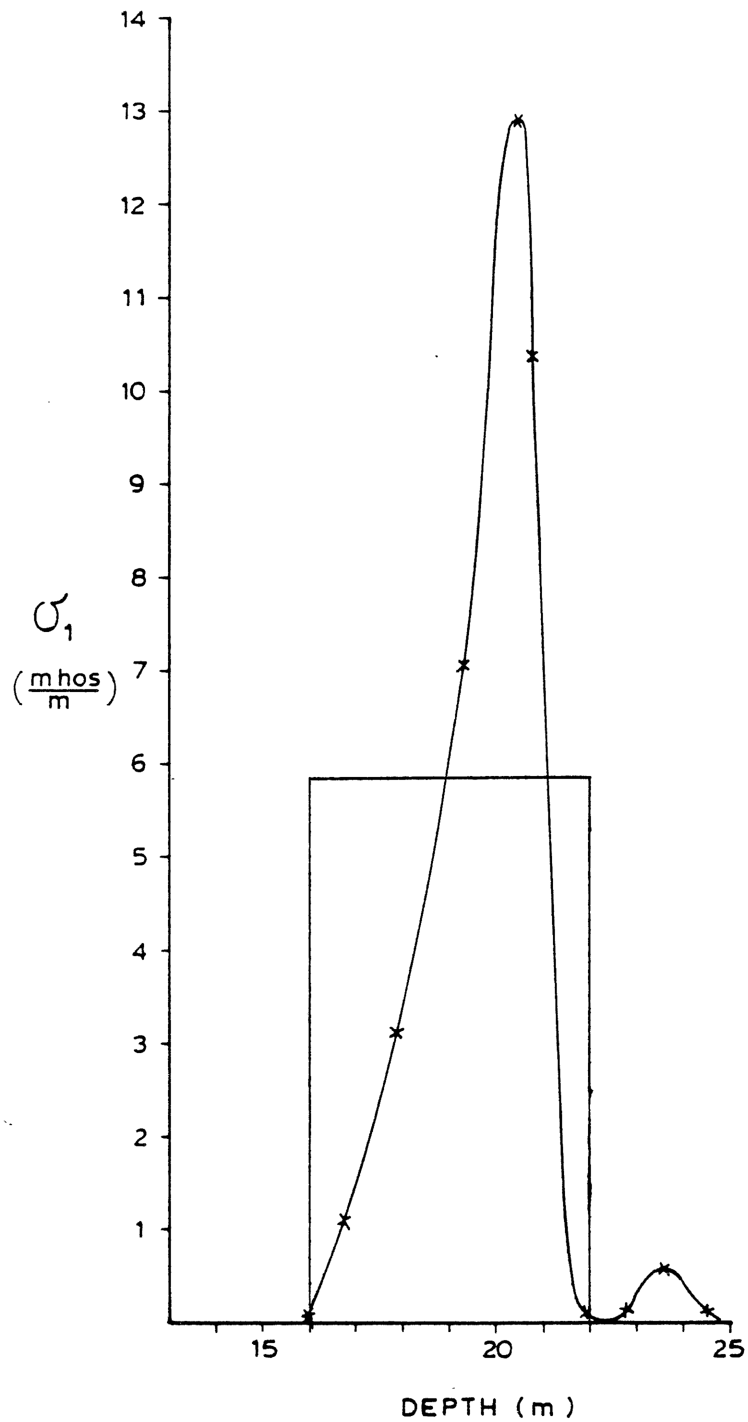
The mid points between the zero crossovers determine the in-phase and quadrature values to be used with the characteristic curves. For a dipping structure these values will not be the maximum values because of the asymmetry of the profiles. The values from the profile in Fig. 11 are plotted in Fig. 12. In this case a shallow depth is indicated —$d < 0.1$ or a depth of less than five metres. This depth agrees with an observed depth of six metres (overburden thickness) at drill hole 224-12 and with the fact that there is exposed rock outcrop between 5E and 6E. (Fig. 2)

The response parameter (α) from Fig. 11 is estimated to be 25 ± 2. Knowing values for ω, μ and ℓ for the system, one can compute a value for σS (conductivity x conductor width):

$$\sigma S = \frac{\alpha}{\mu \omega \ell} = \frac{25}{4\pi \times 10^{7} \times 11165 \times 50}$$

$$\sigma S = 35 \pm 3 \text{ mhos}$$

If the width of the conductor can be estimated by other methods, then a value for the conductivity can be determined. For a thickness of six metres, the conductivity is $\approx 6 \frac{\text{mhos}}{\text{m}}$. This σS is shown as a rectangle in Fig. 13. The area under the curves of Figures 5A and 5B is a measure of σS in two directions as defined by the drill core analysis. The average of these two σS vlaues, 29 ± 3 mhos is not significantly different from the above estimate based on the field data. Telford et al. (1976) questions the value of separating σ and S. The conductivity thickness product is a practical parameter of interpretation and could give a rough estimate of volume or tonnage. (Telford et al. 1976) A highly conductive but narrow zone tends to give the same response as a less conductive but wider zone.



COMPARISON OF OS

Figure 13

MAGNETICS

A uniformly magnetized dike-like structure with infinite strike length and infinite depth has a total field intensity anomaly (ΔT) given by:

$$\Delta T(x) = 2Jbc \sin\theta\Big[\sin\alpha\Big[\tan^{-1}\Big(\frac{x+d}{h}\Big) - \tan^{-1}\Big(\frac{x-d}{h}\Big)\Big] - \frac{\cos\alpha}{2} \cdot \log_e\Big[\frac{(x+d)^2+h^2}{(x-d)^2+h^2}\Big]\Big]$$

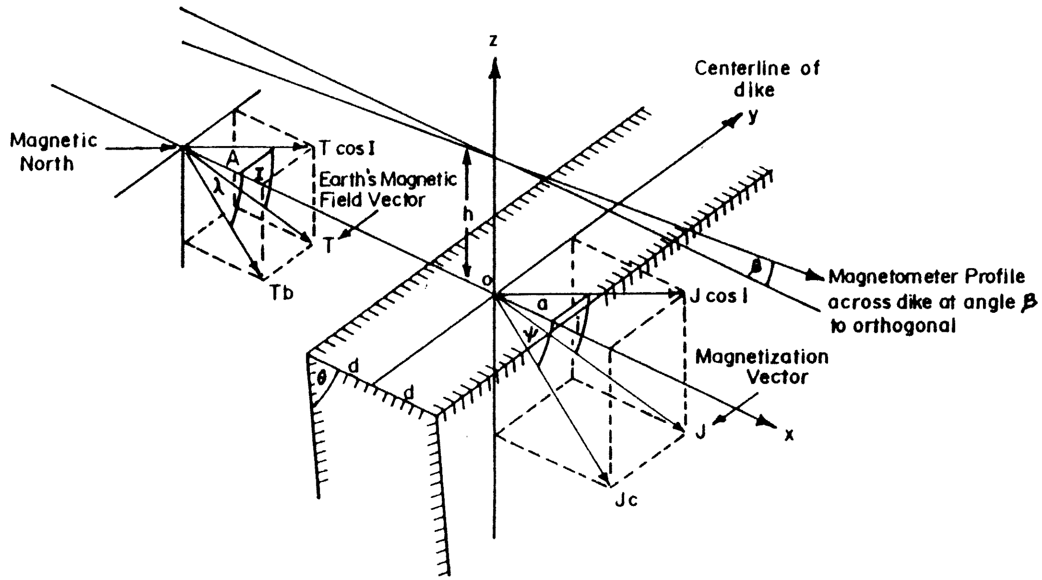
(Hood, 1964)

where

- J = intensity of magnetization of the dike $= \Delta k_e T$ if the remanence is negligible or is aligned in the direction of the earth's field,
- Δk_e = the effective magnetic susceptibility contrast between the dike and the enclosing country rock,
- T = total intensity of the earth's main magnetic field,
- b = $(\sin^2 i + \cos^2 a)^{1/2} = \sin i/\sin\psi$,
- c = $(\sin^2 I + \cos^2 I \cos^2 A)^{1/2} = \sin I/\sin\lambda$,
- I = angle of inclination of the earth's magnetic field, (-90 degrees to 90 degrees), positive in the northern and negative in the southern hemispheres,
- i = inclination of the magnetic polarization vector J, (-180 degrees to 180 degrees),
- a = angle between the horizontal projection of J and the positive x axis, (0 degrees to 360 degrees),
- $\alpha = \lambda + \psi - \theta$, (-450 degrees to 270 degrees),
- λ = angle of inclination of the component of I in the xy plane = $\tan^{-1}(\tan I/\cos A)$,
- ψ = angle of inclination of the component of J in the xy plane = $\tan^{-1}(\tan i/\cos a)$
- θ = angle of dip of dike measured down from the positive x axis, (0 degrees to 180 degrees),
- d = half-width of the dike,
- h = depth to the top of the dike from the plane of observation.

(See Fig. 14)

Figure 14



DIPPING DIKE

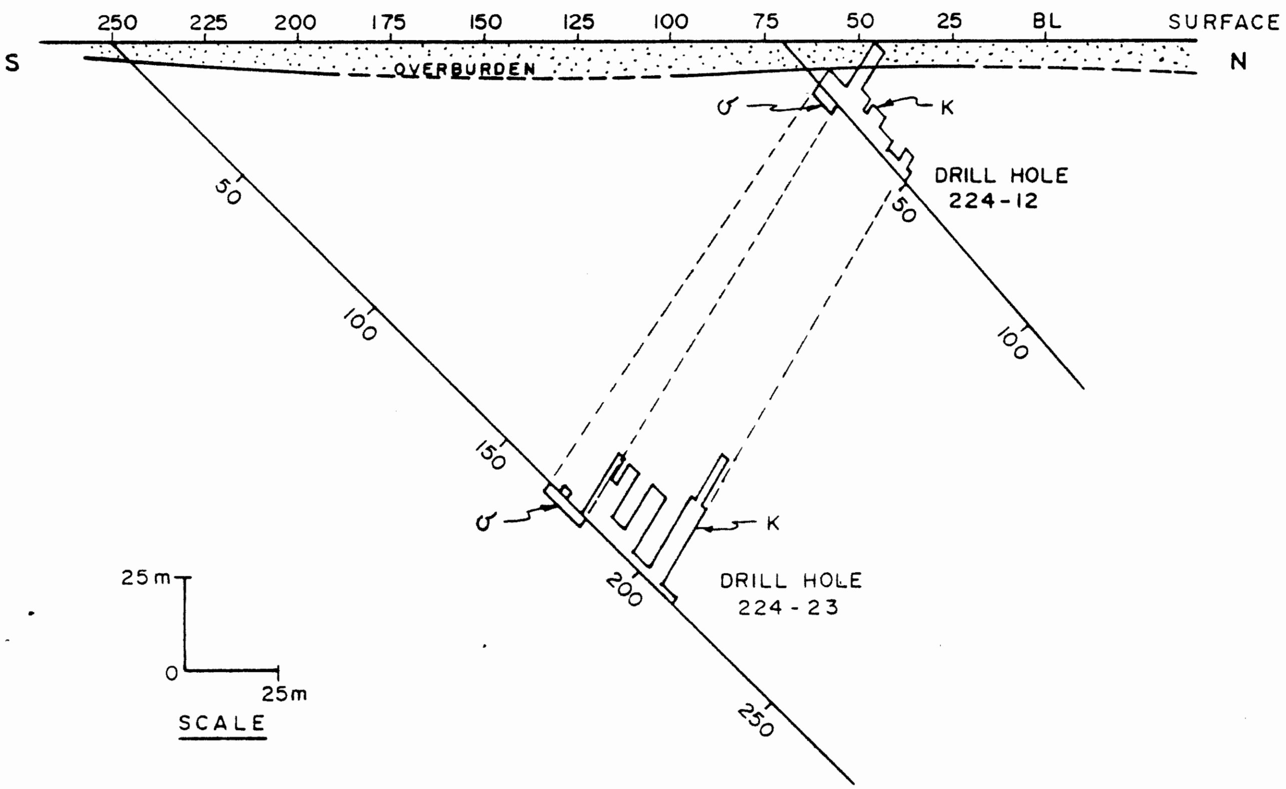
HOOD (1964)

The term 2Jbc sin θ may be considered the amplitude and the shape of the anomaly curve is dependent on the angle. (Hood 1964) Because the traverse at Eastville House Grid is parallel to magnetic north and the dike has an east-west strike the calculation is simplified. A computer program was written to generate theoretical profiles using the above expression for ΔT.

The input values to produce the ΔT profile are:

ΔK_e = 2500 x 10^{-6} emu
T = 55200 gammas
b = 1
c = 1
I = 63.°7
i = 67.°7
a = 0
θ = 60° (radians)
d = 15 m
H = 7 m

The theoretical profile is plotted on Figure 17. The dip of the magnetized body was set at 60° in the program to agree with known data from drill holes 224-12 and 224-23. Drill hole 224-23 was projected onto the plane of the section of Line E5 from E6. Figure 5 is a section for Line E5 showing the relative location of measured parameter in the two drill holes.



σ = CONDUCTIVITY (DETAIL PLOT FIG. 5)

K = SUSCEPTIBILITY (DETAIL PLOTS FIG. 9 AND FIG. 10)

SECTION — LINE E5 — HOUSE GRID

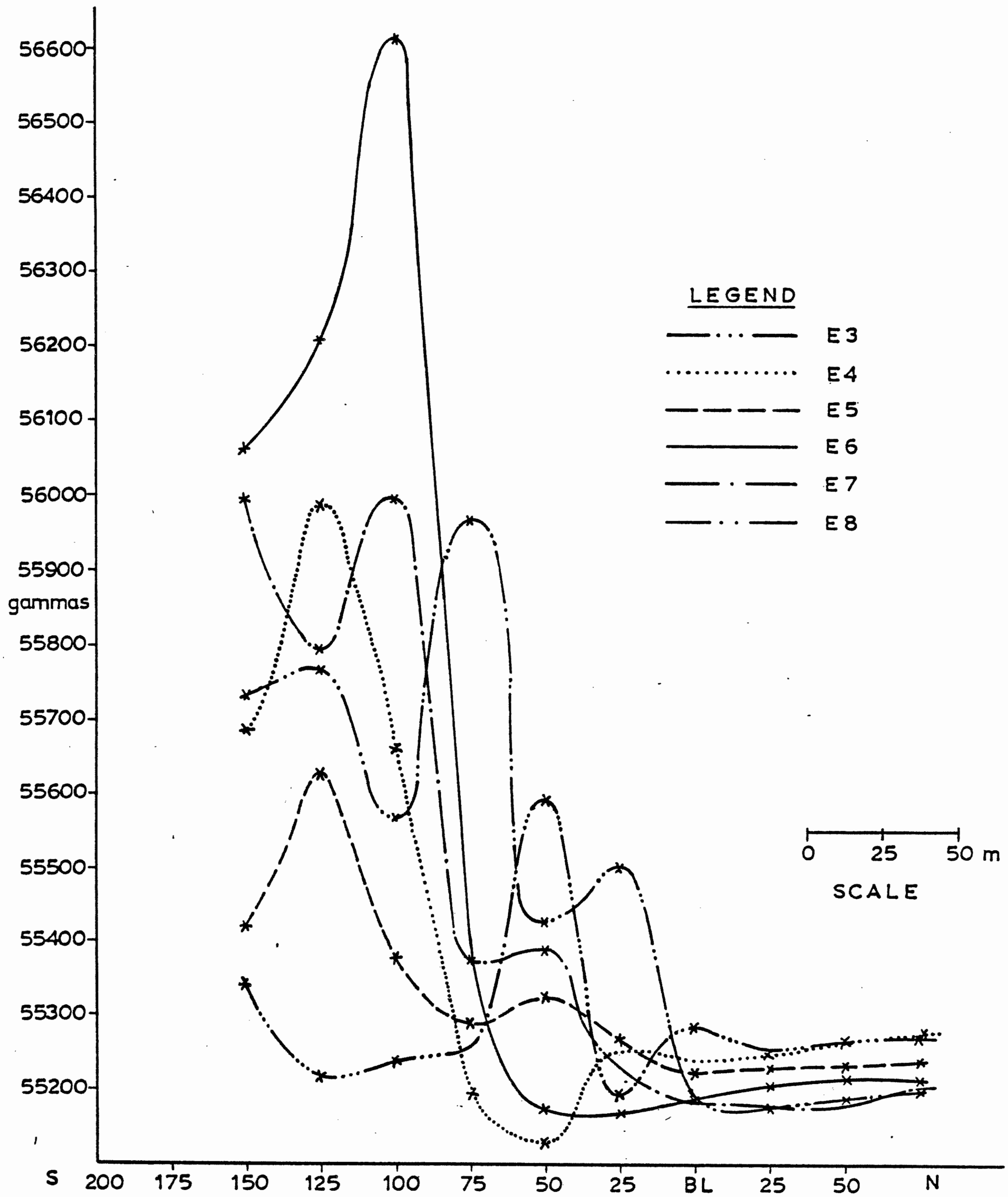
Figure 15

The source of the magnetic anomaly is believed to be pyrrhotite in the Halifax Formation and in the transition zone between the Halifax Formation and the Goldenville Formation. The rock is believed to contain up to ten percent pyrrhotite, both disseminated and in distinct beds. (Binney 1985) Based on the susceptibility measurements from drill hole 224-12, I estimated the width of the magnetic zone to be approximately 30 - 50 metres with a possibility of extending higher into the Halifax slates. This estimate appeared to agree with the section of the lower Halifax Formation for which I had susceptibility measurements. (Fig. 9 and 10) With a K = 250 x 10^{-6} (emu) and a width of 30 metres, the theoritical curve yielded an approximation for the shape of the anomaly but with a smaller amplitude. The K required to produce an amplitude equivalent to the observed anomaly is approximately 2500 x 10^{-6} (emu), an order of magnitude more than was measured. The range of magnetic susceptibility for pyrrhotite is $(10^{2}-5x10^{5})x10^{-6}$emu. (Telford et al 1976) If one considers the range of values possible, the measured values are not unreasonable. The susceptibilities measured from chip and powdered samples from two drill holes may not be a good representation of the magnetic materials in the anomaly area. In fact the drilling from drill hole 224-23 (Binney 1981) shows pyrrhotite distributed through the Halifax slate from the top of the hole to 201.6 metres. The susceptibility was not measured in the upper portion of drill hole 224-23.

For the limited section of drill hole 224-12 within the Halifax slates, the distribution of Fe assay values reflect the changes in susceptibility in the shales and the transition zone. (compare Fig. 18 and Fig. 9)

Profiles of the magnetometer survey for lines E3 to E8 are plotted in Figure 16. Given the variability of the profiles, a composit magnetic profile of lines adjacent to the drill holes 224-12 and 224-23 was drawn for comparison to the theoretical profiles. (Fig. 17)

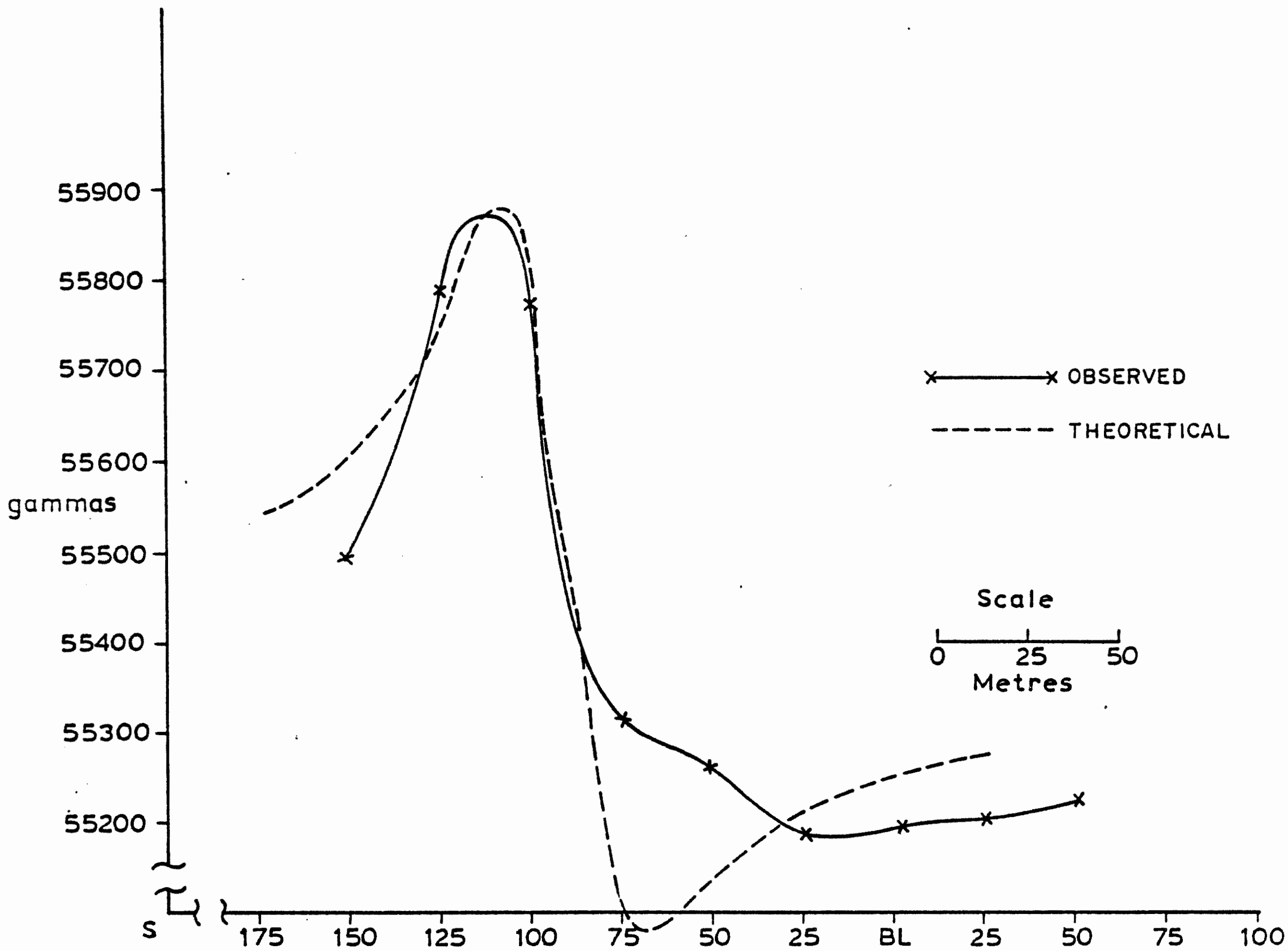
Comparing the theoretical and the composite magnetic profiles, it is clear the fit is not very good except as a first approximation. If you look at the profiles on Figure 16, you see that each profile has two or more peaks so the total anomaly is a combination of several smaller ones. The smaller anomaly to the north on line E5 appears to be related to the inferred location of the top of the structure and the larger peak to the south may be associated with a deeper and wider structure. The composite profile is not a realistic representation of the anomalies over this structure. The distribution of magnetic materials that produce the observed profiles is poorly represented by a two dimensional dipping dyke of limited width.



MAGNETOMETER PROFILES

HOUSE GRID

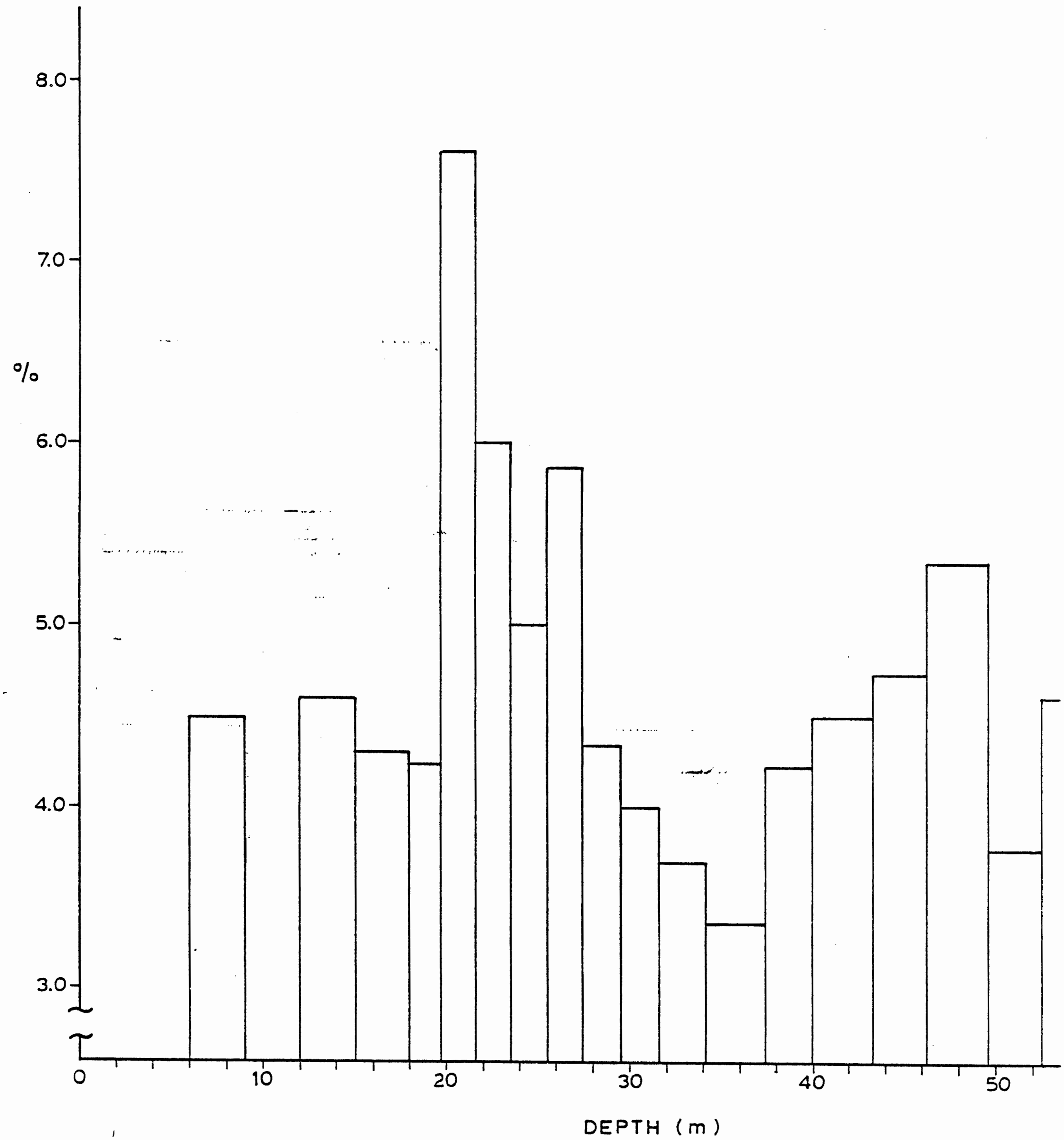
Figure 16



COMPOSITE MAGNETIC PROFILE

AREA OF DRILL HOLE 224-12

Figure 17



DISTRIBUTION OF Fe

DRILL HOLE 224-12

Figure 18

SUMMARY AND CONCLUSION

Concentration of sulfide in the Meguma Group occurs in the black slates at the base of the Halifax Formation. Figure 5 shows the distribution of the narrow conducting zone. The semi-infinite dipping sheet used for the model yielded interpretation values very similar to the values measured from the drill core.

In order to derive the maximum amount of information from H.L.E.M. profiles, additional data points should be observed in the vicinity of the zero crossovers. The shape of the curve near the zero crossovers and the distance between the zero crossovers are important for interpretation.

The dipping dike model used in the magnetic interpretation appears to be too simple and does not adequately explain the observed magnetic anomaly profiles of the House Grid. The anomaly on a detailed scale has more than one peak which implies that the magnetic materials are concentrated in more than a single layer. The small peak to the north on most of the profiles give a good indication where the Goldenville-Halifax boundry is located. The second peak is relatively remote from the actual contact and transition zone and reflects magnetics over a broad area.

TABLE I

SUMMARY CONDUCTIVITIES DRILL HOLE 224-12

SAMPLE	DEPTH	0_3	0_1	0_2
316	9.22	-	-	-
333	10.14	0.57		
300	11.23	-		
334	12.21	-		
319	13.33	-		
301	13.96	0.16		
320	14.82	-		
302	15.69	-		
317	16.88	0.10	1.12	1.52
321	17.76	0.19	3.15	2.64
318	19.38	0.73		
304	20.90	1.28	12.94	7.00
323	21.39	1.06	10.38	3.73
305	21.92	-	0.02	-
324	22.42	0.03	-	-
306	23.05	0.08		
325	23.54	0.06	0.42	
326	24.78	-	0.12	
327	25.99	-		
309	26.94	.02		
328	28.00	-		
329	29.15	-		
310	29.83	-		
330	32.00	-		

TABLE II (MAGNETIC SUSCEPTIBILITIES)

SAMPLE	$\Delta R\Omega$	SHAPE CORR.	VOL. CORR.	$K \times 10^{-6}$
5336	10	1.413	2.00	101
5337	11	"	1.90	105
5338	34	"	2.11	362
5339	20	"	1.90	192
5340	14	"	1.90	134
5341	16	"	2.00	162
5342	14	"	1.90	134
5343	09	"	1.90	86
5344	06	"	1.90	57
5345	09	"	2.00	91
5346	05	"	2.00	20
5347	12	"	2.00	120
5348	06	"	2.00	60
5349	05	"	2.00	20
5350	07	"	2.00	71
5351	08	"	2.00	81
5352	08	"	2.00	81
5353	06	"	2.00	60
1534	05	"	1.54	39
1530	51	"	"	397
1531	29	"	"	226
1532	29	"	"	226
1533	27	"	"	210
1534	42	"	"	326
1648	12	"	"	93
1649	14	"	"	107
1635	26	"	"	202
1536	46	"	"	358
1650	05	"	"	39
1651	05	"	"	39
1537	35	"	"	272
1538	82	"	"	638
1539	102	"	"	794
1540	54	"	"	420
1652	11	"	"	85
1653	05	"	"	38

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