REPORT ON A GEOCHEMICAL ORIENTATION AND STREAM SEDIMENT SURVEY

FRANCES LAKE AREA, YUKON

for the
Canico-Metall-Matt Berry
Joint Venture

by
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I.A. & N.D.

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INTRODUCTION

This report summarizes the results of a geochemical orientation survey and a stream sediment survey which was supervised by the writer during September and October, 1970 for the Canico-Metall-Matt Berry Joint Venture.

Part A of this report discusses the results of the orientation survey and Part B refers to the stream sediment survey with recommendations for follow-up geochemical investigations.

Location of Property

The survey area is located over a group of claims along the East Arm of Frances Lake, approximately 100 air miles north of Watson Lake, Yukon Territory. Plate 1 shows the location of the survey area with respect to the claim boundaries which are approximate only.

General Geology

On the east side of the East Arm (of Frances Lake) graphitic black phyllites and hornfels striking northwest and dipping northeast border a large granitic intrusive. On the west side of the East Arm, calcareous phyllites, grading upwards into limestone or dolomite and black phyllites, strike northwest and generally dip southwest. A small acidic intrusive plug crops out to the south. Other less dominant rock types noted in the area are: quartz-sericite augen schist, greywacke and intermediate volcanics.

The majority of the interpreted local faults trends are east-west.

The general geological features are shown superimposed on the geochemical plans (Plates 2 to 5).

PART A

GEOCHEMICAL ORIENTATION SURVEY

Survey Objectives

The basic objectives of the orientation survey was to obtain knowledge of the geochemical dispersion characteristics in the streams and soils and the element associations present over known mineralized sources in the survey area to assist in:

(a) Assessing the effectiveness of geochemical methods in locating mineralization elsewhere in this survey area and

(b) Selecting the best sampling and analytical procedures to obtain optimum geochemical response to mineralization.

Obtaining this information was considered to be of particular importance in this area as the effectiveness of geochemical tracing of mineralization may be considerably reduced due to the masking effect of a terrace of alluvium which covers a considerable portion of the survey area.

Thomson Creek Stream Orientation

Stream sediment samples were collected up to 1,000' upstream at 200-foot intervals from the lead-zinc showing on Thomson Creek and downstream from the showing to the lake at 100-foot intervals (See Figure 1).

All samples were then subjected to the following tests:

1. Element association analysis
2. Comparative digestion analysis
3. Comparative size range analysis

Element Association Analysis
(See Figures 2 to 3)

In addition to lead and zinc, the samples were analysed for silver, copper, cadmium, nickel, cobalt, manganese, arsenic, antimony -

to detect other possible indicator elements associated with this type of mineralization. Their relative responses were compared and are shown in Figures 2 to 3 . Lead and zinc are strongly anomalous in the sediments downstream from the showing. Silver, and to a lesser extent, copper are weakly anomalous depending on the digestion method employed. All other elements analysed did not show any obvious anomalous association in the stream samples with this type of mineralization, although manganese, nickel and antimony show slight increases in one or two samples.

Comparative Digestion Analysis

Three digestion methods were employed on the -80 mesh size fraction to determine which method gives the greatest contrast between anomalous and background levels for zinc, lead, silver and copper.

The digestions used were:

(a) cold 2N Hydrochloric acid, - a weak digestive attack.

(b) nitric-hydrochloric acid, a strong digestive attack.

(c) ascorbic acid, a digestion particularly suited for sulphide extraction.

Results are shown on Figures 4 to 7 . The nitric-hydrochloric acid method gave the greatest anomaly contrast for all four elements and this digestion was selected for the stream reconnaissance survey. Copper showed no anomalous response with the 2N Hydrochloric digestion but weak responses with the other two methods. Silver did not respond with the ascorbic digestion but shows weak anomalous values with the other digestions.

The 2N Hydrochloric digestion for zinc gave only one quarter the anomaly contrast as that obtained by the stronger nitric-hydrochloric digestion.

The 2N Hydrochloric digestion is similar to the cold extractable tests for copper and zinc and if cold extractable field tests are employed later in follow-up investigations of stream anomalies, interpretations based on their use should be carefully considered with the responses obtained by the orientation survey.

Comparative Size Range Analysis

In addition to the -80 mesh fraction, analysis by the nitric-hydrochloric acid digestion was carried out on three other size ranges to compare anomaly contrast to background. The size ranges selected were:

-40 +80 mesh
-80 +120 mesh
-120 mesh

Results are shown on Figures 8 to 11 .

Maximum contrast was obtained from the -120 mesh fraction for lead and zinc. Considering all four elements, the -80 mesh fraction gives good anomaly contrast with slightly improved anomaly definition in the case of copper. The -80 mesh fraction was analysed in the stream reconnaissance survey.

Soil Orientation Survey

Orientation tests on soil samples were conducted over two selected areas to provide data in determining the effectiveness of soil sampling in detecting the type of mineralization in the Thomson Creek Showing and in selecting the most effective sampling and analytical procedures in reconnaissance soil sampling and soil sampling follow-up of stream sediment anomalies.

Samples were collected at 100-foot intervals along four grid lines; 2 lines, (800 and 1,000 south) across the Thomson Creek showing (See Figure 1) and 2 lines, (4,000 and 4,200 south), across two EM conductors and a weak zinc soil anomaly where mineralization might be present, undisturbed by surface workings.

Element associations were determined by analysis of rock fragment samples from the bottom of the mineralized trenches at Thomson Creek. Dispersion of these possible indicator elements into the surrounding soil profile were determined by sampling the soil at selected locations draining these trenches.

The zinc, lead, copper and silver content of the soil along the four grid lines was analysed using the -80 mesh fraction B horizon with a nitric-hydrochloric acid digestion. One line in each of the two areas tested (lines 1,000 S and 4,000 S) was also subjected to additional analyses to determine the effect of the parameters of size fraction, digestion method and soil profile in providing maximum anomalous contrast.

The following will briefly summarize the observations and tentative conclusions suggested by study of the data in Figures 12 to 27.

Element Associations

Samples for element association analysis at the Thomson Creek showing were analysed for 9 elements; copper, lead, zinc, silver, cobalt, nickel, cadmium, arsenic and antimony.

Unfortunately, both in the Thomson Creek and the EM conductor survey areas, the mineralization or possible mineralization (in the case of the latter) coincides with a zone of shallow or no overburden compared to the depth of overburden over the rest of the grid line sampled for background comparison.

This casts some doubt in assessing to what extent the anomalous response obtained is caused by mineralization and to what extent it may be caused by a contrast between the thicker terrace alluvium and a thinner soil cover derived in part from weathering of the underlying phyllites. This could be clarified further by additional sampling along grid lines where mineralization is not suspected.

Antimony appears to be more highly concentrated in the soils in the vicinity of the mineralization and may be a good indicator element for detecting and/or screening soil anomalies resulting from this kind of mineralization.

Cobalt, nickel and arsenic also show slight increases in the mineralized area but the evidence is less conclusive and additional analyses are required along lines 1,000 S and 4,000 S.

Cadmium content of the soils showed no relationship to the mineralization.

Zinc gave the best response in detecting the Thomson Creek mineralization and also showed anomalous values in close proximity to, and downslope from, the EM conductors. This element produced the greatest anomaly contrast and, although somewhat erratic, the largest width of dispersion of the four elements.

Lead showed only a very slight anomalous response in the two profiles over the Thomson Creek prospect but gave an identifiable but narrow response between the EM conductors. As only one sample is involved, its significance is still questionable.

Copper in the soil of the Thomson Creek Showing was higher than background in some samples but erratic. A slightly anomalous but narrow response (again, one sample) was obtained coincidental with the lead and zinc anomalous values in close proximity to the EM conductors. The other high copper values in the profiles of lines 4,000 S and 4,200 S are attributed to selective concentration of copper in certain samples containing a high organic content.

Silver showed only a light recognizable association to mineralization in two samples downslope from the surface workings at Thomson Creek.

Comparative Digestion Analysis

The nitric-hydrochloric and cold 2N Hydrochloric digestions gave comparative results for lead but the nitric-hydrochloric digestion gave the greatest anomaly contrast for copper and zinc.

The ascorbic acid digestions while giving the most subdued profile may prove to be useful in screening significant lead and zinc anomalies from non-significant ones where these elements are present in the soils, in part, as sulphides. This is suggested by the orientation profile on line 1,000 S where the ascorbic digestion shows a stronger anomaly over the surface workings and suppresses the one over 200 E which may be due to a cause other than mineralization. Further comparisons are required, however, to confirm this observation.

Size Range Analysis

In general, the -80 +120, -120 and -80 mesh size fraction all give comparable results for copper, lead and zinc, while the -40 +80 fraction gives a slightly lower anomaly contrast. It may be significant to note in the profile of line 1,000 S the various size fractions diverge. This is true for lead, zinc and to a lesser extent, copper. Should further testing show this observation is persistent, it could also provide a means of isolating significant and non-significant anomalies in this area.

Comparative Soil Horizon Analysis

Development of the A_1 (humus), A_2 (leached) and B soil profile is good in the majority of the locations sampled and the analyses confirm the B horizon, 1" to 2" below the leached zone, is the best position in the profile to obtain optimum response. In a number of locations the entire profile, to a depth of more than 30", is grey or black and contains a high organic content. This should be carefully noted in sampling this area due to the selective concentration of certain elements, particularly copper in these samples, producing a high metal content unrelated to mineralization.

PART B

RECONNAISSANCE STREAM SEDIMENT SURVEY

Field Data and Procedures

Data and procedures pertinent to the stream sediment survey are tabulated below:

Total number of samples collected: 656

Period of Sampling: September to October, 1970

Sampling Interval: Mainly 500 feet, at times 700 feet

Sample Site Identification: Stream sample sites are marked in the field with red plastic masking tape indicating sample number. Position (in certain locations approximate only) is shown on photomosaic base of the Location Plan (Plate 1).

Part of Stream Sampled: Active stream sediment.

Analytical Procedures

Sample Preparation: samples were air dried in field camp, and split to retain a 50% untouched representative sample for future reference. The remaining 50% was seived to -80 mesh with nylon screening and the oversize rejected (see also below under analytical precision).

Analyses: After assessment of the orientation stream survey at the Thomson Creek prospect, samples were analysed for copper, lead and zinc on the -80 mesh fraction using a nitric-hydrochloric digestion with atomic absorption determination. Analyses were performed by Bondar-Clegg & Co. Ltd. in Ottawa, Ontario.

Analytical Precision: To check the precision of the analytical results, the -80 mesh fraction of approximately every 20th sample was carefully homogenized and split and both splits sent for analysis. Alternate check samples (every 40th sample) were included in their proper sequential order as a precision check on each analytical batch. The remaining check samples were analysed together upon completion of all sample analyses to provide a precision check on correlation between analytical batches.

The analytical results obtained are well within acceptable limits and are shown in Appendix I.

Presentation of Data

Sample numbers and their location are shown on a photomosaic base in Plate 1.

The parts per million metal content of the stream sediments is shown for copper, lead and zinc separately in Plates 2, 3 and 4. Changes in the metal distribution of the streams is indicated by full range, equal interval contouring. Copper and lead contours commence at 20 p.p.m. and increase by 10 p.p.m. Zinc contours commence at 100 p.p.n. and increase by 50 p.p.m.

Major geological and morphological features are superimposed in a lighter tone on these plans. Geological features shown are based on mapping by Dr. H. Thalenhorst of Metall-Gesellschaft.

Frequency histograms showing the distribution range of the three elements are shown in Figures 28, 29

A composite presentation of the metal distribution is shown on Plate 5 together with the interpretation outlining significant stream anomalies, their possible source area, and their priority classification for follow-up investigations.

Interpretation and Recommended Follow-up
(See Plate 5)

In assessing the geochemical data the interpreted significant anomalies have been classified into A and B priorities.

Priority A anomalies are those having a high rating with respect to characteristics such as intensity, length of dispersion, element associations and geological environment, etc. There is a good possibility that these anomalies may be caused by mineralization and they highly warrant follow-up investigations to determine their cause and source.

Priority B anomalies have fewer and less favourable characteristics. There is less certainty as to their significance or a lower likelihood they are caused by mineralization.

Too great a reliance should not be placed on the boundaries of the possible source areas shown on Plate 5. In some cases, where streams have not been sampled completely, their source may lie further upstream. The intention is primarily to indicate relative sizes between drainage anomalies and to suggest possible significant trends indicated by the anomalies.

Priority A Anomalies

Of 11 anomalies outlined, 5 have been classified as A priority.

Anomaly 1-A: This is the highest anomalous copper zone obtained in the surveyed area. Two streams show a well defined copper dispersion pattern more than a mile in length with a maximum content of 480 p.p.m. at the head of one of the streams. Weakly anomalous copper values are also present in a third stream to the east. More than one source of copper may be involved here. Weak lead-zinc values are also associated in some samples. This zone is also of interest because of the density of interpreted faulting recorded in the area.

Follow-up investigations of this anomalous zone should include:

1) examination of the analysed stream samples for organic content to confirm that the anomaly is not due to the selective concentration of copper in samples containing excessive organic material.

2) soil testing and prospecting of the area drained by the anomalous streams. Field analytical kits would be useful initially for testing samples at the site to guide the search for the source and followed later by laboratory analysis.

3) stream sampling of the most easterly stream containing weak copper values should be extended upstream to its headwaters within the granite.

4) because of the close proximity to the granite, samples should be analysed for molybdenum to determine if a copper-molybdenum porphyry-type association exists.

Anomaly 2-A: This anomaly lies outside the claim block but as no streams or seepages adjoining the anomaly are present within the claim block, the zone is not necessarily fully outlined (note that the claim boundaries shown are approximate only). It is characterized by moderately anomalous copper values in four small streamlets draining into the lake. Weakly anomalous but persistent lead, and to a lesser extent, zinc values are associated. The zone is roughly along the strike of the country rock hosting the Thomson Creek prospect and the EM conductive zone.

Soil sampling in the vicinity of the anomalous streams should be attempted to try to locate the source. However, difficulty in obtaining any response might be encountered due to the masking effect from the capping of the terrace alluvium.

Anomaly 3-A: This zone contains the present prospect of interest along Thomson Creek. Anomalous lead values are obvious downstream from the showing and although the zinc response appears very low on Plate 5, this is mainly due to the contour interval selected. The zinc content downstream from the showing is about double the content elsewhere on Thomson Creek.

Comparison of the metal values in the small drainages along shore north of Thomson Creek with those to the south of Thomson Creek suggest more exploration attention might be warranted in the area immediately north of Thomson Creek.

Anomaly 6-A: This anomaly contained within, and extending north beyond the claim group, may be very significant. Highly anomalous zinc values to a maximum of 640 p.p.m. are present in every stream sampled along a zone extending for at least 3 miles. A copper or lead association is not strongly evident but locally, slightly higher lead and copper values coincide with the higher zinc values.

The dispersion pattern in the streams appears to parallel the strike of the strata and suggests the anomaly source may be contained within a particular horizon in the stratigraphic sequence. While it is possible the anomaly may be caused by a particular stratigraphic horizon with a high zinc background unrelated to sulphide mineralization, it is equally possible that this higher background is a reflection of a zone potentially favourable for mineralization. This interpreted anomalous zone is contained within a sequence of limestone (or dolomite) with black and calcareous phyllites which is a highly favourable environment for stratiform lead-zinc deposits. Lead-zinc mineralization has been found at one location in this zone.

Further investigation of this anomaly should involve:

1) Extension of the stream sampling upstream, where possible, to isolate the anomalous zone.

2) Thorough prospecting of the zone for evidence of mineralization.

3) Completion of the geological mapping in this area.

4) Composite rock chip sampling of the various units of the stratigraphic sequence at 3 or 4 locations along the zone for trace element analysis to determine if an anomalous zinc horizon is present.

5) If present, conduct a soil sampling survey along this horizon.

<u>Anomaly 10-A:</u> This anomaly has been selected because of high lead and copper values occurring along two streams close to a small acidic intrusive. More than one source may be involved here. The close coincidence

of the geochemical anomalous zone with limestone in the vicinity of the intrusive suggest a very favourable environment for mineralization.

Follow-up of this zone should include:

1) Completion of the stream sampling further upstream along the two streams to confirm the source is not further upstream.

2) More detailed mapping and prospecting of the area.

3) Soil sampling in the environs of the stream anomalies.

4) Analyse the stream samples draining the granite for molybdenum.

Priority B Anomalies

Six of the 11 anomalies outlined have been classified as B priority. .

Anomaly 4-B: This zone contains higher lead and zinc values than adjoining streams with a similar environment, and coincides with a faulted displacement of the granite contact. Further upstream sampling to isolate the anomaly and prospecting of the area for mineralization should be carried out.

Anomaly 5-B: This anomaly is outlined because of consistent slightly higher lead, copper and to a lesser extent, zinc values in all 5 streams compared to the streams to the south draining a similar environment.

Propsecting and further sampling of the streams within the granite should be done to determine if this increase is related to a slightly higher metal rich phase of the granite or is restricted to the contact zone.

Anomaly 7-B: This anomaly is selected because of a local increase in lead, zinc and copper values in a favourable environment created by a limestone-phyllite contact zone associated with a interpreted fault which is adjacent to a mineral showing roughly 1 1/2 miles to the east. It might also be due to the precipitating action of the carbonate environment.

This increase in metal content should be confirmed with additional closer spaced stream sampling and the area searched for signs of mineralization.

Anomaly 8-B: This zone may be related to Anomaly 6-A but because of a change in its mineral associations (lower zinc and higher lead) may have a different source. The limestone and adjacent strata should be examined for mineralization.

Anomaly 9-B: This anomaly is outlined because the lead, zinc, copper content appears to be increasing up this branch. Further sampling upstream should be carried out to define the trend.

Anomaly 10-B: The local increase in copper in this zone may be responding to a mineral showing known to occur in this general area. This showing should be examined and its position with respect to the anomaly noted to determine if another source is indicated.

Recommendations on Additional Reconnaissance Geochemical Exploration

Reconnaissance Soil Sample Profiling: In considering the questions of where to search for extensions of, or new mineral targets of the Thomson Creek type in the phyllite sequence and how to detect them, the following suggestions are offered.

On Plate 5, the stipled boundaries of the recommended search area are shown. These boundaries have been based on:

(a) the suggestion of a zone of higher metal values (bounded by zones 2-A and 3-A) shown in seepage samples along the east shoreline.

(b) incorporation of the stream anomalies in the area and

(c) the assumption that Thomson Creek mineralization is of the stratiform type and extensions are likely to be found along a zone parallel to the general strike of the country rock.

The base line should be extended through this zone and soil samples collected at 200' intervals along compass-controlled traverses spaced 600' apart.

Parts of this area are not particularly well-suited for geochemistry because of the capping of terrace alluvium but unless the geophysical orientation survey provides a better method, soil sampling is probably the most inexpensive and practical method to scan this zone for mineral targets of the Thomson Creek type.

Regional Stream Sediment Survey

In reviewing the number of known mineral showings within and beyond the present survey area, the overall geological setting and the response obtained by the stream survey to-date, particularly in outlining what may be a very favourable environment for stratiform lead-zinc deposits (Zone 6-A), the writer recommends that consideration be given to mounting a rapid, helicopter supported, reconnaissance stream survey over a much larger area of interest.

Such a survey would quickly detect and guide exploration to additional zones of potential mineralization, and the presence of a helicopter on site would greatly expedite the follow-up programme in the present survey area.

Respectfully submitted,

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APPENDIX I

STREAM SEDIMENT SURVEY
ANALYTICAL PRECISION

Precision Within Batches

Sample No. (and duplicates)	Cu (P.P.M.)	Pb (P.P.M.)	Zn (P.P.M.)
20	6	8	31
	6	8	31
60	27	45	108
	29	51	110
100	21	32	88
	22	32	92
140	17	21	120
	16	21	116
180	21	14	66
	19	13	63
220	10	26	75
	11	28	82
259	29	25	44
	30	15	43
300	12	14	62
	12	16	62
340	13	23	56
	14	22	53
400	18	21	250
	19	21	255
438	34	30	160
	33	29	145

Precision Between Batches

Sample No. (and duplicates)	Cu (P.P.M.)	Pb (P.P.M.)	Zn (P.P.M.)
40	14	16	47
	17	18	52
80	42	47	76
	43	48	76
120	8	13	93
	9	14	92
160	88	26	135
	86	22	135
201	22	33	76
	37	32	81
241	20	22	83
	24	23	81
280	14	20	115
	15	18	120
320	21	14	62
	23	14	72
358	28	22	104
	31	21	114
420	14	18	94
	14	15	96
460	15	16	138
	16	15	134

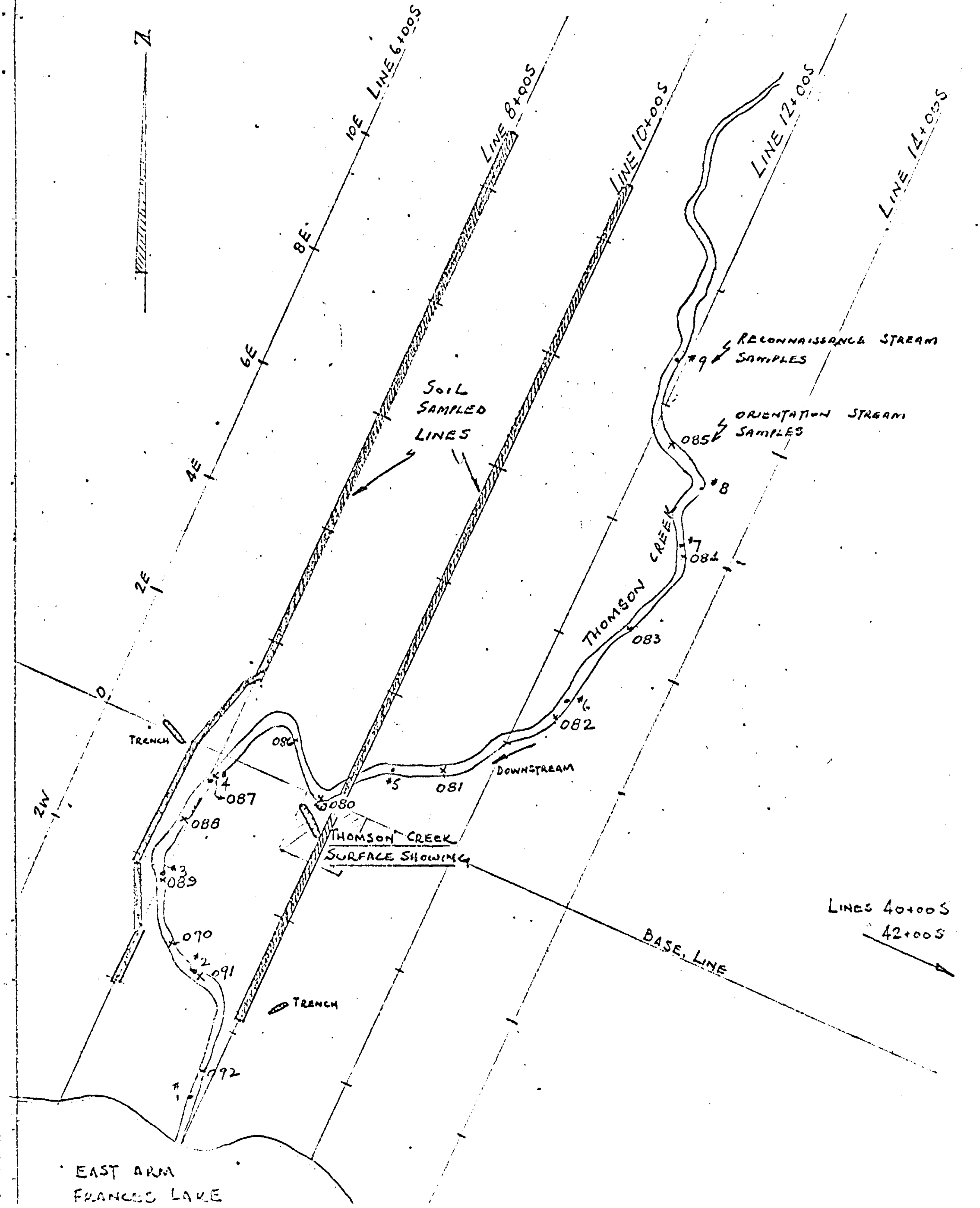
Appendix I (Continued).....

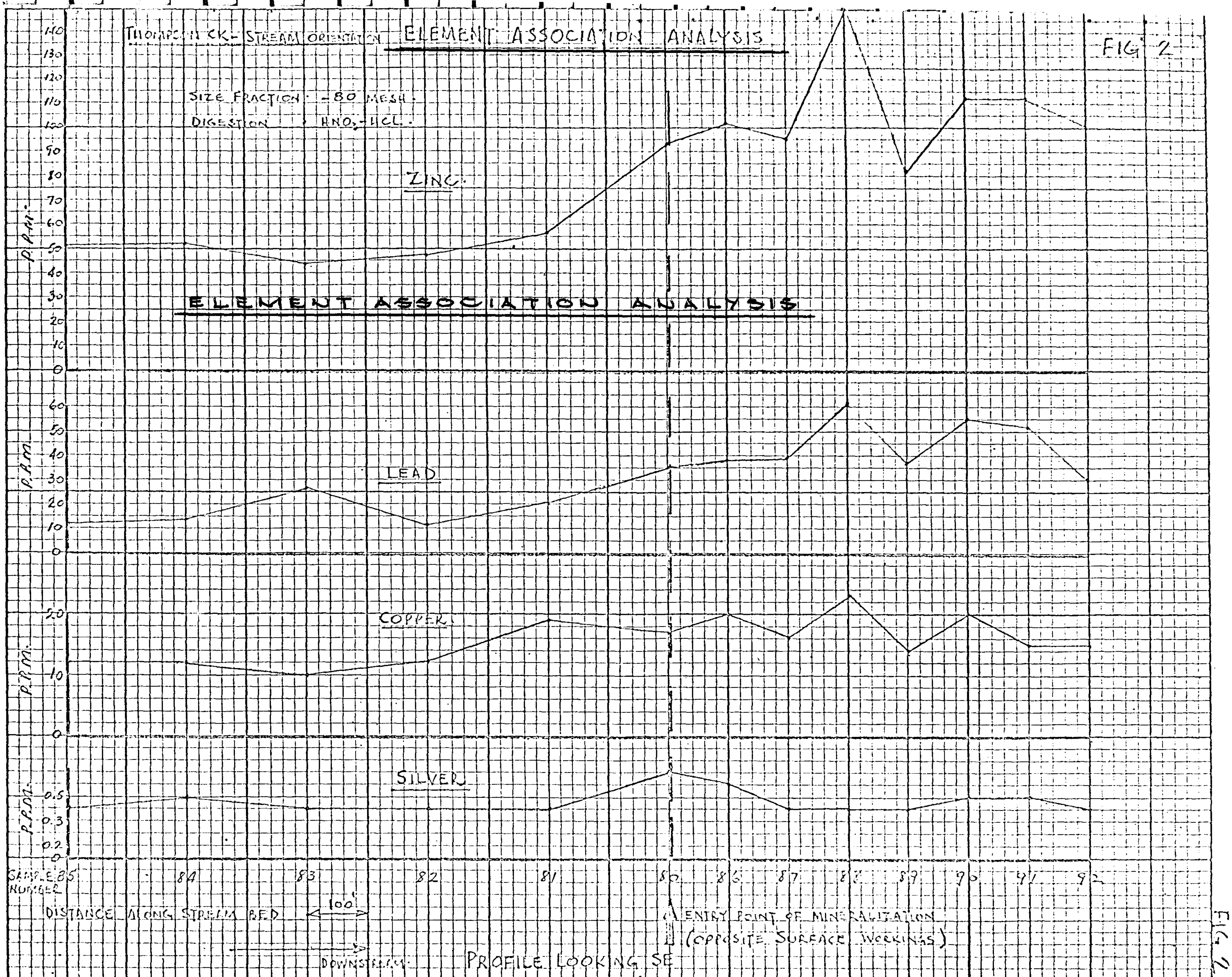
	Cu	Pb	Zn		Cu	Pb	Zn
479	22	19	109	500	18	18	116
	22	18	107		16	16	119
523	8	13	66	540	19	25	94
	7	12	62		21	23	100
561	15	17	82	580	36	36	150
	15	16	79		33	35	145
601	10	14	125	621	16	20	108
	11	15	122		16	18	108
641	14	16	175	660	13	19	81
	13	16	178		13	20	80
678	24	18	83				
	22	17	75				

FIG. 1

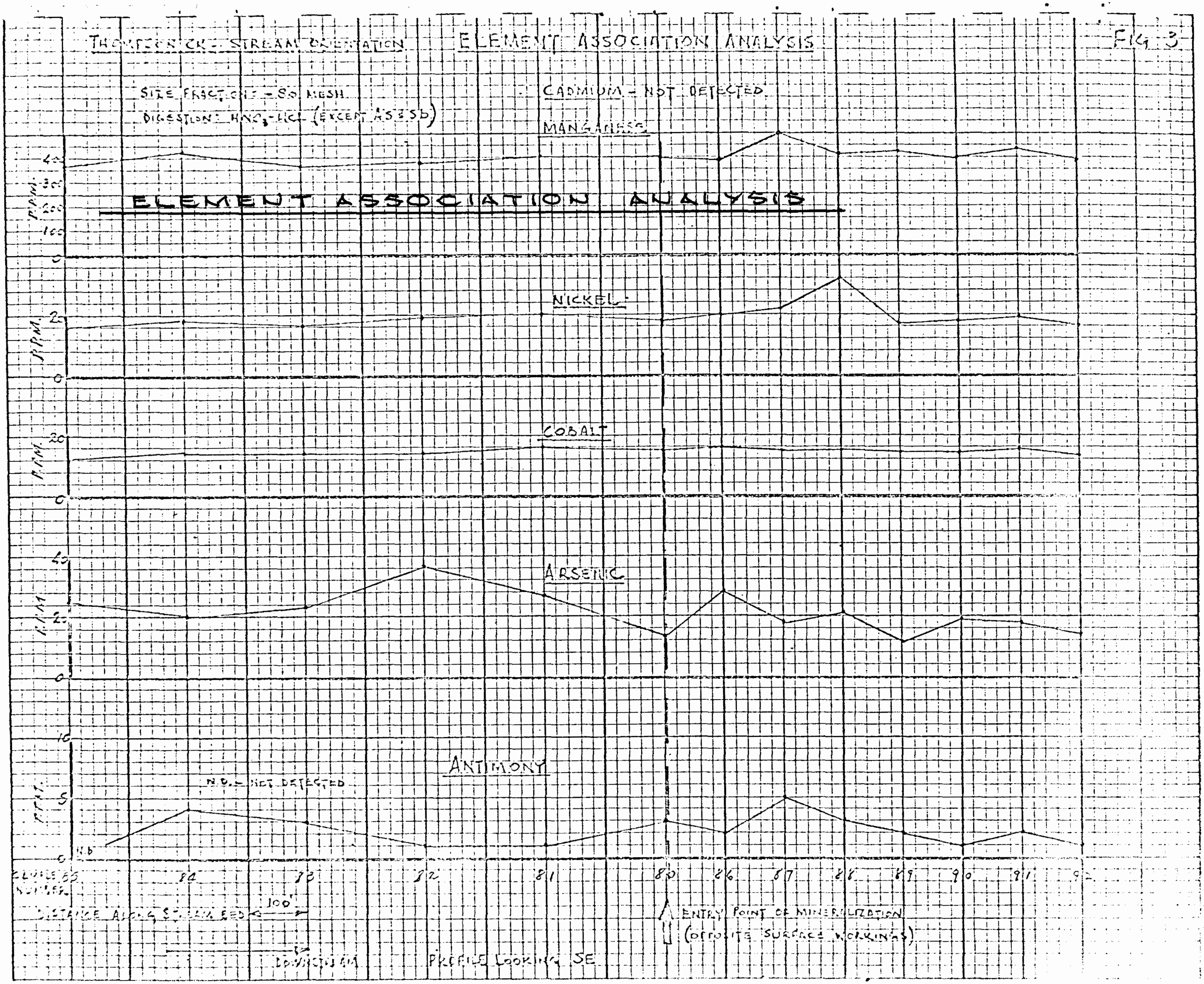
SKETCH LOCATION MAP - ORIENTATION STREAM-SOIL SAMPLES.

SCALE: 1" = 200'





HUGHES OWENS 335-5066 10×10



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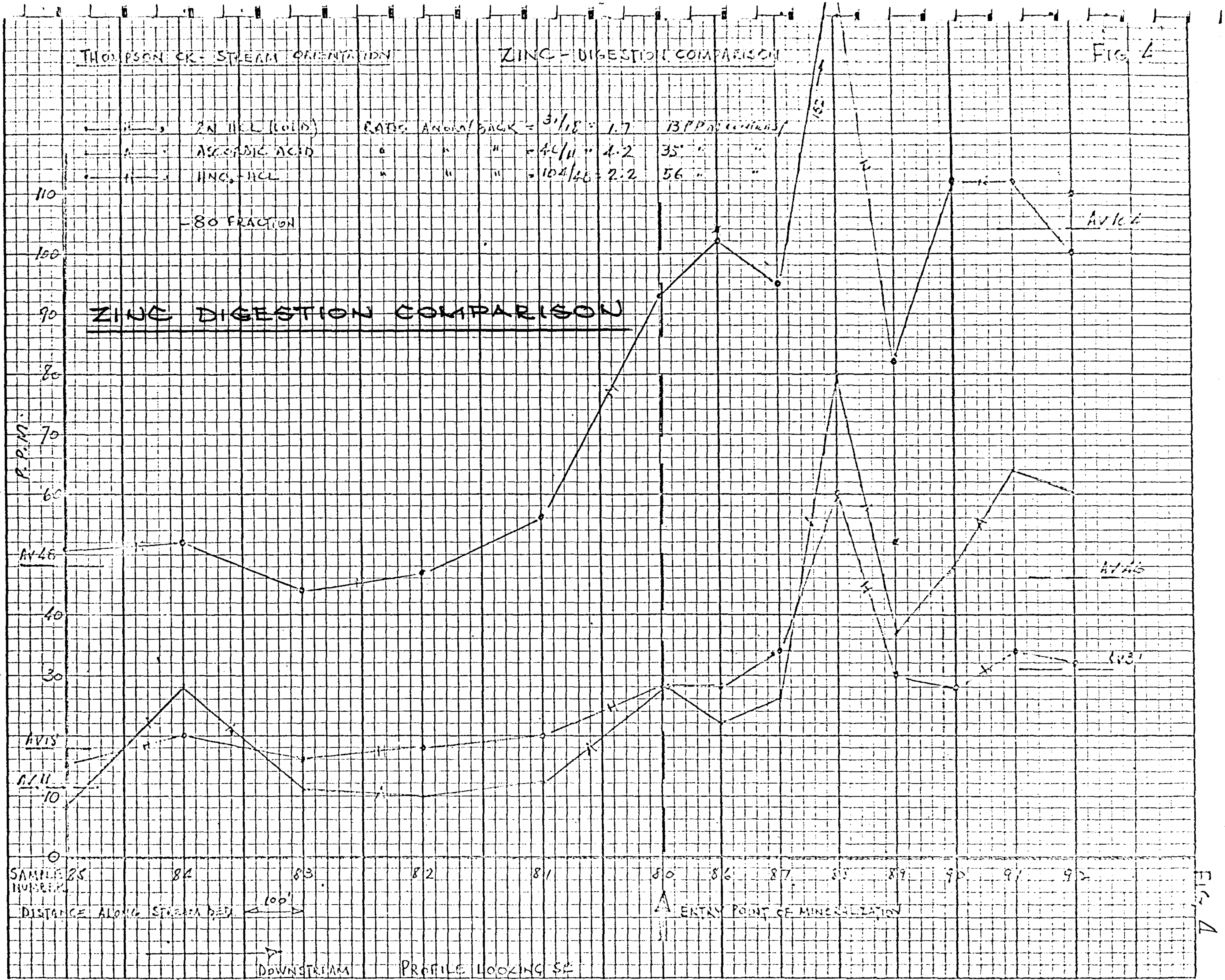
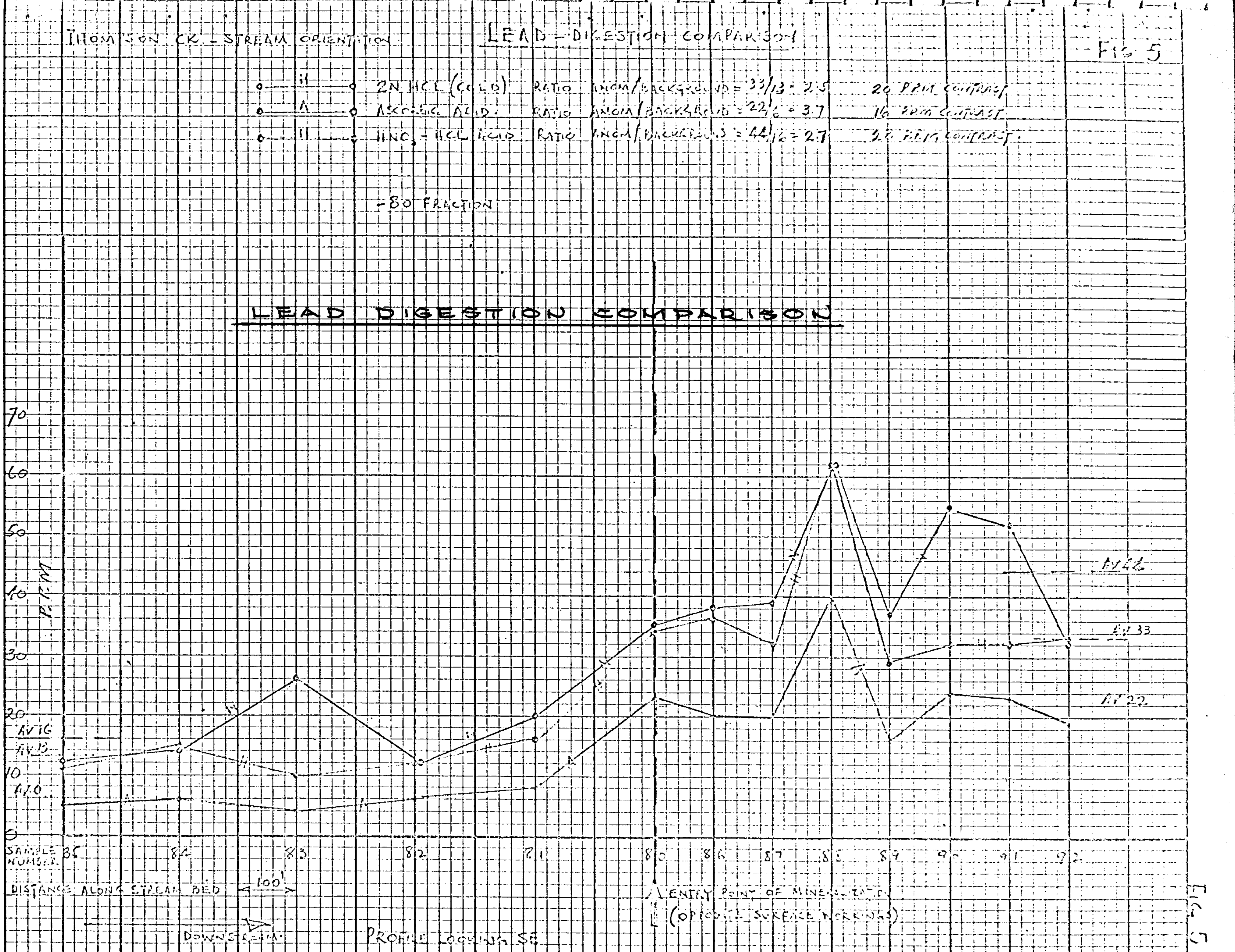


HUGHES OWENS 335-5066 10x10

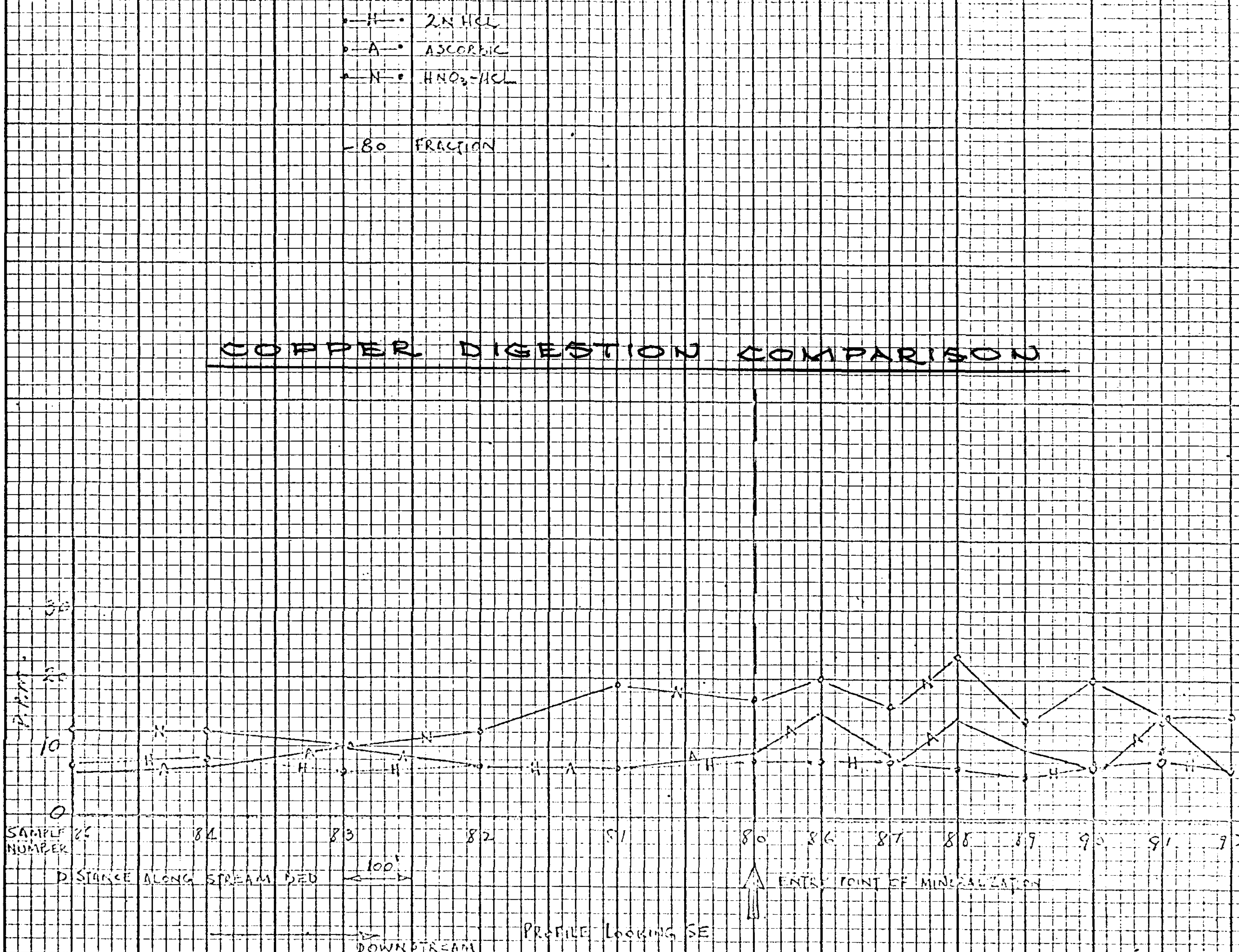


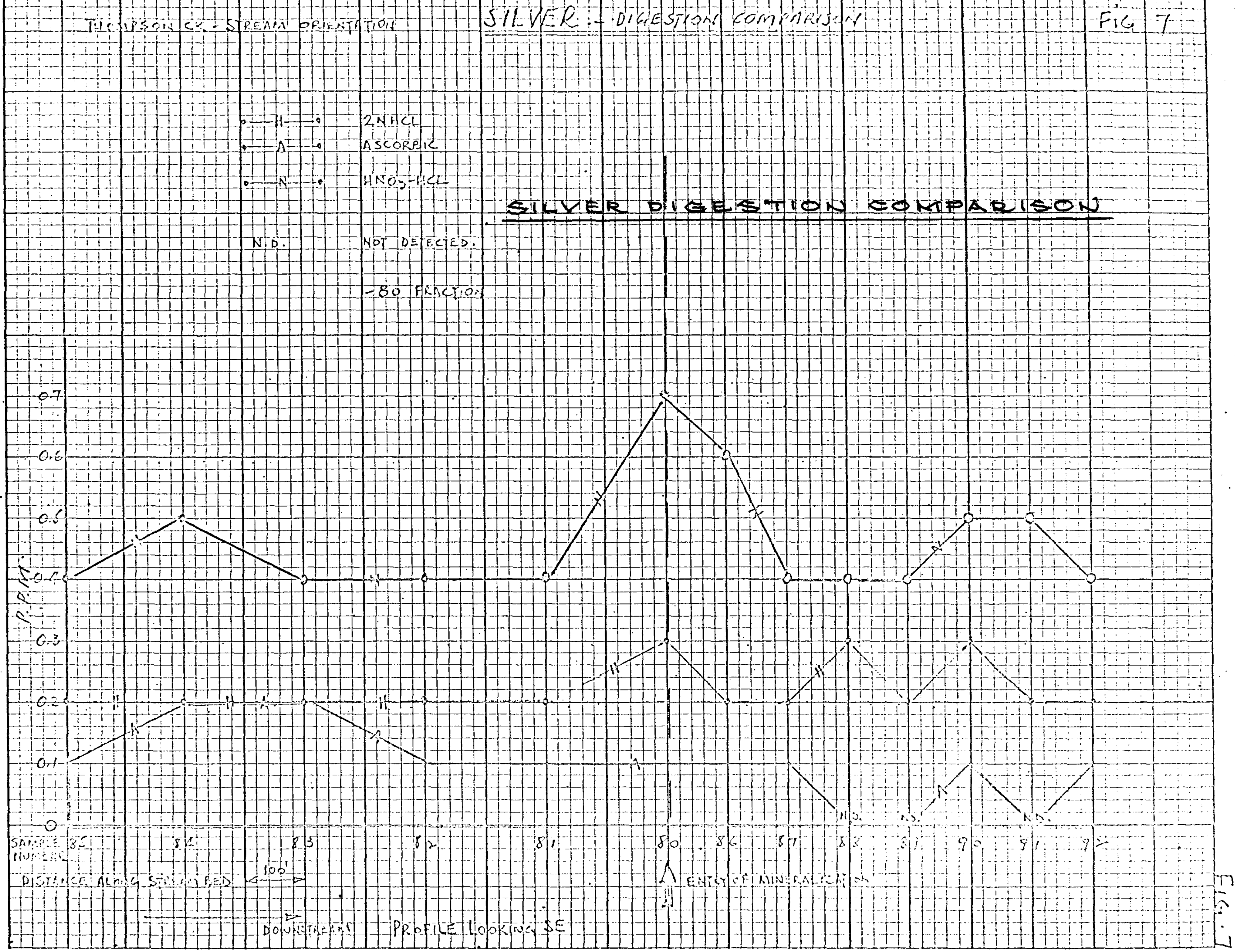
HUGHES OWENS 335-5066 10×10

THOMPSON CREEK - STREAM ORIENTATION

COPPER - DIGESTION COMPARISON

FIG. 6





HUGHES OWENS 335-5066 10×10

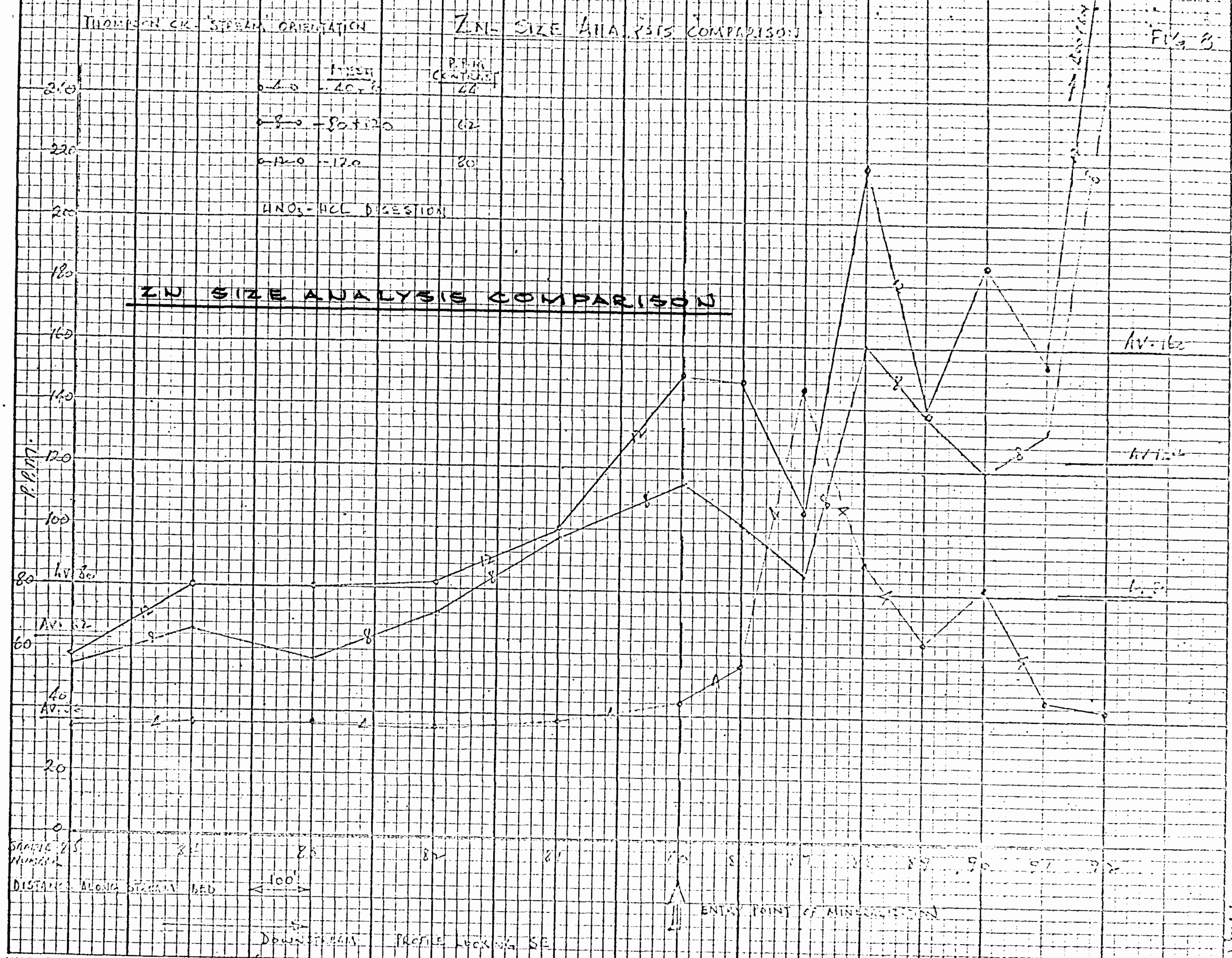
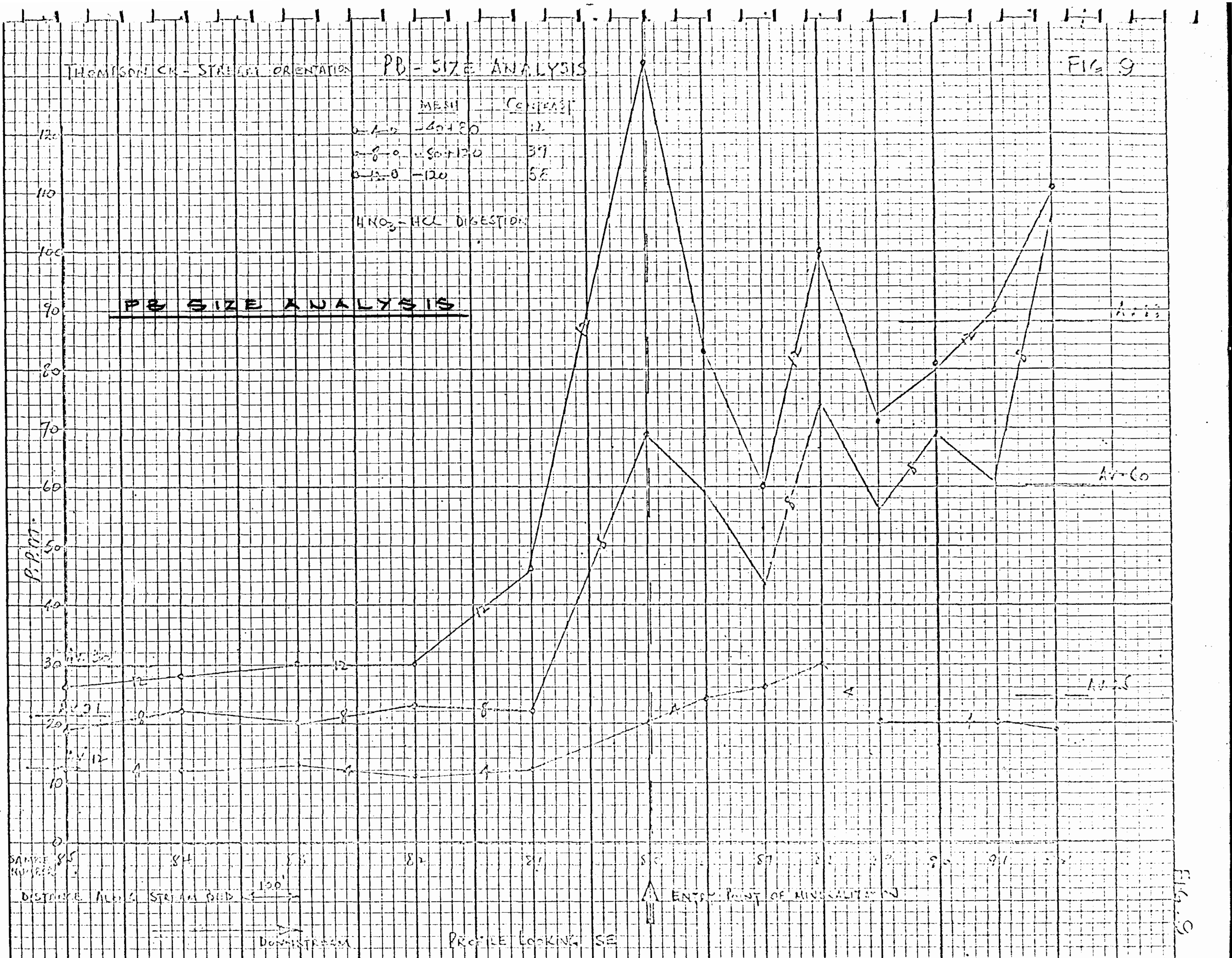
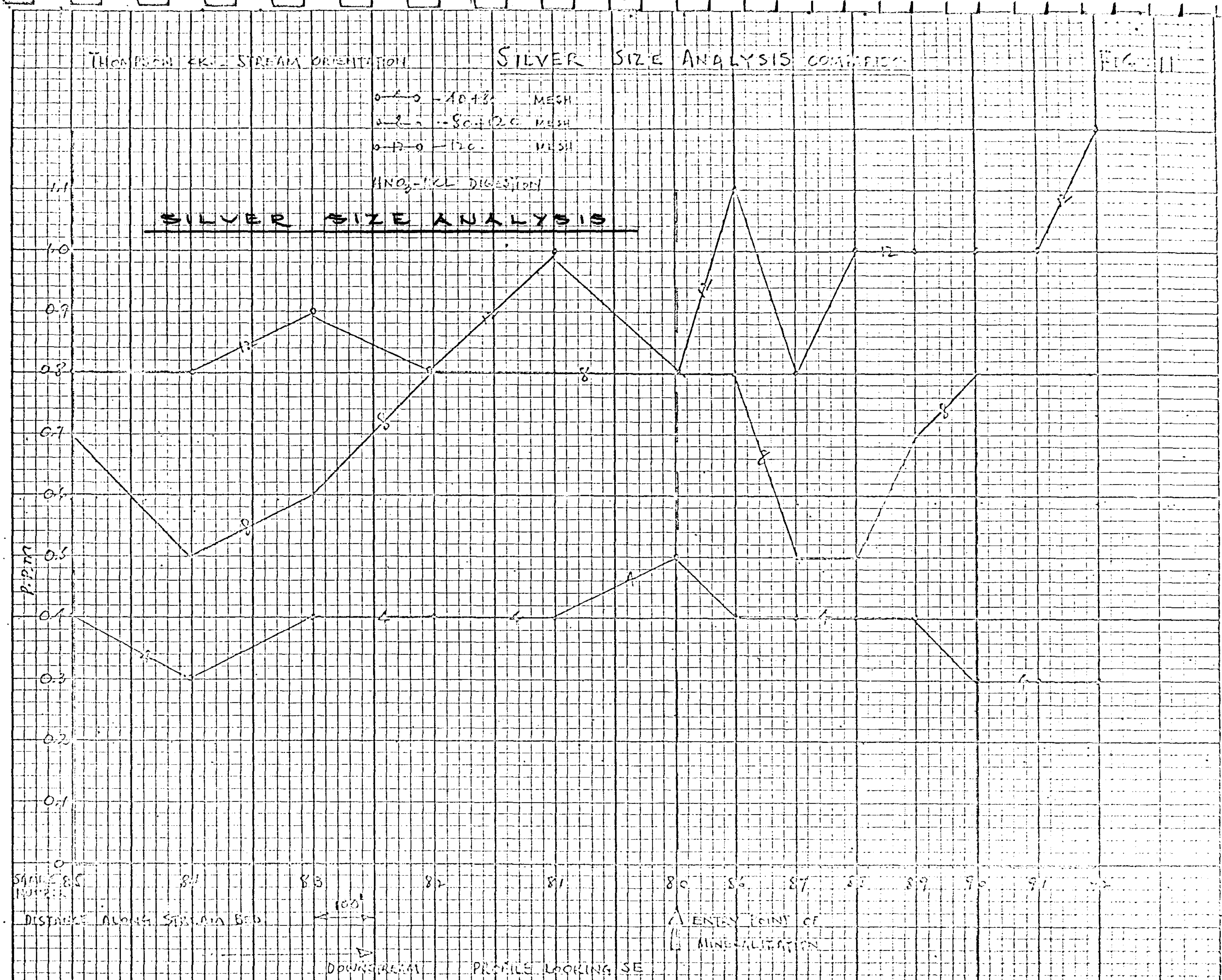

THOMPSON CK. STREAM ORIENTATION
ZINC SIZE ANALYSIS COMPARISON
FIG. 8
MESH
P.P.M. CONTRAST
-40+80 44
-80+120 62
-120 80
HNO_3 - HCL DIGESTION
ZN SIZE ANALYSIS COMPARISON
P.P.M.
SAMPLE NUMBER
DISTANCE ALONG STREAM BED
100'
ENTRY POINT OF MINERALIZATION
DOWNSTREAM PROFILE LOOKING SE

FIG. 8


PB - SIZE ANALYSIS
FIG 9
MESH
CONTRAST
HNO3 - HCL DIGESTION
PB SIZE ANALYSIS
P.P.M.
120
110
100
90
80
70
60
50
40
30
10
0
AV 60
SAMPLE NUMBER
85
84
82
81
DISTANCE ALONG STREAM BED
100'
ENTRY POINT OF MINERALIZATION
DOWNSTREAM
PROFILE LOOKING SE

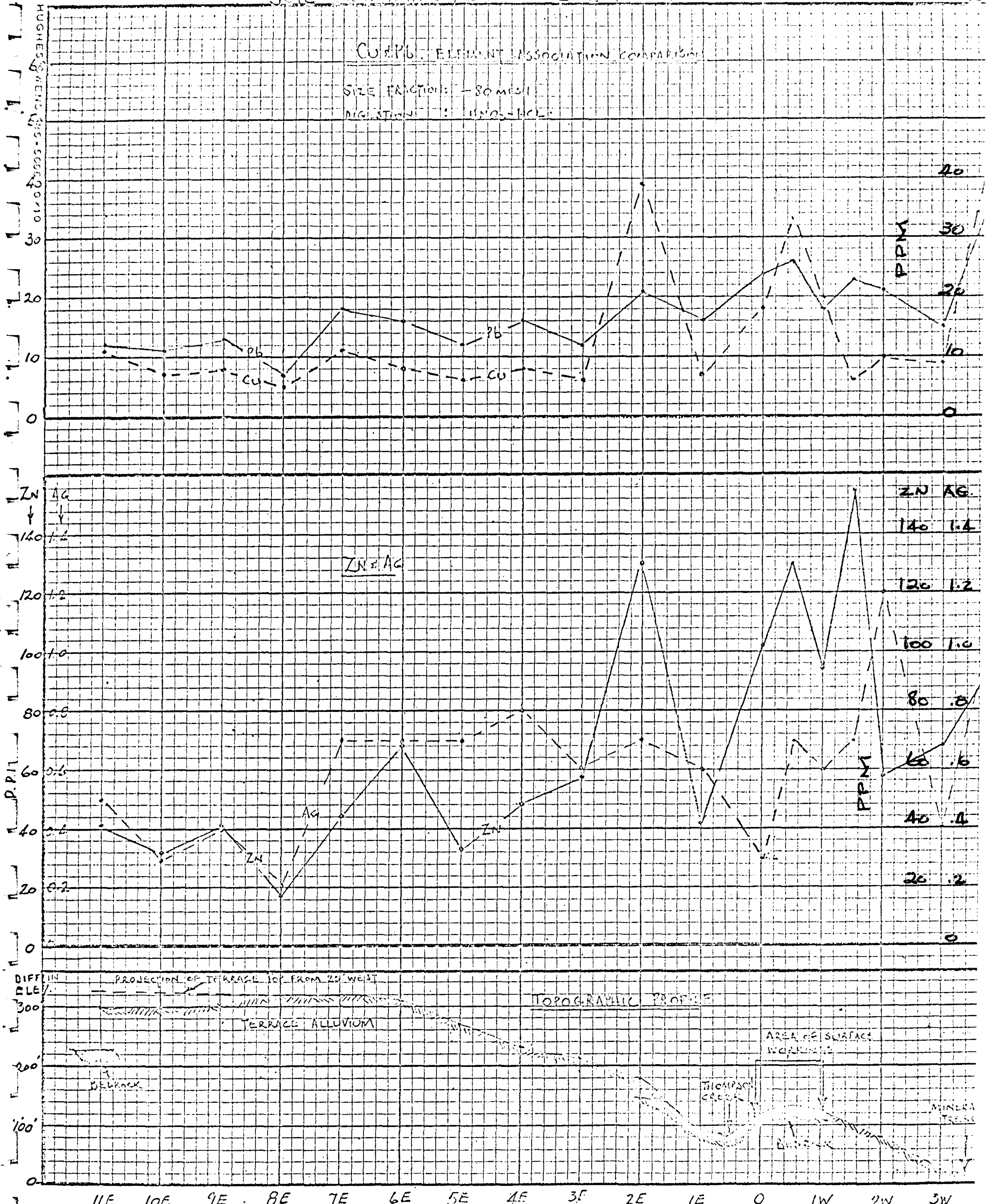
HUGHES OWENS 335-5066 10×10



HUGHES OWENS 335-5066 10×10

SOIL ORIENTATION PROFILE - LINE 1000 S

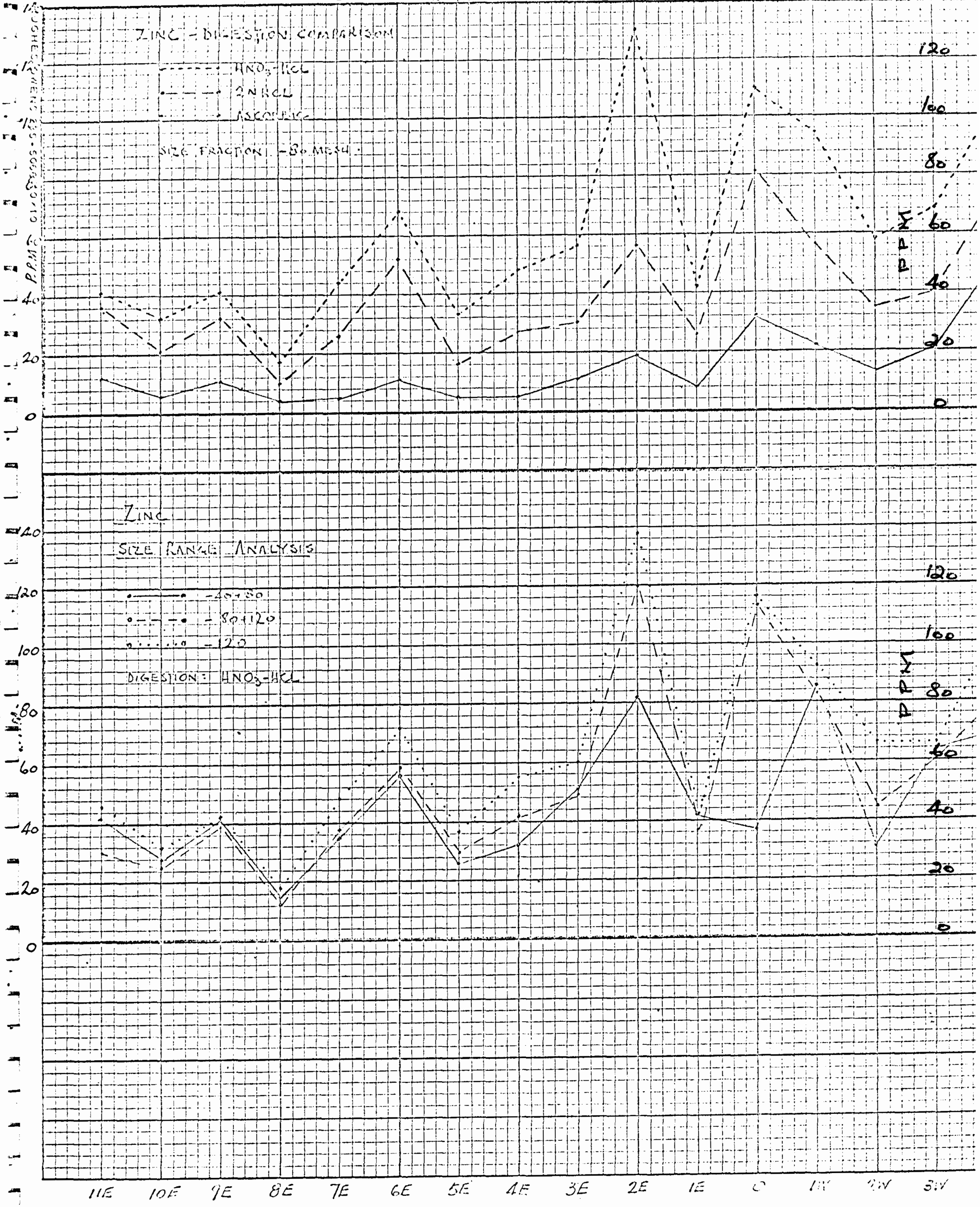
FIG. 17



PROFILE LOOKING SE

SOIL ORIENTATION PROFILE. LINE 1000S

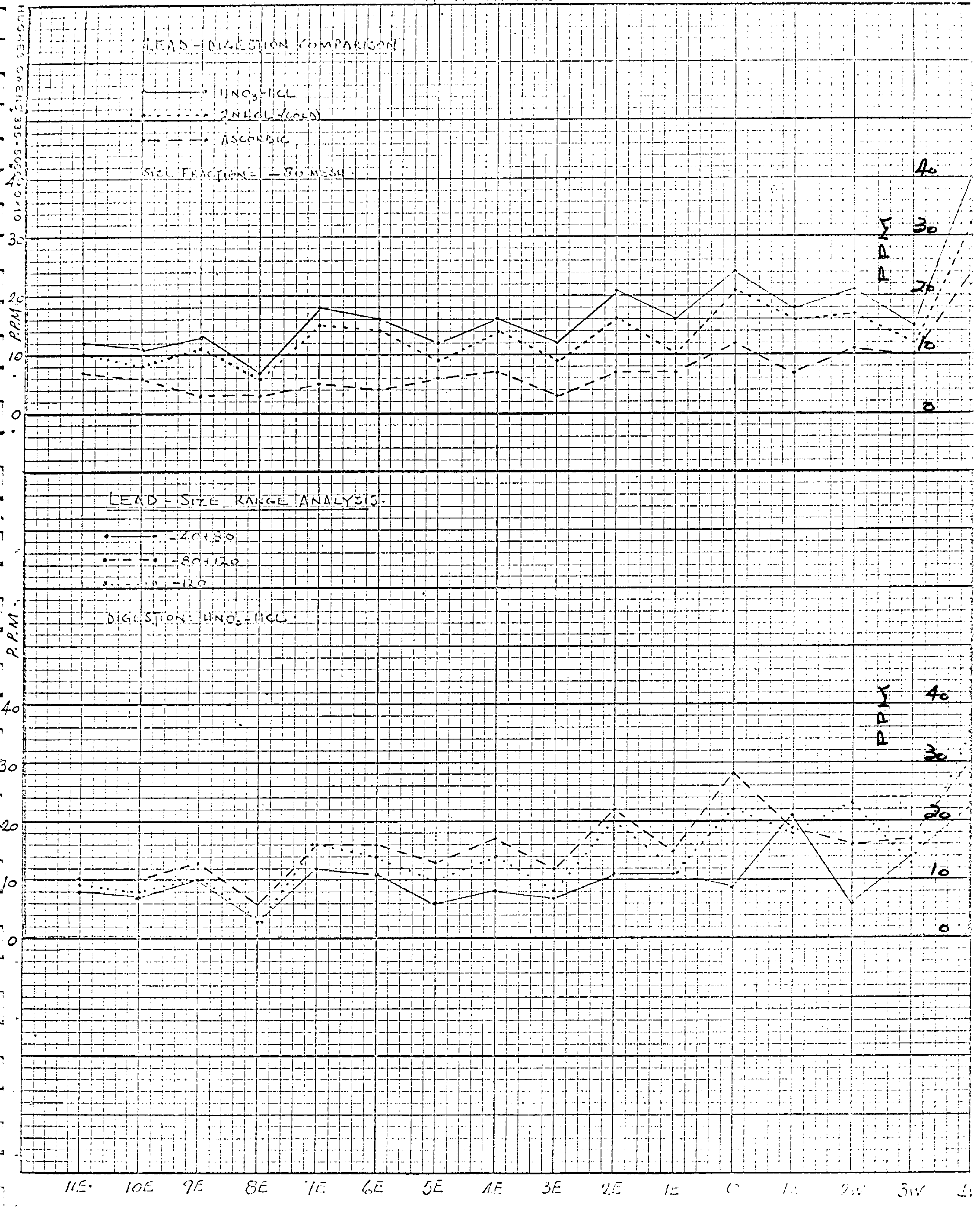
FIG 13



PROFILE LOOKING SE

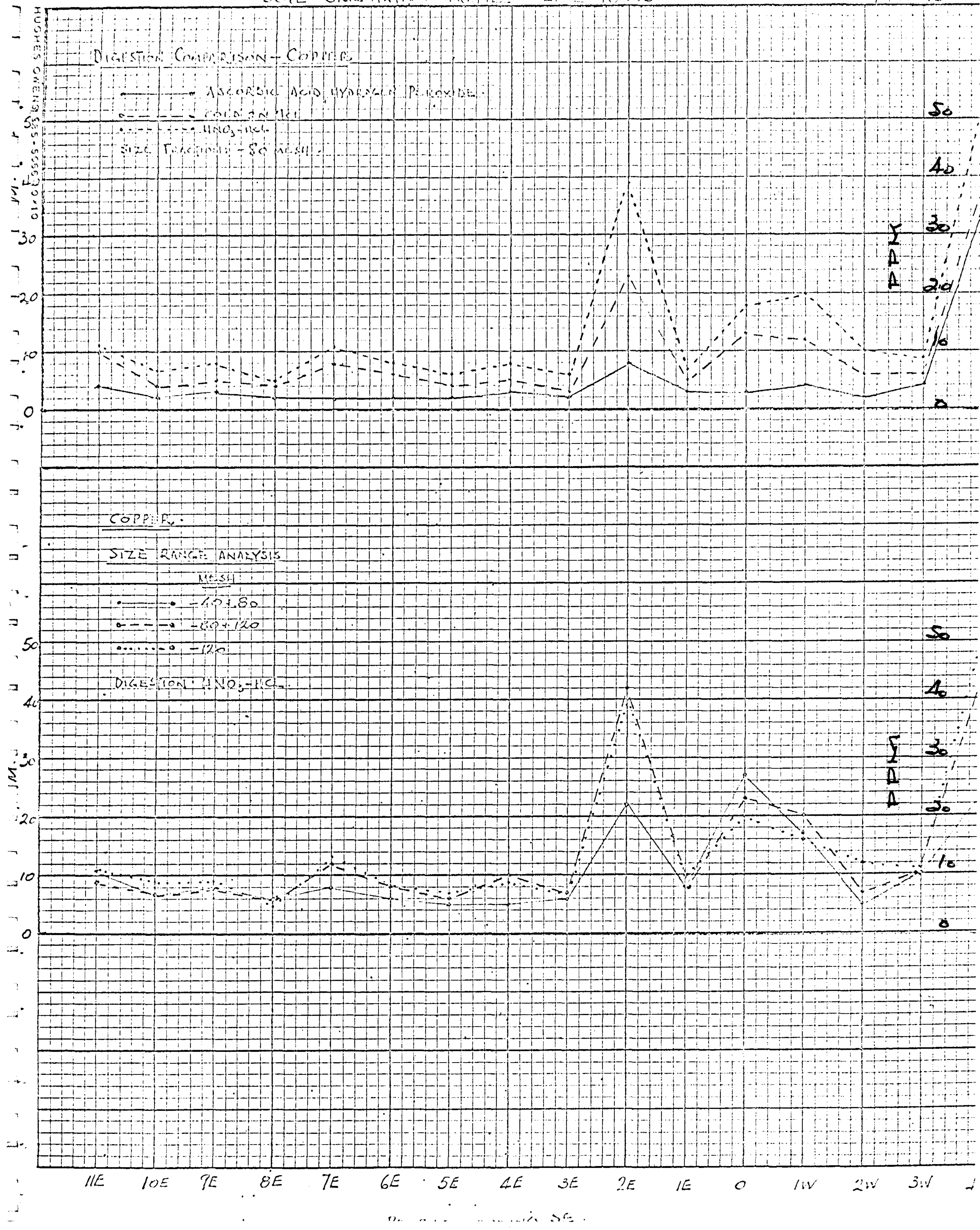
SOIL ORIENTATION PROFILE LINE 1000S

FIG. 14



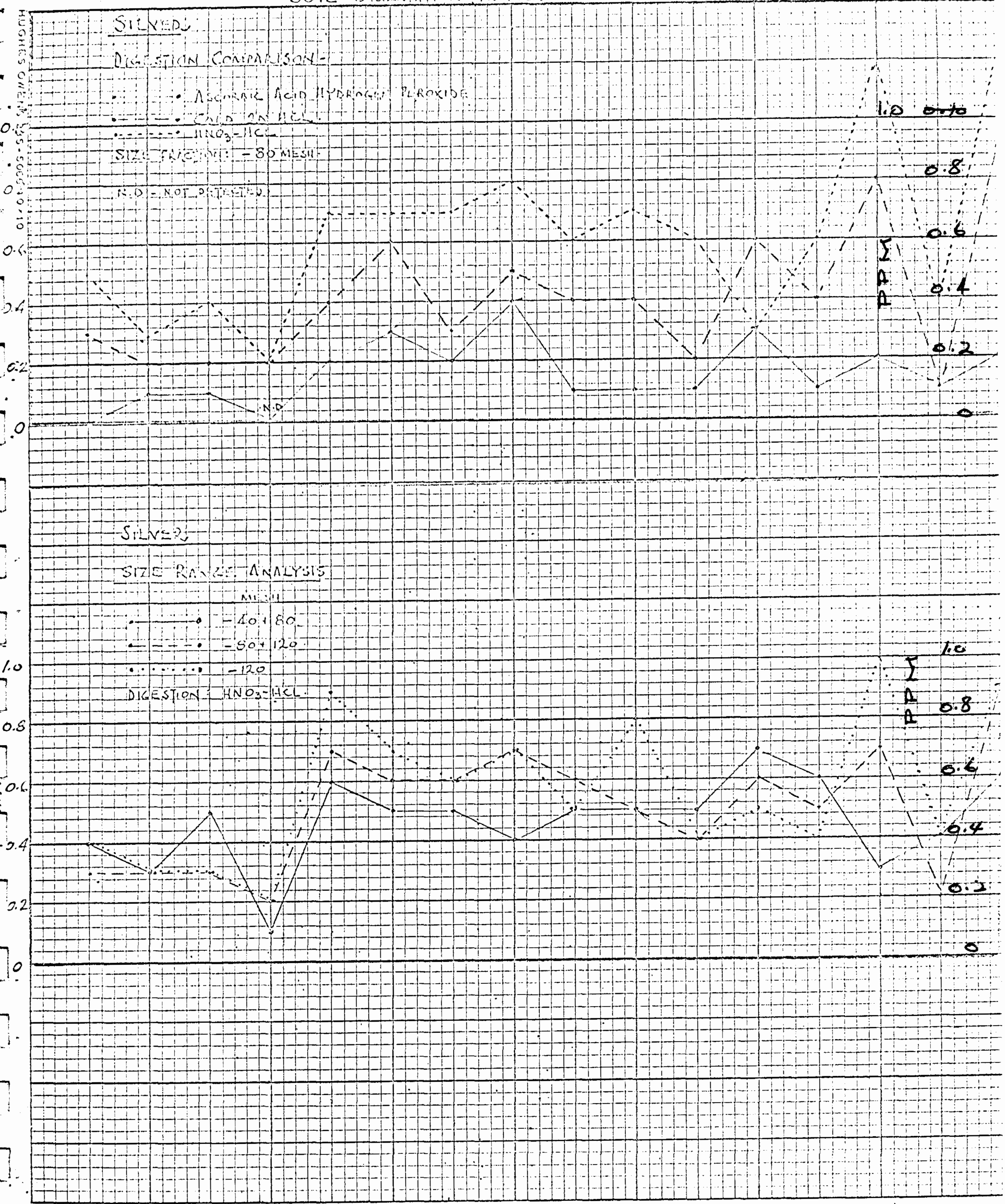
SOIL ORIENTATION PROFILE - LINE 1000S

FIG. 15



SOIL ORIENTATION PROFILE LINE 1000S

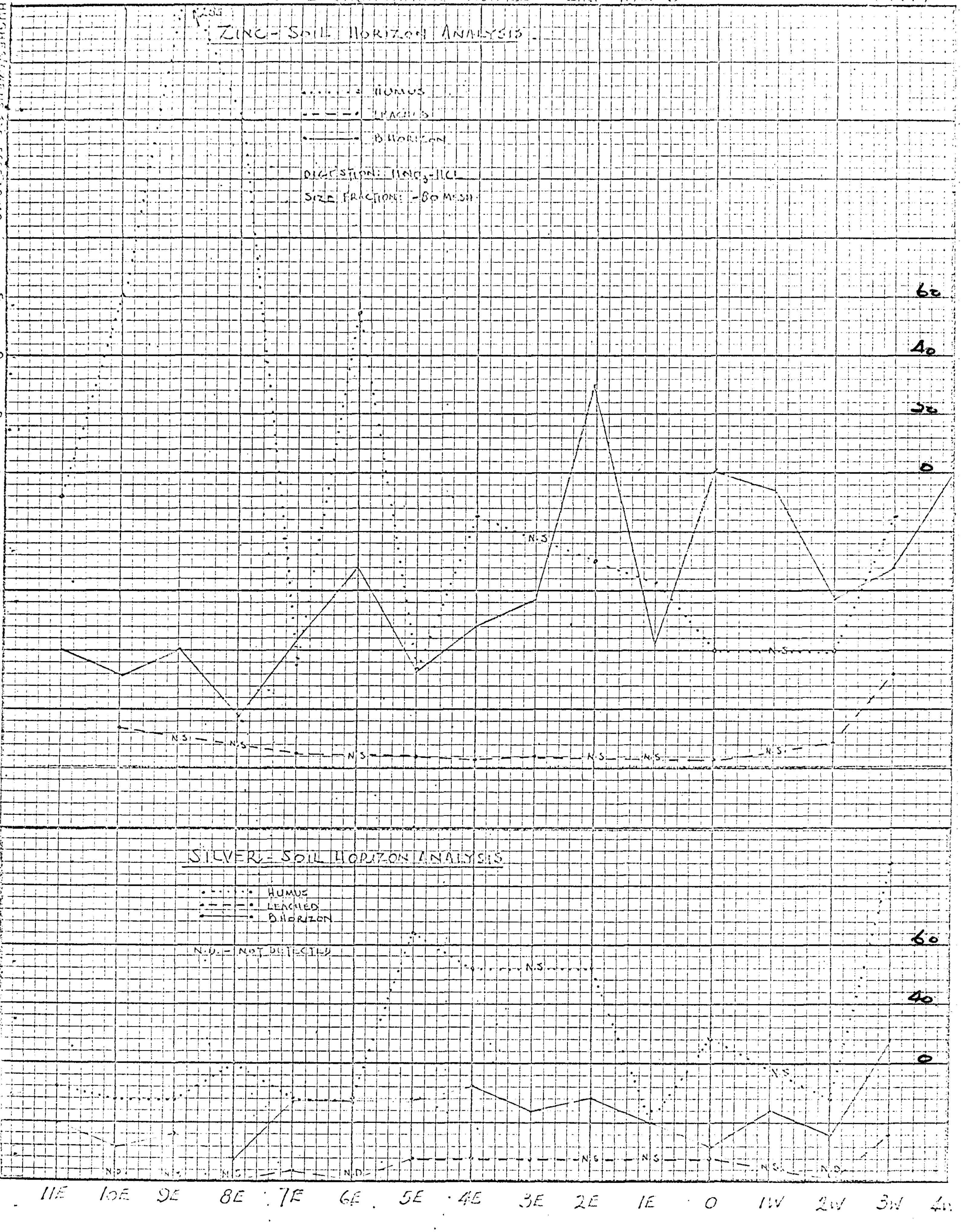
FIG. 16



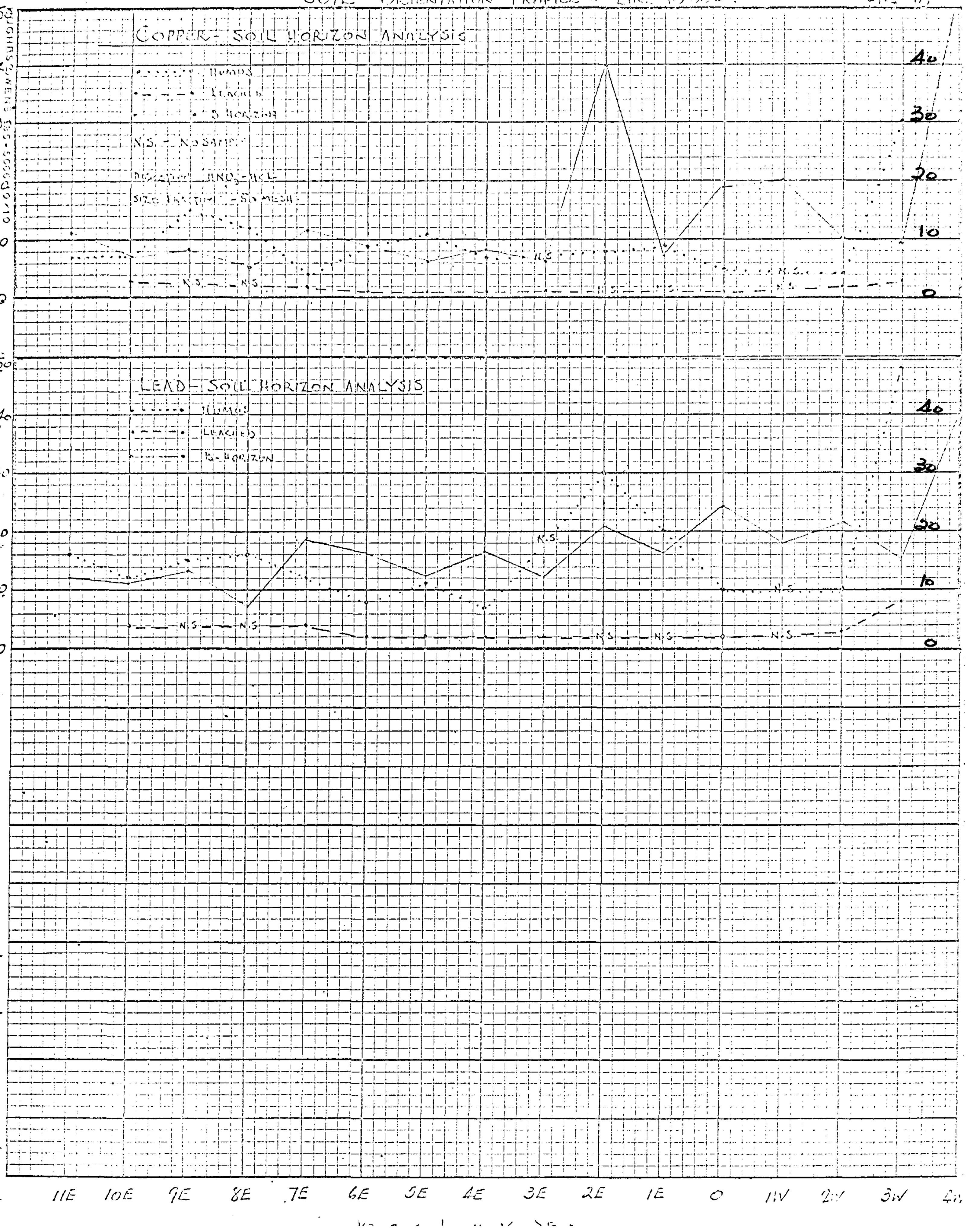
PROFILE LOOKING SE.

Soil Orientation Profile - Line 1000 S

Fig. 17

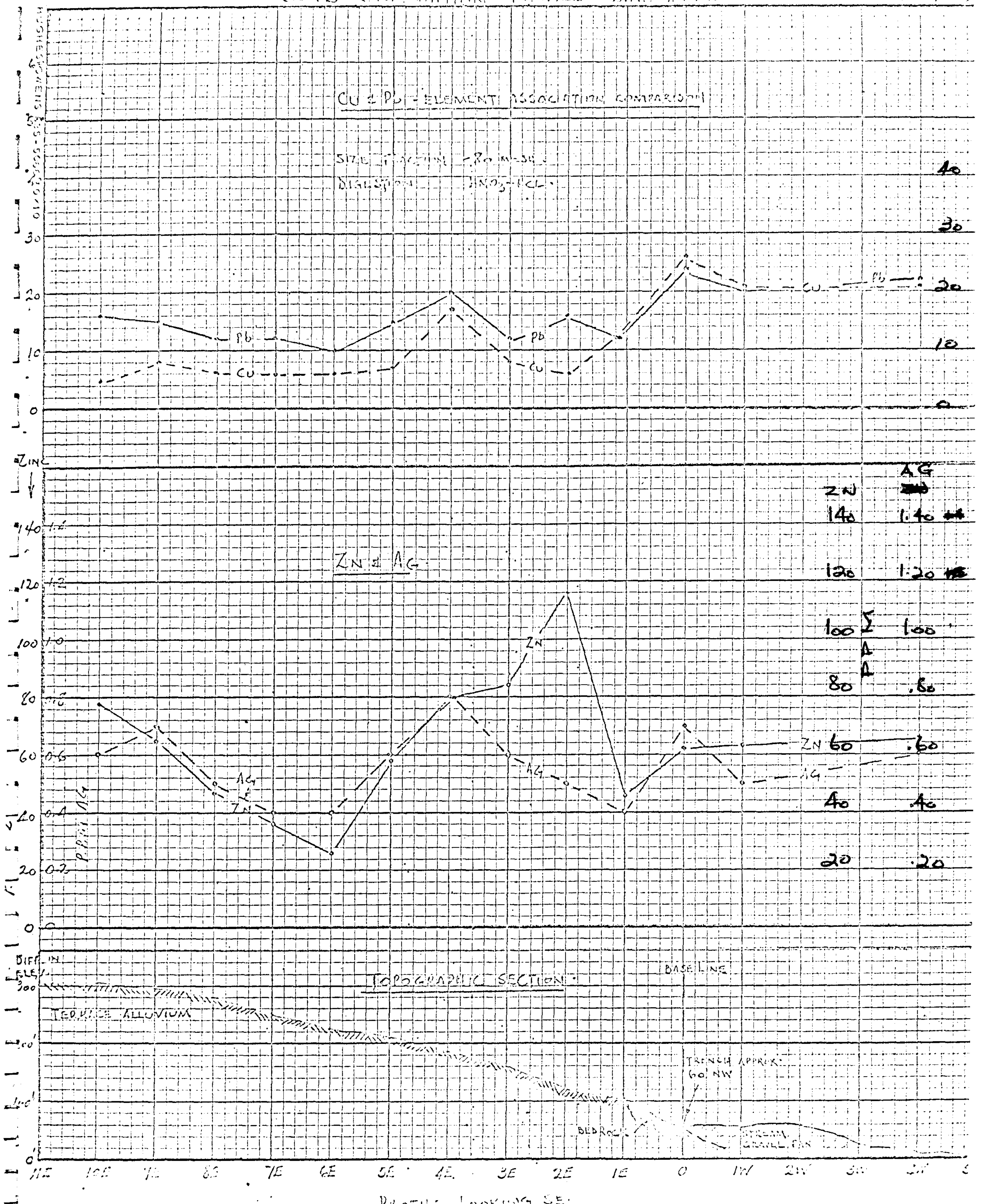


SOIL ORIENTATION PROFILE - LINE 1000 S. FIG. 18



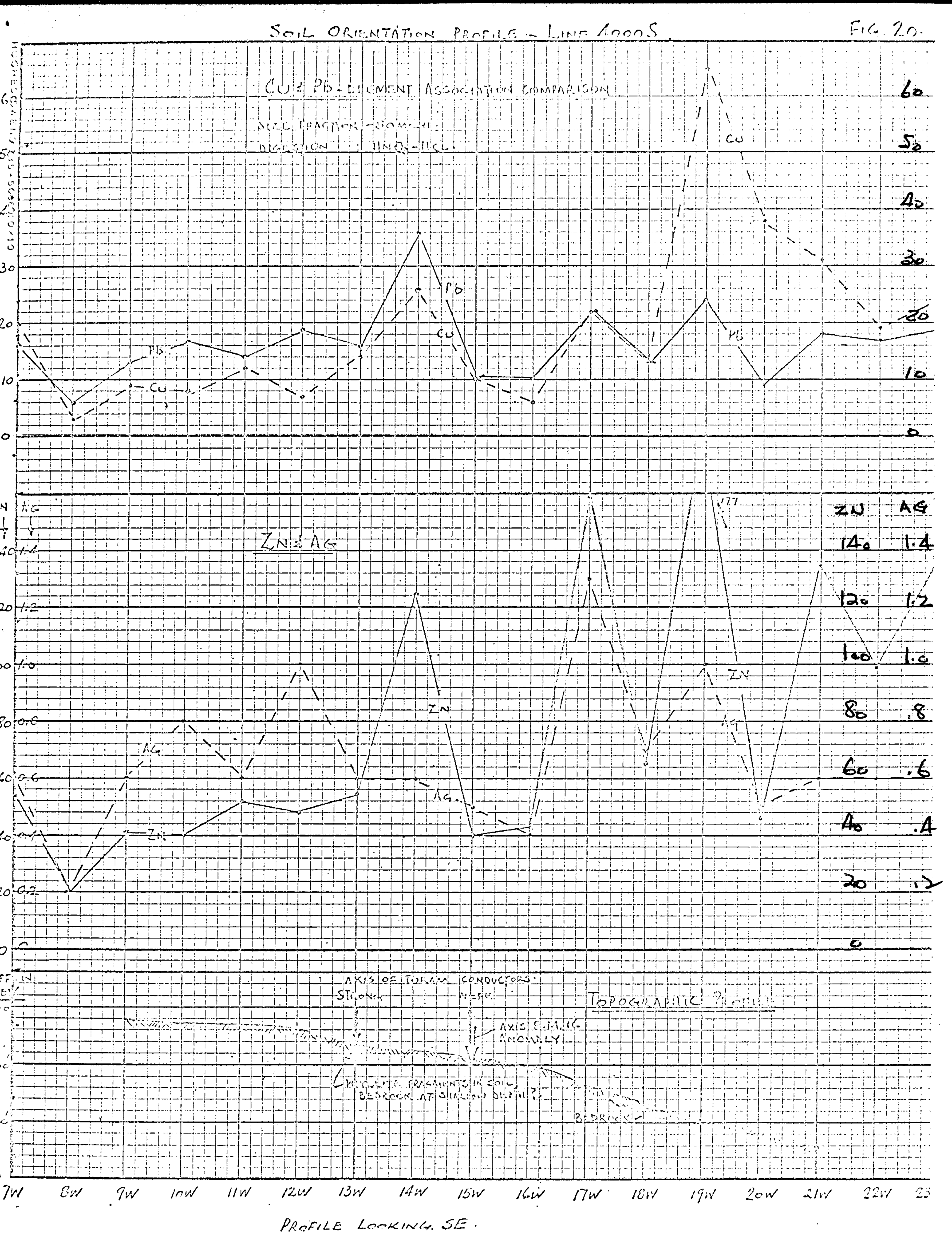
SOIL ORIENTATION PROFILE - LINE 200 S.

FIG. 19



PROFILE LOOKING SE.

Fig. 20.


Soil Orientation Profile - Line 1000S.
Cu & Pb - Element Association Comparison
Zn & Ag
Zn
Ag
Cu
Pb
Axis of Turam Conductors
Strong
Weak
Axis of Mag Anomaly
Topographic Profile
Bedrock
7W
8W
9W
10W
11W
12W
13W
14W
15W
16W
17W
18W
19W
20W
21W
22W
60
50
40
30
20
10
0
140
120
100
80
60
40
20
1.4
1.2
1.0
.8
.6
.4
Profile Looking SE.

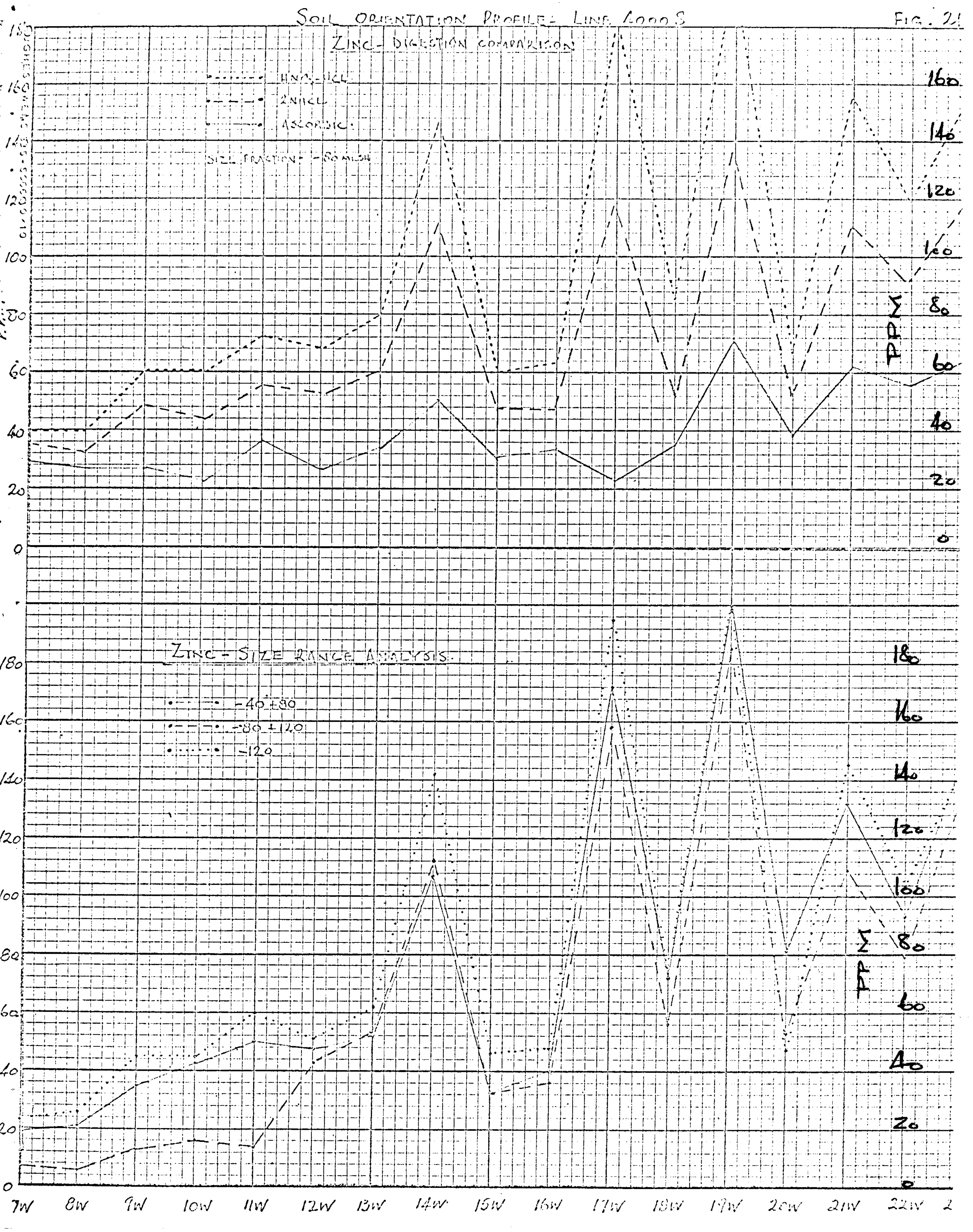
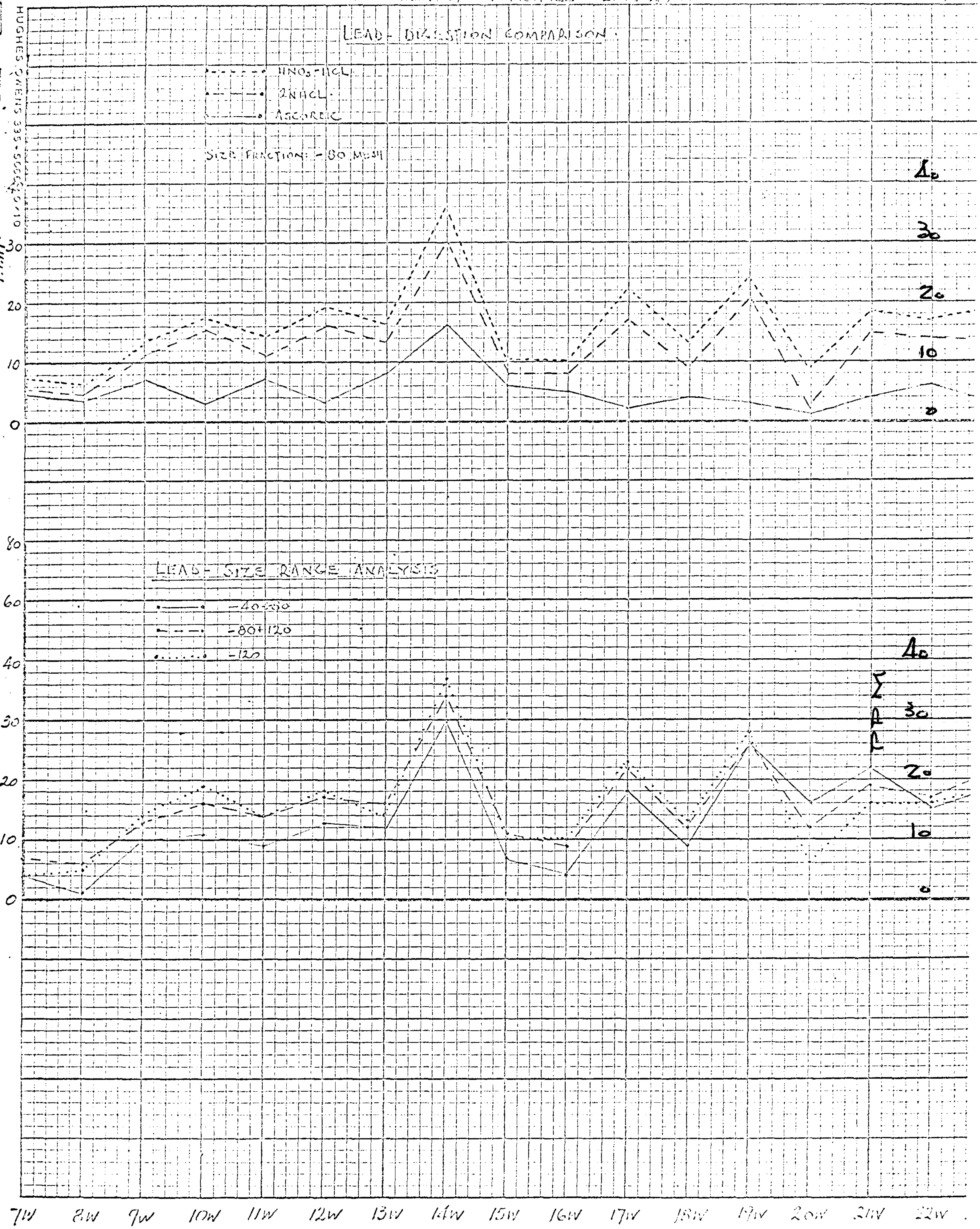

SOIL ORIENTATION PROFILE - LINE 6000 S
ZINC - DIGESTION COMPARISON
HNO_3-HCL
2N HCL
ASCORBIC
SIZE FRACTION - -80 MESH
PPM
ZINC - SIZE RANGE ANALYSIS
-40 +80
-80 +120
-120
PPM
7W
8W
9W
10W
11W
12W
13W
14W
15W
16W
17W
18W
19W
20W
21W
22W

FIG. 21

SOIL ORIENTATION PROFILE - LINE 1000 S

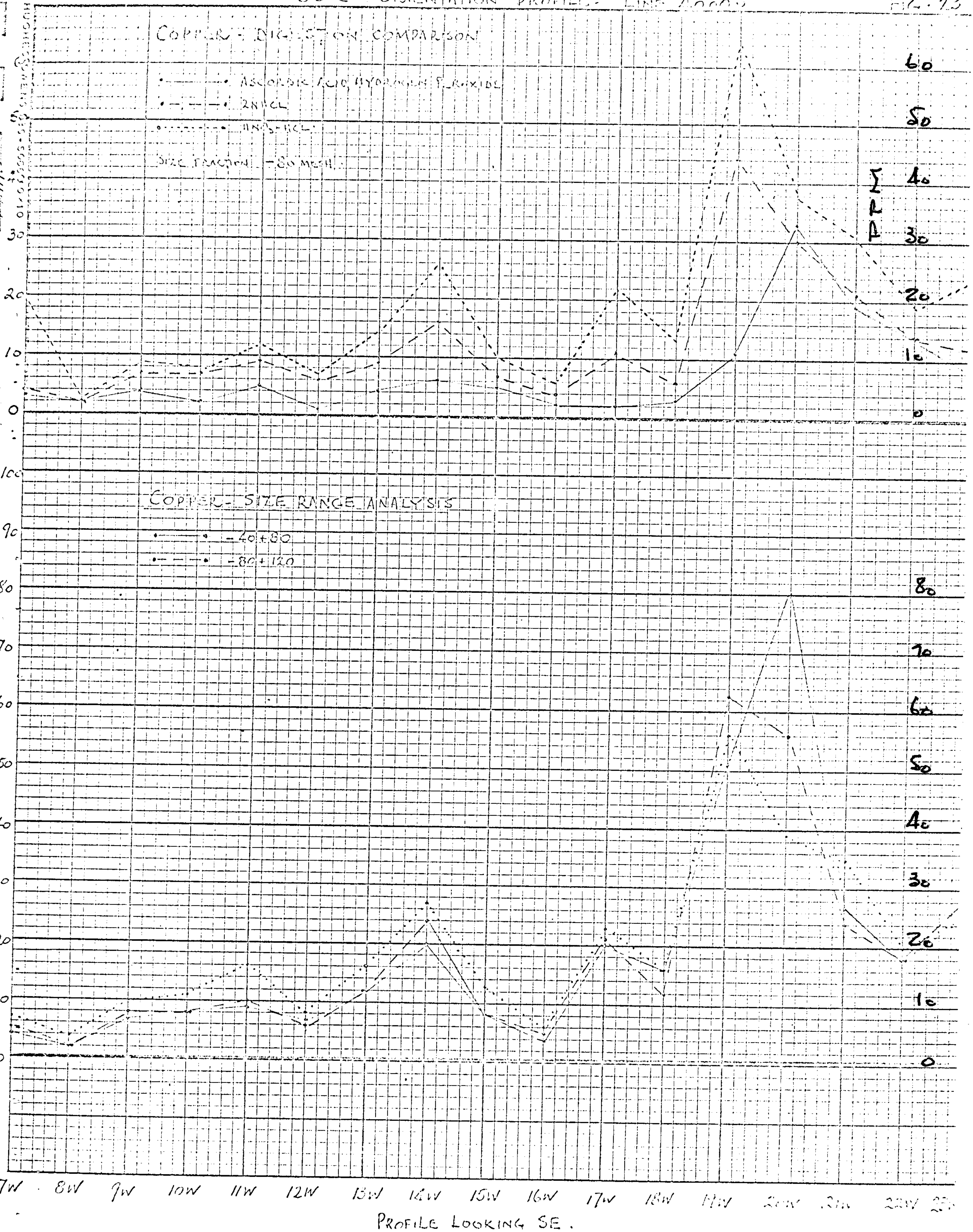
FIG. 22



PROFILE LOOKING SE.

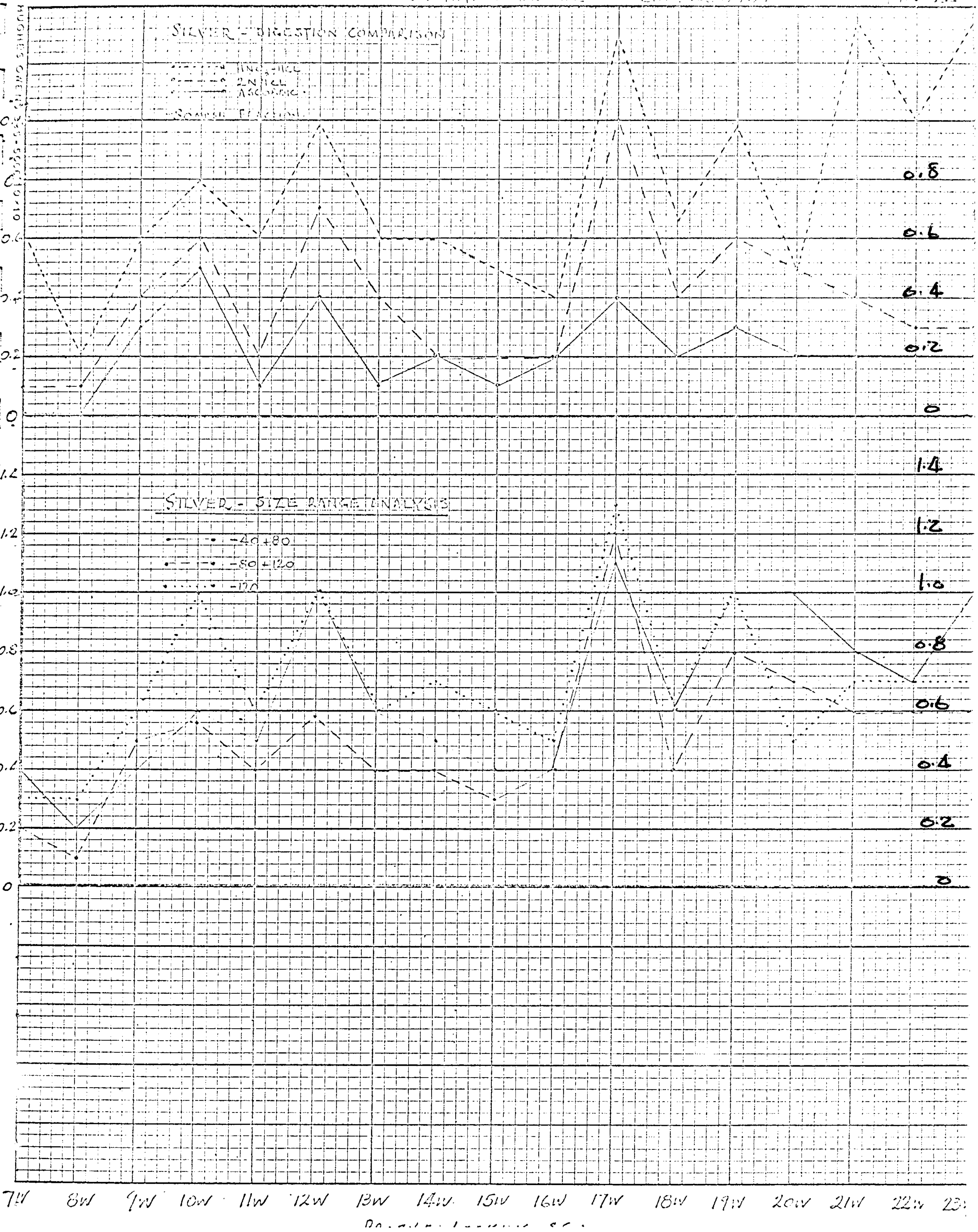
SOIL ORIENTATION PROFILE - LINE 4000 S

FIG. 23



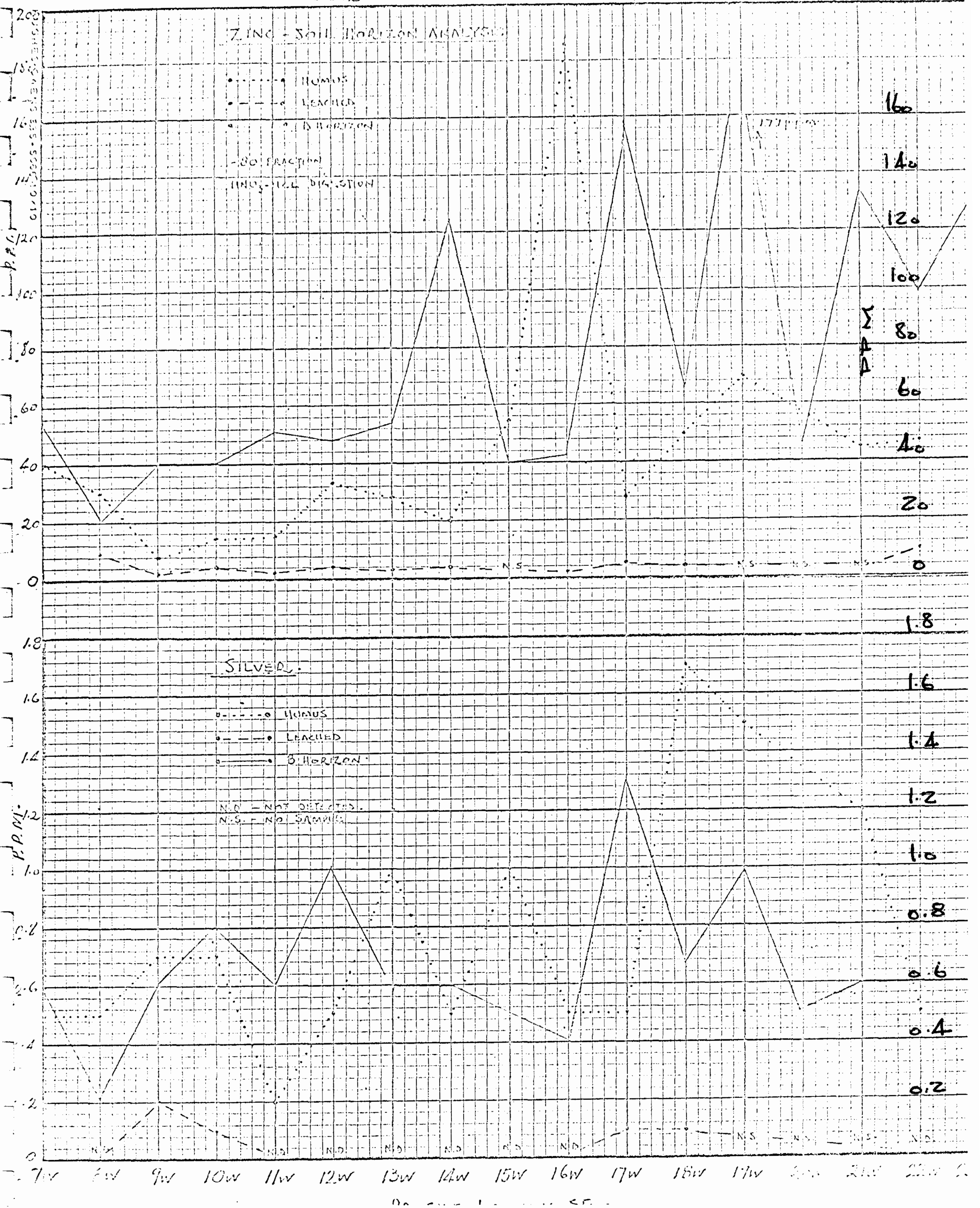
PROFILE LOOKING SE.

Soil Orientation Profile Line 4000S. Fig. 24

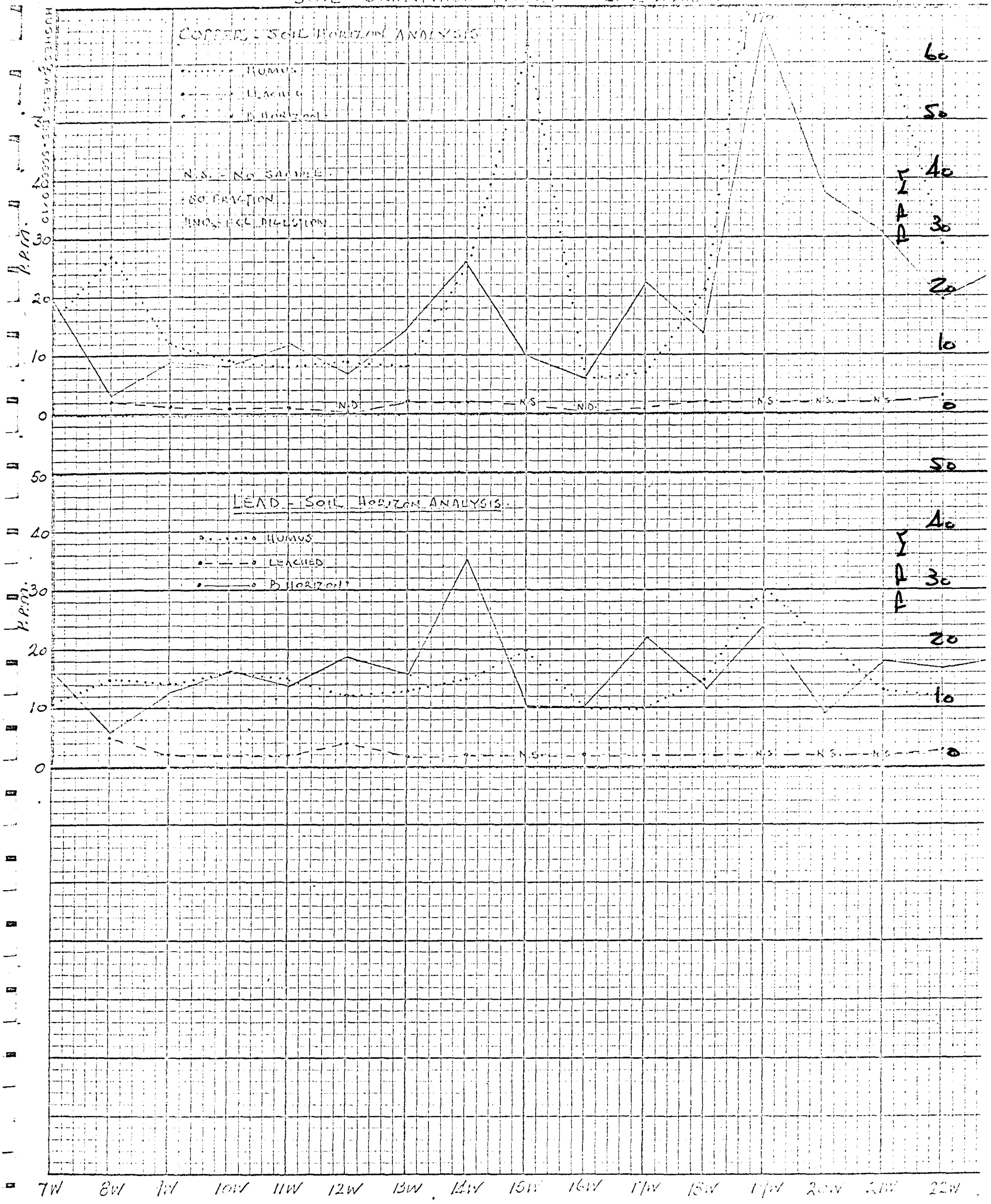


SOIL ORIENTATION PROFILE - LINE 1000 S

FIG 25

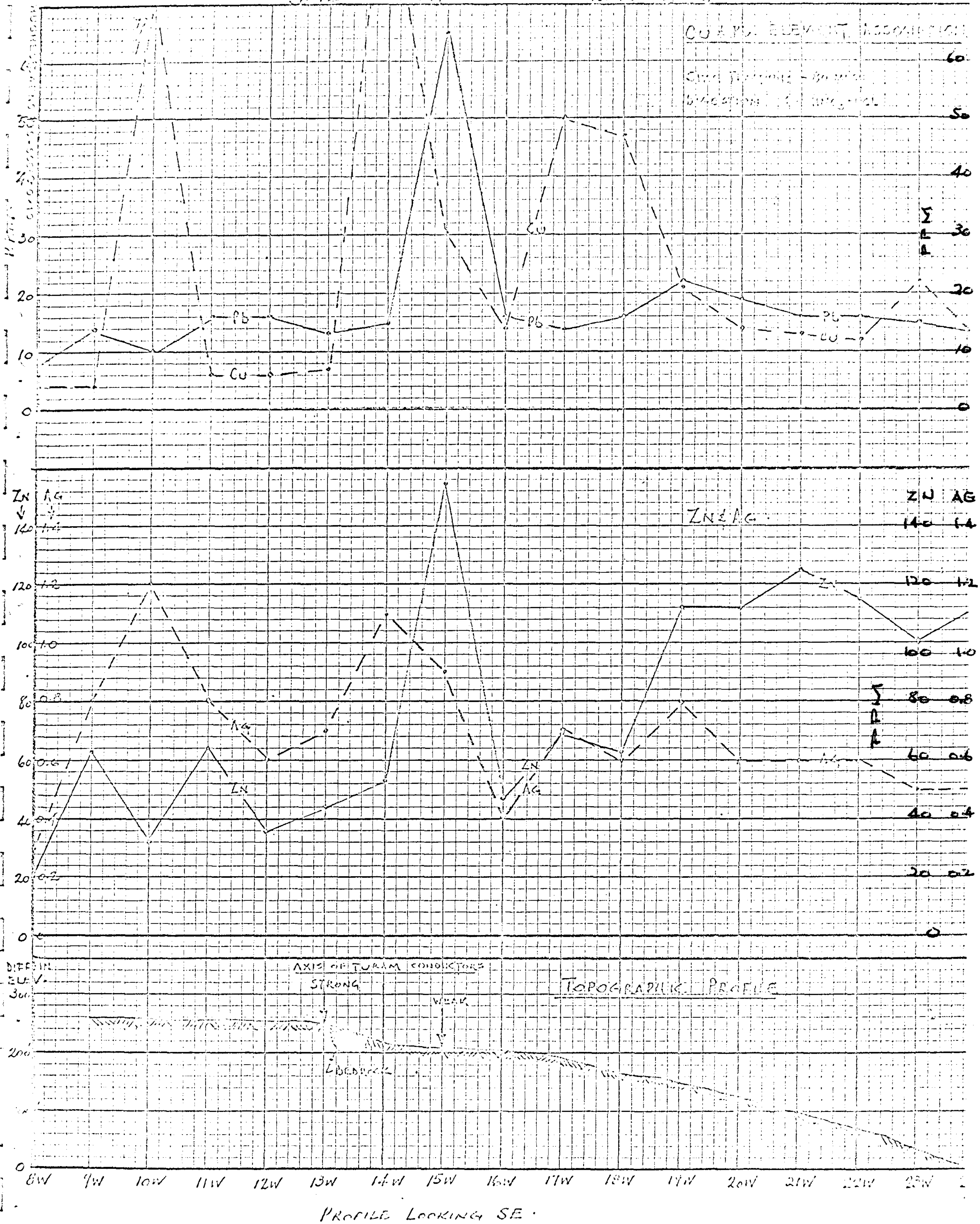


SOIL ORIENTATION PROFILE - LINE 1000S. Fig. 26



PROFILE LOOKING SE.

SOIL ORIENTATION PROFILE - LINE A2+00 S   FIG. 2



PROFILE LOOKING SE.

FIG. 28

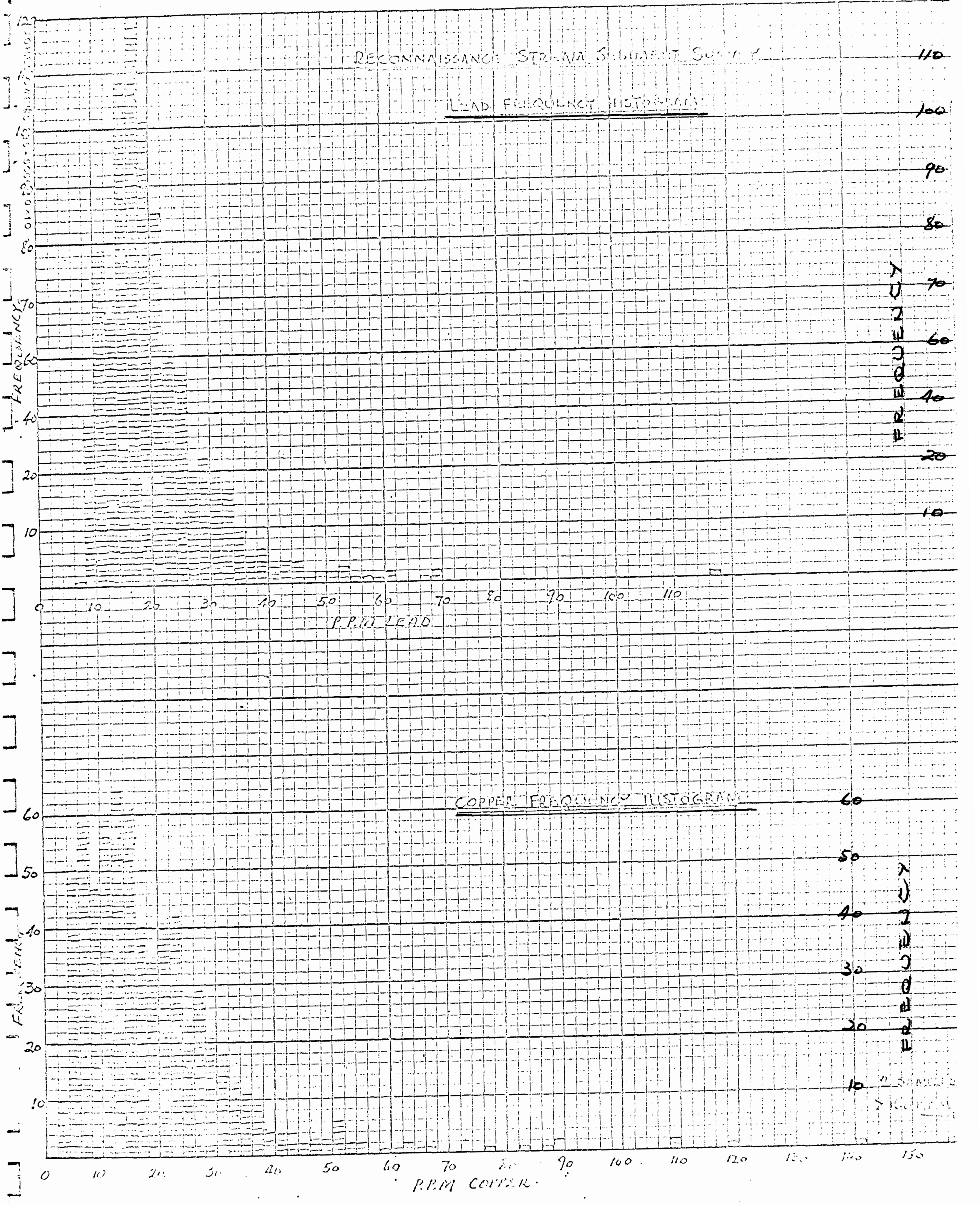
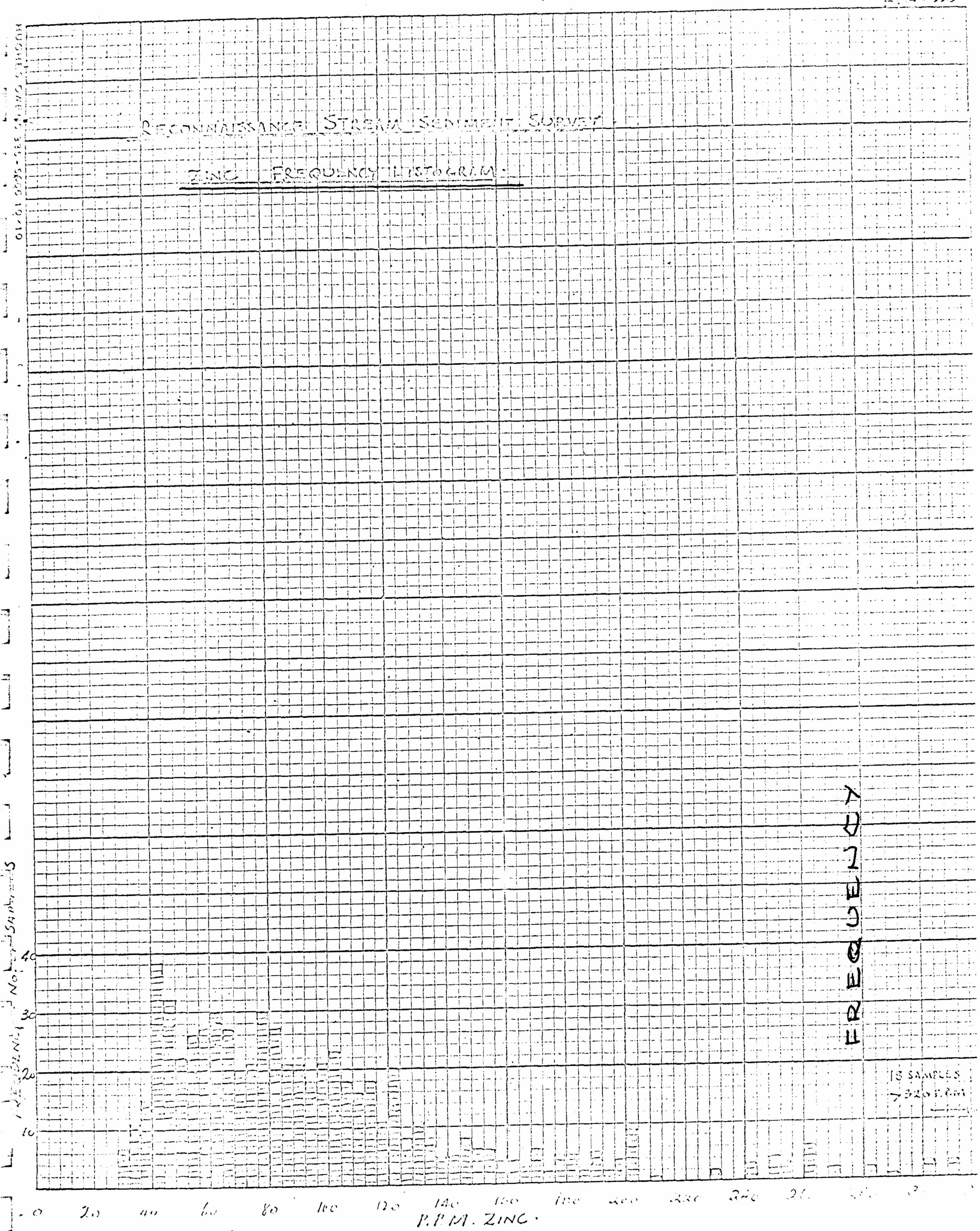

RECONNAISSANCE STREAM SEDIMENT SURVEY
LEAD FREQUENCY HISTOGRAM
FREQUENCY
P.P.M LEAD
COPPER FREQUENCY HISTOGRAM
FREQUENCY
P.P.M COPPER

FIG. 23

RECONNAISSANCE STREAM SEDIMENT SURVEY

ZINC FREQUENCY HISTOGRAM



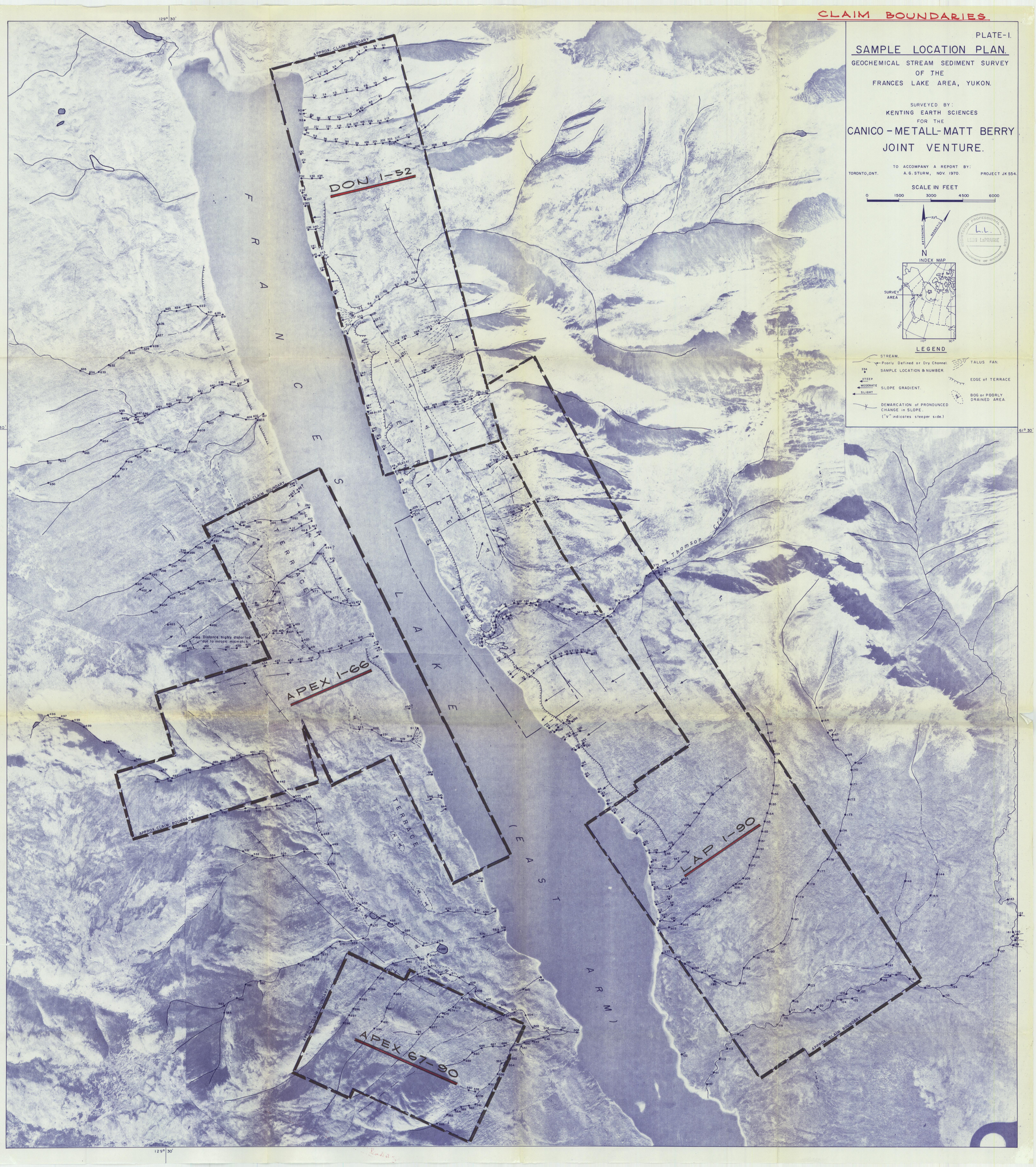

CLAIM BOUNDARIES
PLATE-I.
SAMPLE LOCATION PLAN.
GEOCHEMICAL STREAM SEDIMENT SURVEY
OF THE
FRANCES LAKE AREA, YUKON.
SURVEYED BY:
KENTING EARTH SCIENCES
FOR THE
CANICO - METALL - MATT BERRY
JOINT VENTURE.
TO ACCOMPANY A REPORT BY:
TORONTO, ONT.
A. G. STURM, NOV. 1970.
PROJECT JK 554.
SCALE IN FEET
0
1500
3000
4500
6000
33°
ASTRONOMIC
MAGNETIC
N
REGISTERED PROFESSIONAL ENGINEER
LEON LaPRAIRIE
PROVINCE OF ONTARIO
INDEX MAP
SURVEY AREA
LEGEND
STREAM.
Poorly Defined or Dry Channel.
SAMPLE LOCATION & NUMBER.
STEEP
MODERATE
SLIGHT
SLOPE GRADIENT.
DEMARCATION of PRONOUNCED CHANGE in SLOPE.
("V" indicates steeper side.)
TALUS FAN.
EDGE of TERRACE
BOG or POORLY DRAINED AREA.
61° 30'
129° 30'
DON 1-52
APEX 1-66
APEX 67-90
LAP 1-90
FRANCES
LAKE
(EAST ARM)
TERRACE
Thomson Creek
APPROX. CLAIM BOUNDARY


PLATE - 2.
COPPER ANALYSIS PLAN.
GEOCHEMICAL STREAM SEDIMENT SURVEY
OF THE
FRANCES LAKE AREA, YUKON.
SURVEYED BY:
KENTING EARTH SCIENCES
FOR THE
CANICO - METALL - MATT BERRY
JOINT VENTURE.
TO ACCOMPANY A REPORT BY:
TORONTO, ONTARIO.
A. G. STURM, NOV. 1970.
PROJECT No. JK 554.
SCALE IN FEET
0 1500 3000 4500 6000
LEGEND
GEOCHEMICAL
SAMPLE LOCATION SITE WITH Cu ANALYSIS IN PARTS PER MILLION.
CONTOUR INTERVAL OF 10 p.p.m. STARTING AT 20 p.p.m.
GEOLOGY
1a 1b GRAPHITIC, BLACK PHYLLITE (1a) SAME BUT CALCAREOUS (1b).
2 SIMILAR TO 1 BUT SOFTER.
3 QUARTZ - SERICITE AUGEN. SCHIST.
4 HORNFELS.
5 CALC - PHYLLITES, IN PART WITH LIMESTONE.
6 INTERMEDIATE VOLCANICS.
7 LIMESTONE.
8 GRAYWACKE.
9 GRANITE AND OTHER ACID INTRUSIVES.
FAULT.
GEOLOGICAL BOUNDARY OBSERVED, INFERRED.
X MINERALIZED SHOWING.
MORPHOLOGY
STREAM.
POORLY DEFINED OR DRY CHANNEL.
DEMARCATION OF PRONOUNCED CHANGE IN SLOPE. ("V" INDICATES STEEPER SIDE.)
TALUS FAN.
EDGE OF TERRACE.
BOG OR POORLY DRAINED AREA.
STEEP
MODERATE
SLIGHT
SLOPE GRADIENT.
TOPOGRAPHIC BASE : Uncontrolled photomosaic.
GEOLOGICAL BASE : From a geological map by H. Thalenhorst.
GEOCHEMICAL DATA : ANALYSIS: By Bondar - Clegg laboratory, Ottawa, Ont. Cu, Pb and Zn digestion by nitric - hydrochloric acid; determination by atomic absorption.
SIZE FRACTION: All samples, minus 80 mesh.
SAMPLE COLLECTION : September - October 1970.
INDEX MAP
SURVEY AREA
N
FRANCES LAKE
(EAST ARM)
Thomson Creek
FAULT 2
Py, Po, Cpy
129° 30'
61° 30'

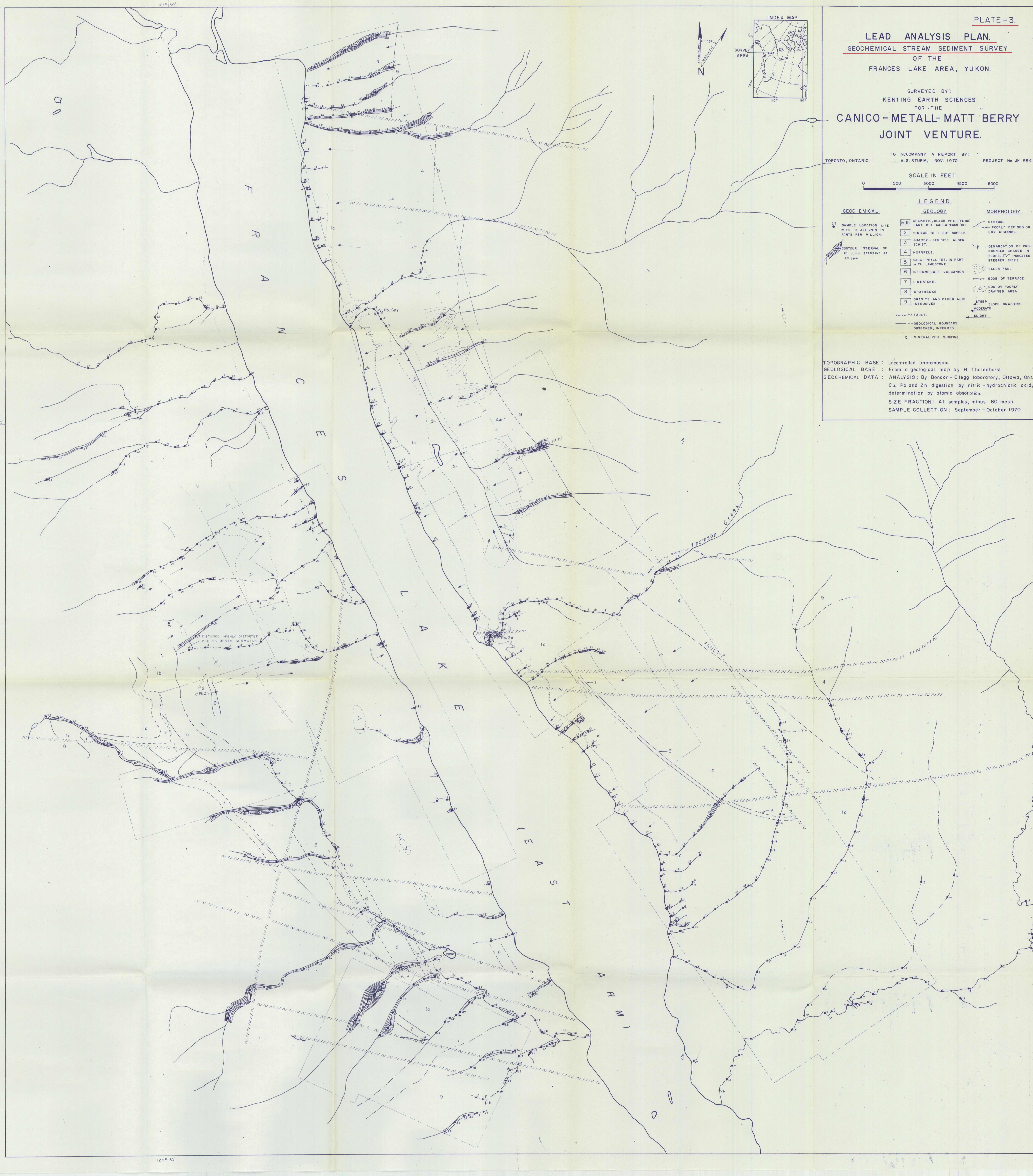


PLATE-3.
LEAD ANALYSIS PLAN.
GEOCHEMICAL STREAM SEDIMENT SURVEY
OF THE
FRANCES LAKE AREA, YUKON.
SURVEYED BY:
KENTING EARTH SCIENCES
FOR THE
CANICO-METALL-MATT BERRY
JOINT VENTURE.
TO ACCOMPANY A REPORT BY:
TORONTO, ONTARIO.
A.G. STURM, NOV. 1970.
PROJECT No. JK 554.
SCALE IN FEET
0 1500 3000 4500 6000
LEGEND
GEOCHEMICAL
SAMPLE LOCATION SITE WITH Pb. ANALYSIS IN PARTS PER MILLION.
CONTOUR INTERVAL OF 10 p.p.m. STARTING AT 20 p.p.m.
GEOLOGY
1a 1b GRAPHITIC, BLACK PHYLLITE (1a) SAME BUT CALCAREOUS (1b).
2 SIMILAR TO 1 BUT SOFTER.
3 QUARTZ-SERICITE AUGEN. SCHIST.
4 HORNFELS.
5 CALC-PHYLLITES, IN PART WITH LIMESTONE.
6 INTERMEDIATE VOLCANICS.
7 LIMESTONE.
8 GRAYWACKE.
9 GRANITE AND OTHER ACID INTRUSIVES.
FAULT.
GEOLOGICAL BOUNDARY OBSERVED, INFERRED.
X MINERALIZED SHOWING.
MORPHOLOGY
STREAM.
POORLY DEFINED OR DRY CHANNEL.
DEMARCATION OF PRONOUNCED CHANGE IN SLOPE. ("V" INDICATES STEEPER SIDE.)
TALUS FAN.
EDGE OF TERRACE.
BOG OR POORLY DRAINED AREA.
STEEP
MODERATE
SLIGHT
SLOPE GRADIENT.
TOPOGRAPHIC BASE: Uncontrolled photomosaic.
GEOLOGICAL BASE: From a geological map by H. Thalenhorst.
GEOCHEMICAL DATA: ANALYSIS: By Bondar-Clegg laboratory, Ottawa, Ont. Cu, Pb and Zn digestion by nitric-hydrochloric acid; determination by atomic absorption.
SIZE FRACTION: All samples, minus 80 mesh.
SAMPLE COLLECTION: September-October 1970.
INDEX MAP
SURVEY AREA
N
129° 30'
61° 30'
FRANCES LAKE
(EAST ARM)
Thomson Creek
FAULT ?
DISTANCE HIGHLY DISTORTED DUE TO MOSAIC MISMATCH

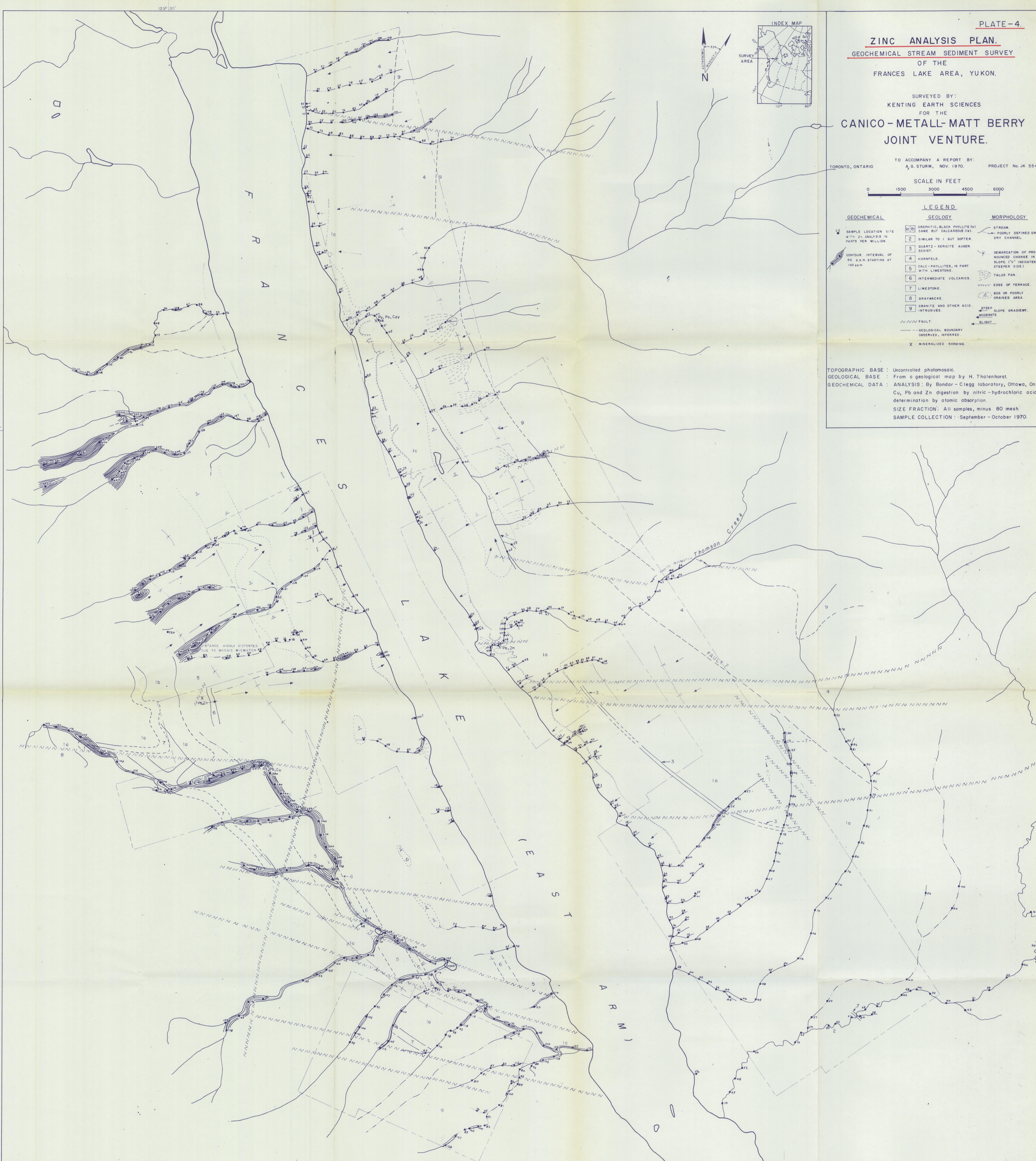


PLATE-4.
ZINC ANALYSIS PLAN.
GEOCHEMICAL STREAM SEDIMENT SURVEY
OF THE
FRANCES LAKE AREA, YUKON.
SURVEYED BY:
KENTING EARTH SCIENCES
FOR THE
CANICO-METALL-MATT BERRY
JOINT VENTURE.
TO ACCOMPANY A REPORT BY:
TORONTO, ONTARIO.
A. G. STURM, NOV. 1970.
PROJECT No. JK 554.
SCALE IN FEET
0 1500 3000 4500 6000
LEGEND
GEOCHEMICAL
SAMPLE LOCATION SITE WITH Zn. ANALYSIS IN PARTS PER MILLION.
CONTOUR INTERVAL OF 50 p.p.m. STARTING AT 100 p.p.m.
GEOLOGY
1a 1b GRAPHITIC, BLACK PHYLLITE (1a) SAME BUT CALCAREOUS (1b).
2 SIMILAR TO 1 BUT SOFTER.
3 QUARTZ-SERICITE AUGEN. SCHIST.
4 HORNFELS.
5 CALC-PHYLLITES, IN PART WITH LIMESTONE.
6 INTERMEDIATE VOLCANICS.
7 LIMESTONE.
8 GRAYWACKE.
9 GRANITE AND OTHER ACID. INTRUSIVES.
FAULT.
GEOLOGICAL BOUNDARY OBSERVED, INFERRED.
X MINERALIZED SHOWING.
MORPHOLOGY
STREAM.
POORLY DEFINED OR DRY CHANNEL.
DEMARCATION OF PRONOUNCED CHANGE IN SLOPE. ("V" INDICATES STEEPER SIDE.)
TALUS FAN.
EDGE OF TERRACE.
BOG OR POORLY DRAINED AREA.
STEEP
MODERATE
SLIGHT
SLOPE GRADIENT.
TOPOGRAPHIC BASE: Uncontrolled photomosaic.
GEOLOGICAL BASE: From a geological map by H. Thalenhorst.
GEOCHEMICAL DATA: ANALYSIS: By Bondar-Clegg laboratory, Ottawa, Ont. Cu, Pb and Zn digestion by nitric-hydrochloric acid; determination by atomic absorption.
SIZE FRACTION: All samples, minus 80 mesh.
SAMPLE COLLECTION: September-October 1970.
INDEX MAP
SURVEY AREA
FRANCES LAKE
(EAST ARM)
Thomson Creek
FAULT ?
61° 30'
129° 30'

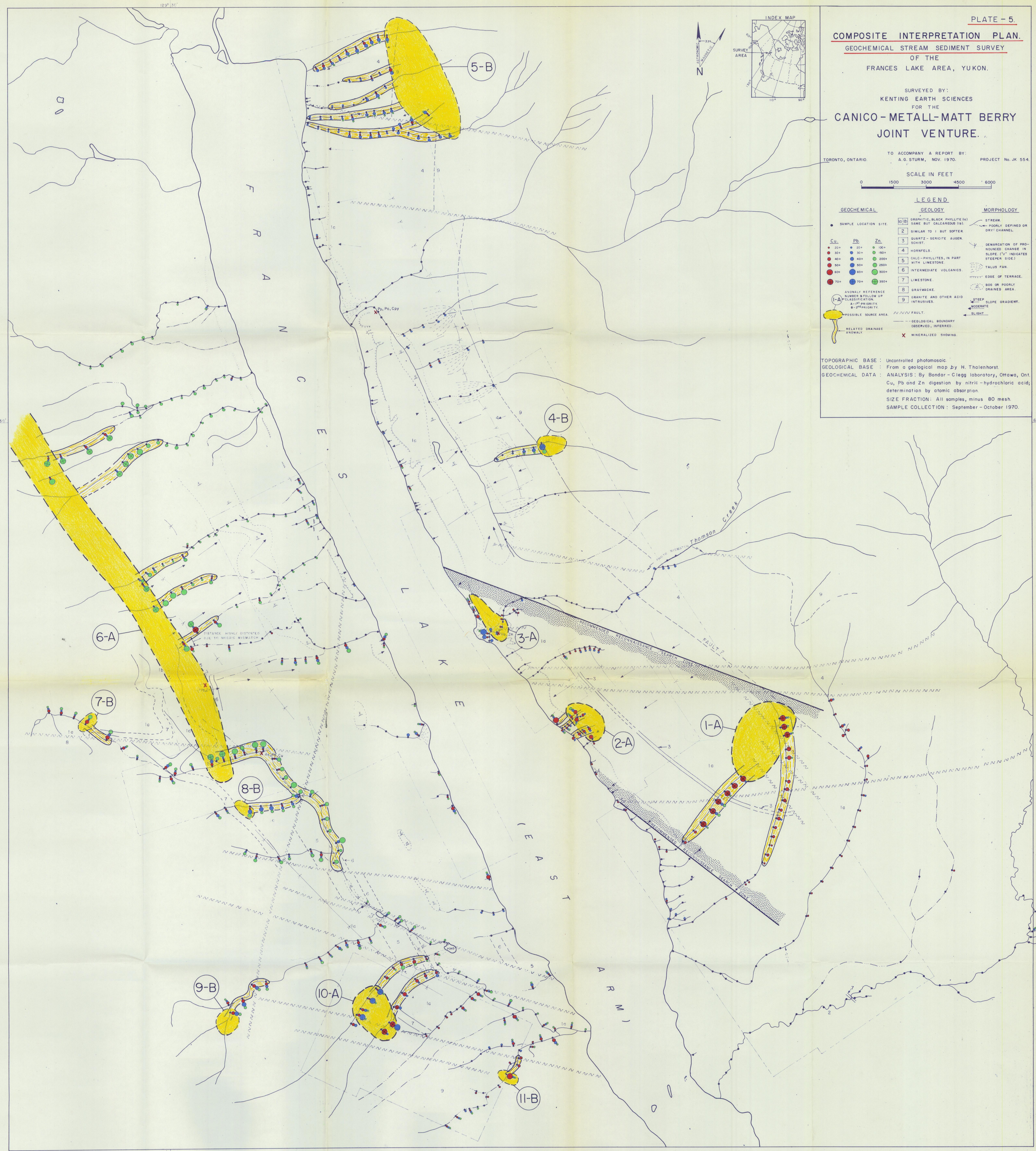


PLATE - 5.
COMPOSITE INTERPRETATION PLAN.
GEOCHEMICAL STREAM SEDIMENT SURVEY
OF THE
FRANCES LAKE AREA, YUKON.
SURVEYED BY:
KENTING EARTH SCIENCES
FOR THE
CANICO - METALL - MATT BERRY
JOINT VENTURE.
TO ACCOMPANY A REPORT BY:
TORONTO, ONTARIO.
A.G. STURM, NOV. 1970.
PROJECT No. JK 554.
SCALE IN FEET
0
1500
3000
4500
6000
LEGEND
GEOCHEMICAL
SAMPLE LOCATION SITE.
Cu.
Pb.
Zn.
20+
30+
40+
50+
60+
70+
100+
150+
200+
250+
300+
350+
ANOMALY REFERENCE NUMBER & FOLLOW UP CLASSIFICATION.
A - 1st. PRIORITY.
B - 2nd PRIORITY.
POSSIBLE SOURCE AREA.
RELATED DRAINAGE ANOMALY.
GEOLOGY
Ia Ib GRAPHITIC, BLACK PHYLLITE (Ia) SAME BUT CALCAREOUS (Ib).
2 SIMILAR TO I BUT SOFTER.
3 QUARTZ - SERICITE AUGEN. SCHIST.
4 HORNFELS.
5 CALC - PHYLLITES, IN PART WITH LIMESTONE.
6 INTERMEDIATE VOLCANICS.
7 LIMESTONE.
8 GRAYWACKE.
9 GRANITE AND OTHER ACID INTRUSIVES.
FAULT.
GEOLOGICAL BOUNDARY OBSERVED, INFERRED.
MINERALIZED SHOWING.
MORPHOLOGY
STREAM.
POORLY DEFINED OR DRY CHANNEL.
DEMARCATION OF PRONOUNCED CHANGE IN SLOPE. ("V" INDICATES STEEPER SIDE.)
TALUS FAN.
EDGE OF TERRACE.
BOG OR POORLY DRAINED AREA.
STEEP
MODERATE
SLIGHT
SLOPE GRADIENT.
TOPOGRAPHIC BASE : Uncontrolled photomosaic.
GEOLOGICAL BASE : From a geological map by H. Thalenhorst.
GEOCHEMICAL DATA : ANALYSIS: By Bondar - Clegg laboratory, Ottawa, Ont. Cu, Pb and Zn digestion by nitric - hydrochloric acid; determination by atomic absorption.
SIZE FRACTION: All samples, minus 80 mesh.
SAMPLE COLLECTION: September - October 1970.
INDEX MAP
SURVEY AREA
N
129° 30'
61° 30'
F R A N C E S
L A K E
(E A S T A R M)
Thomson Creek
FAULT ?
RECOMMENDED RECONNAISSANCE SEARCH ZONE
Py, Po, Cpy
1-A
2-A
3-A
4-B
5-B
6-A
7-B
8-B
9-B
10-A
11-B

JOINT VENTURE

CANICO - METALL - MATT BERRY

GEOLOGICAL REPORT

(Frances Lake Area, Yukon)

Mineral Claims
Matt-Jim-Berry-Lap-Apex-Don

Latitude 61-30' Longitude 129-30'

This report has been ... Geological ...

Yukon Territory

By
H. Thalenhorst, Phd,
September and October 1970

airie, P. Eng.,
1970.

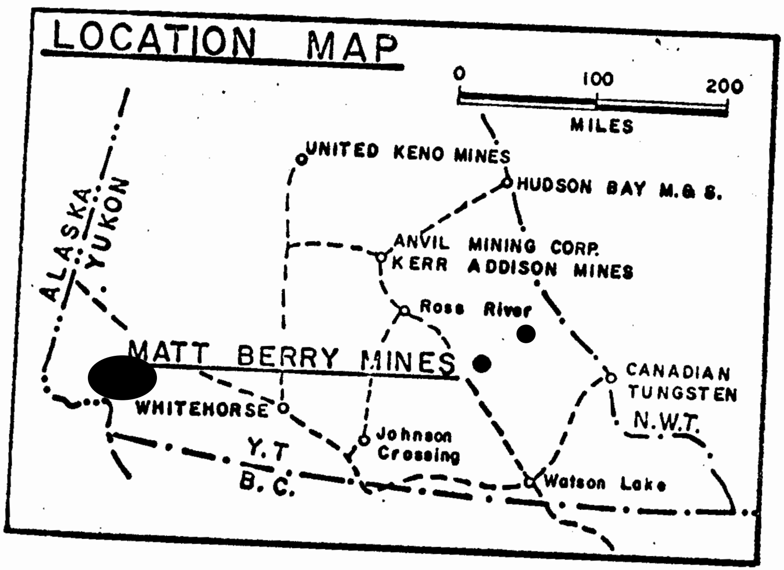


TABLE OF CONTENTS

APPENDIX

MAP POCKET

LEGEND

1a.	Graphitic black phyllite (1a)
1b.	same but calcareous (1b)
2	Similar to (1) but softer
3	Quartz-sericite augen schist
4	Hornfels
5	Calc-phyllites, in part with limestone
6	Intermediate volcanics
7	Limestone
8	Greywacke
9	Granite and other acid intrusives

INTRODUCTION

During September and October 1970, the writer spent about six weeks mapping along both shores of the eastern arm of Frances Lake, covering a strip 10 by 1.5 miles on the eastern shore and an area 4 by 2 miles on the western shore.

Mapping was done mainly by means of traversing, mostly along creeks, guided and supplemented by air photo interpretation. Only in rare cases were certain geological boundaries actually followed up in the field.

Mapping was necessary for a number of reasons:

a. No geological information is given on the government map GSC # 6-1966 Sheet 105 H (scale 1" = 4 miles) in the immediate area of the Thompson Creek deposit or along both shore lines;

b. Even where the government map provides information, it was not sufficiently detailed to allow any reliable interpretation of the initial stream sediment survey or of possible follow-up investigations;

c. Presuming that the Thompson Creek sulphide occurrence is of the stratiform type, mapping is necessary to define the general horizon in which the deposit occurs, both petrologically (lithologically) and stratigraphically, on a local as well as on a more regional scale.

As can be seen from the map, outcrop is distributed rather irregularly, in some areas there is almost no outcrop while there is enough outcrop in other areas to allow relatively reliable geological mapping.

STRATIGRAPHY OF THE SEDIMENTARY ROCKS

This section deals with those sedimentary rocks in which hornfelses have not developed and are thus considered not to have been affected by the intrusion of acidic rocks. The hornfelses are discussed in section 5.

It turned out early in the survey that mapping had to be based strictly on lithological criteria as there are almost no fossils to be found because of the effects of strong foliation and low grade regional metamorphism. Thus the map presented is primarily a petrological/lithological map and it has not so far been possible to back up the stratigraphic interpretation with paleontological data. In particular, facies changes to be expected in such a geological environment, which have been reported from comparable areas not too far away, cannot usually be detected.

Wherever limestones or limey rocks were found, specimens were collected and sent out to be checked for the occurrence of conodonts; however, the results have not yet been received.

Other samples were sent out for preparation of thin sections and in some cases polished sections. At the time of writing these had not been received so that all petrological observations and terminology in this report and in the map are preliminary.

Opposite shores of the eastern arm of Frances Lake are underlain by entirely different rock sequences and, due to the difficulties mentioned above, their age relationships have not yet been established.

EASTERN SHORE

Apart from acidic intrusive rocks and the surrounding hornfelses, the eastern shore of the eastern arm of Frances Lake is almost exclusively underlain by dark grey to black phyllites (Unit 1a on the map) which in part are banded and in part are not. They are usually siliceous and therefore often display very sharp edges. Foliation is always present and mostly discordant to the bedding planes. Due to limited exposure in outcrop, no reliable subdivision of these phyllites can be made although certain differences exist which might permit subdivision under more favorable conditions.

Around the middle of the sequence, a layer of quartz-sericite-eye-schist about 150 feet thick occurs, dividing the black phyllites into a lower series (ca. 2000 feet thick) and an upper series (ca. 2500 feet thick). This schist is believed to be of a volcanic origin. It seems to be the same as the sericite schist unit encountered in some of the drill holes at Thompson Creek about 100 feet below the ore horizon; and thus is an excellent guide in following this horizon along strike.

The thickness given above should be looked at as "apparent thicknesses" as the phyllites are strongly folded in places, and it is not possible at present to estimate the effect of deformation on thickness.

In the southeastern part of the map area, along a larger creek, a sequence of soft, grey to black phyllites (Unit 2) is exposed with one thin layer of impure limestone (Unit 7). The impression is that these phyllites are older than those of Unit 2; a wide gap, however, exists between the outcrops of Unit 2 and the next outcrop to the north so that this interpretation of age relationship is the most likely one, but is not proven.

WESTERN SHORE

The rocks on the western shore vary considerably and display a well defined sequence of sedimentary strata.

The lowermost rocks are light, soft phyllites with abundant evidence of matemorphic mobilization of quartz-carbonate (ankerite to siderite), grading upwards into more calcareous phyllites to calc-phyllites (Unit 5). These are usually well banded rocks, the bands being between 0.5" and 1" thick. This series has an apparent thickness of at least 1500 feet and contains two layers of probably intermediate meta-volcanics each about 150 feet to 200 feet thick (Unit 6).

The calc-phyllites are overlain by a series of black-phyllites (Unit 1a) very similar to those on the eastern shore but generally displaying a much smaller amount of banding or no banding at all. To the NW these grade into a more calcareous facies with thin layers of very dark and impure limestones (Unit 1b). These black phyllites have an apparent thickness of 1500 feet to 2000 feet. They are subdivided into two parts by an impure limestone (Unit 7) around 200 feet thick with single beds of the order of a few feet in thickness. This limestone yielded fossils at one place (probably brachiopods) which will be determined shortly.

The uppermost part of the sequence so far mapped is a layer of greywacke still rich in organic material (Unit 8) which has a minimum apparent thickness of 100 feet.

AGE OF ROCKS

As mentioned before, little can be said about the age of the rocks encountered and described in the last section. The regional maps do not offer much help as the rocks are labelled "undivided paleozoic" (Map 1048A, Department of Mines and Technical Surveys) or "Devonian and (?) Mississippian" (GSC Map 6-1966). To my knowledge, there is no positive proof of the latter suggestion.

On the other hand, as H. Gabrielse (1969) has pointed out, there seems to be a genetic relationship between the occurence of base metal deposits and certain stratigraphical sections. In particular, Lower Cambrian strata and, to a lesser extent, Middle to Upper

Devonian strata seem to be much more favorable than other units.

It is therefore hoped that the specimens sent out for conodont checks will yield some results to help determine the age of the sedimentary rocks involved in the map area.

REGIONAL METAMORPHISM

The sedimentary rocks in the map area described thus far have been affected by a weak regional metamorphism transforming former slates and shales to phyllites etc. The grade of metamorphism seems to decrease in a westerly direction. More detailed information will be gained through thin section work this winter.

INTRUSIVE ROCKS

Not much work has been devoted to the study of the intrusive rocks of the area and only a few remarks can be made.

The high mountains on the east side of the eastern arm of Frances Lake seem to be entirely made up of a large stock of acidic intrusive rocks. These rocks are found as boulders in all the creeks draining these mountains. The main rock type seems to be a hornblende granodiorite with bordering phases of feldspar porphyry and hybrid rocks formed where the magmatic rocks intermingled with the surrounding sedimentary rocks.

On GSC Map 6-1966 Simpson Tower is shown as a small stock of similar composition on the west side of the eastern arm of Frances Lake; the northeasternmost edge of this intrusive has been examined during the mapping.

The large, eastern granodiorite stock is surrounded by an aureole of hornfelses which is between 3000 feet and 5000 feet wide in the map area. From their macroscopical appearance, these hornfelses could be the contact metamorphic equivalents of the eastern block phyllites (Unit 1a) but no positive proof is possible. As to the degree of contact metamorphism in the hornfelses, thin section work will have to be awaited. It was noted, however, that close to the contact with the granodiorite feldspar crystals start to grow within the meta-sediments.

No such hornfelses were noted in the vicinity of the Simpson Tower granodiorite. This may be due in part to the small size of this body, or in part to the action of two E-W striking faults north of it.

TECTONICS

FOLDING

All sedimentary rocks in the map area have been subjected to a relatively intense deformation. Depending upon the mechanical character of the individual rock types they have responded in quite different ways to the same dynamic processes. The black phyllites of Unit 1a have not only reacted through folding but also through the development of a very intense schistosity which is generally younger than the folding and tends to obscure or even obliterate the bedding planes. Not much is known about the type of folding in the hornfelses of Unit 4; but they seem to have reacted in a similar manner.

On the other hand, the rocks of Unit 5 which are usually rather thinly banded and bedded, rarely display transverse schistosity but are much more intensely folded than all other rocks will fold wavelengths of usually a few inches to a few feet.

A third type of reaction is to be found in the limestones of Unit 7 on the western side which show only flexurelike folds with wavelengths of a few tens of feet and no schistosity whatsoever.

The axial planes of all folds dip rather flatly to the E or NE and generally strike about NNW-SSE; the tranverse schistosity is similarly oriented.

Computation of measurements made during mapping leads to the developemnt of diagrams D-1 to D-3. Interpretation of these diagrams and direct observations in the field can be summarized as follows:

The most pronounced and earliest phase of folding yielded a regional B-axis of similar orientation on both the eastern and the western side of the eastern arm of Frances Lake (D-1, D-2), striking NNW and plunging gently in that direction.

The development of the schistosity took place at a later time and has generally not been much affected by later folding (D-3).

In some areas, however, folding outlasted the formation of foliation and the planes of schistosity are themselves weakly folded (D-3).

These three events most probably belong to one and the same major phase of deformation.

There is some information in D-1 that this major deformation might have developed a $B \perp B'$ tectonic fabric common in other fold belts around the world; this is not certain yet, however.

In the second phase of deformation of less intensity than the first, bedding and schistosity planes have been folded about an axis which strike NE-SW and plunge 20% to 25% NE (D-1, D-2, D-3).

These are just a few observations which certainly do not reflect the whole tectonical history of the rocks involved.

FAULTING

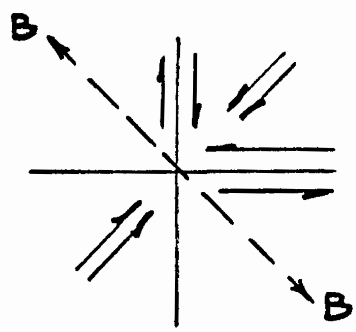
A number of faults have been identified on the air photos and have in part been reconfirmed on the ground. They belong to three sets:

a. (Most common) strike E-W, dip steeply N, offset more or less horizontal, the northern parts having moved to the W;

b. Strike N-S, dip unknown, presumably steep, apparent offset horizontal with the western side having moved to the N;

c. Strike NW-SE, dip (in one case) steeply SW, direction of offset unknown; containing quartz-veins.

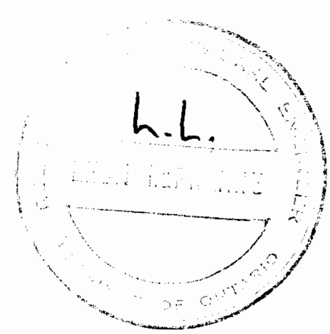
The faults of Sets a. and b. can be attributed to deformation of the main phase of folding phase according to the following sketch:



As the direction of movement along the NW-SE striking faults are unknown no such statement can be made for them.

Respectfully submitted,
METALLGESELLSCHAFT CANADA LIMITED

H. Thalenhorst, Ph.D.
Senior Exploration Geologist



REFERENCES

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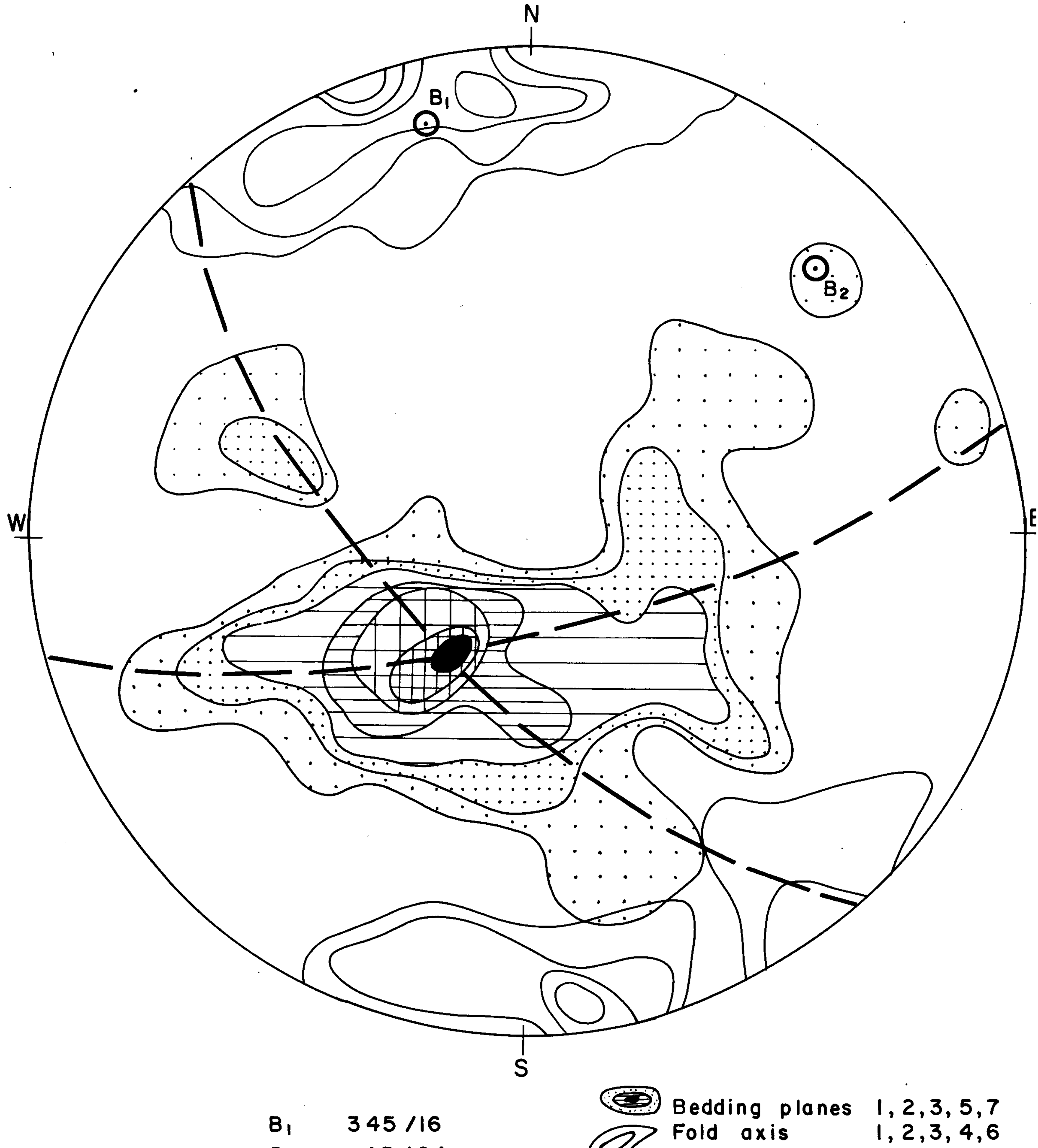
GABRIELSE, H.: Lower Cambrian Strata and Base Metals; Western Miner, February 1969, pp. 22-28, 1969.

GABRIELSE, H., RODDICK, J.A. & BLUSSON, S.L.: Flat River, Glacier Lake, and Wrigley Lake, Distr. of Mackenzie and Yukon Terr.; GSC Paper 64-52, 1965.

GEOLOGICAL SURVEY OF CANADA: Prelim. map No. 6-1966, Geology by Roots, E.F. et al., 1966.

Whitehorse, Y.T., December 10, 1970

FRANCES LAKE, EASTERN ARM, EAST SIDE



B_1 345/16

B_2 45/24

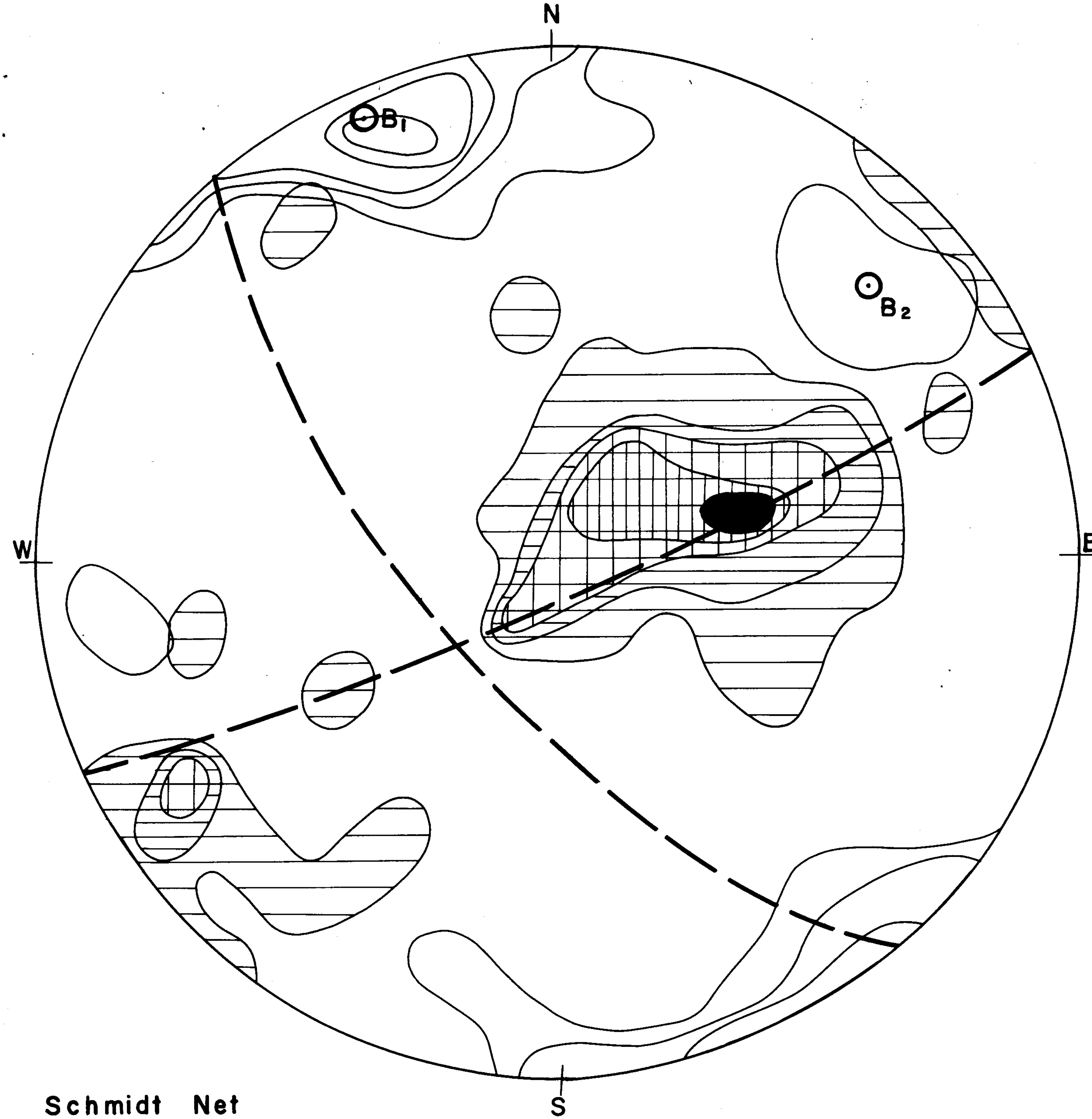
Schmidt Net

Lower hemisphere

Dia. - 1

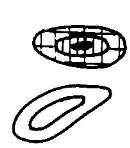
FRANCES LAKE, EASTERN ARM, WEST SIDE

43 Bedding planes
34 Fold axis



Schmidt Net
Lower hemisphere

B_1 335/5NW
B_2 50/20NE

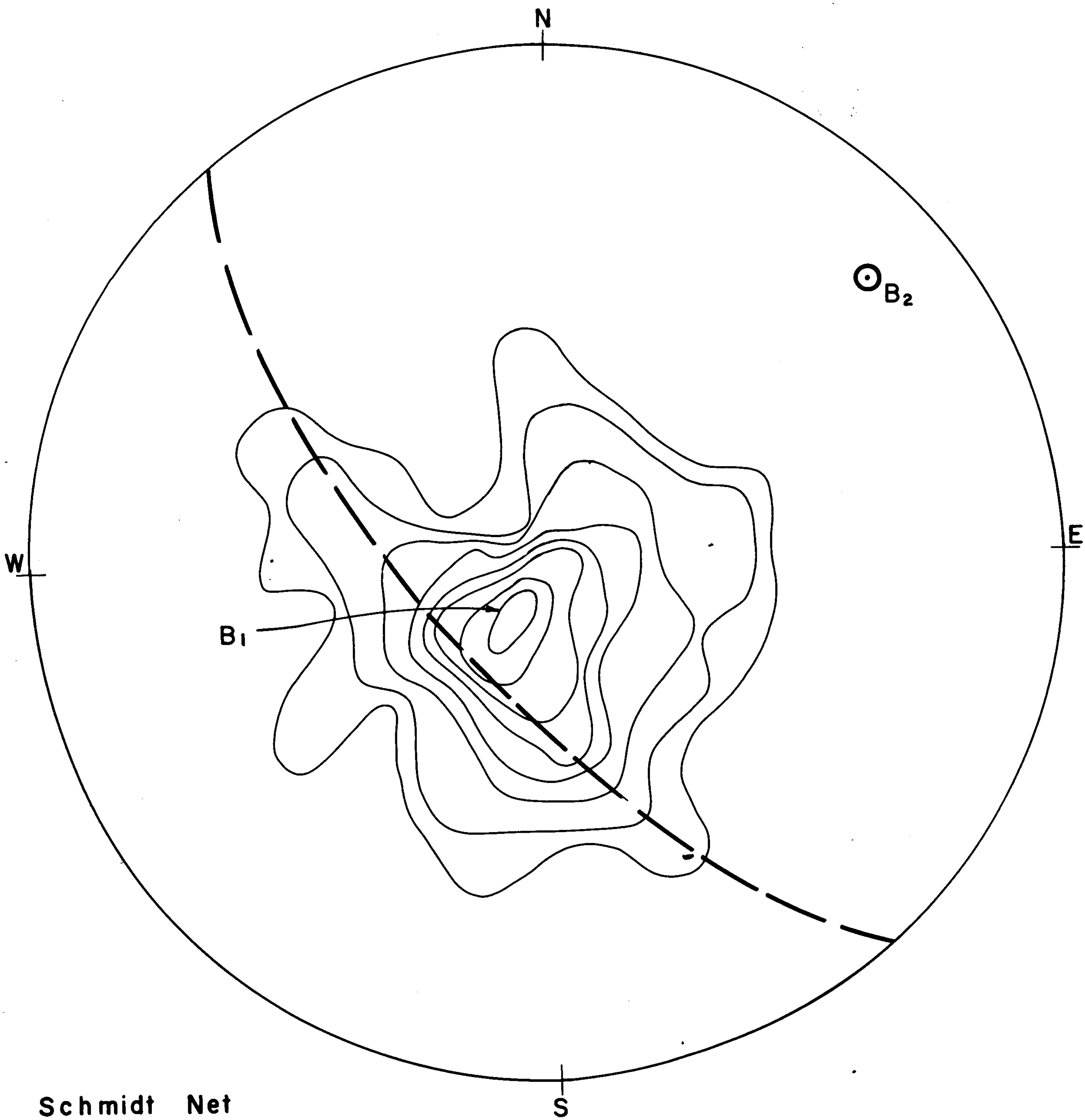


Bedding planes 1, 2, 3, 5, 7
Fold axis 1, 2, 3, 4, 6

Dia.- 2

FRANCES LAKE, EASTERN ARM

102 Planes of Schistosity (mainly from the eastern side)

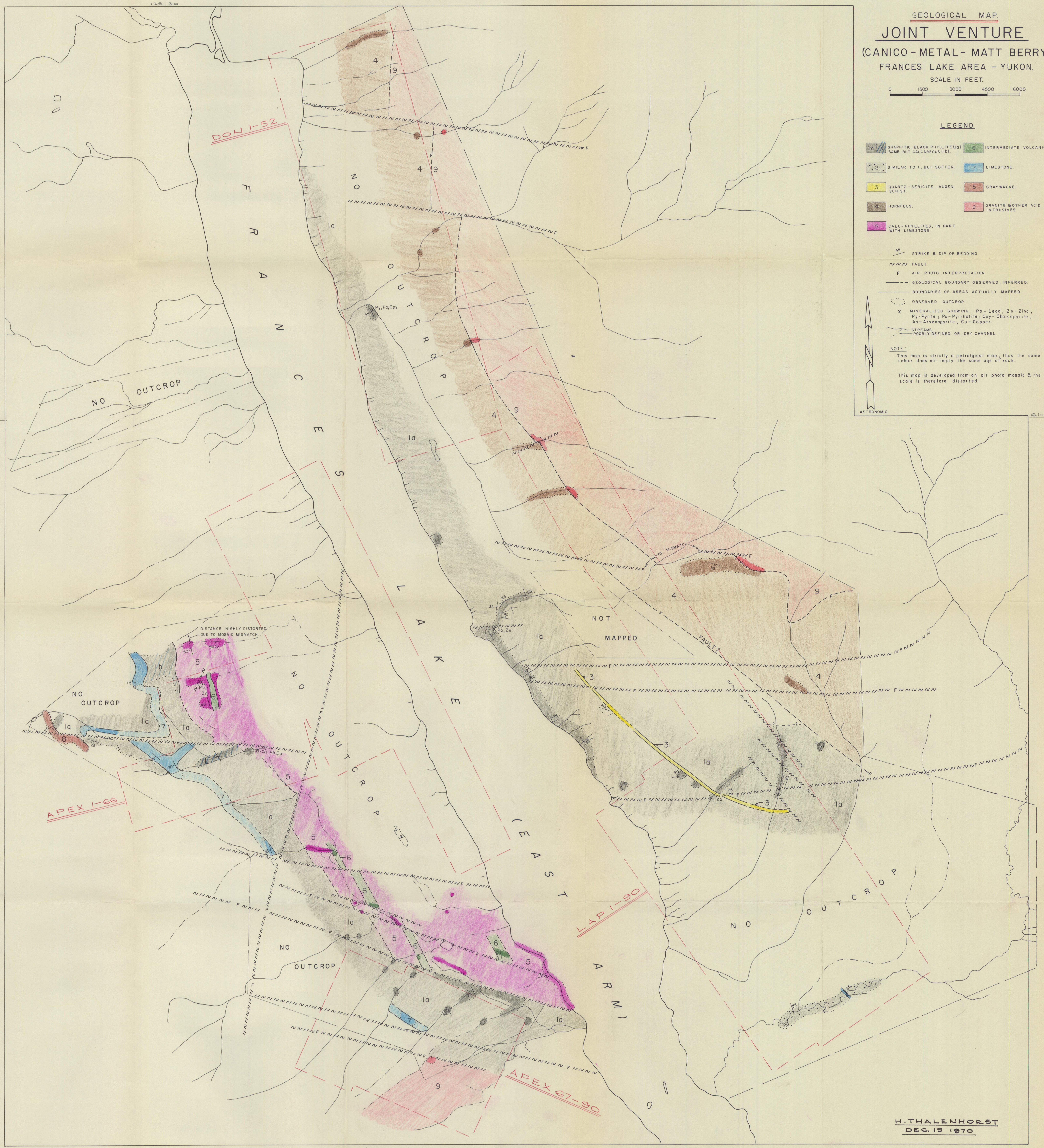


Schmidt Net
Lower hemisphere

B_1 125 / 12NE
B_2 40 / 20NE

1, 2, 4, 7, 10, 15, 20, 25 %

Dia.- 3


GEOLOGICAL MAP.
JOINT VENTURE.
(CANICO - METAL - MATT BERRY.)
FRANCES LAKE AREA - YUKON.
SCALE IN FEET.
0 1500 3000 4500 6000
LEGEND
1a 1b GRAPHITIC, BLACK PHYLLITE (1a) SAME BUT CALCAREOUS (1b).
2 SIMILAR TO 1, BUT SOFTER.
3 QUARTZ - SERICITE AUGEN. SCHIST.
4 HORNFELS.
5 CALC - PHYLLITES, IN PART WITH LIMESTONE.
6 INTERMEDIATE VOLCANICS.
7 LIMESTONE.
8 GRAYWACKE.
9 GRANITE & OTHER ACID INTRUSIVES.
STRIKE & DIP OF BEDDING.
FAULT.
F AIR PHOTO INTERPRETATION.
GEOLOGICAL BOUNDARY OBSERVED, INFERRED.
BOUNDARIES OF AREAS ACTUALLY MAPPED
OBSERVED OUTCROP.
X MINERALIZED SHOWING. Pb - Lead; Zn - Zinc; Py - Pyrite; Po - Pyrrhotite; Cpy - Chalcopyrite; As - Arsenopyrite; Cu - Copper.
STREAMS.
POORLY DEFINED OR DRY CHANNEL.
NOTE:
This map is strictly a petrolgical map; thus the same colour does not imply the same age of rock.
This map is developed from an air photo mosaic & the scale is therefore distorted.
ASTRONOMIC
N
128 30
61-30
FRANCES LAKE (EAST ARM)
DON 1-52
APEX 1-66
APEX 67-90
LAP 1-90
NO OUTCROP
NOT MAPPED
FAULT?
PHOTO MISMATCH
DISTANCE HIGHLY DISTORTED DUE TO MOSAIC MISMATCH.
Py, Po, Cpy
Pb, Zn
H. THALENHORST
DEC. 15 1970

RECEIVED MAR 2? 1971 MINING RECORDER LAND AGENT WATSON LAKE, Y.T. I.A. & N.D.

RECEIVED APR 23 1971 MINING INSPECTION OFFICE WHITEHORSE, Y.T.

RECEIVED 23 APR 1971 MINING RECORDER'S OFFICE WHITEHORSE, Y.T.

GEOPHYSICAL ORIENTATION SURVEY FOR CANICO-METALL-MATT BERRY JOINT VENTURE

Frances Lake Area, Yukon

105H 6

This report has been examined by the Geological ... recommended ... ed ... $67,952.87

D. B. Craig

... work under ... Quartz Mining Act

... of Yukon Territory

By

Kenting Earth Sciences Eastern Division
Toronto, Ontario

December, 1970

TABLE OF CONTENTS

INTRODUCTION

Kenting Earth Sciences carried out a geophysical orientation survey in the Frances Lake Area, Yukon during the period November 7th to December 1st, 1970. The field crew was joined during the latter part of the survey by T. R. B. Dundas, geophysicist, in order to interpret results and change survey parameters where necessary.

Purpose

The purpose of the survey was to determine which geophysical methods (a) could be used to locate the extension along strike of a known lead/zinc deposit on a local basis and (b) be used on a more regional basis in exploration for similar deposits.

1. I.P. METHOD

1.1 Equipment and Method Used

The equipment used consisted of a 2 1/2 Kw transmitting unit manufactured by Huntec Limited, Toronto combined with a Newmont type receiver manufactured by Scintrex Limited, Toronto.

The array used was pole-dipole, the majority of the survey being conducted with a C_1 P_1 distance of 200 feet but on some lines this was increased to 400 feet to give greater penetration.

1.2 Results and Interpretation

The apparent chargeability and apparent resistivity results for the 200 foot separation have been presented as plan maps (Drawings 1 and 2) with the interpreted causative represented on the chargeability plan. The results are also presented as profiles (Drawings 3 - 7) which include the results from the 400 foot separation and also the corresponding magnetic values. The location of the causative body projected to surface has been given, but the direction of dip has been assumed as this cannot be definitely established from the results. There are some indications from the 400 foot results that the dip is to the east along the profiles.

The results in general are characteristic of a very narrow zone which is what would be expected from the lead/zinc deposit. The country rock appears to contribute only a small percentage to the total I.P. effect as background values are very low and the anomaly is expressed as a very sharp feature.

The anomaly appears to close to the north at the edge of the lake but this effect could be produced by a rapid increase in water depth resulting in a lack of penetration. The anomaly is still obvious on Line 22 S but the level has been reduced considerably.

2. MAGNETIC METHOD

2.1 Equipment and Method Used

The instrument used consisted of a Sharp M.F. 2 magnetometer which is a fluxgate instrument reading the vertical component of the earths magnetic field.

A base station of 590 gammas was established between Lines 0 and 2S just west of the baseline and all readings were corrected to this level. Readings were taken at 100 foot station intervals in a series of loops, and these values were corrected for diurnal drift. The station interval was reduced to 50 feet over anomalous areas.

2.2 Results and Interpretation

The results are presented as a plan map (Drawing 8) and are also shown as profiles in combination with the I.P. results (Drawings 3 - 7).

In general the magnetic results show an increase directly over the area where a causative body has been projected to the surface. The anomaly is greatest on Line 14 S where values show an increase of approximately 300 gammas. The correlation of higher magnetic values with the surface extent was not established on all lines. Anomalous values are usually not greater than 50 gammas over the location of the deposit, a variation which appears to be near the background level.

3. VERTICAL LOOP E.M. METHOD

3.1 Equipment and Method Used

The instrument used was a Vertical Loop SS15 system manufactured by McPhar Limited, Toronto. The unit can generate either 1,000 c.p.s. or 5,000 c.p.s.

The transmitter was set up along the strike of the lead/zinc deposit and readings were taken along the survey lines, the penetration being approximately equal to half of the transmitter/receiver separation. The transmitter is orientated for each reading so that the plane of the coil passes through the station, and the change in dip of the generated field is measured at each station in turn.

3.2 Results and Interpretation

The results are presented as a series of profiles (Drawing 9). Only two lines, ie. 10 S and 14 S were covered by the survey using the 1,000 c.p.s. frequency which did not indicate any change over the deposit. The survey was therefore completed using the 5,000 c.p.s. frequency which is highly susceptible to near surface features.

The testing showed that the faulting in the area produces a very complex pattern which is dependent entirely on the exact location and relative positions of the transmitter and receiver. Repetition of lines from different transmitter locations produced changes in the location of the cross-overs demonstrating that conductive zones in the area are numerous and multi-directional.

It was not expected that the lead/zinc deposit would give a strong response and it would appear that any response would be completely masked from effects produced by faults. It must therefore be concluded that this type of method cannot be used directly to locate this type of deposit.

4. HORIZONTAL LOOP E.M. METHOD

4.1 Equipment and Method Used

The instrument used was a Huntematic manufactured by Huntec Limited, Toronto. This uses frequencies of 500 c.p.s., 1,000 c.p.s. and 5,000 c.p.s. with coil separations up to 500 feet.

4.2 Results and Interpretation

The results are presented as a series of profiles (Drawings 10 - 15). These show that there is only very small changes in the out-of-phase component and there is no indication of any anomalous areas over the lead/zinc deposit.

The large changes in the in-phase component are due to a combination of topographic effects and errors in the coil separation so that this component has to be ignored in the interpretation.

5. CONCLUSIONS AND RECOMMENDATIONS

The results in general show that over the area tested the Induced Polarization method was the only one which could be used to definitely establish the location of the lead/zinc deposit. The I.P. effect appears to result directly from the economic mineralization and not from variations in the composition of the country rock, e.g. graphitic and pyritic content. It is difficult to establish the source of the I.P. effect on an experimental basis. Research by Dr. West, University of Toronto, has concluded that work on core samples can produce completely misleading results and has suggested that the only method that could be used would be by using the I.P. method down the drill holes.

The magnetic results show a higher response over parts of the surface extent of the deposit but this is not large enough to determine its location over the whole area by this method alone.

The lack of response obtained by the electromagnetic methods cannot rule out the use of these methods elsewhere in the Frances Lake area. This could have resulted in a lack of sufficient concentration of the mineralization combined with

with an area which is highly faulted producing considerable "noise" as was observed with the vertical loop system. The Turam survey previously carried out over a much larger area than that of this survey, demonstrated that response to the electromagnetic systems can be obtained. It is expected that better response would be obtained over areas where copper mineralization becomes more prominent.

It is recommended that the methods to be used in future work should consist of combined Induced Polarization and magnetics. The use of electromagnetic systems in the area does not appear to be justified.

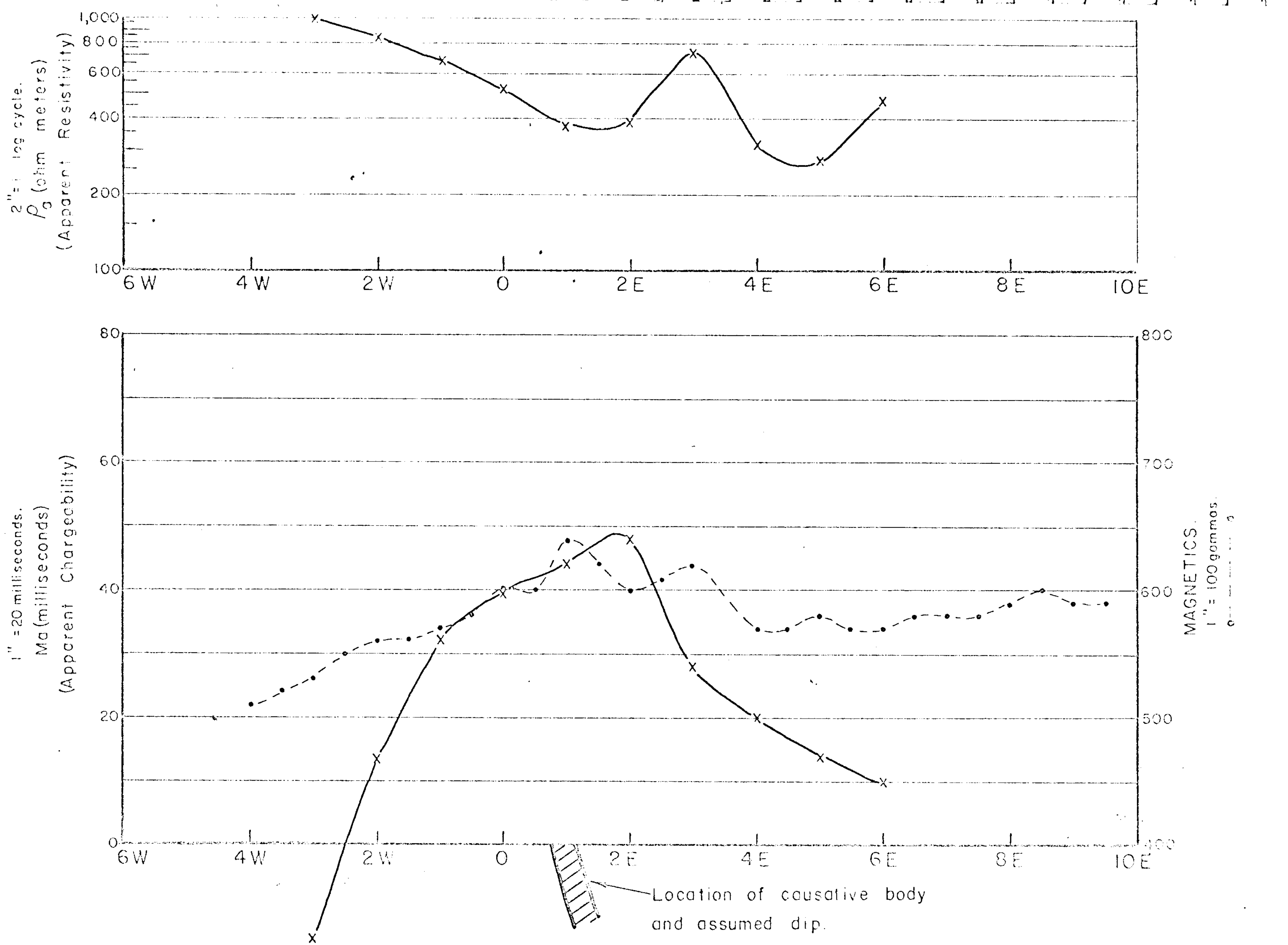
The use of gravity to estimate the volume of the deposit along the dip has been investigated and it is concluded that the body would have to attain a thickness of at least 300 feet before its gravity effect would be obvious over the errors produced by topography, etc. This also means that a thickness estimate of any deposit could only be made to within this accuracy. These estimates assume that the gravity field in the area is reasonably uniform. If this is not the case then a more regional survey would have to be carried out before any estimates of the residual gravity in any local area could be made, thus involving considerable costs.

Respectfully submitted,

KENTING EARTH SCIENCES,

T. R. B. Dundas,
Geophysicist.

APPENDIX I

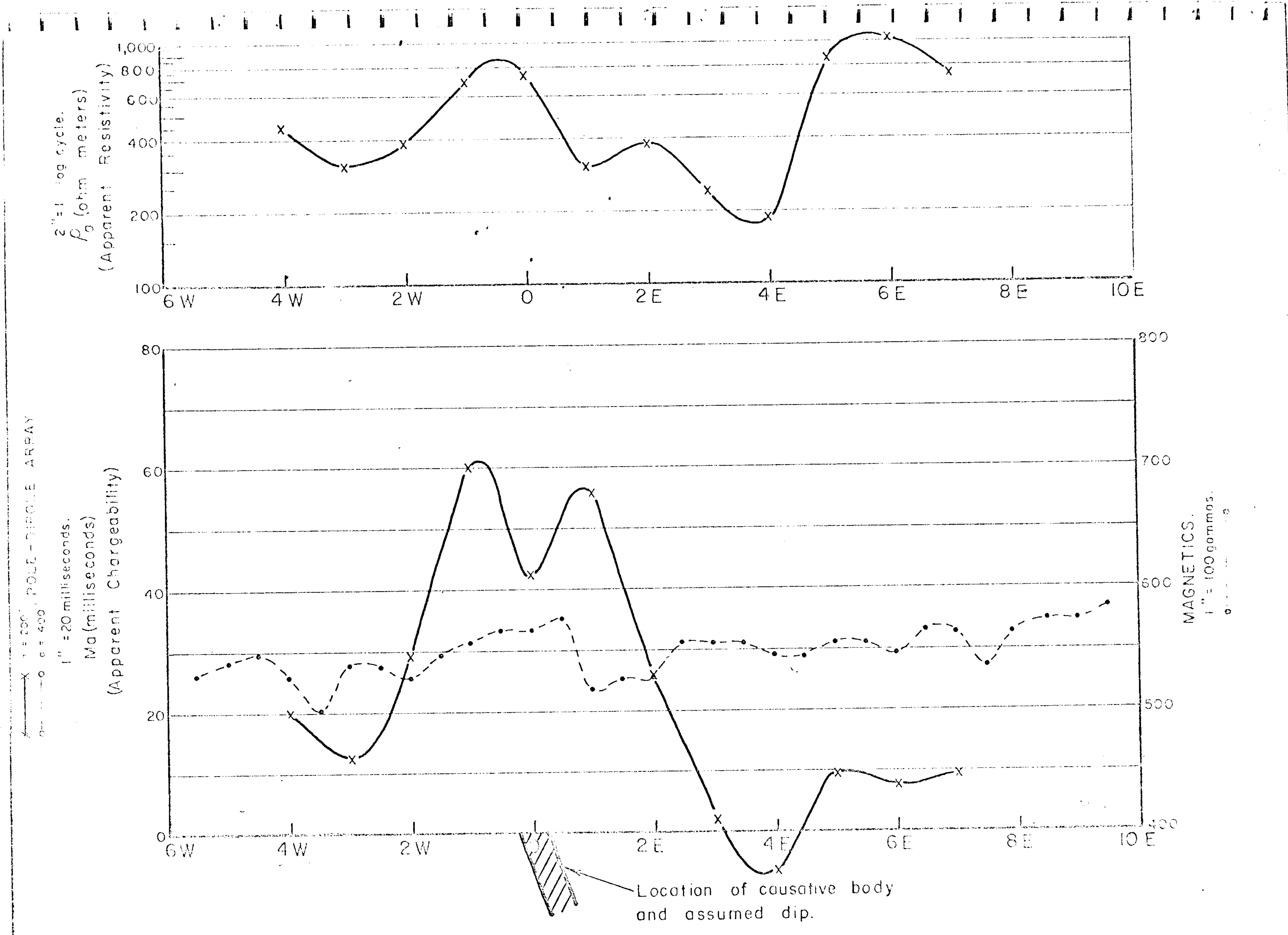


INDUCED POLARIZATION & MAGNETOMETER PROFILES.

LINE -2S.

DWG. Nº: 3

79/70

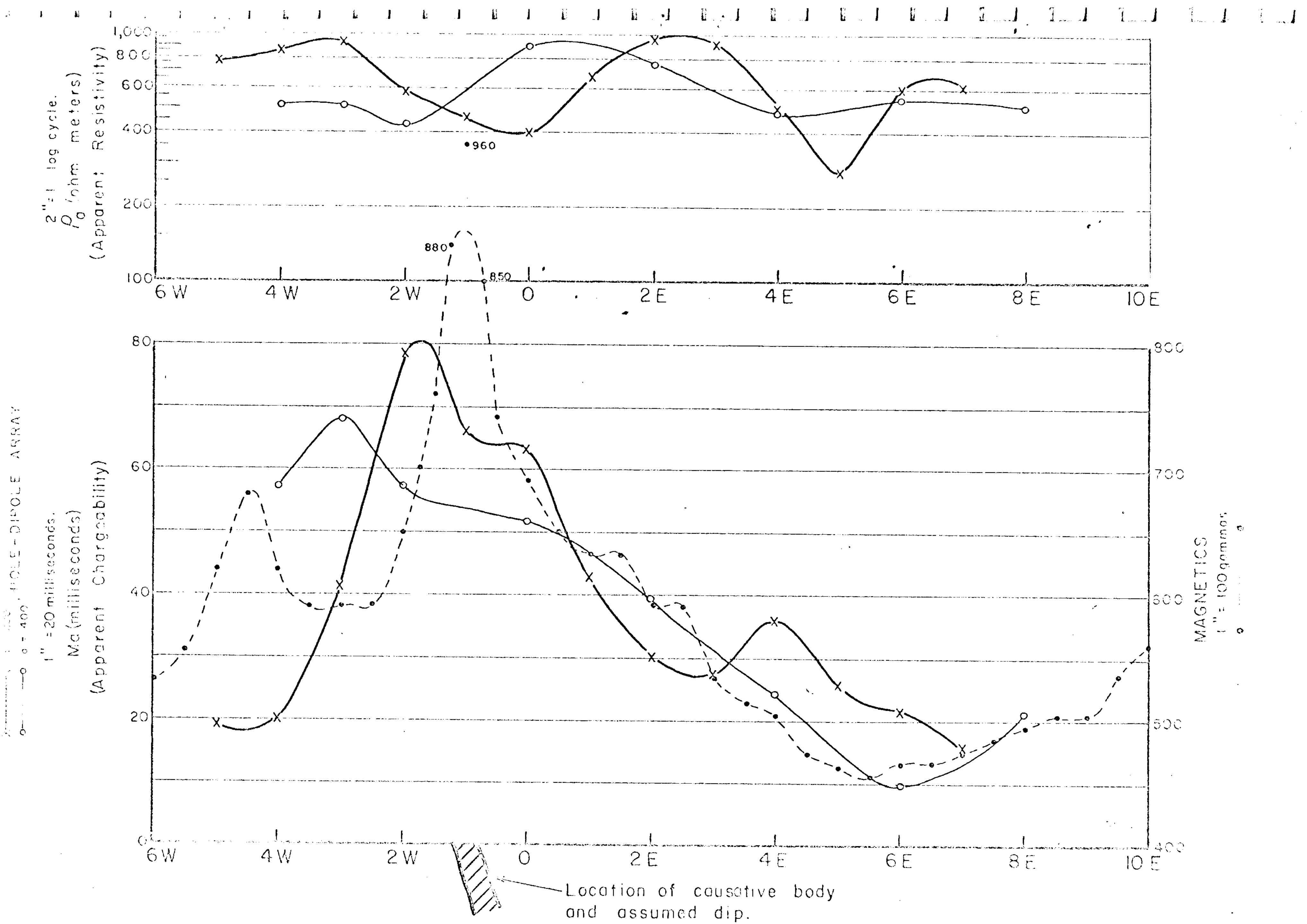


INDUCED POLARIZATION & MAGNETOMETER PROFILES.

LINE – 10 S.

DWG Nº: 4

JK 579/70

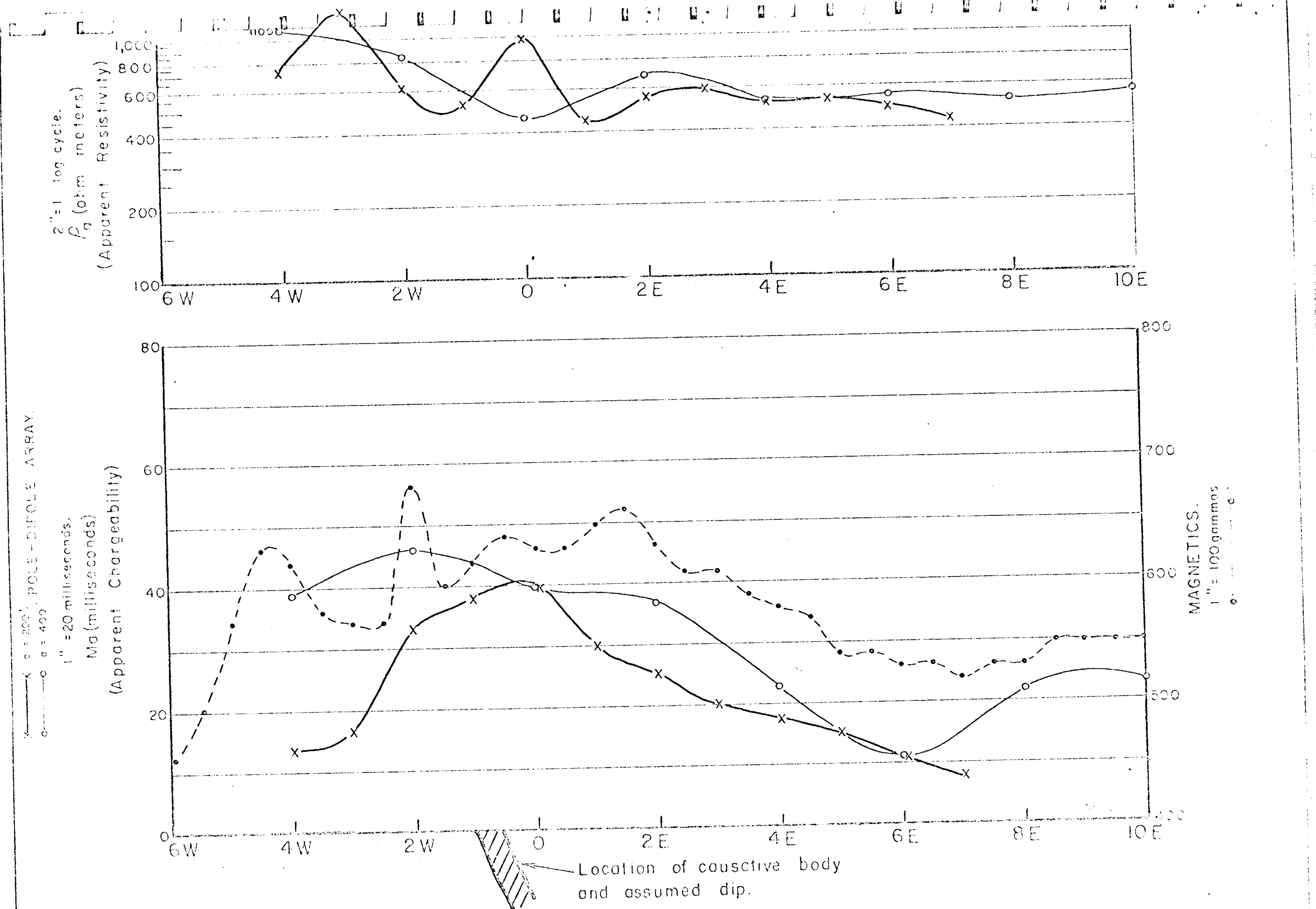


INDUCED POLARIZATION & MAGNETOMETER PROFILES.

LINE - 14S.

K 579/70

DWG NO. 5

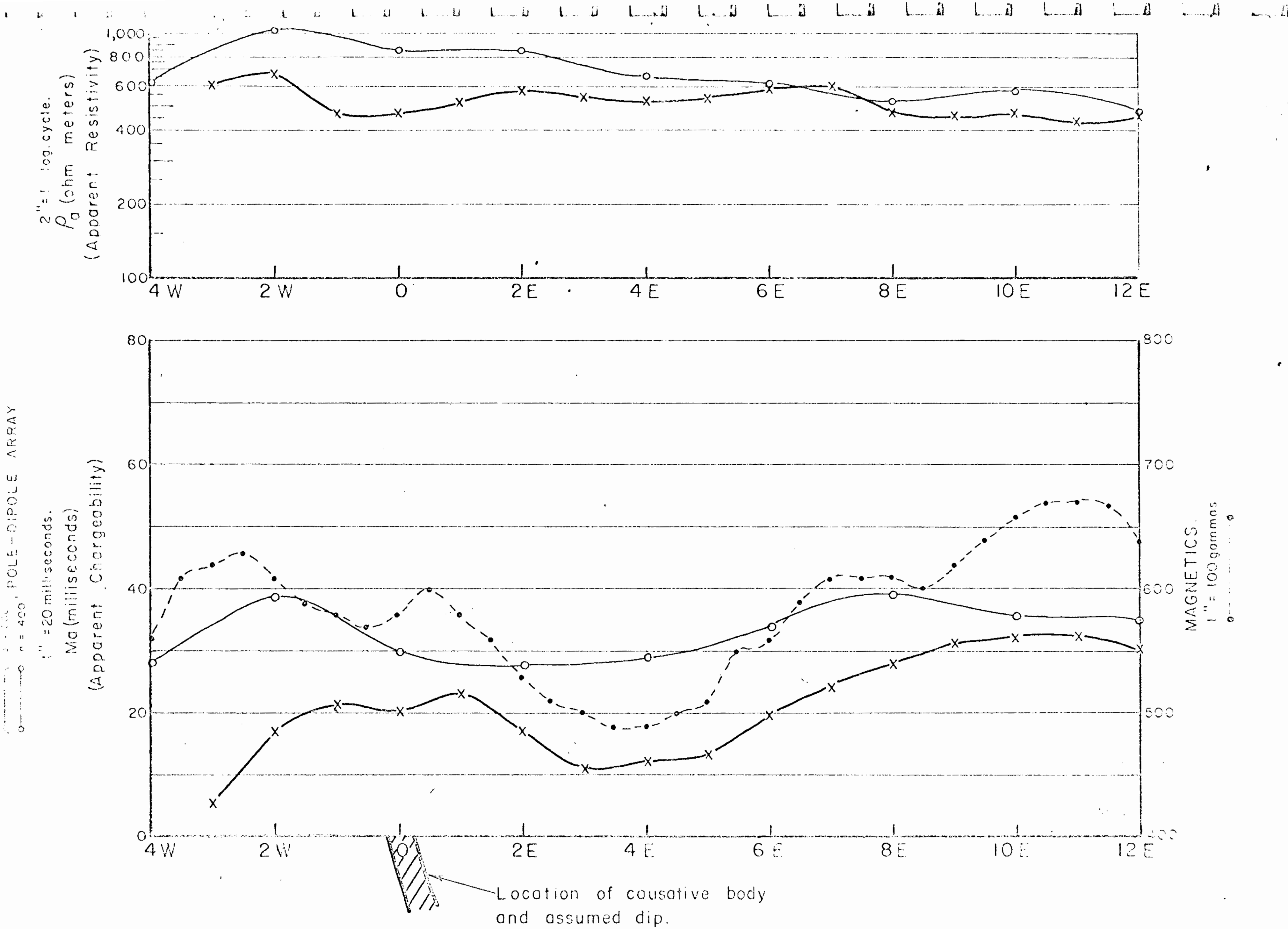


INDUCED POLARIZATION & MAGNETOMETER PROFILES.

LINE - 15 S.

DWG. NO: 6

JK579/70

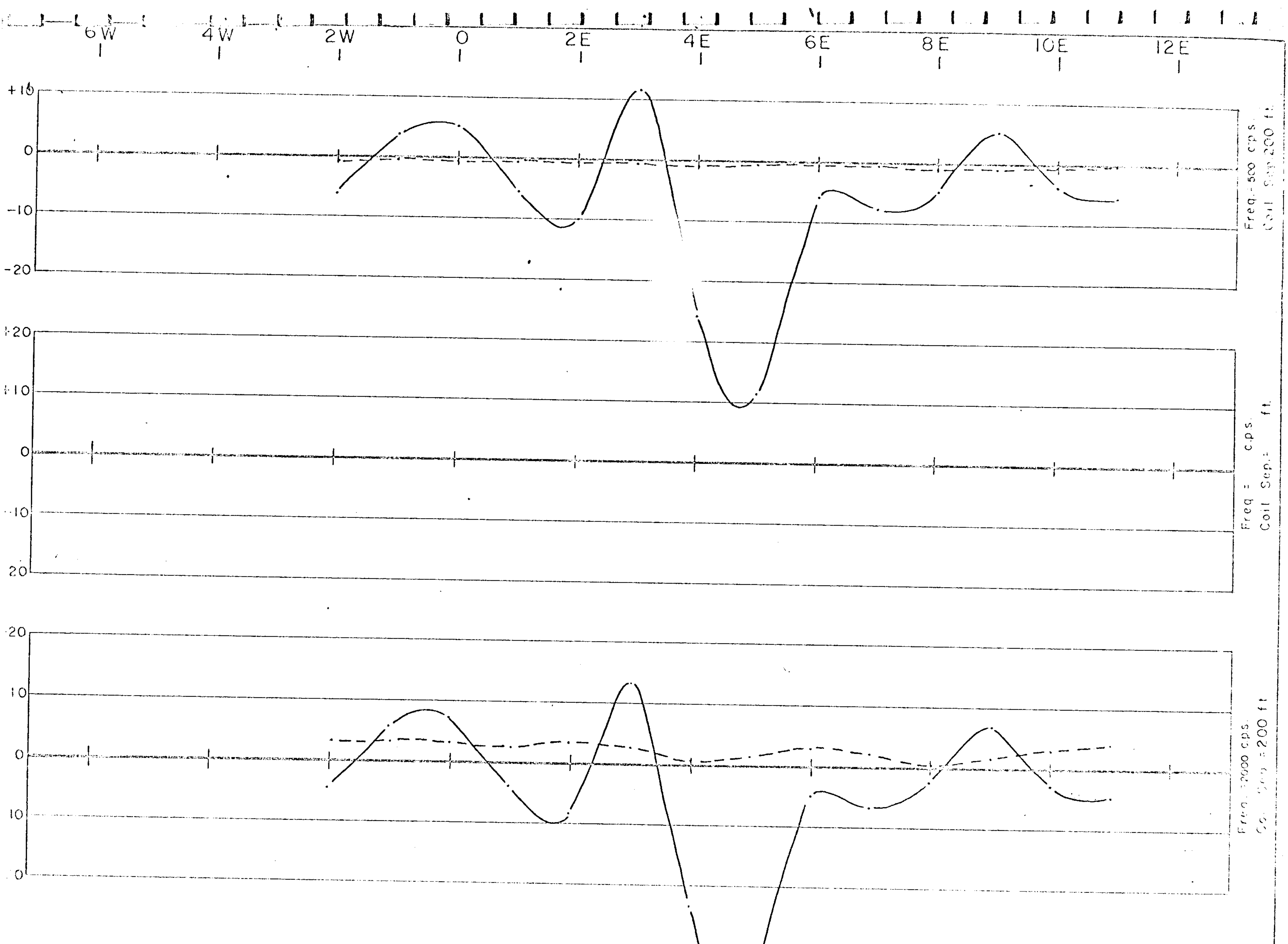


INDUCED POLARIZATION & MAGNETOMETER PROFILES.

LINE - 22S.

DWG No. 7

1579/70



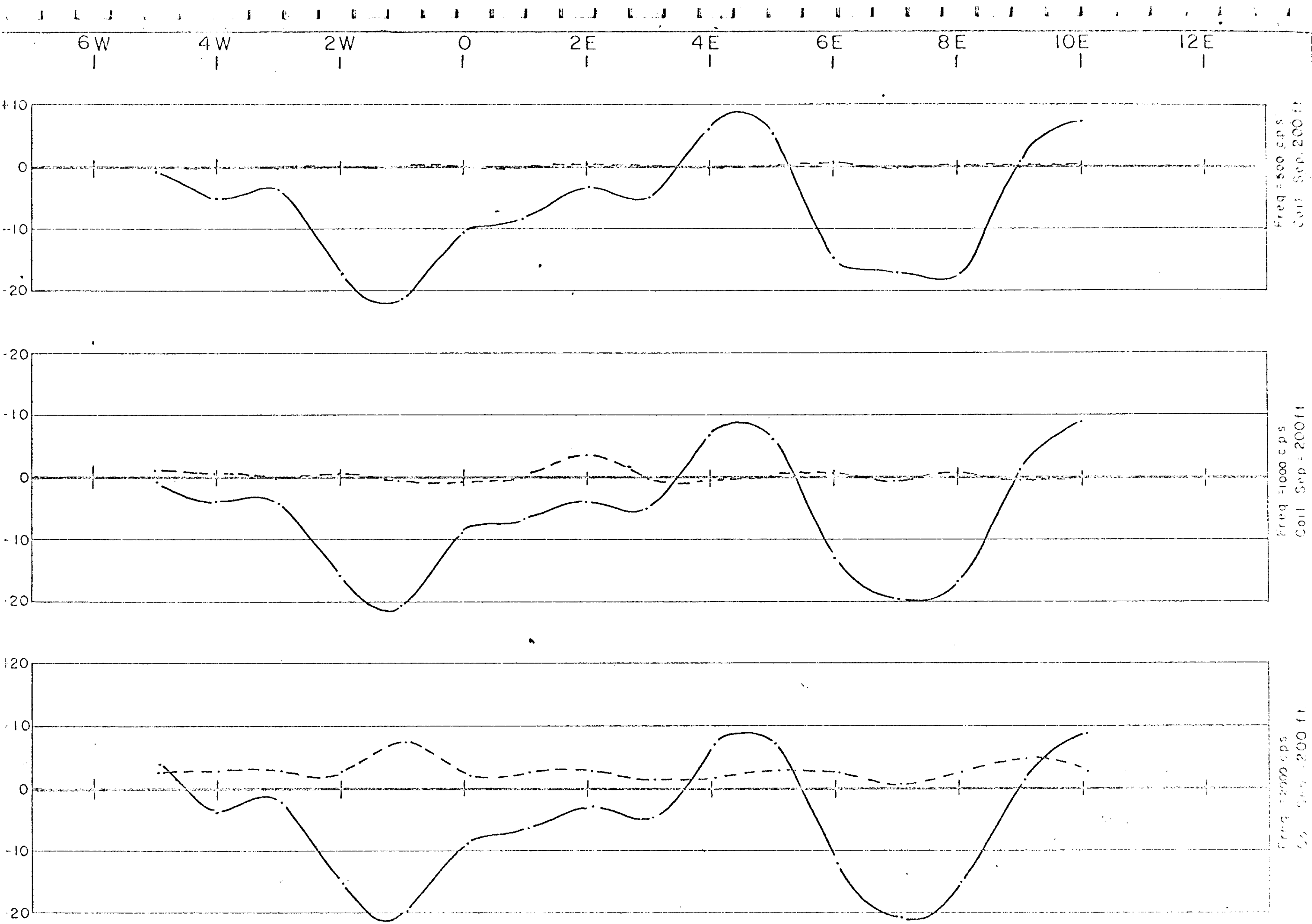
INSTRUMENT: HUNTEMATIC.
HORIZ. SCALE: 1" = 200'
VERT. SCALE: 1" = 20°

——— IN PHASE.
— — — OUT OF PHASE

HORIZONTAL LOOP E.M. SURVEY.

LINE Nº: 2 S

DWG. Nº. 10

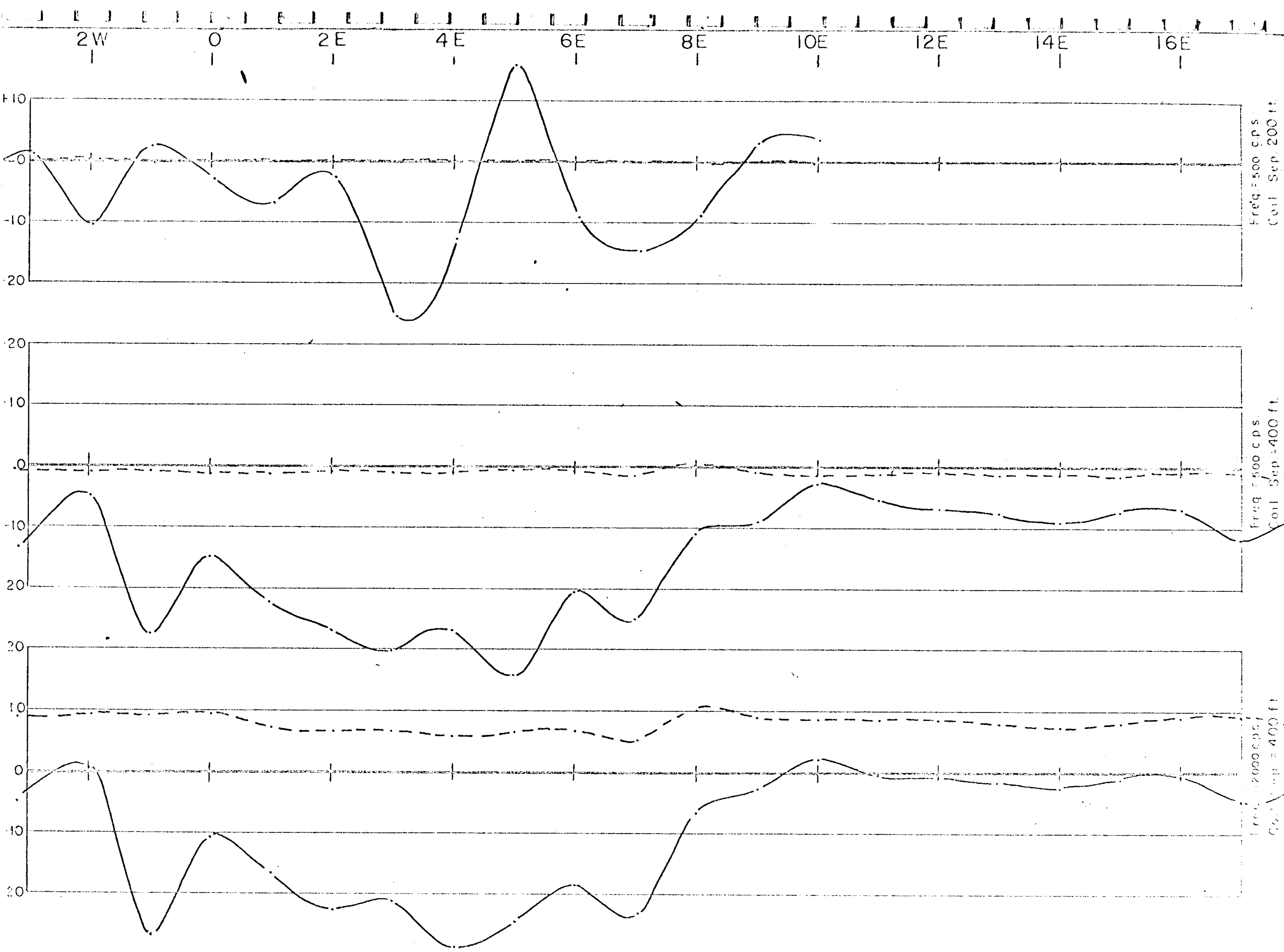


INSTRUMENT: HUNTEMATIC.
HORIZ. SCALE: 1" = 200'
VERT. SCALE: 1" = 20%

——— IN PHASE.
— — — OUT OF PHASE

HORIZONTAL LOOP E.M. SURVEY.

LINE Nº: 6S
DWG. Nº: 11



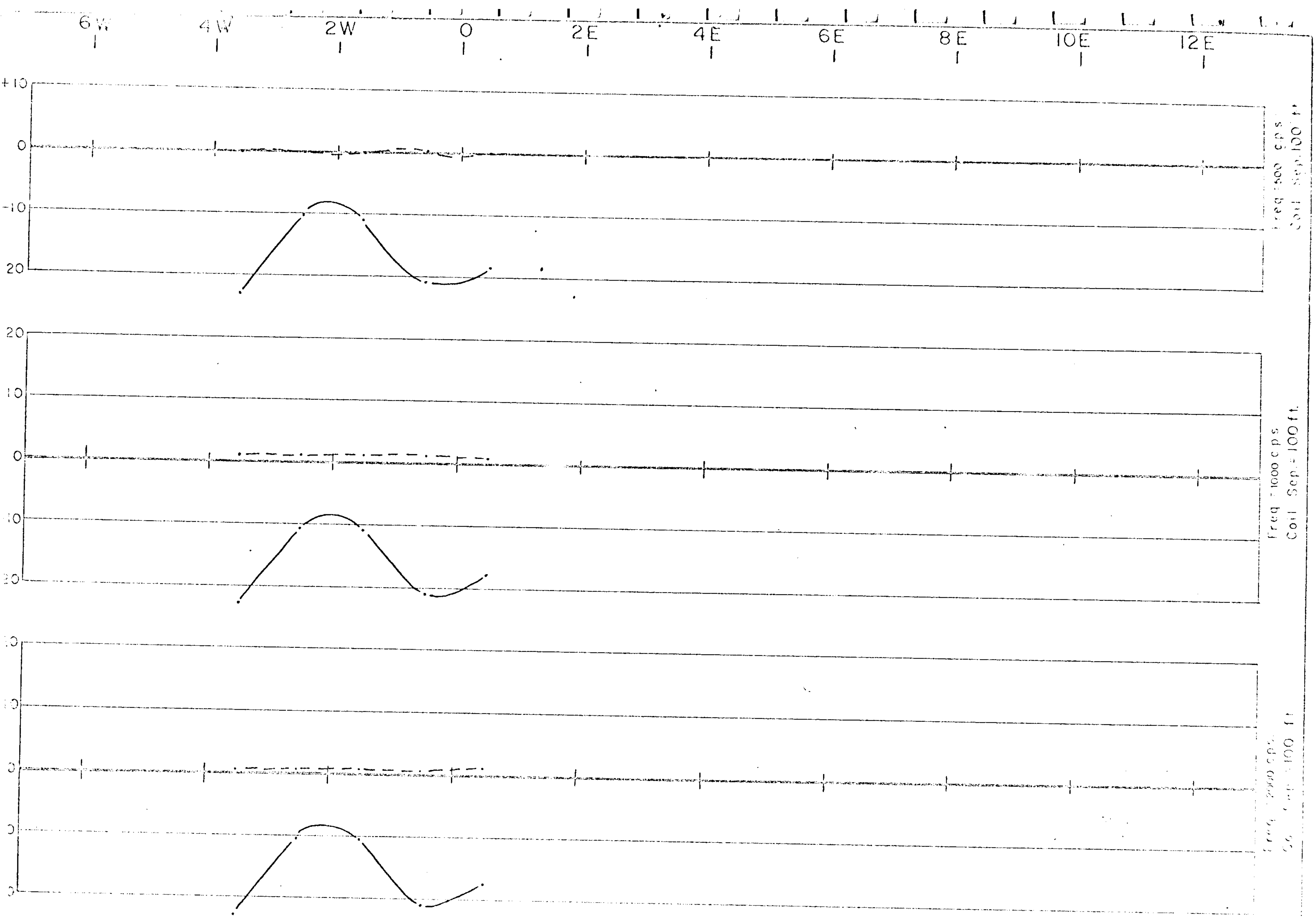
NSTRUMENT : HUNTEMATIC.
HORIZ. SCALE : 1" = 200'
VERT. SCALE : 1" = 20°

——— IN PHASE.
— - — - OUT OF PHASE

HORIZONTAL LOOP E.M. SURVEY.

LINE No. SS

DWG. No. 12



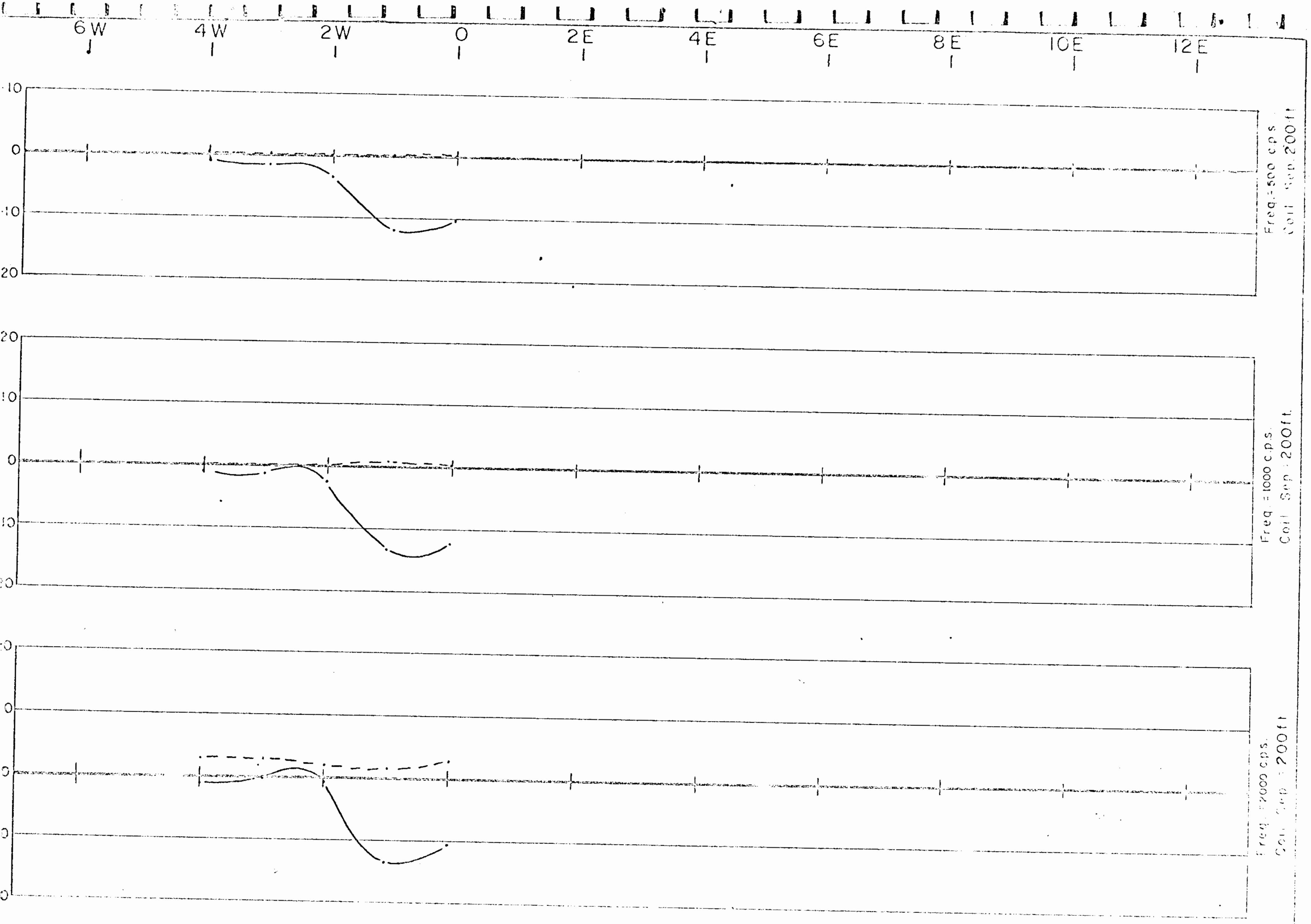
STRUMENT: HUNTEMATIC.
RIZ. SCALE: 1" = 200'
RT. SCALE: 1" = 20°

——— IN PHASE.
- - - OUT OF PHASE

HORIZONTAL LOOP E.M. SURVEY.

LINE Nº: 10 S

DWG. Nº. 15

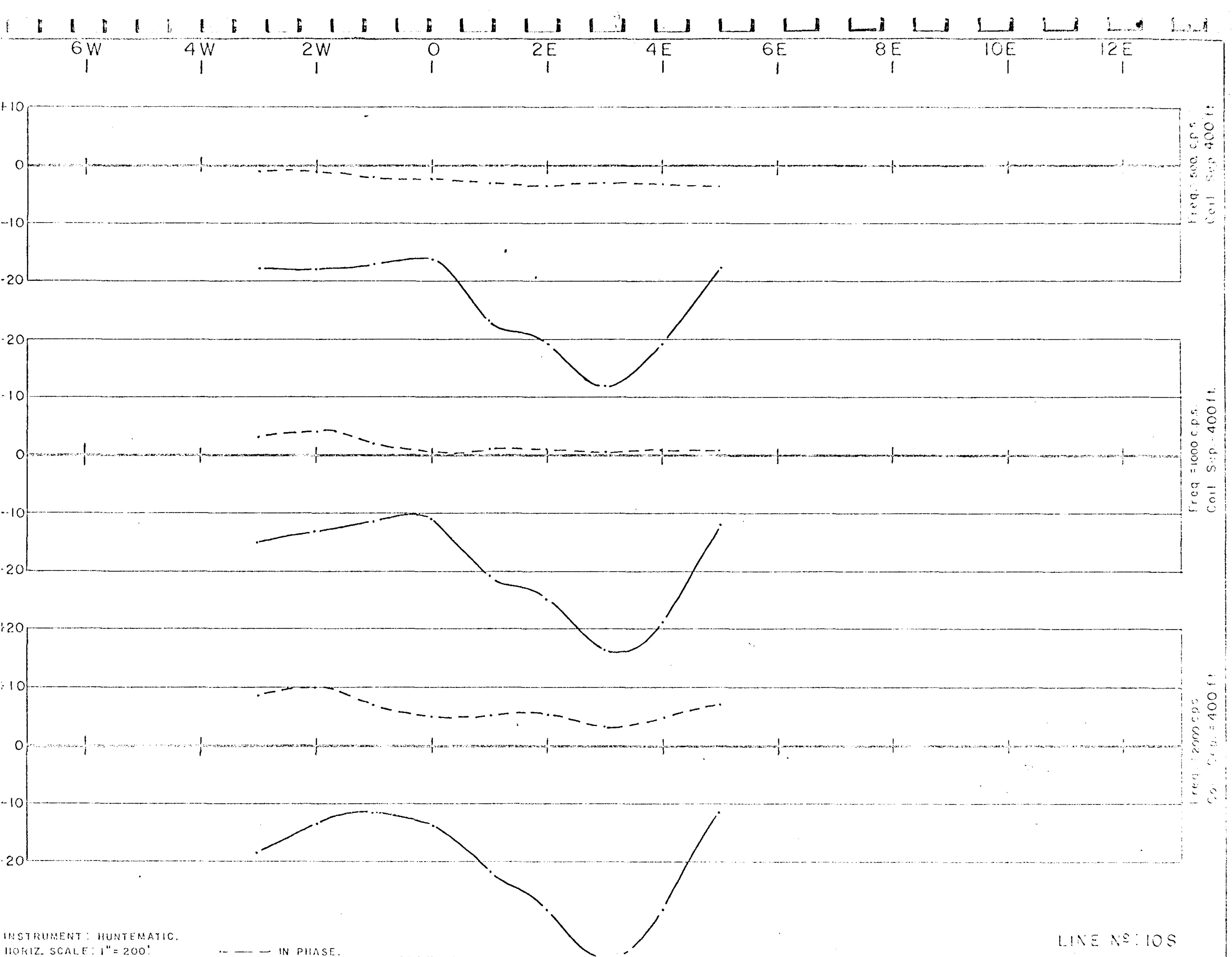


STRUMENT: HUNTEMATIC.
RIZ. SCALE: 1"=200'
RT. SCALE: 1"=20°

——— IN PHASE.
-·-·- OUT OF PHASE

HORIZONTAL LOOP E.M. SURVEY

LINE Nº: 10S

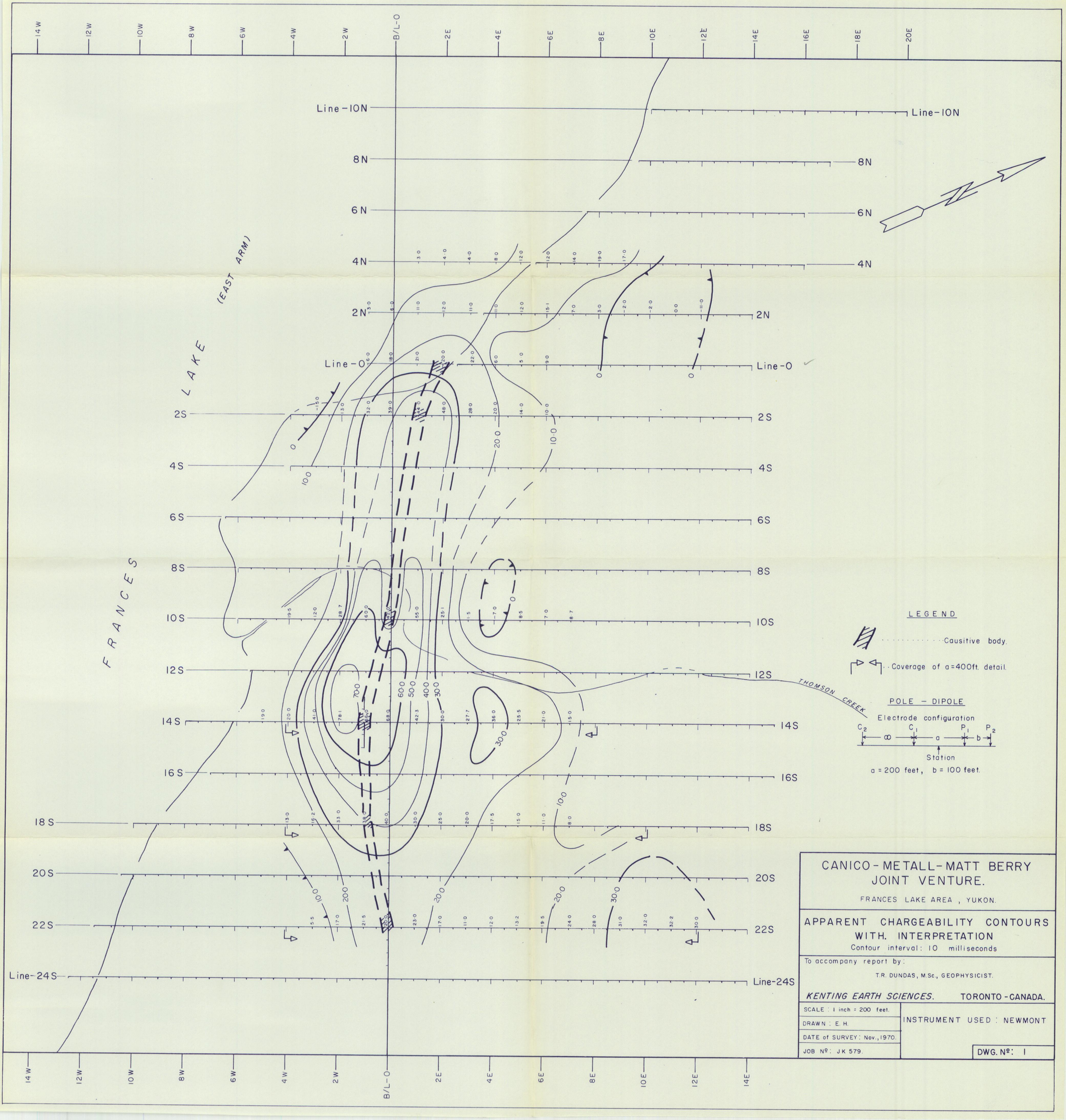


INSTRUMENT: HUNTEMATIC.
HORIZ. SCALE: 1" = 200'
VERT. SCALE: 1" = 20%

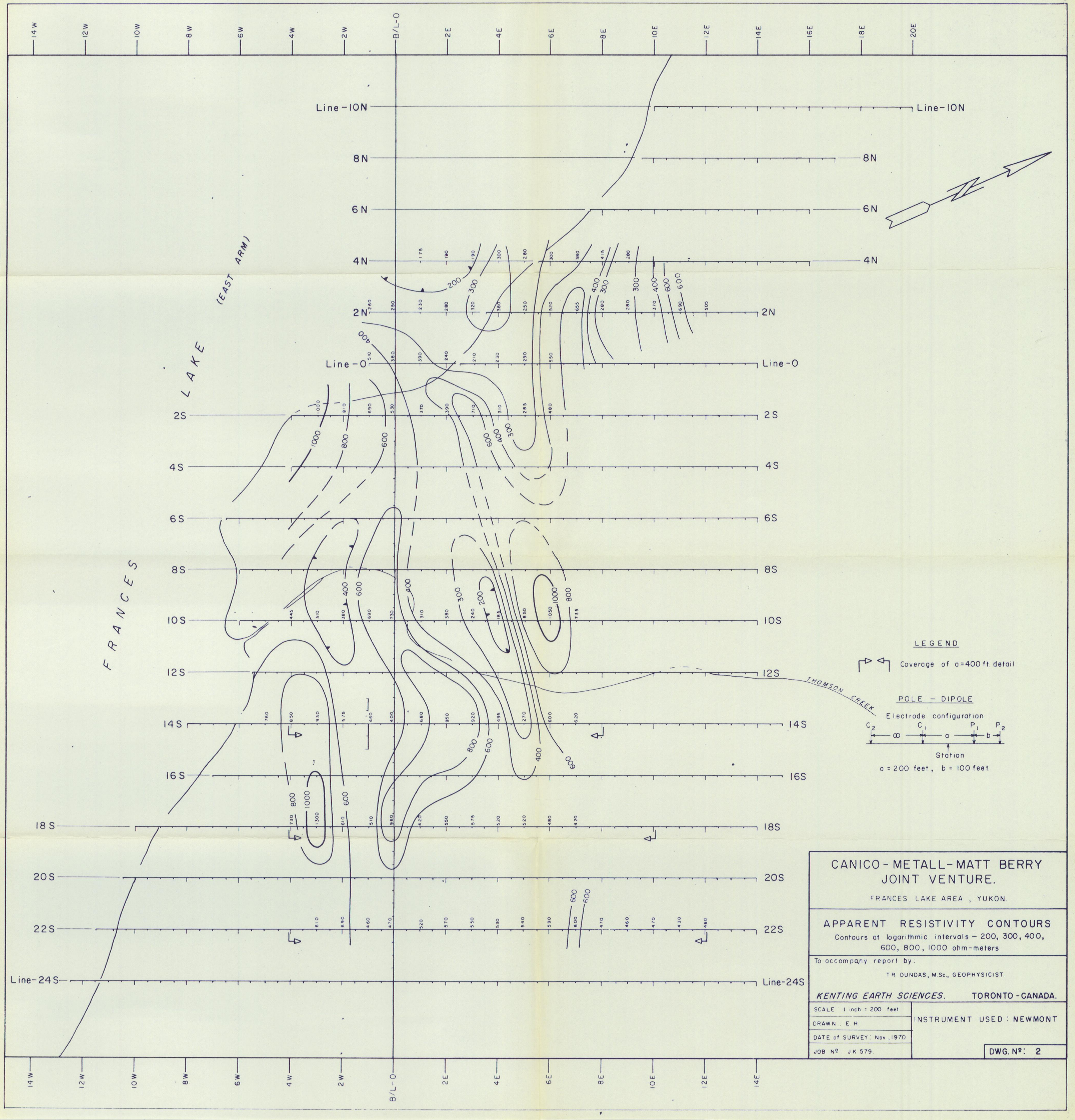
— — — IN PHASE.
OUT OF PHASE

HORIZONTAL LOOP E.M. SURVEY

LINE No. 10S
DWG. No. 15



FRANCES LAKE
(EAST ARM)
THOMSON CREEK
Line-10N
8N
6N
4N
2N
Line-0
2S
4S
6S
8S
10S
12S
14S
16S
18S
20S
22S
Line-24S
B/L-0
LEGEND
Causitive body.
Coverage of a=400ft. detail.
POLE - DIPOLE
Electrode configuration
C2 C1 P1 P2
Station
a = 200 feet, b = 100 feet.
CANICO-METALL-MATT BERRY JOINT VENTURE.
FRANCES LAKE AREA, YUKON.
APPARENT CHARGEABILITY CONTOURS WITH. INTERPRETATION
Contour interval: 10 milliseconds
To accompany report by:
T.R. DUNDAS, M.Sc., GEOPHYSICIST.
KENTING EARTH SCIENCES. TORONTO-CANADA.
SCALE: 1 inch = 200 feet.
DRAWN: E. H.
DATE of SURVEY: Nov., 1970.
JOB Nº: JK 579.
INSTRUMENT USED: NEWMONT
DWG. Nº: 1



CANICO-METALL-MATT BERRY JOINT VENTURE.

FRANCES LAKE AREA, YUKON.

APPARENT RESISTIVITY CONTOURS

Contours at logarithmic intervals – 200, 300, 400, 600, 800, 1000 ohm-meters

To accompany report by:

T.R. DUNDAS, M.Sc., GEOPHYSICIST.

KENTING EARTH SCIENCES. TORONTO-CANADA.

SCALE 1 inch = 200 feet

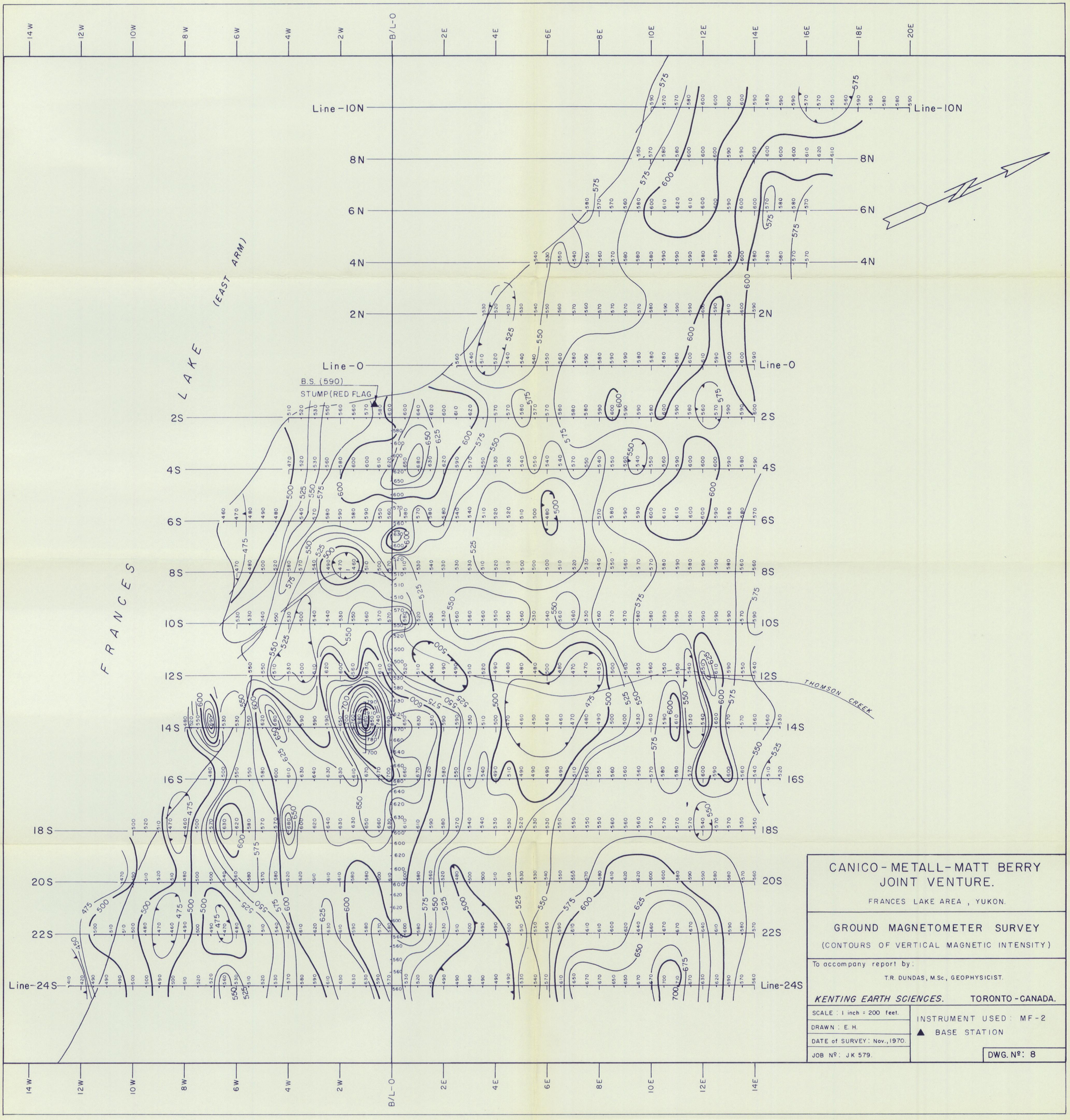
DRAWN: E.H.

DATE of SURVEY: Nov., 1970

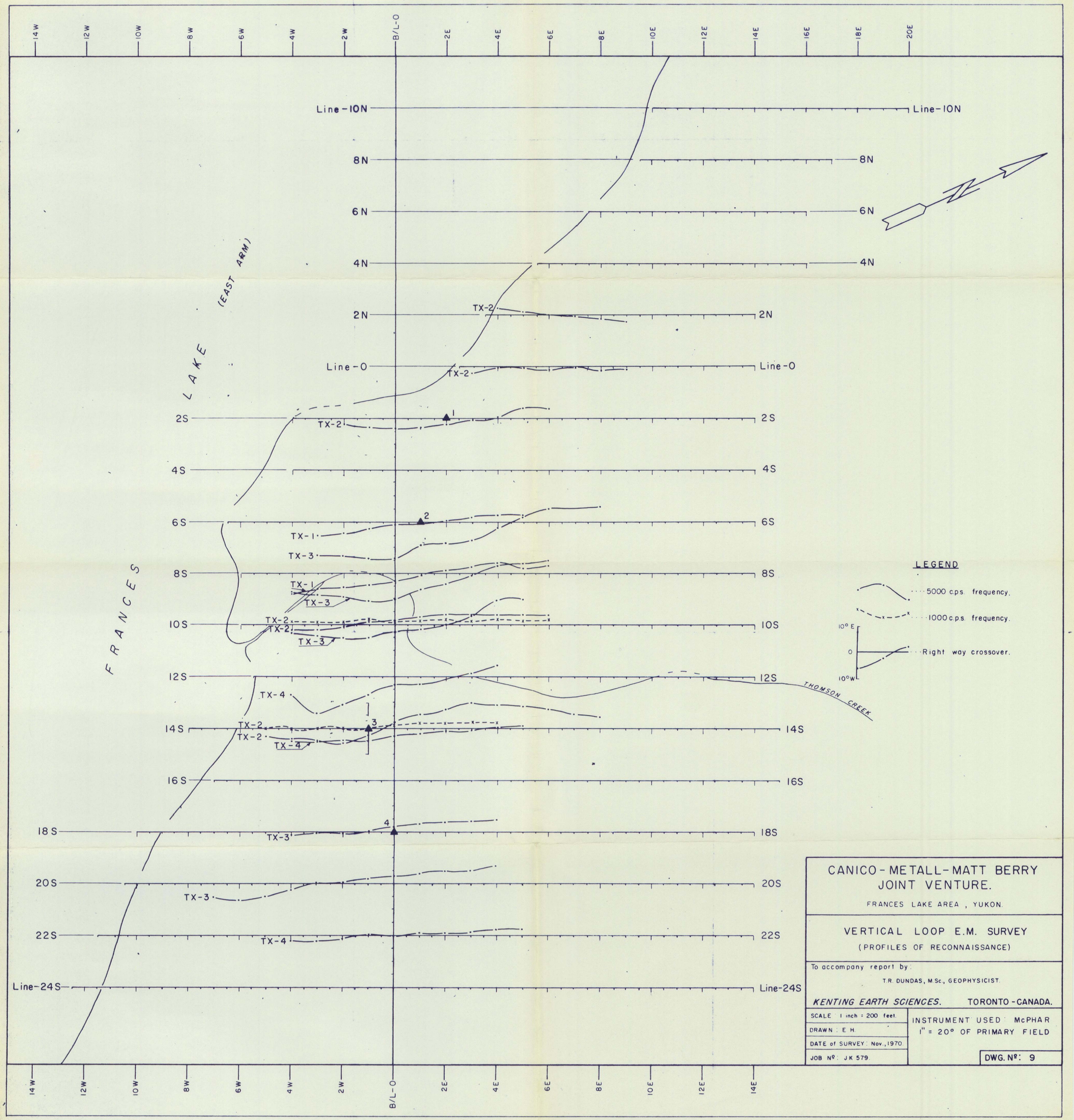
JOB No. J.K. 579.

INSTRUMENT USED: NEWMONT

DWG. No: 2



CANICO - METALL - MATT BERRY
JOINT VENTURE.
FRANCES LAKE AREA , YUKON.
GROUND MAGNETOMETER SURVEY
(CONTOURS OF VERTICAL MAGNETIC INTENSITY)
To accompany report by:
T.R. DUNDAS, M.Sc., GEOPHYSICIST.
KENTING EARTH SCIENCES. TORONTO - CANADA.
SCALE : 1 inch = 200 feet.
DRAWN : E. H.
DATE of SURVEY : Nov., 1970.
JOB Nº : JK 579.
INSTRUMENT USED : MF-2
▲ BASE STATION
DWG. Nº: 8
FRANCES LAKE (EAST ARM)
THOMSON CREEK
B.S. (590)
STUMP (RED FLAG)
Line-10N
8N
6N
4N
2N
Line-0
2S
4S
6S
8S
10S
12S
14S
16S
18S
20S
22S
Line-24S
14W 12W 10W 8W 6W 4W 2W B/L-0 2E 4E 6E 8E 10E 12E 14E 16E 18E 20E



CANICO - METALL - MATT BERRY JOINT VENTURE.
FRANCES LAKE AREA , YUKON.
VERTICAL LOOP E.M. SURVEY
(PROFILES OF RECONNAISSANCE)
To accompany report by:
T.R. DUNDAS, M.Sc., GEOPHYSICIST.
KENTING EARTH SCIENCES.
TORONTO - CANADA.
SCALE: 1 inch = 200 feet.
DRAWN: E.H.
DATE of SURVEY: Nov., 1970.
JOB Nº: JK 579.
INSTRUMENT USED: McPHAR
1" = 20° OF PRIMARY FIELD
DWG. Nº: 9
LEGEND
5000 c.p.s. frequency.
1000 c.p.s. frequency.
10° E
0
10° W
Right way crossover.
FRANCES LAKE (EAST ARM)
THOMSON CREEK
Line-10N
8N
6N
4N
2N
Line-0
2S
4S
6S
8S
10S
12S
14S
16S
18S
20S
22S
Line-24S
14W
12W
10W
8W
6W
4W
2W
B/L-O
2E
4E
6E
8E
10E
12E
14E
16E
18E
20E
TX-1
TX-2
TX-3
TX-4
1
2
3
4

Department of
Indian Affairs and
Northern Development

MAY 21 CANADA
REGIONAL DIRECTOR
OF RESOURCES
YUKON

Ministère des
Affaires indiennes et
du Nord canadien

Resident Geologist,
Whitehorse, Yukon Territory.

Ottawa, Ontario K1A 0H4
May 18, 1971

our file, notre dossier R-1920-7
your file, votre dossier

Matt Berry Mines Ltd. Assessment Report

With regard to the statement of expenditures submitted by this Company in connection with technical reports submitted as evidence of assessment reports on its mineral property in the Francis Lake area of the Watson Lake mining district, the statement has been reviewed by headquarters staff and the explanation as to the difficulty of obtaining all of the receipts and vouchers to support the statement seemed valid. We suggested that a sworn statement verified by the Secretary-Treasurer and the President would be acceptable in this case. I would recommend that the statement be accepted as meeting the requirements of the conditions of accepting assessment work.

B.J. Trevor, P.Eng.,
Administrator of Mining,
Oil and Mineral Division.

SUITE 1102 - 347 BAY STREET
TORONTO 1, ONTARIO
Telephone:
366-9251

This will certify that the Canico-Metall-Matt Berry Joint Venture Frances Lake Field Program Financial Statement of December 31, 1970 showing total expenditures of $ 106,705.25 is for the period from April 29, 1970 to December 31, 1970.

Apart from the Diamond Drilling expenditure of $ 38,752.38 the balance of the expenditure amounting to $ 67,952.87 were used in furthering the exploratory work on the Don- 1-52, Lap 1-90 and Apex 1-90claims.

Sworn before me at the City of Toronto in the Municipality of Metropolitan Toronto, This 5th day of April, 1971.

[signature]

L. F. La Prairie

L.F. La Prairie,
Managing Director, Matt Berry Mines.

REGISTERED PROFESSIONAL ENGINEER
LEON LaPRAIRIE
PROVINCE OF ONTARIO

Kathleen M. Foley

Kathleen M. Foley
Secretary-Treasurer, Matt Berry Mines

A Notary Public in and for the Province of Ontario.

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MINING RECORDER
LAND AGENT
WATSON LAKE, Y.T.
I.A. & N.D.

JOINT VENTURE

FRANCES LAKE FIELD PROGRAM

SUMMARY OF FINANCIAL POSITION

DECEMBER 31, 1970

EXPENDITURES		
Exploration	$ 106,705.25	
Administration	4,470.68	$ 111,175.93
PARTICIPANTS INVESTMENTS		
Canadian International Nickel Co. of Can.	$ 50,000.00	
Metallgesellschaft Canada Ltd.	50,000.00	$ 100,000.00
EXCESS OF EXPENDITURES OVER INVESTMENT TO DATE.		$ 11,175.93
Consisting of:		
Accounts payable and accrued liabilities		$ 40,381.68
Less:		
Cash on hand	$ 27,188.45	
Accounts receivable and advances	2,017.30	$ 29,205.75
		$ 11,175.93

ADMINISTRATION EXPENDITURES

FOR PERIOD ENDING DECEMBER 31, 1970

Office salaries	350.00
Head office services	2,300.00
Office supplies and expense	360.00
Telephone and telex	506.07
Travel	403.56
Legal fees	550.00
	$ 4,470.68

JOINT VENTURE

FRANCES LAKE FIELD PROGRAM

EXPLORATION EXPENDITURES

	Balance Nov. 30/70	December Expenditures	Balance December 31/70
"SCHEDULE A"			
Engineer's fees and services	$ 700.00	1,200.00	$ 1,900.00
Supplies	30.67	-	30.67
Travel	2,624.98	1,283.44	3,908.42
Equipment rental	1,017.85	-	1,017.85
Assaying	546.00	472.00	1,018.00
Diamond drilling	25,407.81	13,344.57	38,752.38
Contract line-cutting	3,688.62	-	3,688.62
Geological mapping	7,188.06	1,183.15	8,371.21
Geochemical surveys	9,555.08	3,915.82	13,470.90
Camps and equipment	4,226.53	366.80	4,593.33
Board and lodging	6,701.39	315.13	7,016.52
Licenses, fees and taxes	275.50	-	275.50
Engineers supplies and expenses	788.09	2.50	790.59
Insurance	144.75	-	144.75
Freight and haul	1,399.34	-	1,399.34
Telephone and postage	706.76	13.40	720.16
Sundry expense	2.00	-	2.00
Equipment repairs and maintenance	434.72	-	434.72
Bulldozing and trenching	29.64	-	29.64
Geophysical surveys	8,900.71	6,473.16	15,373.87
	$74,368.50	$ 28,569.97	$102,938.47
"SCHEDULE B"			
Geological mapping	1,580.49	35.82	1,616.31
Geochemical surveys	$ 2,114.66	$ 35.81	$ 2,150.47
	3,695.15	71.63	3,766.78
	$78,063.65	$ 28,641.60	$106,705.25

38,752.38

67952.87

EXHIBIT A

SUITE 1102 - 347 BAY STREET
TORONTO 1, ONTARIO
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I.A. & IND.

WE, Joint Venture - Frances Lake Field Program, certify that the enclosed unaudited statement ending December 31st, 1971, is true, correct and complete according to the General Ledger.

Signed Leon LaPrairie
(Chairman)

Signed Dolores M. Mowick
(Secretary-Treasurer)

Dated Feb 24th, 1971.

REGISTERED PROFESSIONAL ENGINEER
L. L.
LEON LaPRAIRIE
PROVINCE OF ONTARIO

JOINT VENTURE

FRANCES LAKE FIELD PROGRAM

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JOINT VENTURE

FRANCES LAKE FIELD PROGRAM

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Geochemical surveys	$ 2,114.66	$ 35.81	$ 2,150.47
	3,695.15	71.63	3,766.78
	$78,063.65	$ 28,641.60	$106,705.25

EXHIBIT B

MATT BERRY MINES LIMITED.
EAST ARM FRANCES LAKE - 105H-6

DON CLAIMS

DON	1	Y42303	DON	28	Y42332
	2	04		29	33
	3	05		30	34
	4	06		31	35
	5	07		32	36
	6	08		33	37
	7	09		34	38
	8	10		35	39
	9	11		36	40
	10	12		37	41
	11	13		38	42
	12	14		39	43
	13	15		40	44
	14	16		41	45
	15	17		42	46
	16	18		43	47
	17	19		44	48
	18	20		45	49
	19	21		46	50
	20	22		47	51
	21	23		48	52
	22	24		49	53
	23	25		50	54
	24	26		51	29
	25	27		52	30
	26	28			
	27	31			

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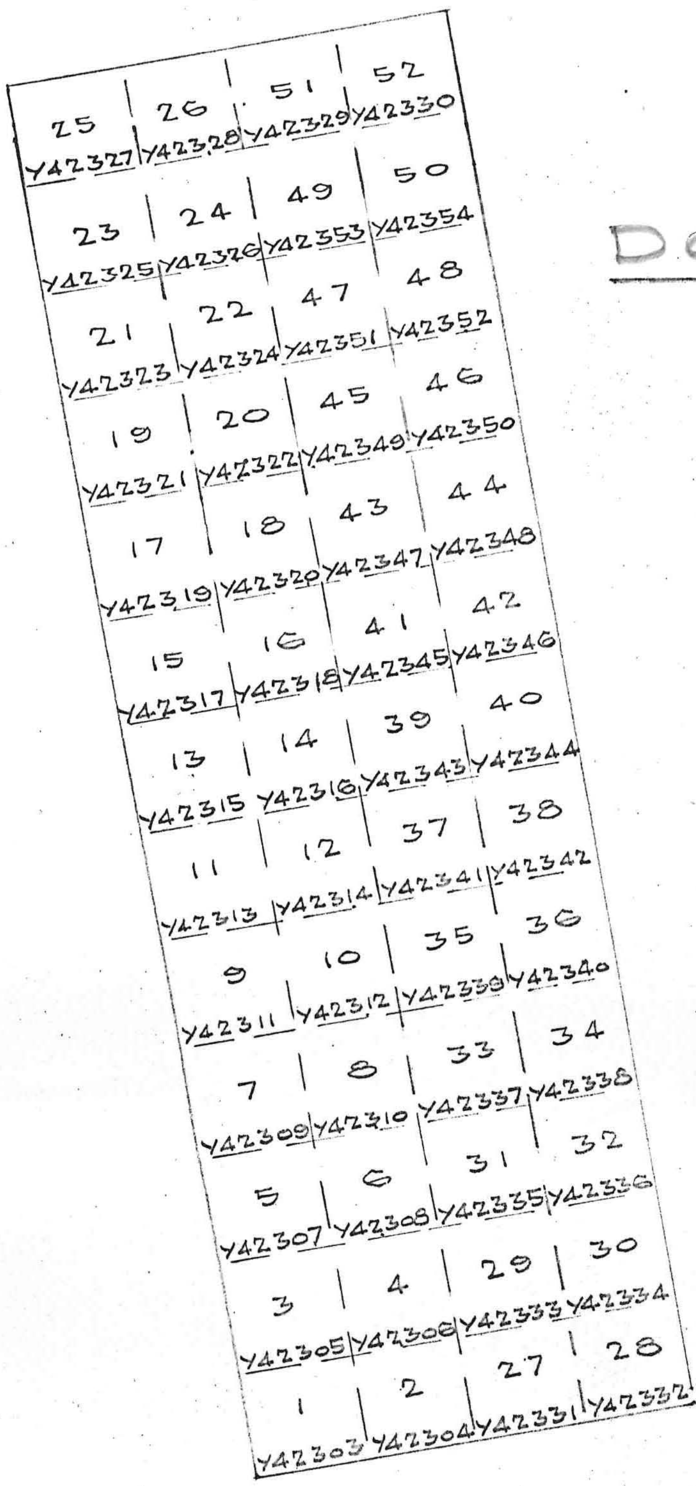
MINING RECORDER
LAND AGENT
WATSON LAKE, Y.T.
I.A. & N.D.



DON 1-52

MATT BERRY MINES

EAST ARM FRANCES LAKE

105 H-6

SKETCH A

MATT BERRY MINES LTD.

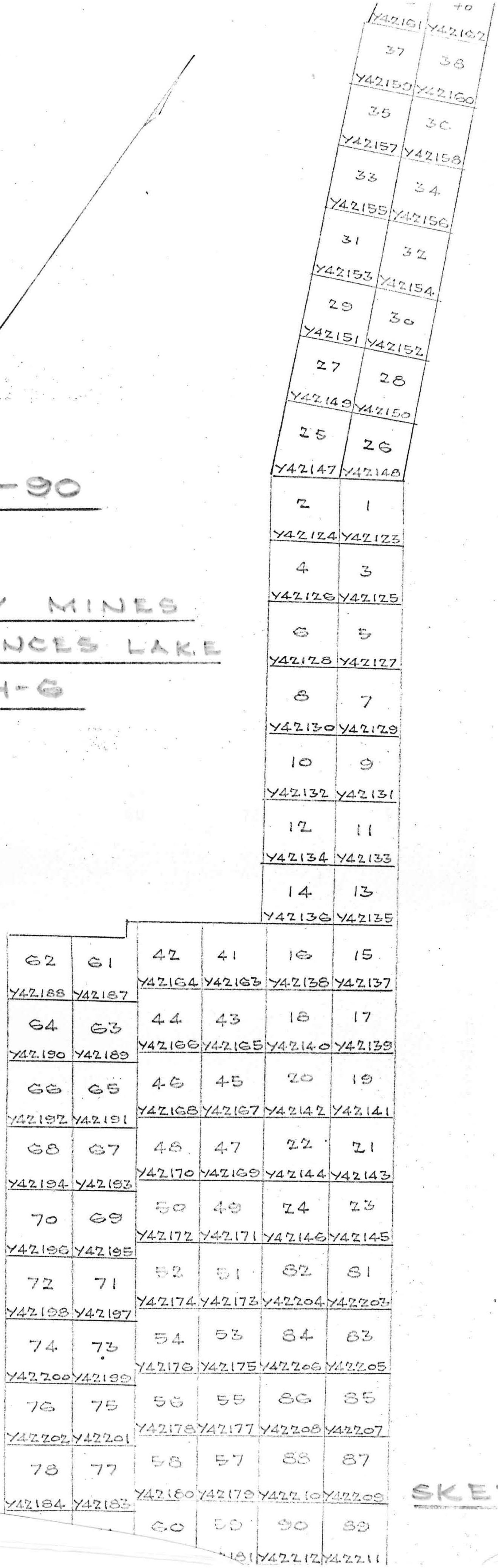
EAST ARM FRANCES LAKE - 105H-6

LAP CLAIMS

LAP	1	Y42123	Lap	31	Y42153	Lap	61	Y42187
	2	24		32	54		62	88
	3	25		33	55		63	89
	4	26		34	56		64	90
	5	27		35	57		65	91
	6	28		36	58		66	92
	7	29		37	59		67	93
	8	30		38	60		68	94
	9	31		39	61		69	95
	10	32		40	62		70	96
	11	33		41	63		71	97
	12	34		42	64		72	98
	13	35		43	65		73	99
	14	36		44	66		74	200
	15	37		45	67		75	201
	16	38		46	68		76	202
	17	39		47	69		77	183
	18	40		48	70		78	184
	19	41		49	71		79	185
	20	42		50	72		80	186
	21	43		51	73		81	203
	22	44		52	74		82	204
	23	45		53	75		83	205
	24	46		54	76		84	206
	25	47		55	77		85	207
	26	48		56	78		86	208
	27	49		57	79		87	209
	28	50		58	80		88	210
	29	51		59	81		89	211
	30	52		60	82		90	212

LAP 1-90

MATT BERRY MINES
EAST ARM FRANCES LAKE
105 H-6



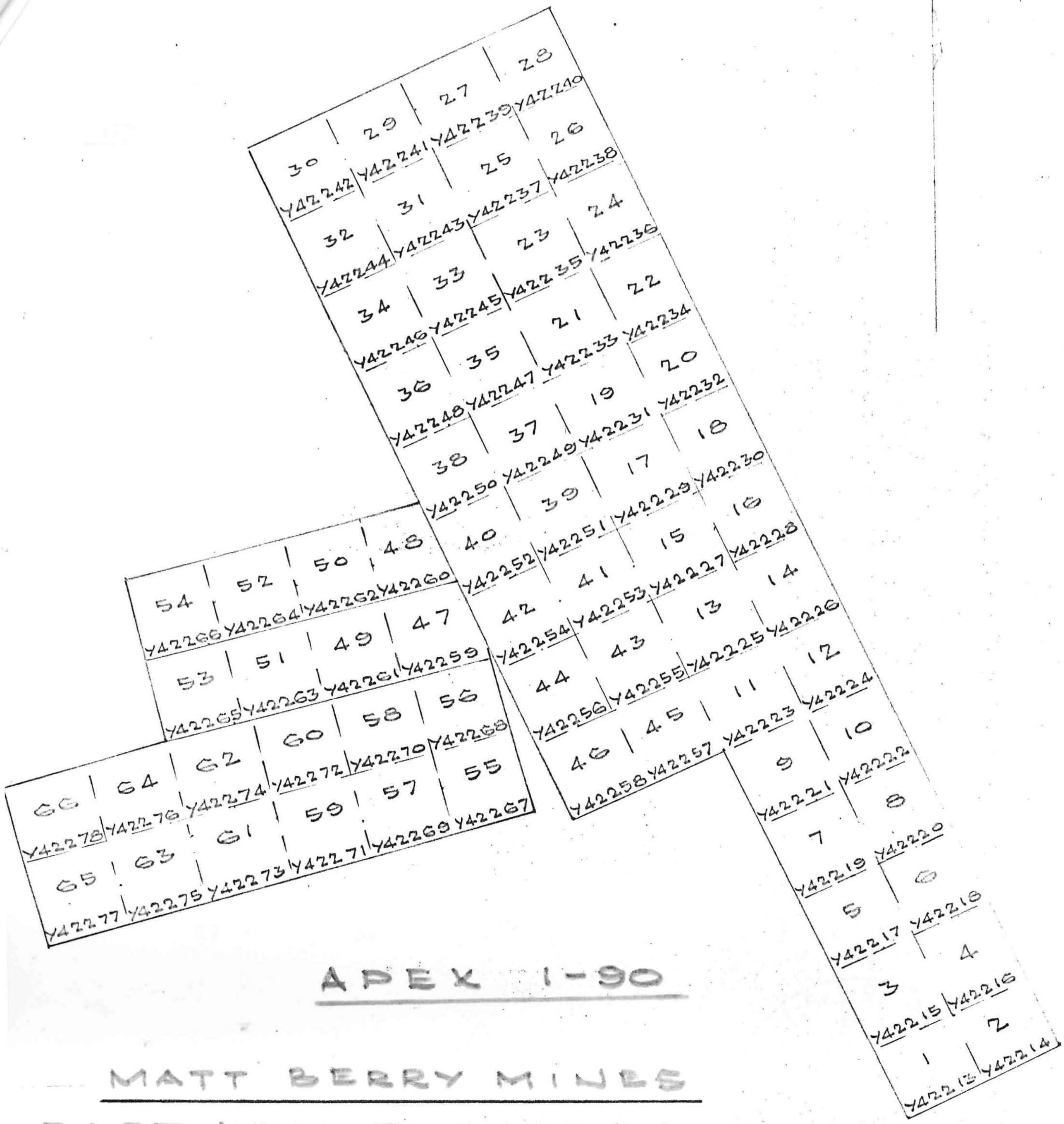
SKETCH B

MATT BERRY MINES LTD.

EAST ARM FRANCES LAKE - 105H- 6

APEX CLAIMS

APEX 1	Y42213	APEX 31	Y42243	APEX 61	Y42273
2	14	32	44	62	74
3	15	33	45	63	75
4	16	34	46	64	76
5	17	35	47	65	77
6	18	36	48	66	78
7	19	37	49	67	79
8	20	38	50	68	80
9	21	39	51	69	81
10	22	40	52	70	82
11	23	41	53	71	83
12	24	42	54	72	84
13	25	43	55	73	85
14	26	44	56	74	86
15	27	45	57	75	87
16	28	46	58	76	88
17	29	47	59	77	89
18	30	48	60	78	90
19	31	49	61	79	91
20	32	50	62	80	92
21	33	51	63	81	93
22	34	52	64	82	94
23	35	53	65	83	95
24	36	54	66	84	96
25	37	55	67	85	97
26	38	56	68	86	98
27	39	57	69	87	299
28	40	58	70	88	300
29	41	59	71	89	301
30	42	60	72	90	302

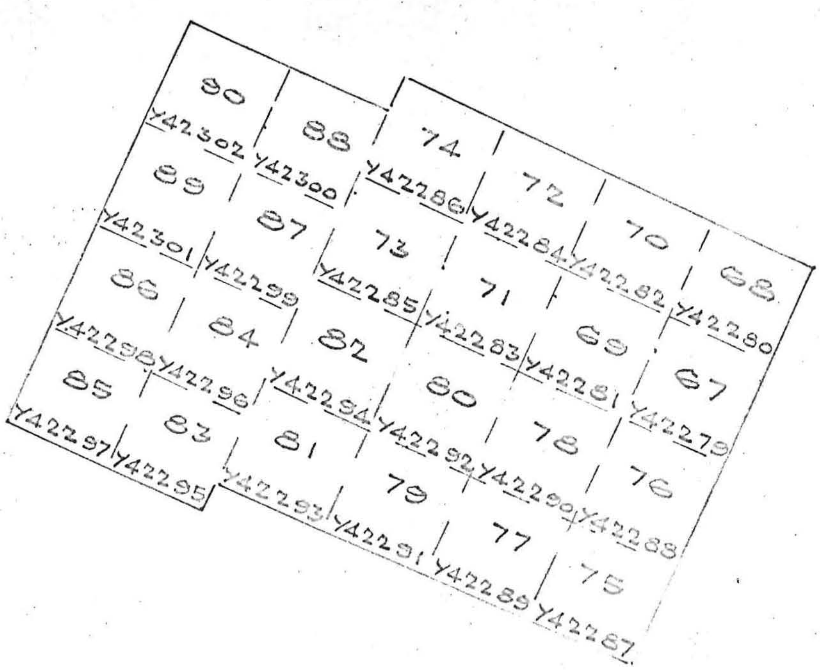


APEX 1-90

MATT BERRY MINES

EAST ARM FRANCES LAKE

105 H-6



SKETCH C