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PART II

ORIENTATION STUDIES

MT. LYELL AREAS

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PART II

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WHITE SPUR AREA

I.
Orientation on Western Area, line 36 N Costean (see Appendix I)

The results of rock sampling of closely interbedded tuffaceous shales, grey carbonaceous shales and black pyritic shales show only background base metal values (95-140 ppm Cu, 35-50 ppm Pb and 70-115 ppm Zn), associated with only moderate (for shale) Mn values (120-580 ppm Mn, with the 120 ppm value in green tuffaceous shale).

The overlying soil profile consists of C horizon saprolite covered by thin (16 cm) of locally derived glacial clay. This is waterlogged and lacks any A_0 or A_1 (organic) horizon development.

Results are as follows:

sample no.	depth (cm)	Cu	Pb	Zn	Mn	Fe	Co
24501	0 - 8	41	74	84	98	280	5
2	8 -16	90	89	380	385	1110	21
3	16 -24	23	75	61	34	25	5
4	24 -32	8	61	34	31	81	5
5	32 -40	83	74	129	150	320	12
6	40 -48	82	81	124	154	325	7
7	48 -56	95	50	110	120	27500	13

Thus iron is low, due to the leached (by downward percolating humic acids from button grass) profile, except in the 8-16 cm interval, where higher Fe is associated with higher Mn, Co and Zn values. In fact there is an almost 1:1 correspondance between Mn and Zn, and the higher Co value attests to some scavenging effect. No obvious change in soil profile appearance was noted, however.

This higher zone within the glacial soil cover could represent an interbed of higher value glacial soil from anomalous rocks nearby.

A major potential problem here is that the glacial soil, being thin and patchy, and often lacking obvious boulders, is difficult to recognise and map.

Washing of soil samples and examination for rounded exotic quartz fragments is recommended on all +80# samples from this area. These are kept in the sample preparation shed.

By this means, a map of glacial soils can be produced to aid interpretation of existing results.

A further problem is that sampling the 8-16 cm interval would lead to a false anomaly in Zn. Thus monitoring Mn, Fe and Co content is recommended, although priority should be given to coincident Pb-Zn (and Cu) anomalies.

Elsewhere on line 36 N, analysis of grey tuffaceous sandstone, black shale and black pyritic shale all showed similar background values for this rock type. (samples 24511 - 13; Cu = 135-160 ppm, Pb = 15-65 ppm, Zn = 90-150 ppm, Mn = 300-310 ppm).

2.
Orientation on NE area, line 39 N costean.

Routine "C horizon" soil sampling near the orientation sample sites gave the following results:

location	Cu	Pb	Zn	Mn	
4800 E	37	50	94	315	
5000 E	39	42	305	370	
5050 E	24	33	360	4600	(I P anomaly E3)
5100 E	29	100	255	320	

The grey tuffaceous shale at 4830 E carries only background metal values.

At 5065 E, chloritized feldspathic crystal tuff is anomalous in Pb (350 ppm) and Zn (360 ppm) as is the locally derived plumbing system sample of iron rich joint plane filling (Pb 250 ppm, Zn 250 ppm). Only background Cu is present,however (70 and 65 ppm).

The overlying thin glacial clay (not "C Horizon" saprolite as stated on the routine survey sheets) is also anomalous in Cu (58 ppm), Pb (69 ppm), Zn (108 ppm) and Mn (144 ppm) relative to other routine survey values on this line.

At 5080 E, the host rock chloritized feldspathic crystal tuff is anomalous in Zn (340 ppm) and Pb (130 ppm). A "plumbing system sample" of fault-fill Mn wad in this host rock is also anomalous in Zn (310 ppm), Pb (290 ppm) and Co (430 ppm). Note that although Co is highly enriched (scavenged) in the wad relative to the host rock (430 ppm Co for 7500 ppm Mn in wad; 17 ppm Co for 370 ppm Mn in host rock), there is no Zn enrichment, and only two-fold Pb and Cu enrichment.

This is further evidence, recurring throughout this report that the Zn-Mn association is a fundamental one related to mineralization, not false scavenging.

The overlying A_0 soil carries Cu Pb Zn values of 36, 54 and 78 ppm respectively. These are not obviously high, but may be relatively anomalous if compared to other A_0 values on this line - further orientation sampling is needed.

Sample 24521 (laminated feldspar crystal tuff) is anomalous in Zn (590 ppm), Mn (920 ppm), and Fe (7.4%).

The overlying red-brown B horizon clay is surprisingly low in Zn (18 ppm), and a further puzzling feature is the very low Mn (26 ppm) and Fe (45 ppm), consistent with a leached A_2 profile rather than B. The sample should be examined for color to check for gross error, and if necessary this site should be re-sampled.

The overlying A_0 soil carries similar low background values.

3.

Comments on Annual Report EL9/66 (1977-78) by A.C. Walter.

The geochemical characteristics of the White Spur area have been thoroughly detailed in this report.

The following comments by N.J. Marshall are made from an inspection of the data, although a thorough analysis and ground follow-up was not undertaken.

1) data presentation - these comments hold generally for all grid areas under joint venture.

Data are presented as auger soil sample result plans, which have been color contoured as follows:

Cu	80 and 30-80 ppm
Pb	200, 100-200 and 50-100 ppm
Zn	200, 100-200 and 50-100 ppm

These colored maps would have been more useful on transparencies (sepias), which allow closer assessment of element anomaly coincidence by superimposing plans and geologic map on a light table.
This is recommended as a general procedure.

The plotted number data are too detailed and confusing to make a visual overall impact by pattern recognition. The colored contour maps, while useful in giving a broad pattern, are not so useful on detailed examination because the rather arbitrarily chosen contours are themselves distorting.

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Thus in detail, coincident anomaly zones may not appear to be anomalous because the thresholds have been arbitrarily defined in advance. For example,values of 29, 50 and 50 ppm on a line over thicker glacial soils running 3-5 ppm local background may be just as anomalous, in the relative sense, as values of say 50, 150 and 150 ppm on the strike projection to another line where soils are residual and local backgrounds higher (say 30, 50 and 60 ppm).

Contouring using a fixed background/threshold value would not show this as a continuous zone running through two lines.

This is particularly important in an area where backgrounds vary across the map due to the vagaries of soil type (topographic and vegetation control) and presence/absence of glacials, a problem which is recognised in the annual report, which mentions difficulties with correlation from line to line. The use of stacked line profile plotting would overcome this problem, and enable zonal patterns to be recognized by changes in relative amplitude, irrespective of absolute value.

For example, line 29 N at 500 E-500 W is shown on contours as an anomalous Pb-Zn zone with no Cu, but Cu is also anomalous in the relative sense compared to adjacent values.

Mn data also need to be plotted (preferably as stacked profiles) in view of the importance of Mn as a guide to favorable rock type for mineralization (as at Beatrice).

2) The assay plan of the costean line 36 N (fig. 23 in annual report) shows only background or low Cu Pb Zn Mn values, with higher (but not anomalous) Cu associated with shales.
I regard the absence of high Mn as a discouraging sign, and back-up values for alteration elements such as Ba, B, K, Na, and Rb by total rock analysis are required. The costean should also be logged with acid for CO_3 - alteration.

3) The above approach should also be done on the line 39 N costean in the N E area, and in the drill core. (in progress).

4) Ag analyses are below or at the analytical detection limit (about 2 ppm), and unless a detection of 0.2 ppm can be achieved, are not useful. Only the highest extreme base metal values report in Ag above detection limit.
As would be a more useful back-up pathfinder for sulfides (including barren pyrite).

5) Conformable basic sills sometimes give rise to Pb-Zn or Cu-Zn relative soil anomalies (annual rept. table 3). Where outcrop is poor, back-up lithogeochemistry of basic rock influence can be provided by Ni analyses, which should contrast well against the acid tuffs.

6) In the western half of the grid, black pyritic shales are common (cf. N E section has grey to brown tuffaceous shale) as interbeds within a sequence of felsic crystal and welded tuffs. The exploration problem is to recognize mineralized shales adjoining volcanics from unmineralized carbonaceous shales carrying high background base metals, as both would give geochemical and geophysical responses

4. Conclusions and Recommendations.

The White Spur Area occurs on the southern strike extension of the Rosebery and Hercules mineralization, in similar rock types. Geochemical and geophysical responses are complicated by shales, but according to Gee (PhD thesis, 1970), black shales are not necessarily conducive to ore, and carry normal to low base metal values compared to average black shales. The N E section of White Spur grid, where drilling is imminent on line 39.5 N should be less complex to interpret as black shales do not occur there.

1) A problem with the geochemistry is the variation in soil types in response to rock type, topography, vegetation and glacial influence.

Every effort should be made to obtain as consistent a sample as possible, so that relative comparisons may be made.

In some instances, nominal " C horizon " sampling is actually compacted glacial boulder clay, having a superficial resemblance in auger samples to weathered greenish saprolitic material. The "+80#" stored fractions of this should be washed, as these contain a large amount of clay aggregate and are not truly +80#. Coarse fragments after washing should be examined for water-worn exotic quartz, indicative of glacial origin, and the glacial samples noted on the maps.

2) Although B horizon sampling is preferred (where available), the A_0 humus horizon is a fairly ubiquitous medium occurring at surface, and, by analogy with other areas, should give a good geochemical response, particularly for Pb.

Such sampling would be rapid and consistent. (cf. augering to " C horizon "), and may be useful in other, ungridded areas for the future.
By way of orientation for application to new areas, the costean line 39 N, in the N E area, should be sampled for litter (L or A_{00}), A_0, B (if available) and bedrock samples, over the mineralized section and well into background either side.
Samples should be run for Cu Pb Zn Mn Co As and geochemical responses compared.

3) On existing samples where outcrop information is lacking and Cu-Zn or Pb-Zn anomalies occur, Ni should be run to check for response due to basic intrusives.

4) The entire White Spur Grid data should be replotted (computer) as line profiles for Cu, Pb, Zn and Mn, on transparent base maps. Overlays to geology and visual pattern recognition will enable a better interpretation of trends to be made, and will help overcome the effects of variable background due to changing soil types.

5) The line 39.5 N drill core should be logged for carbonate (with acid), and the entire core chip sampled. Analyses should be carried out for Cu Pb Zn As Mn and the usual alteration zone elements.
These may provide a guide for similar mineralization elsewhere.

6) Arsenic analyses on barren pyritic shales and mineralized sections of drill core should be carried out to build up a case history of arsenic response.

Arsenic anomalous rock samples should be followed through with equivalent soil profile sampling.

Ultimately, the As data should be extended to I P anomalous zones.

As may help discriminate I P anomalies due to graphitic shales (low As, moderate base metals) from mineralized rocks (high As and base metals). In situations where an I P anomaly is coincident with As only, barren pyrite could be the cause.

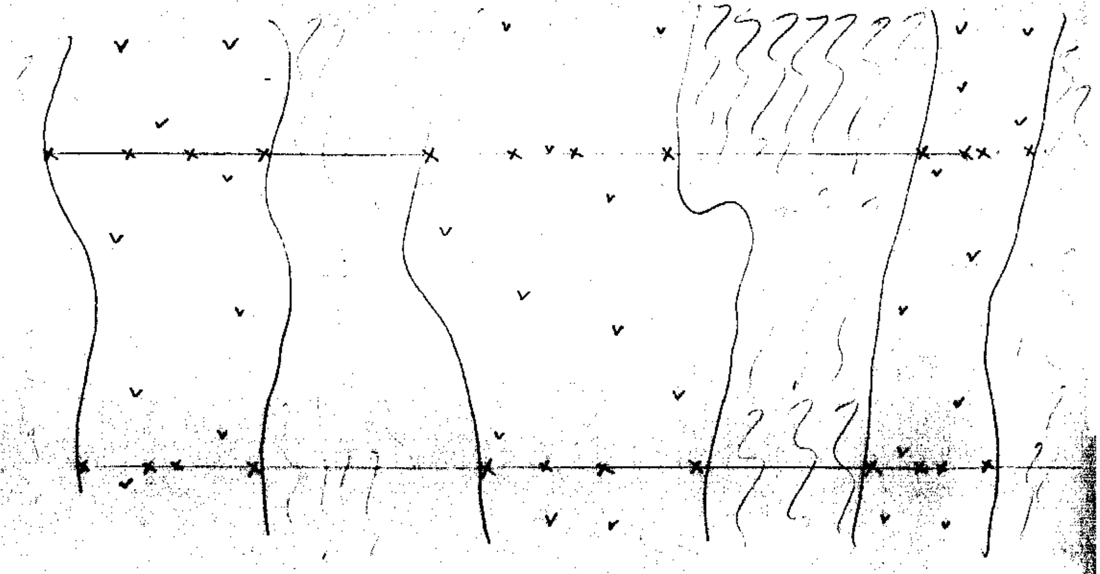
Without the supporting As data, and in the absence of base metal anomalies, I P anomalies cannot be as readily explained.

Initially, the orientation samples 24507 -24516, 24518B, and 24519-21 should be tested for As.

7) In the interpretation of line profiles from the entire White Spur grid, preference should be given to Mn rich zones in altered, anomalous volcanics adjacent to shales.

8) Having accurately defined the various soil anomalous zones in volcanics adjacent to shales by overlay of line profiles (of existing data) with geology, some priority system for rating these is required.
This can be done by taking semi-regional rock samples (outcrop, auger chips or local float) on lines across each stratigraphic zone, and testing these for base metals, As, Mn alteration elements and carbonate.

Four rock samples (one on each contact and two across the middle) across each horizon on parallel lines are suggested, as illustrated in the diagram below.



x = SAMPLING POINTS

Priority for follow-up would then be based on anomalous base metal zones which are coincident with strongest and most extensive rock alteration.

5. Addenda :

Line 39.5 N has now been drilled (R. Mears, pers. comm.)

29.3.79 and shows only low grade disseminated pyrrhotite with slight sericitic alteration. Thus this is not a good orientation core except to provide barren background data. Nevertheless, the principles suggested should be applied on any subsequent well mineralized sections discovered, including Lake Beatrice and Henty River drilling.

Since this report was completed, the costean line 39 N has been orientation sampled. Unfortunately, even C horizon results are low, as confirmed by drilling, so there is no marked litter anomaly/

The A_0 horizon does have a weakly anomalous zone from 4930-4970, corresponding to the B and C horizon (also weakly anomalous).

II. LAKE BEATRICE GRID

Refer also to Appendix II, and the Dora-Huxley EL 10/69 annual report, 1977/78 by M.J. Hutton.

1. Disposition of Geophysical Anomalies. (see fig. 3 of annual report.)

1) I P anomalies.

Strong chargeability anomalies occur from the central mineralized black shale unit and its adjacent tuffs, westward across the quartz-feldspar porphyry body. The top of this quartz feldspar porphyry anomaly is believed to be 100-200 m below surface.
Its cause is not understood.

2) On line 18 N, between 330 and 600 W in porphyritic crystal tuffs between two units (possibly a synclinal fold repetition) of pale altered lithic tuffs.
A small occurrence of adjacent black shale is also mapped here.

3) On line 4 N/1600 W and line 6 N/1470 to 1635 W in quartz-feldspar porphyritic felsic lavas, with intercalated black shales.

4) On several lines in the SE quadrant of the map, in altered feldspar/quartz porphyritic coarse grained crystal lithic tuffs, and their presumed extension under glacial cover.

2. Disposition of Geochemical Anomalies.

For the purpose of this report, two profiles (lines 14 N and 16 N) have been hand plotted with an accompanying strip profile of lithology and topography. (see figs. 9 and 10 series.)

1) "Anomalies" associated with quartz-feldspar porphyry.

Spotty anomalies due to Pb only have been recognized by Hutton on some soils taken over the porphyry hill which is underlain by the strong I P anomaly.

Some orientation rock and soil profile samples were taken by the author with M.J. Hutton, with emphasis on sampling the routine survey anomalies. Close inspection was paid to rock alteration, and several creeks were sampled for stream sediments. Some samples were also taken in a gully at the break in slope. The stream sediment and gully sample were chosen from the air-photographs as representative of potential faulting.

Any mineralization present should have some fault expression and it was hoped that sampling along the faults would reflect this. (see Appendix II).
M. Hutton has also collected numerous rock samples over this area, and results of these were made available for study.

a) rock characteristics.

The rock is predominately a massive feldspar-quartz porphyry with aphanitic groundmass, and variable clear quartz phenocrysts. It is massive, very hard and coarsely jointed, with occassional sub-horizontal barren quartz veins. (see photo II.3.)

In places the outcrop shows variable development of more potassic (K feldspar) phases and chloritic phases.

It was suggested that if desired, the more potassic rich phases could be mapped, in an attempt to delineate zoning within this rock unit, by using a scintillometer, or, preferably, a portable gamma ray spectrometer using the K^{40} channel.

In hand specimen appearance, I cannot agree that this unit represents welded ash-flows (ignimbrite) and it appears singularly barren and devoid of strong alteration or structural disturbance.

b) soil characteristics. (see descriptions, Appendix II).

The porphyry hill area is covered by thin, skeletal, azonal soils (lithosols) forming steep slopes.

Vegetation consists of ti-tree and cutting grass scrub. (see photos II.2. and II.4.)

The soils consist of somewhat bleached azonal grey silty clays (resembling an A_2 profile), often overlain by a thin organic humus (A_0) layer, sitting on fresh bedrock.

Thus auger sampling did not collect A_1, B or C horizon samples during the routine survey.

c) orientation soil and rock geochemistry. (Appendix II).

i) site 1600 N/1260 W, site of 590 ppm Cu, Pb and Mn relative to the underlying skeletal soil
(eg. Cu Pb Zn Mn = 370, 2000, 55, 390 vs. 55, 370, 24, 90 respectively).

ii) site 1600 N/1350 W, site of 400 ppm Pb anomaly in routine sampling.

The A_0 soil here is only moderately organic compared to the previous site, but is again enriched in Cu Pb (Zn) Mn relative to the underlying skeletal soil. The outcrop (sample 22938) confirms only background values for Cu, Pb, Zn, Mn (40, 30, 40, 50).

At 1355 W, some organic rich soil was collected from moss growing in a joint plane, and confirmed organic enrichment to 350 ppm Pb.

iii) site 1650 N/1470 W

Again, low background rock values (sample 22939) are particularly enriched in Pb in the A_0 organic layer (Pb in rock = 30, in azonal soil = 160, in A_0 = 220).

Fe/Mn encrustations from a spring seepage at this site show moderately anomalous Pb.

iv) site 1800 N/1800 W

Barren rock values (22940) are reflected in the thin azonal soil. A_0 was not available at this site.

v) site 1800 N/2010 W.

The azonal soil at the possibly fault controlled break in slope is barren.

vi) site 1600 N/1860 W.

barren values in azonal soil at possible fault control slope.

d) <u>orientation stream sediment geochemistry</u>.

Of the three sites sampled, site 1400 N/1440 W may be slightly anomalous in Pb (175 ppm) and Zn (144 ppm) but this sample is associated with a 4x higher Mn content. Thus it possibly represents background variation which could be accounted for by changes in Mn content and/or amount of active fines in the sample.

e) <u>F series rock samples collected by M.J. Hutton.</u>

The samples collected over the porphyry show low (normal background) values except F745 (1000 N/955 W).
(Cu Pb Zn = 320, 270, 410 ppm).
This is associated with a higher Fe content and may reflect local enrichment with ferromagnesians.

f) <u>line profiles 16 N and 14 N (figs. 10 and 11 series, also figs. 8 and 9)</u>.

From routine survey sampling.

Line 16 N: a 1 station Pb anomaly at 1005 W is reflected by higher Mn and Cu.
(Cu Pb Mn = 380, 530, 670 ppm)
This probably represents a more organic A_0 sample taken relative to its surroundings.
Arsenic should be run on this sample to check for a sulfide association, and rock sampled at this site.

Line 14 N: Minor Pb anomalies should be checked by rock sampling, soil profile sampling and soil arsenic analyses. However, contamination by enriched A_0 horizon(relative to surrounding azonal samples)is the likely cause.

g) Conclusion.

There is no geological or geochemical evidence for mineralization in the quartz-feldspar porphyry, or of any leakage from possible underlying mineralization.

Anomalies obtained are essentially for Pb only, and due to sampling inconsistencies (contamination by A_0 horizon). The organic A_0 is enriched in base metals by biogeochemical cycling. (A_0 is advocated as a reconnaissance sampling medium (higher backgrounds prevail) provided this is done consistently).
Some Pb enrichment may occur locally with more potassic feldspar rich and ferromagnesian rich phases.

In my opinion, drilling priority through the quartz porphyry (I P anomalous) should be downgraded pending geochemical back-up of the altered IP anomalous tuffs on the eastern half of the grid.

2) Altered tuffs, eastern side of grid.

These are associated with I P anomalies which also occur over glacial material presumably overlying the tuffs.

Some black shale, and sphalerite/galena mineralization associated with coarser grained, altered (chlorite/sericite) tuffs is also shown on the geologic map.

This area has been proposed for geochemical sampling later this year.

In view of the association of black shales, known mineralization, and altered coarse grained volcanics in this SE Map quadrant, this area may require a higher priority.

Recommendation.

By way of geochemical reconnaissance to establish priorities, the following steps are recommended.

a) Visit the various mapped rock types and collect rock samples of altered material. At this stage, field measurement of K^{40} activity with a scintillometer or gamma spectrometer is recommended.

Analyze for the alteration assemblage Ba, B, Sr (emission spectroscopy as an initial semiquantitative scan) and H F based digest Na, K, Rb, Sr, (by AAS), with Cu, Pb, Zn, Mn on the same solution.

Analysis for rock F should also be run by fusion and selective ion electrode.

At the same time the presence of any carbonate effervescence during acid attack should be noted by the analyst and relative abundance of carbonate noted on an arbitrary scale from 0 to 4. (see discussion of West Hercules orientation).

b) Soil litter samples should be collected over any rock samples with a characteristic alteration signature, wet-ashed ($HClO_4/HNO_3$) and analyzed for Pb Zn Mn and As (As by colorimetry from the same digest).

c) Regional stream sediment sample results, if already available, should be critically studied.

d) Mn/Fe coated stream pebbles should be collected along streams in the southern bordering glacials above the Comstock River. - analyze for Cu Pb Zn Mn Co using hydroxylamine leach.

N.B.

The sampling interval for this, versus conventional -80# stream sediment sampling can be ascertained after the recommended orientation sampling dispersion study has been carried out along Itat Ck. draining the Beatrice prospect.

Any favorable regions established by such reconnaissance can then be re-assigned priorities for routine close grid sampling.

Where a consistent, readily obtained B horizon sample is available, this should be collected by augering during this detailed stage. Hydromorphic anomalies on slopes can be monitored by ratioing cold extractable (0.5N HCl, 4 hours leach) to "total" results, on the samples.

Further follow-up of hydromorphic anomalies (Cx values approximate total values where anomalous) involves depth profile sampling uphill to the source, and collection of bedrock samples.

(in part I)

Where thick glacial soil cover predominates (see photo II.5.) litter sampling should be done consistently, and this sample type noted.

Such glacial soils can be recognized (in absence of surface erratics of Owen Conglomerate or road cuttings) by washing the clay from a small sample and looking for poorly sorted grit-sized rounded quartz grains.

3) Other altered tuffs, central portion of map sheet.

The rock units east of the lines sampled over the Beatrice prospect, although lacking in I P response, should also be sampled by initial reconnaissance using the same approach as suggested for the SE quadrant.

4) Beatrice Prospect area. (see line profiles 16 N and 14 N figs. 7-11.)

a) previous investigations.

Strong Cu Pb Zn Mn anomalies occur with a bordering I P anomaly in the Beatrice fault area, associated with a black shale and adjacent altered porphyritic crystal tuffs. The black shale is bounded to the west by the quartz feldspar porphyry, previously discussed, and in view of its I P response there remains the possibility that the porphyry is a flat-dipping body underlain by mineralized porphyritic crystal tuffs.

The area has been well sampled by routine auger soil geochemistry with excellent high contrast anomalies, (up to 1.1% Pb on line 16 N). Gridding was done at 200 m line spacing, using 15 m intervals, stepped out to 30 m away from the anomalous zone. This gridding continued W over the quartz feldspar porphyry.

The area was discovered following 1:6000 scale mapping and stream sediment geochemistry, which showed values of the order of 1000 ppm Pb and Zn. (M.J. Hutton, pers. comm.)

The zone of sheared black shale follows the fault zone (topographically expressed as Itat Ck.), and strong geochemical anomalies extend to the E of the shale, over porphyritic crystal tuffs and lithic tuffs with a quartz-sericite matrix. (probable K alteration).

According to M.J. Hutton, most samples were of C horizon but where problems with auger penetration were encountered, A and/or B horizon samples were taken.

Pits dug on lines 14 N and 16 N exposed fine-grained low-grade sphalerite with patches of galena, and the drill access road exposed bedrock mineralization corresponding to the geochemical anomaly zone, between lines 14 N and 16 N.

The strongest I P anomaly, however, is W of the creek, and only a weak I P response bordering this to the east underlies the mineralized bedrock.

b) soil types.

On the steeper sections of lines 18 N and 20 N, soils are thin and stony, whereas on lines 8 N, 10 N and 12 N, there is a cover of glacials. These have a local origin at least in part, as evidenced by black shale fragments in the glacial clay matrix. (Photo II.5.in part I)illustrates thick glacial development on the access road south of the prospect. The glacial cover over the prospect is not shown on the map.

Line 6 N is over a mixture of glacial and non-glacial material, whereas lines 14 N to 20 N are largely soils developed on bedrock.

In the glacial areas (lines 8 N - 12 N), sampling of A_1 horizon under litter was undertaken. These still gave an excellent geochemical response even over 35 meters of glacial cover.

eg) line 12 N/570 W - top of ridge.

	Cu	Pb	Zn	Ag	Mn
A	110	3200	44	1	15500
B	50	3400	37	2	15500
C	58	4500	68	2	32500

line 12 N/645 W

	Cu	Pb	Zn	Ag	Mn
A	220	640	240	5	15.5%
B	90	470	145	3	11.5%
C	104	300	210	3	12%

Where an enforced litter sample was taken, due to abundance of glacial boulders, values up to 5200 ppm Pb were obtained.

The actual relationship of the nominal "A", "B" and "C" horizon samples is not clear, as there seems to have been some confusion in terminology used for describing soil horizons.

c) rock sampling.

Rock samples collected by M. Hutton, of shales,altered tuffs and altered felsic volcanics show anomalous Pb and Zn (and to a lesser extent Cu, Ag and Au) associated with sulfidic rocks which are often high in Mn.

Recommendation.

These should be re-examined for alteration elements - K, Na, Rb, Sr, Ba, B, Mg, and F; and also As; to build up a case history file (as for Rosebery and Hercules mineralization.) These data could then be applied to regional rock alteration reconnaissance a suggested above.

d) drilling.

Drilling on line 16 N (hole MS1) showed disseminated Pb-Zn-Ag mineralization (negligible Cu), associated with altered tuffs and shales under the geochemical anomalies, and the exposed bedrock mineralization in the road cutting, rock outcrops, pits and trenches.

Recommendation.

The entire core from this hole, or any subsequent more strongly mineralized one, should be geochemically sampled using a core shaving device, or chipping at 15-20 cm intervals for compositing. The device built by EBR workshops for CRA is reported to be very sucessful. Composites should be taken from each lithologic interval, or at 5 meters (whichever is less).

The core should be analyzed using a total silicate digest (HF based) and run for the base metals and alteration elements discussed above by AAS, except for Ba, F, and B.

Barium and boron can be determined cheaply by emission spectrographic scan, with XRF follow-up where more precise values are warranted.

In addition, all drill core should be logged for relative carbonate content (alteration), simply by applying a streak of conc. HCl acid from a wash-bottle and noting intensity and distribution of carbonate zones.

Carbonate alteration zones in sawn sections of drill core can, if desired, be further studied for carbonate mineralogy by using the staining technique described in the reprint supplied with this report.

Such studies of mineralized core are invaluable to building up a case history file of types of mineralization, from which models the potential significance of a prospect can be assessed.

For example, orientation studies carried out by the author have demonstrated that the footwall rocks at W Hercules are anomalous in carbonate, Ba, F (sometimes), B (sometimes), and Rb, and low in Sr, even when base metal values are low. That is wall-rock alteration and/or a distinct geochemical facies extends for at least 1000 ft from ore, and provides a bigger target as well as a signature for this style of mineralization.

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Henty Fault Zone mineralization, on the other hand, might on subsequent testing show no such signature, suggesting that this style of mineralization is fault controlled and not of the Rosebery type.

e) Mn wad.

Sample 22916 (near 1800 N/900 W) of surface Mn wad (18% Mn) is highly anomalous in Pb and Zn. This can be regarded as a "plumbing system" sample or leakage anomaly from local mineralization.

f) anomaly transport downslope.

The question of whether the weaker geochemical anomalies over the glacial lines south of 14 N are due to a covered mineralized source or a combination of glacial smearing and/or hydromorphic dispersion downslope from the 14-16 N area remains unresolved.

Drilling is the only ultimate guide; however, the following indications may help, at least to establish a case history for future reference in this situation.

1) examine glacials carefully by panning for mechanically transported mineralized fragments. If found, then at least some glacial smearing component is present and sampling by drilling to bedrock is the only answer.

2) if transported mineralized fragments are absent, compare cold extractable (0.5N HCl leach for 4 hours) with "total" leach results. Hydromorphic anomalies moving downslope will tend to give a Cx result approaching the total value, as on the W Hercules orientation study.

3) analyze for immobile alteration indicator elements such as Ba in the glacial clay fraction. If locally derived from a bedrock source (assuming test 1) proves negative), Ba may be anomalous. Ba would not be expected to be hydromorphically transported, except where associated with hydromorphic Mn.

4) analyze for arsenic.
Arsenic is scavenged by iron rather than Mn. Thus hydromorphic Mn carrying base metal values may not carry As unless there is a significant co-existing Fe component.

5) The geologic map shows that the black shale unit and fault zone continues to the south. Thus it is reasonable to expect the southern anomalous zones to be valid dispersions through glacial cover, albeit weakened during dissemination through this cover.

6) Depth profile sampling into glacials should show an overall increase in values toward bedrock; hydromorphic dispersion may show a zonation along planes of water flow.

7) See figs. 7a and 7b.

Cumulative log-probability plots for Pb over residual soils (lines 14 N-20 N) versus glacial cover (lines 8 N -12 N) show essentially parallel slopes, although the mean is lower over glacials. (very roughly 60 ppm vs. 150 ppm, considering the bulk populations and ignoring contributions from anomalous population A). This indicates that variances are approximately equal, suggesting that the same geochemical dispersion processes prevail over both glacial and non-glacial areas, apart from dilution due to extra cover.

Further back-up could be provided by comparing the same sample groups for Zn (contrasting mobility to Pb).

g) <u>Lines 16 N and 14 N (see figs. 8-11 inclusive)</u>.

The anomalous Beatrice prospect portion of these lines shows a highly correlated zone of Cu Pb Zn and As with Mn, the Mn being related to rock type or rock alteration. In detail, the base metal highs are not invariably associated with Mn, but occur within the Mn unit (lithologic control). Thus the association with Mn is a lithologic one rather than due to scavenging. Mn scavenging is not believed to be a major problem, as discussed elsewhere in this report.

Rock samples of altered tuff collected from the Beatrice prospect also show a high Mn association with mineralization.

Some samples were run for As by Renison, using XRF. These require about 20 g of sample; hence some data could not be obtained due to "insufficient sample".

A simple colorimetric test for As, recently published by the author, has been made available, and future samples done by perchloric/nitric digest can be run at Mt. Lyell laboratories for As using aliquots of the same sample digest.

Initially, -80# and -10+80# soil fractions were run during the routine survey, and found to give equivalent results.

Examination of the -10+80# fraction however, showed that in this and other areas, it consists essentially of coarser aggregates of fine clay, rather than a true coarse fraction as such.

Nevertheless, the clay size -80# fraction is best, and a true (wet sieved) coarser fraction is likely to contain a higher proportion of barren clastics.(Wet sieving for coarse fractions may help define mechanically dispersed (glacial) versus chemically dispersed (hydromorphic) mineralization in certain follow-up cases, however.

(1) line 16 N.

Mn (fig. 10b) - occurs in 2 zones (720 W- 795 W; 885 W- 930 W)over the porphyritic crystal tuffs and shale, and a minor 1 station anomaly over porphyry.

The intermediate low zone suggests a different lithologic interbed.

Pb (fig 10a) - follows the Mn zones except for the 1 station high at 1260 W in the porphyry. It occurs within a narrower portion of the first Mn zone where it is correlated with Cu, and most of the second Mn zone where it is even more strongly associated with Mn and Zn.
The topographic section (fig 8a) and drill section MS1 show that the low Mn and base metal values between the zones must be real and that slope dispersion has not influenced the surface geochemical values.

Cu (fig. 10c) - gives a rather noisy profile, consistent with the negligible Cu in core MS1, but showing a broad relationship to mineralized zones. A 1 station high of 380 ppm is associated with a low Pb and Mn high in the porphyry near its contact, and could represent vein mineralization.

Zn (fig. 10d) - is confined to the altered tuffs and shales and shows strong spatial correlation with Pb and most of the second (stronger) Mn zone. Like Pb it is not as prominently distributed throughout the first Mn zone.

As (fig. 10e) - shows a strong 1 station anomaly at 570 W over pale, altered lithic tuffs. (non-manganiferous). Its unique association here may be due to barren pyrite veining. Two other As zones are correlated with the Beatrice mineralization, with the stronger zone associated with highest base metal and Mn values.

(2) line 14 N.

Mn (fig. 11b) - forms a high zone extending beyond the porphyritic crystal tuffs for 45 ft into the pale, altered lithic tuffs. If this mapped contact is accurate, it would suggest that the Mn is due to alteration pervading both rock types, rather than a change in original Mn content. A minor 2 station high on the porphyry is associated with weak Pb,Cu and Zn responses, and may need follow-up soil profile and rock sampling.

Pb (fig.11a) - shows a strong double anomaly zone as on line 16 N, and, as before, the western zone is more intense in amplitude and dimension.

Cu (fig.11c) - is noisy and of weak amplitude. Some Cu highs (no Zn and little spatial Pb correlation) on the porphyry are probably due to soil organic enrichment.

Zn (fig.11d) - reflects the Mn-Pb-Zn Beatrice association well, and is again stronger with the westernmost of the double anomaly.

As (fig.11e) - is more erratic (analytical problems?) but again is highest with the westernmost side of the anomaly.

Conclusions and Recommendations - soil geochemistry.

The line profile samples give an excellent response to Beatrice mineralization, and suggest that it is associated with Mn alteration within the tuff-shale complex.

Topographic relationships show that the surface geochemistry reflects mineralization in tuffs as well as shales, and downslope dispersion is not a problem, nor is Mn scavenging.

Mineralization seems to be of the Pb-Zn-Mn variety, and it is recommended that Mn soil geochemistry be used as a mapping guide to favorable host rocks. Thus Mn needs to be plotted on routine maps.

Arsenic analysis can provide a useful back-up,more so than silver, which is of limited usefulness except in analysis of mineralized drill core and rock.

Arsenic soil values may also serve as a back-up to sulfide mineralization (including barren pyrite) and in this context may help grade I P anomalies and the probably spurious Pb anomalies in quartz feldspar porphyry.

h) Stream sediments and Mn coated pebbles.

Several stream sediments of both -80# and -30+80# fractions were taken by M. Hutton on 9.2.79, mainly from minor creeks near the porphyry body.

Some iron and manganese coated pebbles were collected by N.J. Marshall on 8.2.79 and the reactive coatings leached sequentially, first by hydroxylamine (favors Mn leaching) and then by hydrazine (favors remaining Fe leaching plus less reactive Mn remaining).

A Mn wad sample (24537) was also collected at 1395 N/840 W.

See also Appendix II.

Details are as follows:

pebble sample no.	location.	site description.
24526	1420N/905W	drains mineralized zone in road cut 200Ft. above drill site.
24528	1650N/1470W	small spring in porphyry.
24534	"porphyry creek"	collected by M. Hutton, 9.2.79.

stream sed. location.	site description.	-80# results.	
		Pb	Zn
1420N/905W	200ft.above drill site-drains mineralized zone.	362	475
1400N/835W	near Mn wad sample on glacial scree	926	1000
00/1000W	drains quartz feldspar porphyry felsic lavas and anomaly on line 400N/1200-1320W	137	64
1400N/1430W	drains porphyry body - fault leakage ?	175	144
1400N/1530W	downstream from 1600N/1865W, shown on map as on contact with felsic lavas and draining them, not porphyry body.	102	28
1600N/1865W	nominally in porphyry body - but map shows drainage from felsic lavas and some black shale to the N.	105	44

The results show that the first two stream sediment samples near the drill site are highly anomalous in Pb and Zn (362, 475 ppm and 926, 1000 ppm), as expected. Some of this may be contamination. There is no apparent enrichment of Co (13 and 15 ppm) with the Mn (1150 and 5300 ppm), and thus the base metal values are probably real, reflecting their availability from mineralization, rather than scavenging.

However, Mn, Cu, Pb, and Zn do disperse together in solution from the mineralized (Cu Pb Zn Mn) system and precipitate out together

The Mn wad sample 24527 (see photo II.1.) carries Cu Zn Co Mn Fe values of 85, 5600, 1650, 130, 75,000 ppm and 12% respectively.

Thus it represents a true "plumbing system" or leakage anomaly developed superficially in the glacial till (see photo).

Recommendation.

This sort of material is a valuable sampling medium in this area, and could be used successfully in glacial scree areas, where soil results might be dubious.

The other stream sediment samples carry anomalous Pb values and 1400 N/1430 W is also anomalous in Zn. As noted on the site description, only 1400 N/1430 W is draining the porphyry body. This may represent a local fault leakage from underlying mineralization, but conclusions cannot be drawn on this one sample alone. Moreover, the soil and rock orientation over the porphyry gave no convincing evidence of mineralization.

The Mn/Fe pebble coating 24526 proved highly anomalous in Pb and Zn by both extracting agents. This proves that this is a viable sampling medium which gives better contrast than stream sediments, and hence, possibly, a greater dispersion train. (see also sections on Henty River and Sock Ck. orientation).

Sample 24528 is possibly anomalous in Pb.

Sample 24534 has low Pb and Zn hydroxylamine extractable values, which are not believed to be anomalous. Although higher than some Basin Lake equivalent sample types analyzed in the same batch, the Co value is also higher, indicating that some scavenging by Mn has taken place. (see also EZ regional pebble sampling orientation data). Co is a virtually constant low level element (about 5 ppm) in these rocks and soils - it is highly scavenged by Mn and hence its content is a guide to relative scavenging).

Recommendation for Stream Sampling Orientation.

Insufficient numbers of pebble coating samples are available, but data from Henty River and the EZ regional orientation demonstrate the effectiveness of this sample medium as a potentially superior technique to conventional stream sediment sampling.

It is recommended that pebble samples be taken in conjunction with conventional -80# stream sediments down Itat Ck. (draining the Beatrice prospect), at 200 m intervals for several km, well into background. Side tributaries draining background should also be sampled.

This will provide a unique opportunity in the Mt. Lyell-EZ joint venture area to assess geochemical contrast and length of dispersion train. Hence sample intervals for future regional drainage geochemistry can be based on these findings.

III BASIN LAKE ORIENTATION, Line 75 S

1. General Environment.

The grid area is covered by glacial moraine 30 - 50 meters thick, forming a low ridge of boulders with associated boulder-clay and water-worn sands of Owen Conglomerate from the Tyndall Range - see photo III.1. showing similar physiography in the E Tyndall Grid.

In places, such as the low-lying small depression on the N W section of the Basin Lake Grid, peat bogs are developed (see photo III.2.).

Due to subdued relief, and the relatively impervious glacial boulder clays, only stunted heath and button-grass vegetation is able to grow, and the soils are acidic, organic rich (peaty) and generally water-logged (hence reducing environment with grey Fe^{2+} rich clays under the overlying humus layer). In fact the peat bog (photo III.2)is an extreme development of this general condition.

Photo III.3 shows the upper part of the soil profile exposed in a road cutting through a low moraine ridge on the Basin Lake Grid. Note the A_0 humus layer, poorly differentiated (due to poor drainage) into a sandier (lighter colored) A_1 organic soil horizon overlying moraine material with boulder clay.

Although a significantly deeper profile than this was not available in the thick moraine area around line 75 S, it is likely that the profile is similar to that illustrated by the lower sections of photos II.5 and II.6. - ie) thick rather impervious boulder clays with juvenile development of A_0 and A_1 soil horizons. However, a strongly leached A_2 horizon may be missing due to the subdued relief and poor drainage.

Thus the soil can be described as a hydromorphic podzol.

2. Potential Problems of Geochemical Dispersion.

In this area, humic acid from the overlying A_0 layer causes downward leaching, limited by the poorly drained nature of the sub-soil. Precipitation exceeds evaporation, so upward transport of metal ions by capillary action would be limited.

Hydromorphic (transported) anomalies, due to solubilization of base metals by humic acids may occur at breaks-in-slope, or in stream beds (stream sediments) at the base of slope.

Generally, conditions are not conducive to the formation of geochemical anomalies at surface from a source immediately below.

Penetration by vegetation to bedrock is not possible in the area studied.

However, there is the possibility of an electrochemically produced anomaly forming from a massive sulfide orebody, as documented by Govett (1973), Bolviken and Logn (1975) and suggested for the Pinnacles area by Farrell and Orr (1977). However, it is important to note that Farrell and Orrs' profiles were determined over comparatively shallow massive sulfide mineralization - shallow enough to be exposed in a trench, and to permit auger sampling to bedrock.

Similarly, in the Basin Lake area, base metal soil geochemical values correlate with values in altered volcanics exposed in the line 00 costean. (Annual rept. EL41/71, 1977-78, figs 4 and 6) where glacial cover is thin.

The likely geochemical dispersion through thick glacials is, however, unknown. Standard Northern Hemisphere practice in thick glacial geochemical surveys is to sample the basal till a few inches above bedrock - a difficult task in this area.

3. Comments on Costean Line 00 Geochemistry.

Report EL 41/71 states that the geochemical anomalies were adequately explained by the eastern sequence of altered tuffs with possible scavenging by manganese oxides present.

Although this area was not studied, the following suggestions are made for further work on this accessible, exposed area.

1 Rock types, alteration and juxtaposition to the carbonaceous shale are potentially favorable indicators of Rosebery type mineralization. Hence channel samples collected should also be tested for As, the potential gangue elements B (from tourmaline and F) as well as Ba, and the potential indicators of wall-rock alteration Mg, Ca, Sr, K, Na, Rb (across the section).

As is a normally low background element not generally scavenged by MnO_2; tourmaline and barite (also Ba in sericite) are resistant to leaching and may survive where sulphides have been leached out.

2 The rock and channel sample Mn values are by no means high, and values of around 500 ppm Pb are probably genuine - they could in fact represent residual Pb remaining after leaching. Co values would give an indication of any relative Mn scavenging.

3 Mn filled fractures should be sampled as such and tested for Ba, As, Ag, Cu, Pb, Zn, Mn, Fe, Co - plumbing system samples associated with quartz veining/ fracture filling near 7350 E, as this could be a near surface expression of mineralization at depth.

4 If responses to 1) and 3) above are favorable, the zone should be tested in depth by drilling.

It is interesting to note that the western pyritic black shale band has a unique high Cu signature.

4. History of Previous Exploration, Line 75 S region.

In 1970, Pickands Mather drilled two vertical holes BL801 (line 82 S) and BL802 (near line 75 S) on EM conductors. BL801 penetrated 100 ft of glacials, then 100 ft of black shales and 100 ft of intermediate intrusives. BL802 penetrated 100 ft of glacials, then 100 ft of very weathered volcanics and 15 ft of 0.47% Pb 0.19% Zn mineralization (no black shales).

Subsequently, following follow-up I P work, the present joint venture partners drilled two angle holes:
BL 1, collared on line 72 S, was an angle hole extending under lines 75 S and 78 S, to test for any down-dip extension of the disseminated Pb-Zn mineralization intersected in the Pickands Mather hole BL802. However, the gradient array I P work did not define any geophysical anomalies. Routine A_1 soil sampling at about 15 cm depth picked up numerous anomalous Pb values although these have a very spotty distribution and cannot be traced to adjoining lines.

Anomalous Pb values on the eastern (upslope) portion of line 75 S (upslope from the BL802 collar) suggested that secondary dispersion was penetrating the 30-50 m thick glacial cover.

Hole BL 1 subsequently proved only weak, disseminated Pb-Zn mineralization at around 300 m depth in 294.7 to 462.85 m section of the hole. This section is in extensively sericitized and pyritized felsic crystal-lithic tuffs above the contact with Comstock tuffs (at 462.85 m).

Hole BL 2, an angle hole collared on 48 S similarly carried weak disseminated mineralization in altered tuffs, as well as a carbonaceous shale unit (source of I P anomaly).

The strongest geophysical/geochemical anomaly was a near surface one on line 00, under thin glacial cover. This was costeaned (see previous discussion) but not drilled.

The aim of this orientation investigation was to examine the possibility of the weak mineralization giving a surface geochemical expression, and to define the cause of the spotty Pb values previously obtained.

5. Orientation Performed.

Because of the abundance of boulders, parent glacial clay/ sand material could not be penetrated, sampling being confined to A_0 and A_1 horizons.

A_0 has a variable local thickness from virtually zero to about 10 cm, but could always be obtained within a few meters of each sampling peg.

A_1 is poorly differentiated due to the juvenile soil development and poor drainage, and could not always be sampled, due to presence of boulders in the A_0.

A full description of samples collected is given in Appendix III.

During field orientation sampling, a Townson conductivity meter was used to measure relative conductivities of soil slurrys. These were prepared by dispersing one level teaspoonful of fine soil material (minus coarser fragments) in 80 ml of distilled water in a beaker, and reading relative conductivity with the K = 0.1 probe on scale B (most sensitive setting).

Mn/Fe coated quartz pebbles and ferricrete were also collected as samples 24529-32 in the Basin Lake area (see Appendix III.).

In addition, the original samples, designated "old samples" which had been sieved to -80# were re-analyzed in the laboratory as follows:

6. Laboratory Investigations.

1 By the routinely used aqua regia digest.
It was observed that the digestion appeared incomplete, because of the abundance of organic particles floating on the surface of test-tubes and the dark humic acid rich color of the solutions.
Previous experience had suggested that this could lead to low metal recoveries and erratic results.
Also, the floating debris gave a problem with clogging of the AA nebulizer. This problem was temporarily solved by the laboratory staff who used a plug of cotton wool inserted into each test tube to hold down the floating debris. However, it was subsequently found by the author that the cotton wool was the source of variable high Pb blanks (equivalent to about 20 ppm), and this practice has now been abandoned.

2 Consequently, the author introduced a perchloric/nitric wet ash procedure. The old samples from line 75 S were re-analyzed with this method. This is in fact less labor intensive than the former method, and results in clear, non-organic solutions with no debris. The wet-ash procedure totally destroys organic matter, and only a white residue of insoluble silica sand grains remains. The grains are rounded quartz of water-washed glacial origin.

3 Consequently, because of the inert quartz sand diluent variably present in each sample, these residues were subsequently collected and weighed, to enable a calculation of the perchloric/nitric acid soluble component to be made. Hence results could be normalized to the active (soluble) component of each sample, having removed the variable dilution (by sand component) effect.

4 Finally, the old sample 75 S/6400 E was analyzed separately 10 times by the routine aqua regia procedure to check analytical (digestion) reproducibility.

5 The"new samples" (orientation samples) were treated as follows:

1) A_0 samples (humus) sieved to - 20 + 80 #; Wet ash. It was hoped that this sieving step would remove the finer sand component from the humus component and organic debris. Unfortunately, residues were not weighed so this cannot be monitored as with the old samples.

2) A_0 samples sieved to - 80# - to compare with - 20+80# and with the old series samples (-80#)

3) A_1 samples (where available) sieved to - 80# and treated by the wet-ash ("total") procedure, and compared to a cold extractable (0.5N HCl for 4 hours at room temperature) procedure.

4) A_1 samples sieved to - 200# and total vs. Cx metals again compared.

All samples and fractions were analyzed for Cu Pb Zn Mn Fe and Co.

7. RESULTS.

Mn and Co results are low and appear to be of background fluctuation only; they are not plotted.

The following plots have been prepared as profiles for line 75 S., from 5100 E (where sampled) to 7000 E. (see Appendix III.).

Fig 1.

Relative soil conductivities, A_0 and A_1 soils, and relative topography.

Fig 2. Copper

a) old samples, - 80# aqua regia vs. wet ash.
b) " " " wet ash, normalized to soluble fraction.
c) new samples, - 20 + 80# A_0 soils, wet ash.
d) " " - 80# " " " "
e) " " " A_1 " wet ash vs. cold extractable.
f) " " -200# " " " " " "

Fig 3.

Percent soluble (wet ash) organic component along profile.

Fig 4. Lead

4a - 4f series as for copper.

Fig 5. Zinc

5a - 5f series as for copper.

Fig 6. Iron

6a - 6f series as for copper.

1.) Analytical.

Despite reservations about the aqua regia digest, results agree well with the wet ash procedure - samples with values slightly higher than the wet ash ones are due to analytical error (probably the cotton wool blanks). Wet ashing is still recommended as a more reproducible and less troublesome technique for high organic (A_0) materials, however.
The analytical coefficient of variation for sample 6400 E (10 replicates) by aqua regia is 3.0% for Pb for a mean of 96.1 ppm and 10.5% for Zn, for a mean of 31.5 ppm. It is curious that detection limits for Cu and Zn on the cold extractions are both 5 ppm - possibly this was due to burner rotation as Zn is a far more sensitive element to AA analysis than Cu.

2.) Soil Conductivities.

There is some suggestion, on one station results only, that conductivity highs occur at 5350 E and 6550 E, either side of the disseminated mineralization. Perhaps, however, these are related to the breaks in slope, but the patterns are not convincing. However, one cannot expect a strong response for such weak mineralization through such depths of cover. The classical response is a "rabbits ear" anomaly with a conductivity low over massive ore and highs well removed and either side of ore.
The technique should be tested again over stronger mineralization, perhaps over the mine leases or on EZ's ground at Koonya, as it is potentially a simple but powerful tool as suggested by recent overseas reports.

3.) Wet ash soluble component.

This shows a surprisingly strong variation, with more active metal bearing component from 6300 E to 7000 E (lows at 6650 E, 6750 E, and west of 6300 E).

All equivalent Cu Pb Zn Fe results for old series samples (a) and (b) series of figures) must be compared with this pattern of fig. 3.

Except for Fe, the old sample Cu, Pb and Zn results show a remarkable similarity to the percent soluble matter profile. The one exception in the Cu Pb Zn profiles is consistently at 6700 E, where high values coincide with a low percentage of active component.

This suggests a reason for the spotty and seemingly erratic base metal values obtained in the routine sampling - that the variation is a result of differences in the amount of inert sand component in each sample.

When normalized to account for variable soluble component, zinc shows a distinct electrochemical type "rabbits ear" anomaly with highs to the E and W, and Pb a less clear double anomalous zone with narrower separation. (Cu is noisy but as an insignificant component of mineralization, this is explainable).

The greater separation of Zn downslope to the W in the normalized fig. 5b is in accord with the mobility of Zn in hydromorphic dispersion.

4.) Cold extractable metal profiles.

These were carried out to detect possible hydromorphic dispersion, characterized by weakly bonded metals.

Traditionally this is done on fine fractions of B horizon clay material, nominally - 80#, or - 200# in glacial till (sampled just above bedrock). However, B horizon samples, or even parent glacial material were not available for sampling, so the less satisfactory organic A_1 soil component (poorly differentiated from A_0) was studied.

Cold extraction was not done on the A_0 component as metals in this fraction are already in effect extractable by vegetation growing on soil (biogeochemical origin).

In most cases, the Cx results are below analytical detection limits (except for Fe) using the routine methods employed, and the odd one-sample peaks just above detection limit do not give a meaningful pattern.

In view of the generally low values and doubtful suitability of this A_1 sampling medium, this approach is not recommended for further consideration in a Basin Lake type situation.

5.) A_1 wet-ash ($HClO_4/HNO_3$) results.

Zn shows an interesting peak (fig 5e) in the -80# fraction, centered at 6050 E, which is not apparent in the corresponding A_0 samples or - 200# A_1. This corresponds with a soil conductivity (A_1 only) high (fig 1).

Its significance is difficult to assess - it may represent some local hydromorphically transported Zn component.

Apart from this, the A_1 samples show no obvious zones, and in view of difficulty in collecting these, study of the ubiquitous A_0 horizon is preferred.

6.) A_0 results.

This is the only ubiquitous sampling medium available here, and effectively represents a decomposed organic litter (A_{00} or L) sample. Thus, metal values are of biogeochemical origin formed by recycling and concentration of extractable metals from vegetation growing on glacial material. Extractable metals are derived from microbial and plant/soil interactions with weathered glacial rock flour, (ie background) plus any geochemically dispersed metal ions travelling in solution from oxidizing sulfide ore. Additionally, there is a potential contribution through electrochemical migration, a massive sulfide orebody acting as a buried galvanic cell.

(1) Cu

Both -80# and -20+80# patterns are identical, with slightly higher values in -80#.

The characteristic pattern is a high zone (20-74 ppm in -80#) from 6250 E through 6950 E, adjoining a low zone from 5100 E through 6200 E (2-20 ppm). A local high at 5750 E (25 ppm) in this low zone may correspond with a break in slope.

The high zone is more uniform in the new series orientation samples compared to the old routine survey samples,in that extreme lows (< 10 ppm) do not occur.

This is attributed to more consistently uniform sampling, with less variability due to barren sand component.

However, an increase in soluble (organic) component between the eastern vs. western portions of this line may still be a contributing factor.

(2) Pb

High zone vs. low zone as for Cu, and again, the high zone is more uniform compared with the former routine samples. Contrast is better in the -80# fraction.

(3) Zn

Same pattern and comments as for Cu and Pb.

(4) Fe

There is an overall trend to higher normalized Fe values (fig 6b) downslope, possibly representing dispersion from a pyritic altered zone.

Similarly, the high at 6250 E on the new sample series (figs 6c and 6d) may be due to this effect, with the high at 5750 E (as noted for Cu) possibly due to hydromorphic accumulation at a break-in-slope.

(5)

Results of Mn leaches of pebble coatings (samples 24529, 24530, 24532).

Sample 24530, from line 48 S/6500 E, has a distinctly anomalous Zn/Co ratio of 11.6 (cf. 3.0 and 0.86) and is just downslope of hole BL2 which has weak Pb-Zn mineralization. This is supporting evidence for hydromorphic dispersion.

8. Summary Discussion.

This study represents a difficult situation due to thick glacial cover, absence of any ubiquitous samples except from the A_0 horizon, and the absence of supporting I P anomalies. Drilling indicates that mineralization is only weak and disseminated in an altered volcanic zone.

Nevertheless, an exploration technique in this sort of environment is needed, which will reveal significant mineralization.

The only hope for detecting anomalies here is through the effects of hydromorphic dispersion (metal ions in solution).

These may accumulate by the following mechanisms.

1) at breaks in slope - and particularly at the lowest break in slope, that is, where groundwater enters the stream bed (stream sediment samples).

2) by electrochemical dispersion from an oxidizing sulfide cell.

3) by biogeochemical cycling and concentration in the A_0 horizon of metal ions extracted by the growing vegetation from interstitial ground-water.

Complicating factors are:

1) dilution by barren background till.
2) release of background metals into vegetation and hence A_0 from glacial rock till.
3) impervious clay below surface.
4) downward leaching by humic acids at surface.
5) the variable amount of active component vs. inert sand evident in the routine samples.

In view of the weak mineralization encountered, and the effect of variable organic matter in the samples, it is not possible to be definitive about the geochemical response obtained.

Whilst it is likely that variable organics play an influence and help mask a true anomaly, the orientation samples suggest a higher base metal zone from 6250 E - 6950 E which roughly corresponds to the zone of altered volcanics carrying higher (but weak) base metal values, rather than a massive, strongly mineralized zone as such.

The normalized Zn values (fig 5b) suggest a classical electrochemical dispersion effect.

Indirect evidence that anomalies from massive mineralization can be detected in glacials is:

1) Farrell and Orr's (1977) work at Pinnacles.
2) Basin Lake line 00 results (shallow costean).
3) Beatrice results - eg) over glacials (35 m thick ?) on line 12 N, 570 W and 645 W (M. Hutton, pers. comm.) were highly anomalous Pb values occur in glacial clay below the litter zone. Where enforced A_0 samples were taken (M. Hutton, pers. comm.) values up to 5200 ppm Pb were obtained.
4) reports from overseas literature. - but note that most sampling of glacials is from till just above bedrock.

9. Conclusions and Recommendations.

Basin Lake deep glacial area, search for massive sulfide mineralization.

1. Careful and consistent sampling is mandatory - (compare variability in routine samples line with orientation line).
2. A_0 horizon should be sampled consistently.
3. Wet-ash perchloric/nitric digestion is preferable. Sample digests to be analyzed for Cu Pb Zn and solution digests retained.
4. Anomalous or suspect digests (the retained portions) to be analyzed for As by colorimetry. Arsenic is an associate of most volcanogenic sulfides (including Beatrice and Rosebery) and unlike base metals, normally has a very low background. Hence any prominent values are likely to be due to mineralization.
5. Ideally, although this is time consuming, the insoluble sand component after wet-ashing should be weighed and metal results normalized to the active component. However, experience may show that careful sampling and sieving may result in sufficiently uniform samples thus negating the need for this procedure.

   Alternatively dried samples can be weighed before and after heating in crucibles in a furnace, and the loss on ignition related to organic matter in an approximate fashion.

IV. HOWARDS ANOMALY.

See also Appendix IV.

Little information was available on this area, as it had been investigated several years ago. Detailed information is being compiled from Company records by G. Drake.

It was decided to visit the area in view of reports of Mn staining and the presence of barite (K.Reid, pers. comm.), and carry out some orientation studies.

Several exposures of road cuttings were available, and detailed orientation sampling was carried out on a road cutting north of line 23 N.

This afforded an opportunity to sample complete profiles, from bedrock, through true B horizon into the leached A_2 horizon and overlying rain forest litter (A_{00} or "L") See photo of typical soil profile, photo IV. 1.

RESULTS ① ROAD CUTTING N OF LINE 23N

See figs. 12 - 14

1) rock samples.

The composite sampling reveals a distinctly anomalous zone in Pb at 30-40 ft., with possible weak Zn and Cu anomalies at this position.

The 30-40 ft. Pb anomaly zone assays Pb = 420 ppm, Zn = 235 ppm, Mn = 41,000 ppm, Cu = 95 ppm, and Ag = 19 ppm. In addition to the supporting high silver value, acid extractable Ba is 370 ppm. Barium occuring as barite or as Ba substituting for K in the sericite lattice (as in Rosebery host rocks) is not soluble in $HC10_4/HN0_3$ acid attack as carried out here. Therefore this Ba is probably associated with the Mn oxides in a mineral phase such as hollandite. True total Ba values as determined by XRF will probably be far higher.

Therefore these rock samples should be re-run by Ba using XRF, and also As, which, unlike base metals, would tend not to be leached out of this highly weathered and sheared rock.

A second, weak Zn anomalous zone (190 ppm) occurs at 50-60 ft. and is supported by high Mn (49,000 ppm) and acid extractable barium (150 ppm) with detectable Ag (2 ppm).

A grab sample near the 30-40 ft. zone, 24533, for which a thin section was requested, consisted of Mn rich (stained) sheared tuff with vugs after possible carbonate.

This was selected because of its somewhat gossanous (carbonate gossan) appearance and alteration. It assayed Cu = 500 ppm, Pb = 1150 ppm, Zn = 480 ppm, Mn = 10%, Fe = 5.7%, Co = 26 ppm, Ba = 200 ppm (acid extractable only) and Ag = 230 ppm.

This should be re-run for Ba by XRF, also As and fluorine (selective ion electrode). The base metals may have been mostly leached out, with reduced Ag occuring as possible native silver.

Samples of Mn rich and adjacent Mn rich zones were sampled at 39 ft. and 44 ft.

Results are as follows:

	Cu	Ag	Pb	Zn	Mn	Fe	Co	Ba
39ft Mn rich	65	17	250	350	78000	50000	33	600
39ft non-Mn	100	8	120	42	1380	30000	14	80
44ft Mn rich	120	3	530	95	94000	69000	74	110
non-Mn	35	2	65	125	4300	125000	23	50

Where Ba is acid extractable, only.

These, and other results for Co show that enrichment due to Mn scavenging is not severe, and in accordance with the Rosebery and Beatrice models, it is suggested that values reflect mineralization associated with Mn alteration or Mn rich facies (probably Mn carbonate).

The Ba values support this, as does Ag. Total XRF and As values are required as further support.

The carbonate vug appearance and general evidence of severe leaching (including all S values $< 0.1\%$) suggests that we have here a mineralized zone with original base metal values depleted through leaching, and a favorable CO_3 = /Mn/Ba/Ag signature.

Recommendation.

Pending further analyses for Ba and As, this zone should be investigated by drilling, although it is narrow.

Other exposures in the area should also be sampled and analyzed for Ba and Mn.

2) B horizon soils.

These show an excellent reflection of the 30-40 ft. anomaly zone for Cu and to a lesser extent Pb and Zn. The high ratio of total values to cold extractable demonstrate the usefulness of this approach in defining residual soil (in situ) anomalies versus hydromorphically transported ones (see also W Hercules orientation - where total/Cx is approximately 1.)

It is interesting that unlike Fe, the Mn values are low in B horizon - further evidence against Mn scavenging.

3) A_2 horizon soils.

No anomalies occur in this horizon.

This graphically illustrates the importance of correct and consistent sampling procedures in this environment.

Recommendation.

The leached A_2 horizon must always be avoided in favor of true B horizon, where present. Where B horizon is absent, then the surface A_0 or litter should be sampled, rather than augering within A_2.

4) surface litter samples.

These show only a broad, low level (83 ppm) Pb anomaly.

This is possibly because of the narrow (10 ft.) width of the anomalous zone, which becomes greatly diluted by averaging out with the surrounding barren background material. Litter samples (recycled biogeochemical samples) represent a large area of influence and thus constitute a valuable sampling medium (especially for Pb) in reconnaissance line surveys.

Recommendation.

Extensive litter anomalies must be followed up with B horizon auger sampling where possible, and these in turn investigated for possible hydromorphic displacement or in-situ nature.

② Line 19 N.- SOILS

The sites of routine soil anomalies were resampled through available profiles. (see Appendix)
These showed no anomalous values - the one possible exception being for Zn in litter over glacials at 800 W. This value is low enough (89 ppm) and lacking in supporting Pb to probably represent a local deviation in background.
It is suggested that weak relative "anomalies" on this line may relate to variable sampling of leached glacial versus organic enriched (A_0) components.

V. HENTY FAULT ZONE

See also Appendix V , annual report Mt. Tyndall EL9/66 (1977-78) by A.C. Walter and file notes and line profiles supplied by A.C. Walter.

1. Previous Investigations.

I P gridding and follow-up soil geochemistry during 1973-74 determined several I P anomalous zones and some weak geochemical base metal anomalies.

The Henty Fault itself gives a strong I P response and an I P anomalous zone also occurs on lines 38 N - 44 N, just east of the Henty Fault. This was investigated with several diamond drill holes and found to be due to carbonaceous-tuffaceous and altered shale sequences, but base metal values were very low.

A strong I P anomaly on line 49 N, 1400/1500 E, with adjacent geochemical anomaly was costeaned in February 1974, and exposed 8 ft of semi-massive sulfide mineralization under a maximum of 5 ft of overburden.

Chip sampling of the almost fresh (mainly pyrite) body gave an average value (over 2.4m) of 1.8% Cu, 1.76% Pb, 0.2% Zn and 37.9% FeS. There is no gossanous development.

The mineralization exhibits banding and possible slump-folding and has been regarded as syngenetic. It occurs interbedded in silicified and sheared acid tuffs (probably rhyolites), with kaolinization along shear planes. Silver assays appear to be unusually high for such comparatively low base metal values, and notes supplied by A. Walter show an average of 95 ppm over a 5ft sampled width, with some individual 1 ft. sections as high as 192 ppm Ag for 1.68% Cu, 2.83% Pb and 0.04% Zn.

The comparatively high, equal Cu-Pb values and very low Zn values are another unusual feature.

It is suggested that this mineralization is in fact fault controlled, and possibly hydrothermal (hence high Ag) - or remobilized mineralization. Polished section mineragraphy of the sulfides (to look for colloform pyrite as at Rosebery) may support or negate this hypothesis.

Drilling (hole HFZ5) of this zone intersected weak Cu Pb and negligible Zn mineralization in disseminated sulfides averaging only 1.45% FeS_2 equivalent over 6 meters. This patchy mineralization (relative to the 38% surface FeS_2 content) is further evidence of fault control rather than a syngenetic, in situ origin. The drill profile shows that mineralization occurs in highly silicified tuffs and lavas between the Henty Fault and Comstock Tuffs, above and below the Comstock Tuff unconformity.

Despite the massive sulfide intersected by the costean, the surface geochemistry gave only a weak one-station anomaly (20 ft sample intervals) of 60 ppm Cu and Pb, and 80 ppm Zn.

To improve the response, fill-in lines were sampled by A. Walter at 100 ft and 200 ft to the south of line 49 N, and sampled, with line 48 N at 20 ft intervals for total and cold extractable Cu Pb and Zn in various size fractions.

Examination of these results by N.J. Marshall shows that total and Cx Cu gives the highest response in the -200# fraction, with approximately equal, but still low (60-70 ppm) peaks.

The Pb and Zn results are more closely bunched regardless of size fraction. The Cu total/Cx results are approximately equal, suggesting, together with the preference for -200#, a hydromorphic origin.

Unfortunately, several 1 station peaks are present and there are not enough background values well removed from the area to uniquely define these as anomalies, rather than background variations.

Other data made available in loose-file form shows higher, (generally one-station) responses.

eg. 1) line 42 N/ 200 E-300 E; peaks of up to 235 ppm Zn with lesser but coincident Pb and Zn, and anomalous I P.

2) line 43 N/ 100 E-200 E; up to 150 ppm Zn with 90 ppm Pb and 80 ppm Cu and anomalous I P.

3) somewhat similar situations on lines 44 N, 47 N, 48 N and 50 N.

Soil mercury contours on lines 48 N, 49 N and 50 N show trends of relative high values parallel to each side of the creek. If these were done by any direct heating techniques rather than a chemical wet-ash attack, I would be extremely suspicious of their validity, and suspect organic humus causing a variable instrumental background effect.

Extensive follow-up geophysics and geochemistry has been proposed on fill-in lines as a future project, with budgeting for a further drill hole north of line 49 N.

2. Orientation Investigations.

See Appendix V , also figs. 15-19, and photos V 1. - V 4.

1) regional samples.

a) Ferricrete, no. 24525, near Henty Camp, was taken as a potential plumbing system sample. This assayed ($HClO_4/HNO_3$ digest) 40 ppm Cu, 3 ppm Ag, 25 ppm Pb 55 ppm Zn, 190 ppm Mn, 32 ppm Co, and 37% Fe, with $<$ 50 ppm acid extractable Ba.

04

The Ag value is close to the detection limit, (2 ppm) and in view of the high iron matrix, is probably a spurious AAS reading due to background light scatter ("non-atomic" absorption). All Ag samples near the detection limit should be run with background correction, if available; or alternatively absorbances obtained with a hydrogen continuum lamp should be subtracted from the Ag lamp absorbance, prior to calculation of concentration. This sample is probably barren.

b) 24536 - plumbing system sample. See photo V.5. Assay 80 ppm Cu, < 2 ppm Ag, 50 ppm Pb, 280 ppm Zn, 23,500 ppm Mn, 87, 000 ppm Fe, 200 ppm Co and 300 ppm acid extractable Ba.

The Zn value may be anomalous, but is not backed up by Cu, Pb, or Ag. Co,is anomalous and suggests scavenging of Co,Zn and Ba from the fractured, weathered host rocks.

To properly assess the significance, if any, of this sample, similar samples are required from this area to arrive at a distribution pattern of values. The host rocks should also be sampled and analyzed for total Ba content around this and any other Ba anomalous samples.

c) 24535 - Mn coating on pebbles in creek. Results of hydroxylamine leach

Cu	Pb	Zn	Mn	Fe	Co
.01	.23	.52	2060	12.0	4.8

These are low background values, despite the very high Mn content

2) Line 49 N area, including costean.

a) General environment: the mineralized zone occurs in moderately steep terrain in dense rain forest (photos V.1., V.4. The high rainfall causes extensive downward leaching of humic acid (reducing) solutions, and in the costean, even highly kaolinized,sheared saprolites after acid tuff contain fine grained fresh pyrite disseminations, due to the reducing environment.

Where such reducing ground waters percolate through shear zones in the costean, they carry Mn in solution, which at the daylight surface precipitates out (by aerial oxidation) to coat silicified volcanic rubble (sample 24524) on the floor of the 5 year old costean. (see photo V.1.)

Glacial valley fill, consisting of a thin layer of washed grits, clay and Owen Conglomerate boulders, overlies the sulfide zone and the adjacent sampling lines in the rain forest. This could not be penetrated by the auger.A_0 and forest litter (A_{00}) is developed on top of this glacial material.

The original soil anomaly on line 49 N/1400 E has been destroyed by the costean, and sampling over the projected strike extension of the sulfide costean zone was carried out on line (49 N- 100).

b) objectives.

The purpose of this detailed orientation was to determine the reason for the weak geochemical response over the sulfide zone, and develop a technique for sampling it.

c) results.

Sample 24524, of recent Mn coating from the floor of the costean, assayed as follows: (results are ppm in soln., from hydroxylamine leach, 5 g sample in 50 ml).

0.18 ppm Cu, 5.56 ppm Pb, 0.27 ppm Zn, 0.34 ppm Mn, 123 ppm Fe and 0.10 ppm Co. This is highly anomalous in Pb and has a Pb/Co ratio of 55 (higher than equivalent samples from Beatrice prospect and Henty River). The Zn/Co ratio of 2.7 is also anomalous. The Pb/(Mn+Fe) x 10^3 ratio is also higher than in the Henty River samples.

Thus, although this is an artificial sample, it does prove that such a sampling and analytical approach works well.

3) rock samples from costean (figs. 15-17).

The profiles show that the anomalous base metal zone is extremely localized, with no wall-rock dispersion. Supporting results show surprisingly low Mn (180 ppm in ore, and 40 ppm elsewhere) and no detectable Ba (acid extractable). Carbonate alteration was not noted.

The sulfide zone is in fact enclosed above by the same barren tuff as occurs on the H W and F W sides, and this cover rock carries low values.

Thus the sulfide zone is not transgressive to the outcrop surface, as previously assumed, and is only an enclosed pod. See photo V.2.showing sharp cut-off with wall rock, barren rock cover and further glacial scree cover.

4) soil samples (see figs. 15-19).

The profile plots show no convincing response in the glacials or overlying organic debris, either in the wall of the costean or in the adjacent soil lines.

Conductivity readings show only a noisy background response.

3. Conclusions and Recommendations.

In view of the combination of downward leaching by reducing solutions, lack of weathering, barren rock cover and glacial overburden, it is not surprising that the orientation study failed to locate the sulfide zone on line 49 N costean.

The nature of the occurrence and its rock geochemical"signature" suggests it is of local fault control origin, lacking in favorable geochemistry such as high Zn (low Cu) and high Mn, Ba and carbonate alteration. Drilling shows this occurrence to be patchy, and it probably does not conform to the Rosebery model.

The occurrence is possibly of too localized an extent to be reflected in orientation soil sampling on line 49 N-100.

The slightly stronger anomalous responses on lines 42 N and 43 N, previously referred to, may be due to similar situations where glacial cover is absent and/or mineralization is not capped by barren rock.

These areas should be re-examined by washing soil samples to look for presence of glacials.

For prospecting in the general vicinity of the Henty Fault, I consider that attention should be paid to zones of high soil Mn, and presence or absence of glacials at each sample site. If glacials are prevalent, then litter sampling for Cu, Pb, Zn and Mn should be used, with follow-up where necessary.

If B horizon soils (as at Howards Anomaly and Henty River) prevail, then consistent sampling of these for Cu Pb Zn would suffice.

Anomalous values should be followed up by analysis for As, and the usual techniques for investigating origin of hydromorphic anomalies (upslope).

On a semi-regional basis, plumbing system sampling with analysis for Cu, Pb, Zn, Mn, Fe, Co, As, Ba, should prove useful.

Finally, at the anomaly follow-up stage, rock alteration elements and carbonate alteration should be looked for, with priority given to base metal anomalies associated with high Mn and alteration elements.

Sampling of the abundant Mn coated stream pebbles in the general area is a viable drainage basin reconnaissance method, and may also reveal seepage anomalies under transported overburden.

VI. HENTY RIVER GORGE.

See also Appendix VI

1. Introduction.

Geochemical soil and rock sampling has been well described in the Henty-Yoland annual report EL 41/71 (1977-78) by R.M.D. Mears.

The soils in the grid area occur in thick rain forest with excellent and accessible B horizon development under A_0 humus and leaf mold (as on the lower sample lines at W. Hercules). This overlies reasonably fresh bedrock, which is accessible for follow-up sampling.

Mineralization occurs in a wedge of steeply dipping, altered and sheared, fine grained felsic tuffs and tuffaceous shales, which thickens to the north. The eastern margin of this wedge is faulted by the Henty Fault Zone, which is outlined by the east bank of the Henty River. Medium grained felsic crystal-lithic tuffs, possibly ignimbrite, occur east of the Fault Zone.

2. Soil Sampling Results.

Geochemical sampling of -80# B horizon soil presented no problems and because of the topographically low position of the mineralization (just above the river bank), a classical response was obtained.

No problems are evident with analysis of this soil using aqua regia digestion.

At the author's request,line 3 N, 3200 E to 3550 E was re-analyzed in view of the low base metal values accompanying very high Mn. This produced slightly lower results (probably since blank variation due to cotton wool contamination was recognized) but confirmed the original trend.

High Mn values occur on both sides of the river, but as noted by Mears, those east of the Henty River Fault are low in base metals and mineralization appears to be absent. Thus base metal scavenging by Mn is not a problem.

The restriction of high Pb-Zn values to a particular zone within a wider Mn rich zone is analogous to the Beatrice situation discussed in this report.

3. Recommendations.

As recommended elsewhere in this report, field logging for carbonate and possibly K^{40} should be carried out.

Some sampling and analysis for alteration assemblage indicator elements is also recommended along this zone and in further prospecting of the area.

Due to the abundance of Mn, sampling of "plumbing system" wads would also be a valuable adjunct to geochemical exploration here.

4. Mn coated stream pebble sampling.

Development of Mn coated stream pebbles is ubiquitous in this area, and samples of these, along with conventional stream sediments, were collected by R. Mears, following recommendations by N.J. Marshall.

The accompanying maps produced by Mt. Lyell are supplied with the Getty copy of this report, and show sample locations.

A variety of diagrammatic profiles illustrating various ratios tried, as advocated by Carpenter, are shown as figs. 20 -27 These figures also illustrate comparative results by sample no. (refer to relevant Appendices for location) of reconnaissance pebble samples from Henty Fault Zone, Beatrice and Basin Lake.

The accompanying table summarizes the Henty River results by listing anomalous and weakly anomalous (in parenthesis) results using each technique.

As concluded with the E Z orientation drainage study, the pebble coatings are capable of giving high contrast results, more so than conventional stream sediment sampling. For a detailed discussion, refer to the section on "Sample Types" in this report.

Downstream dispersion cannot be ascertained as all except sample 24232 were taken from single side tributaries.

The anomalous samples listed in the table were arrived at by deciding on threshold values for stream sediments and pebble soaks from an inspection of the sample values relative to known mineralization.

Due to the high abundance of manganese in the area, only some of which is associated with mineralization, ratios are not as useful as comparative Pb and Zn results in these pebble coatings.

Inspection of the table and diagrams shows that Pb and Zn values in pebble coatings give higher contrast anomalies, than stream sediments from the same site.

Sample "32", from the Henty River itself, is only weakly anomalous in the coatings, and more obviously anomalous in -80#. This is a rare exception, attributed to detrital sulfide "contamination" from the adit mineralization nearby. There has not been sufficient downstream travel to mobilize Pb and Zn onto coatings. The divergent total versus Cx values in the stream sediment support this as being a clastic anomaly.

In detail, there are some moderate pebble anomalies south of the Henty base camp which lack stream sediment support. In the absence of further soil sampling and geological information, their possible significance cannot be assessed.

They may represent mineralization from the Henty Fault itself (samples 25,26, 27 form a distinct background group well away from the fault), or mineralized background "noise", or leakage anomalies along the faulted side creeks.

5. Conclusions.

1) Soil sampling of B horizon presents no problems in this area, and stacked bar profiles should be prepared for Cu,Pb,Zn and Mn.

2) Base metal mineralization is associated within a particular portion of a wider Mn rich zone, as at Beatrice.

3) Hydroxylamine leach of Mn coated pebbles, and comparative analysis for Pb and Zn in solution is a viable exploration technique capable of giving higher contrast anomalies than conventional stream sediments.

	threshold ratio or value	anomalous samples, 24201 - 34 series (242 prefix omitted in table)
Total Pb, -80#	60 ppm	6,7,8 11 (12) (14) 32,33,34
Cx Pb -80#	50 ppm	6,7, 11, 12, (14) 32,33,34
pebble Pb Soln. values	0.7 ppm	6(7) 10,11, (14) (21) (31)32,33,34
pebble Pb/Co(2)		6 17, 34
pebble Pb/(Mn+Fe) x 10^3 (3)		3, 6, 34
Total Zn, -80#	100 ppm	4,5, 6,7 8 (9) 12 25,26,27, 31 32,33,34
Cx Zn, -80#	75 ppm	6, 8,(9) 12 (14) 32,33,34
pebble Zn Soln. values	1.5 ppm	6,7,8,(9)10 14 (19)20, 22, 33,34
pebble Zn/Co(1)		6(7)8 13 34
pebble Zn/(Mn+Fe) x 10^3		(3) 6,7, 14, 24, 28, (33)34

<u>NOTES</u>.

1) Pebble Zn/Co misses significant anomalies at sample 24233 and gives suppressed contrast at extremely anomalous sample sites - not recommended.

2) Pebble Pb/Co has strongest anomaly at 24217 which is not valid, and no anomalies at 24232 and 24233 - not recommended.

3) Pebble Pb/(Mn + Fe) invokes unsupported anomaly at 24203 and only the most obvious anomalies at 24206 and 24234 - not recommended.

APPENDICES

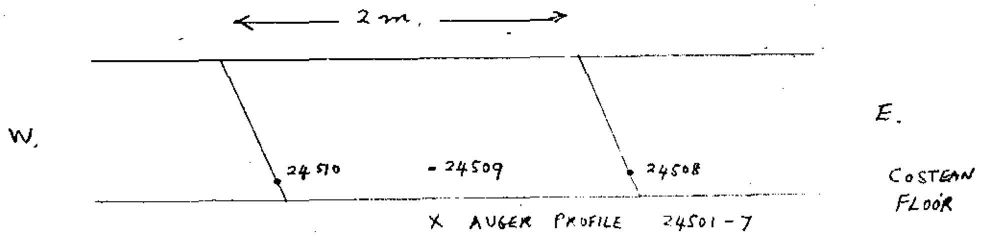
APPENDIX 1
White Spur Orientation Samples

Collected with R. Mears, A. Walter, G. Drake. 6.2.79

1. Costean line 36N, at 1610 W.

Sampled exposed 1 m thick bed of black shale with fine-grain disseminated pyrite and minor tuff bands, adjoining light grey, non-pyritic silty tuffs. Soil profiles taken by auger on bank of costean, where thin local areas of transported (glacial) material are developed. These glacial soils are not very obvious in auger samples, except for rounding of coarse quartz grains.

Diagrammatic sketch of sample relationships.



Sample no.	depth (cm)	Description
24501	0 - 8	Called "A/B". Pale grey stiff clay at root zone of grass. No humus. Glacial clay with rounded quartz fragments. Probably reduced zone azonal or A2 transported soil.
24502	8 -16	as above
24503	16-24	transitional to greener clay
24504	24-32	transitional to greener clay with exotic quartz (glacial) fragments.
24505	32-40	fine rootlets still present, with bedrock fragments.
24506	40-48	green clay with rock fragments.
24507	48-56	C horizon (saprolite). Green f.g. tuffaceous shale.

24508	Black f.g. pyritic shale from costean.
24509	grey, weathered (C horizon) shale.
24510	thin band (1m ?) of dark grey carbonaceous shale 2 m from pyritic band 24508.

Note abrupt change from grey C horizon shale to transported azonal green clay (water-logged, reducing environment).

2. Costean line 36 N, 1520 W.

24511	grey tuffaceous silty sandstone, slightly pyritic
24512	black shale with sedimentary structures in sharp contact with overlying tuff.

3. Costean line 36 N, 1450 W.

24513	Black pyritic shale, with pyrite in fine laminations, Source of IP anomaly. Check for As content of other units.

4. Costean line 39 N, (NE section White Spur Grid)

This section, to be drilled soon, has been covered by geologic mapping, routine geochemistry and IP. Strong IP anomalies at 100 ft. depth, occur with moderate geochemical values in tuffaceous shales on the probable southern strike extension of the Rosebery horizon. This costean section contains no carbonaceous black shale bands.

The rest of this grid has complex geochemical values due to shales (well mapped). A geochemical/geophysical problem is to recognise anomalies due to mineralization within shale from those due to high background from barren shales, within this data population.

Multi-element geochemistry may aid in providing characteristic signatures for barren vs. mineralized shales.

24514	at 4830 E	laminated grey tuffaceous shale in costean, under 50 cm of residual B horizon clay soil covered by 4 cm of chocolate brown humus rich A,- Ao horizon.
24515	at 5065 E	highly weathered (C horizon) chloritized m.g. feldspathic crystal tuff in floor of costean.
24516	at 5065 E	concretionary Fe - Mn fill in joint planes of rock 24515 - " plumbing system sample".

24517	at 5065 E	A_2 grey-tuff thin glacial clay layer with quartz fragments (ex Owen Conglomerate) at 30 cm depth. Overlies outcrop 24515.
24518A	at 5080 E	A_o humus rich soil in costean above 24519
24518B	same site	15 cm pods of black Mn wad in wall of costean.- "plumbing system sample".
24519	same site	host rock for 24518B; highly weathered (C Horizon) chloritized khaki m.g. feldspathic crystal tuff.
24520	at 5100 E	(in road cutting around corner) m.g. to f.g. laminated, grey silicified tuffaceous siltstone.
24521	8 m S of 24520	(road cutting) composite sample (50 cm) of laminated, f.g. and coarse grained feldspar crystal tuff with Mn stains on cleavage planes.
24522	above 24521	Red-brown B horizon clay 15-20 cm below surface. Soil is residual, 40 cm thick over laminated crystal tuffs.
24523	above 24522	chocolate brown A_o humus soil, 0-5 cm depth

Recommendations:

1. Orientation sampling to be carried out as for Howards Anomaly and Henty Fault Zone costeans, sampling litter (Aoo) and any available A_1, B and C horizon samples to study element distribution along the geochemically anomalous zone previously outlined by C horizon sampling. Arsenic vales may be of interest.

2. Following drilling, mineralized and barren (but pyritic) shale sequences to be sampled for base metals and As,(mineralization), Ba, F, B (gangue and metasomatism associates with Rosebery type mineralization) and K_2O, Na_2O, MgO, Rb,Sr, Fe, Mn (wall-rock alteration elements) to identify geochemical signatures.

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BLANKS

From	To	Cu	FeS$_2$	Ag	~~Au~~	~~Sp.Gr.~~	Pb	Zn	Mo	Mn	Fe	Co
SRQ 1 ✓		600										
SRQ 2 ✓		160										
SRQ 3 ✓		80										
SRQ 4 ✓		85										
SRQ 5 ✓		56										
SRQ 6 ✓		56	9.5									
24507 ✓		95	<0.1	<2		green sh. tuff white flour	50	110		120	27500	13
24508 ✓		140	<0.1	<2		black sh. white flour.	35	70		350	39000	10
24509 ✓		130	<0.1	<2		grey c[illegible] shale white flour	35	115		470	51000	18
24510 ✓		100	<0.1	<2		grey-black carb. band white flour	40	110		580	60000	23
24511 ✓		135	0.1	<2		pyritic tuff siltstone white flour	15	90		300	40000	29
24512 ✓		160	0.6	<2		black shale white flour	65	70		300	43000	40
24513 ✓		135	1.1	<2		black pyritic shale white flour.	35	150		310	27000	27
24514 ✓		70	<0.1	<2		laminated grey tuff shale white flour	45	85		280	30000	15
24515 ✓		65	<0.1	<2		altered xstl tuff, white flour	350	360		340	42000	14
24516 ✓		75	<0.1	<2		fault fill white flour	220	250		540	150000	33
24518B ✓		90	<0.1	<2		Mn wad white flour	290	310		7500	50000	430
24519 ✓		55	<0.1	<2		altered xstl tuff host for wad white flour	130	340		370	45000	17
24520 ✓		110	<0.1	<2		grey, silicified tuff siltstone white flour.	25	90		680	37500	14
24521 ✓		115	<0.1	2		xstl tuff composite white flour	35	590		920	74000	26
24525 ✓		40	<0.1	3		Henty Camp ferricrete	25	55		190	370000	32
24531 ✓		45	<0.1	2		Basin Lake ferricrete	25	150		160	390000	40
24533 ✓		500	<0.1	230		Howards Anom 23N. — Mn rich sheared, xtl tuff.	1150	480		100,000	57000	26
243 67		20	n.d.	17			4600	1500		1400	n.d.	n.d.

HENTY RIVER white organic coatings on mineralised shale on cliff face outside #1 adit.

Left Core Shed ..23 [illegible]..R. [illegible]..7/3/79

Received Sample Mill ..23 [illegible]......

Received Assay Office ....[illegible]........

At PLEASE KEEP REJECTS

056

288057

MT. LYELL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH

AREA: WHITE SPUR

SOIL
SPECIALS

PAGE: 1

DATE: 14.2.79

METHOD: AQUA REGIA → AAS

LINE NO:

Assay/Analyse

FRACTION: 2 2 5 2 0.0 X-0

[illegible] line
36 N / 1610 W

	SAMPLE NO.	CU	Pb	Zn	Mn	Fe	Co
A2	24501	41	74	84	98	280	<5
B	24502	90	89	380	385	1110	21
"B-C"	24503	23	75	61	34	25	<5
	24504	8	61	34	31	81	<5
"	24505	83	74	129	150	320	12
C	24506	82	81	124	154	325	7
B	24517	58	69	108	144	330	9
A0	24518A	36	54	78	122	250	8
B	24522	10	31	18	26	45	<5
A0	24523	10	36	20	26	29	<5
	St.	310	160	290			

NO. OF SAMPLES: 10

APPENDIX 11

Beatrice Grid

Collected with M. Hutton, 8.2.79.

1. Line 1420 N drill site area. (fault zone with mineralization in black shale)

24526

200 ft. above drill site, below section of track.

Mn stained pebbles from creek bed following mineralized fault zone. -- for Mn leach studies.

N.B. Some possible contamination from road cutting which has exposed disseminated galena and honey sphalerite in dark lithic tuff outcrops with shards of pumice and fragments of ingested black shale (some graphitic). This lithic tuff fault breccia contains veins of quartz-calcite- PbS-ZnS-FeS_2, but the weathering surface has a bleached exterior up to 5 mm thick, covered with white lichen.

24527

Mn wad forming from groundwater seepage on hillside in disturbed ground in glacials downslope from mineralized lithic tuff.

N.B. Further samples of Mn coated pebbles and - 80 # stream sediment subsequently taken by M. Hutton. eg) 24534 collected from "Porphyry Ck" on 9.2.79.

Recommendation:

Co-existing - 80# stream sediment and Mn coated pebbles to be taken for orientation dispersion studies down Itat Ck, at 200 m. intervals from drill site, downstream into background, for several km if possible. Side tributaries en route to be sampled also.

2. Porphyry Hill area, Beatrice Grid.

Samples were taken at previously pegged sites and follow the conventional grid reference numbering system.

LB 1600 N / 1260 W.

1) A_0 organic humus - ti-tree and cutting grass scrub. On 20^0 slope of scree boulders of porphyry.
2) A_2 azonal skeletal soil, 10 - 15 cm depth.
3) Weathered feldspar-quartz porphyry rock chips from well-jointed outcrop containing sub-horizontal quartz veins.

LB 1600 N/1350 W.

At site of 400 ppm Pb anomaly at peg in "B-C" Soil.

1) A_0 soil, moderately organic (not as much as at 1260 W).
2) Azonal grey wet silty clay soil (called "B-C" previously) with weathered scree fragments of Q - F porphyry.
3) localized organic rich soil from mass in crack in rock outcrop.
4) fresh outcrop around peg. - clear quartz phenocrysts 3-5 mm in pink feldspathic groundmass. Some quartz veining and chlorite development.

24528 Approx 1650 N/1470 W (no peg)

1) Fe - Mn coated pebbles from small spring in steep hillside of Q-F-P.

LB 1650 N/1470 W. near spring.

1) "A_0" - A, grey wet organic rich clay, 0-5 cm.
2) "A_1" - actually A_2 or azonal grey wet clay, 10 cm depth.
3) QFP outcrop sample.

LB 1800 N/1800 W.

1) Rock sample on top of Porphyry Hill - flat area on ridge crest. Feldspar-quartz porphyry in grey aphanitic groundmass.
2) Azonal grey wet puggy clay soil, 5-10 cm depth (to bedrock). Local origin (flat surface at ridge crest). Minor fragments of Owen Conglomerate and possible influence from nearby minor Permian tillite occurrence.

LB 1800 N/2010 W.

In gully bordering arctuate break in slope from QFP hill.

Some scree of Permian tillite and Jurassic dolerite on surface.

1) Azonal gully soil; wet grey clay, 40 cm depth.

LB 1600 N/1865 W.

Stream sediment sample (for - 80#). ½-1 m gully, QFP pebbles and cobbles. Water carries abundant flocculent $Fe(OH)_3$ and humates. Sediment around rootlets of matts of moss on stream boulders provides sample as stream bed is very gravelly.

LB 1600 N/1860 W.

Thick azonal soil, 30 cm depth. Uniform wet grey clay at small break in slope above stream.

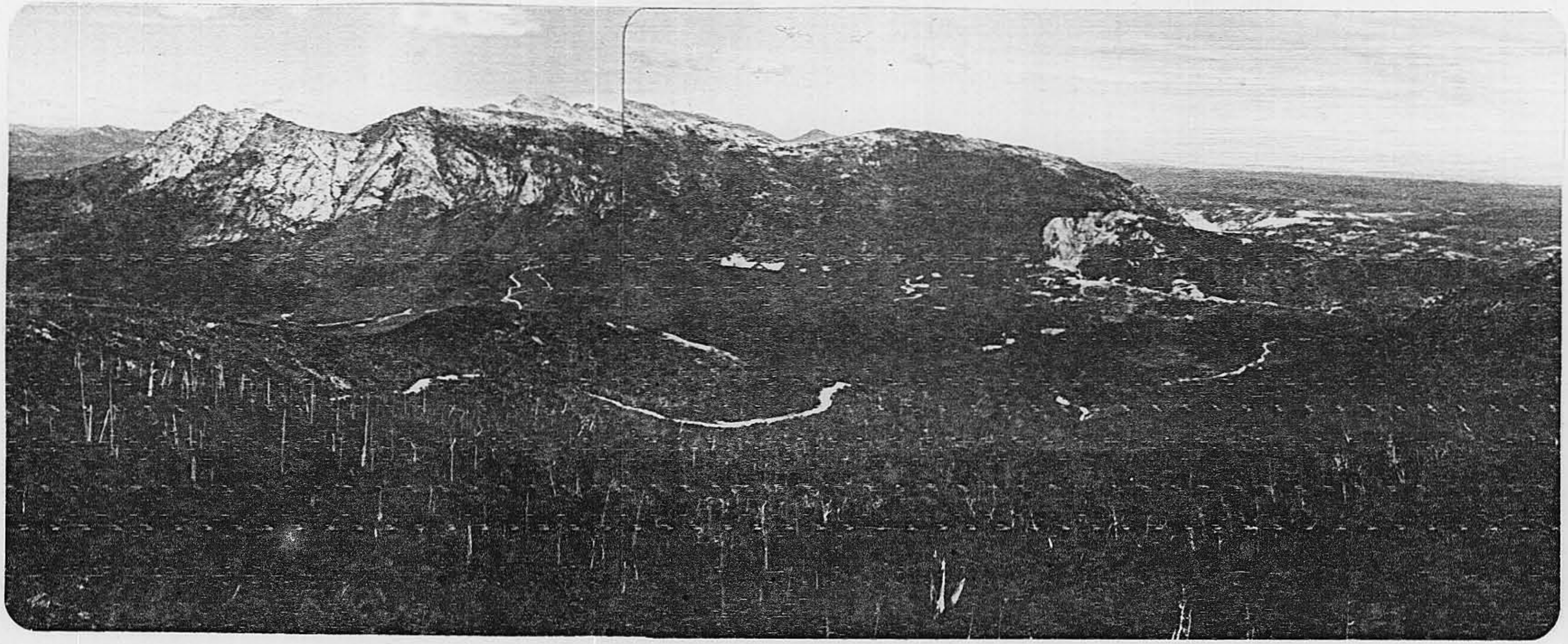
LB 1400 N/1530 W.

Stream sediment sample (for -80#) from 1 m wide stream. Roots of boulder moss in stream provided SS sample. No Mn coated pebbles available.

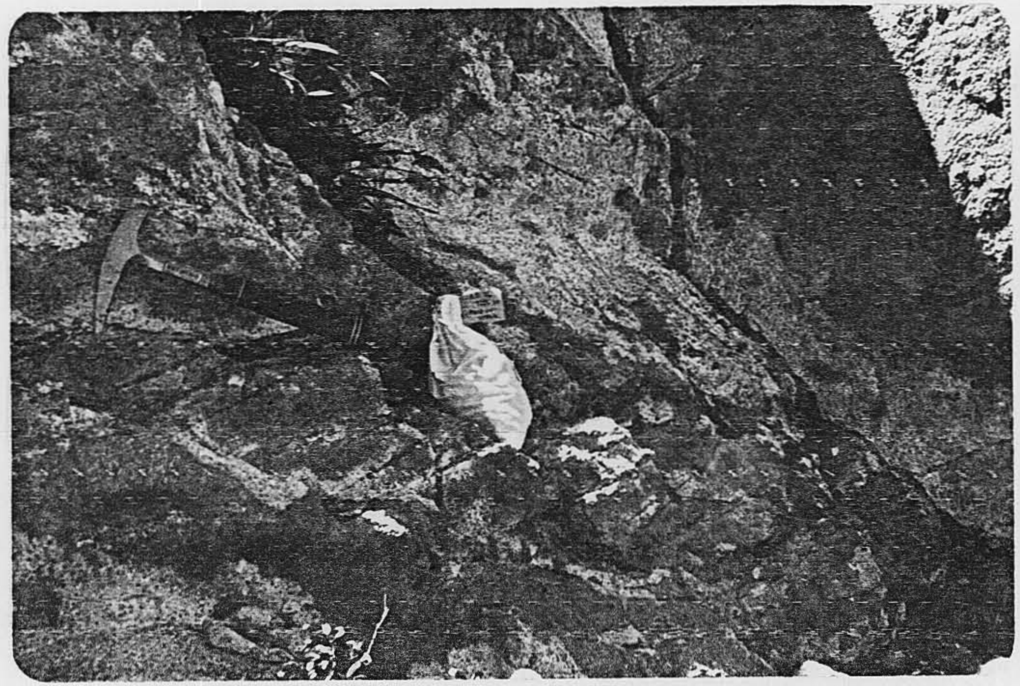
LB 1400 N/1440 W.

Stream sediment sample (for -80#) from ½ m wide stream downstream from 1800 N/2010 W.

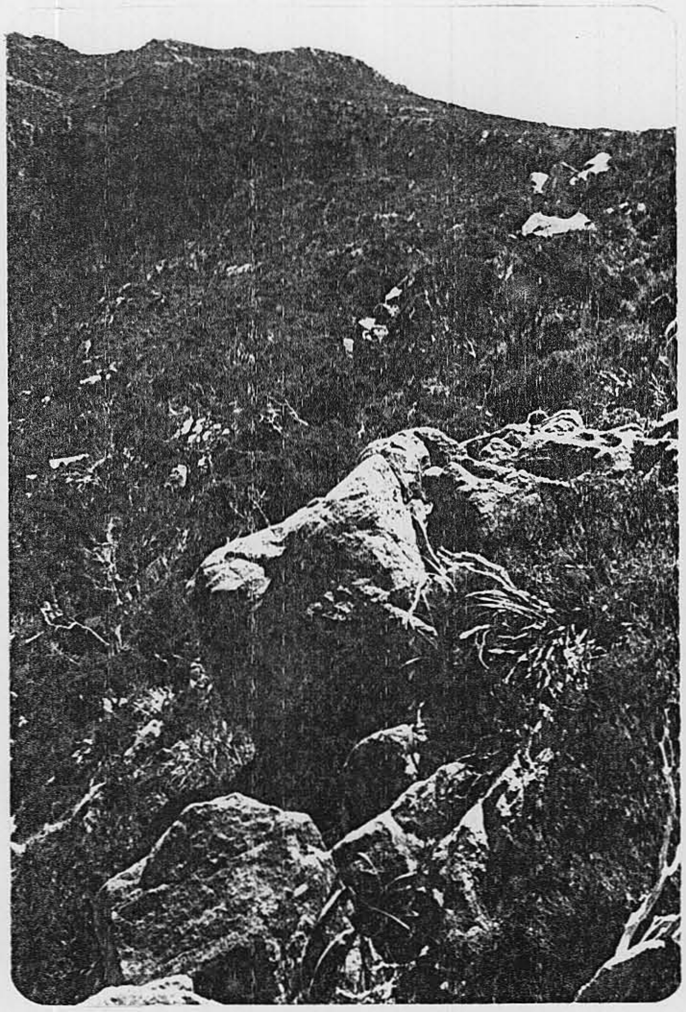
II.1. Sample 24527 Mn wad forming from seepage on hillside, Beatrice drill site area 8.2.79



II. 2. Beatrice grid - porphyry hill in background. Ti-tree and cutting grass scrub with thin skeletal soils (Comstock Valley in middle distance).



II.3. Beatrice Grid - Porphyry Hill.
Sample 16 N/1350 W; site of 400 ppm Pb anomaly.
Quartz filled tension gashes in quartz-feldspar porphyry.



II.4. Beatrice Grid

Porphyry Hill area

Thin skeletal soils on steep quartz-feldspar porphyry.

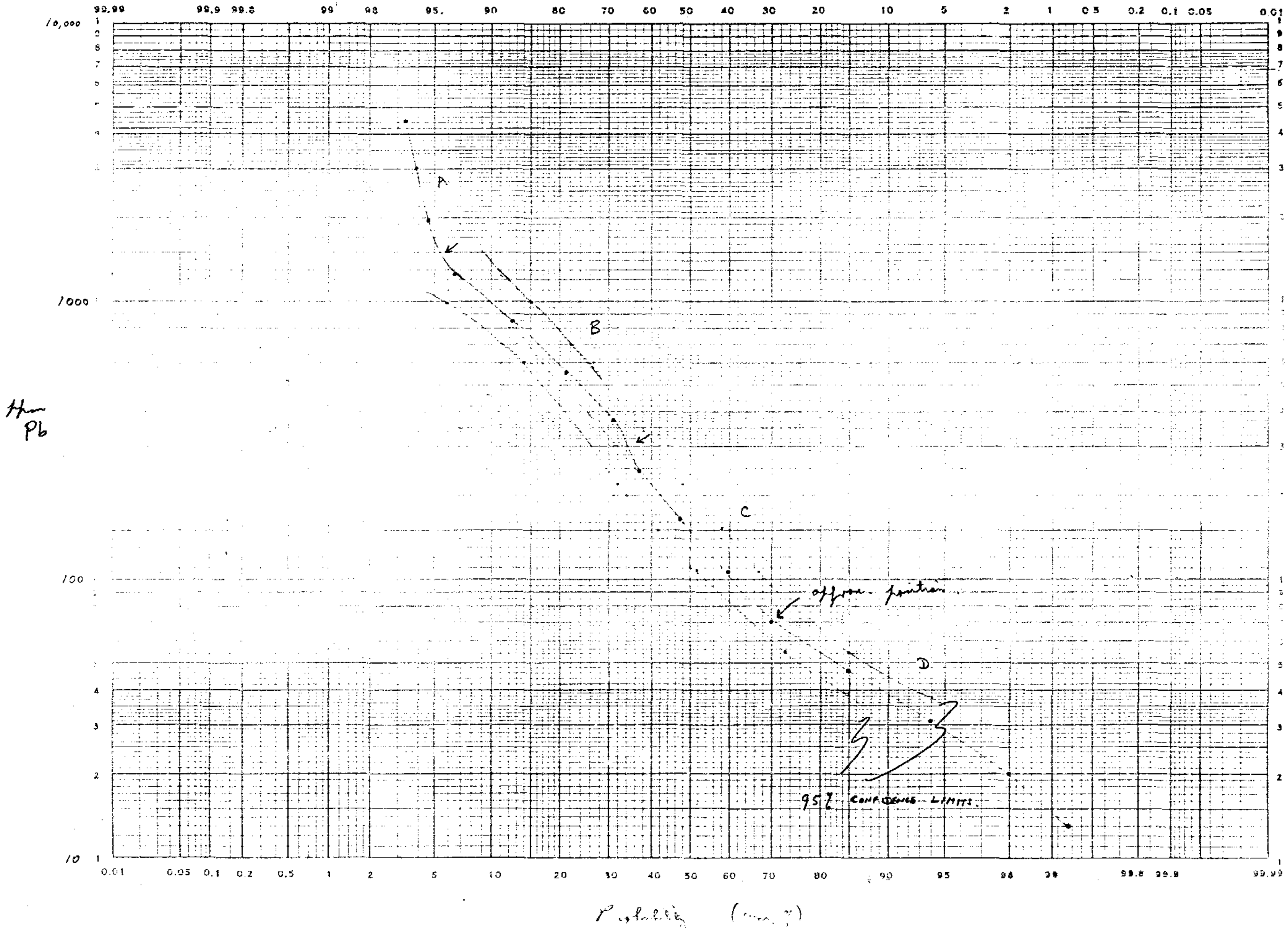
288065

BEATRICE GRID

RESIDUAL SOILS, N = 151

LINES 2000 N – 1400 N inclusive

FIG 7a

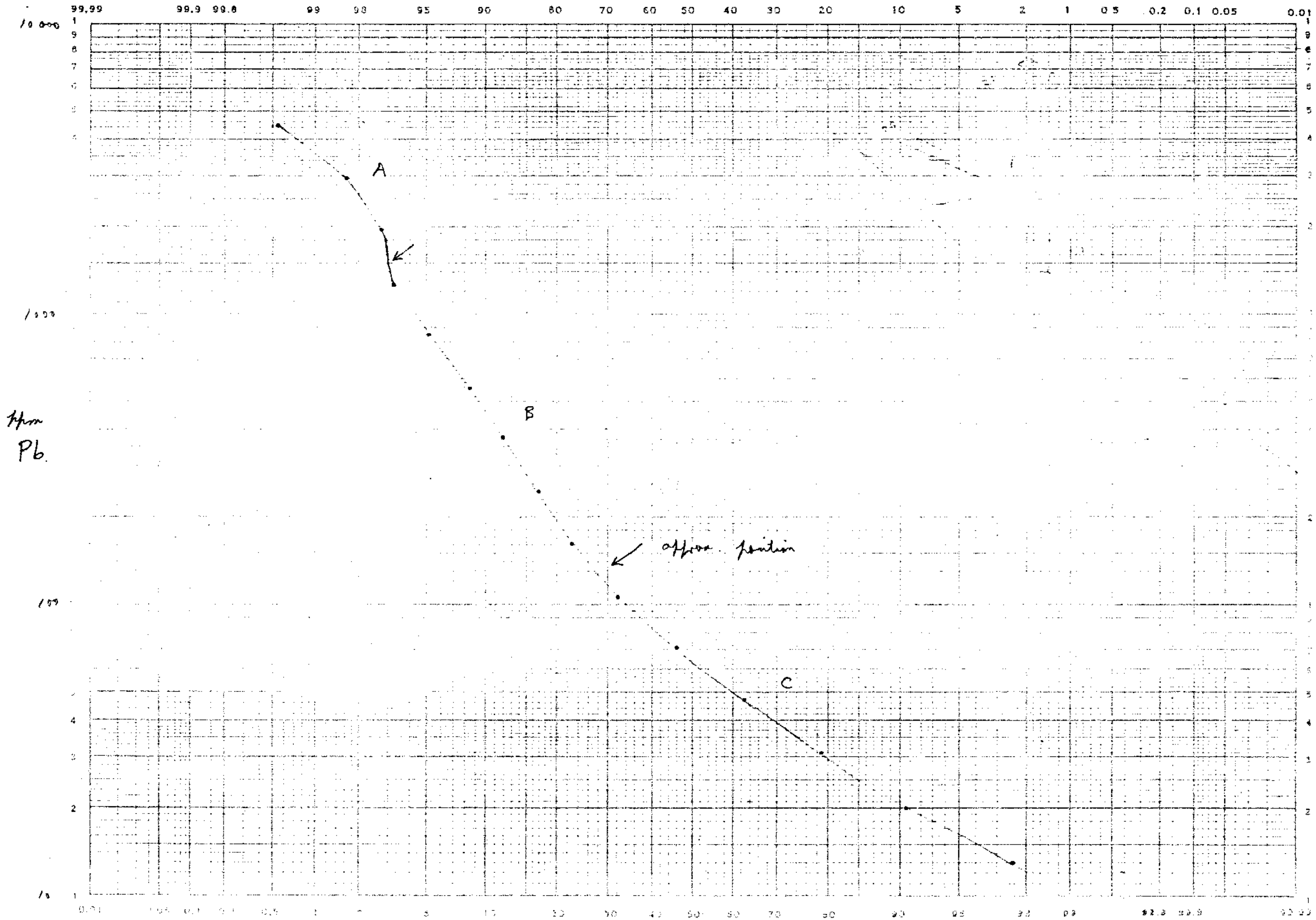


064

288066

BEATRICE GRID LINES, 1200N - 800N. GLACIAL SOILS N = 175

FIG 7b.



065

BEATRICE GRID

FIG 9a

LINE 14N

GEOLOGICAL & TOPOGRAPHIC CROSS SECTION

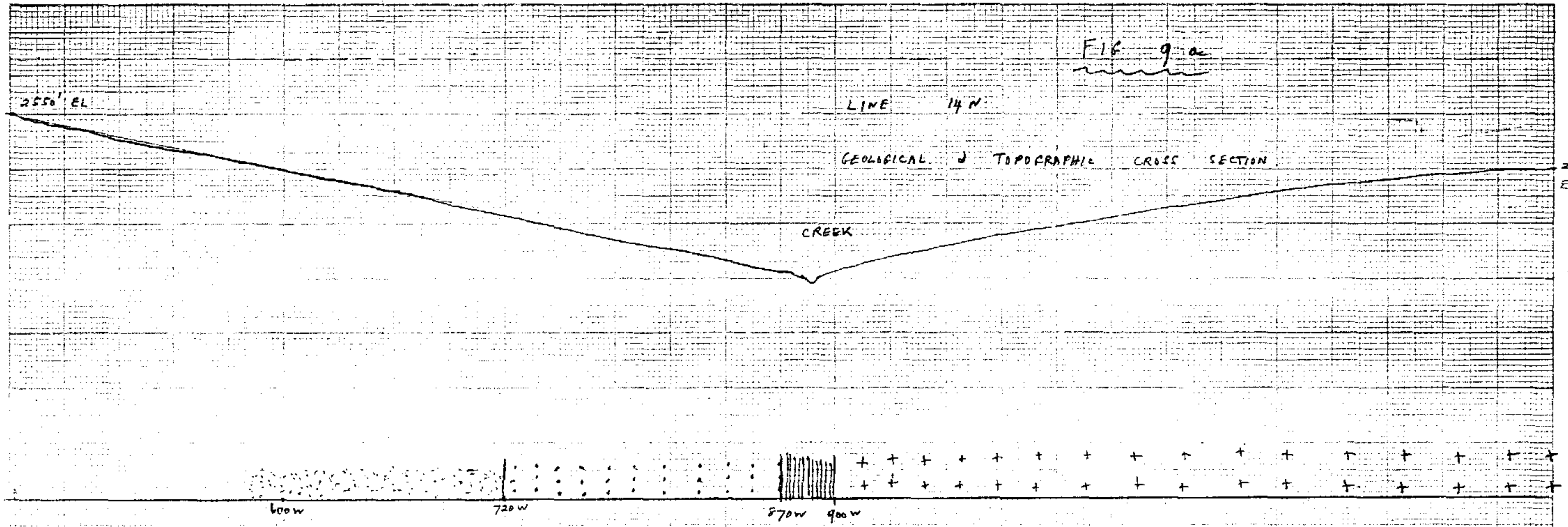


FIG 8a

LINE 16N

GEOLOGICAL & TOPOGRAPHIC SECTION

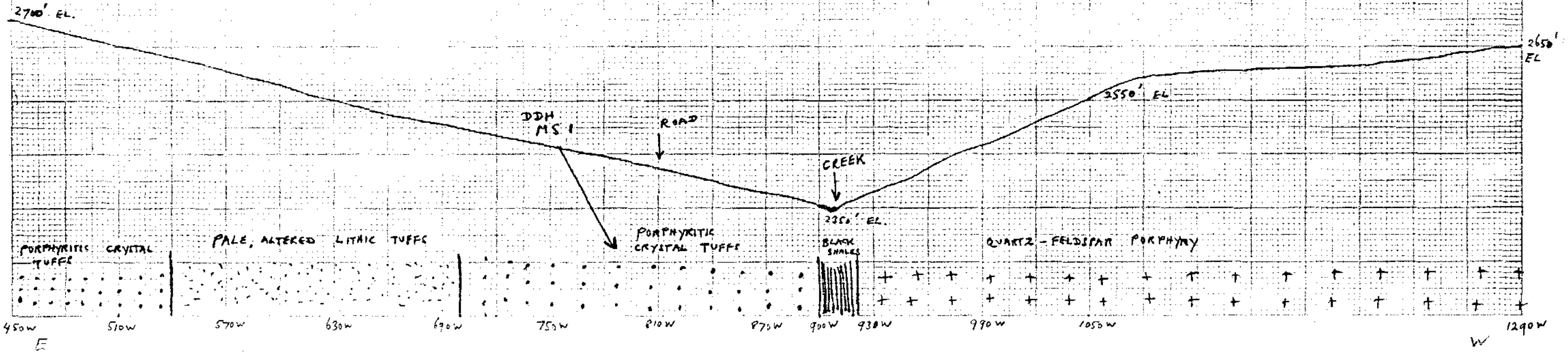


FIG. 10 LAKE BEATRICE, LINE 16N

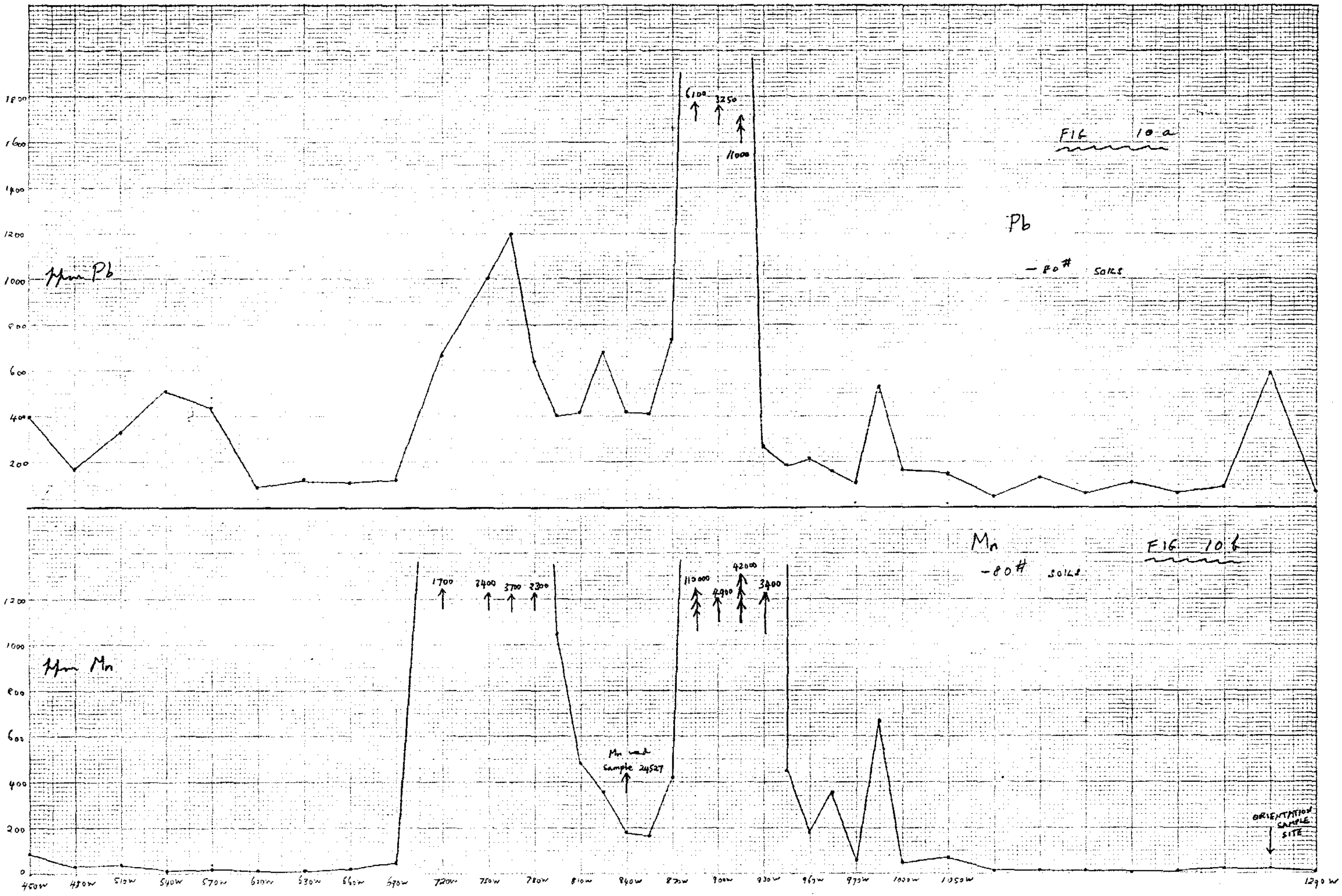


FIG 10. LAKE BEATRICE, LINE 16 N

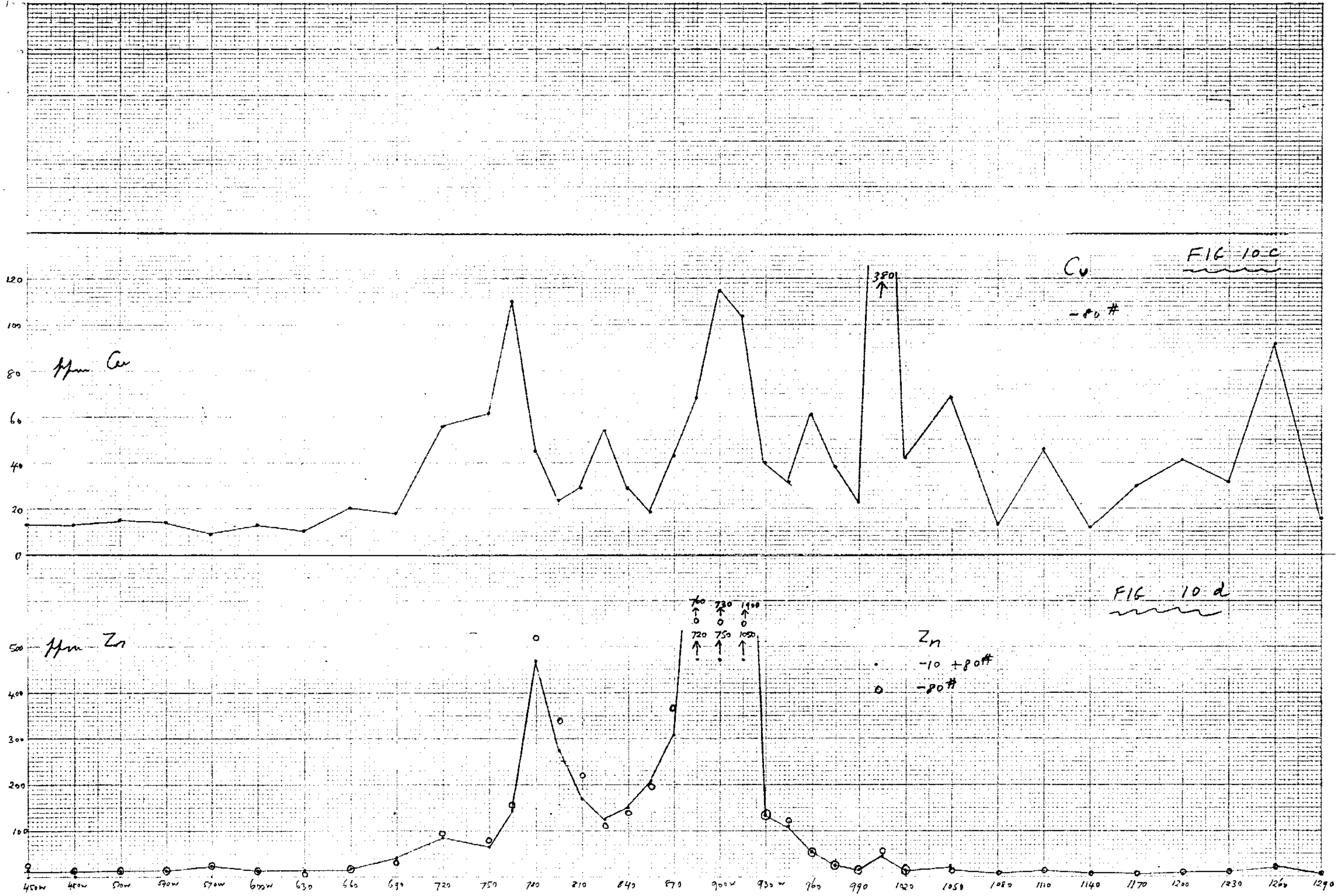
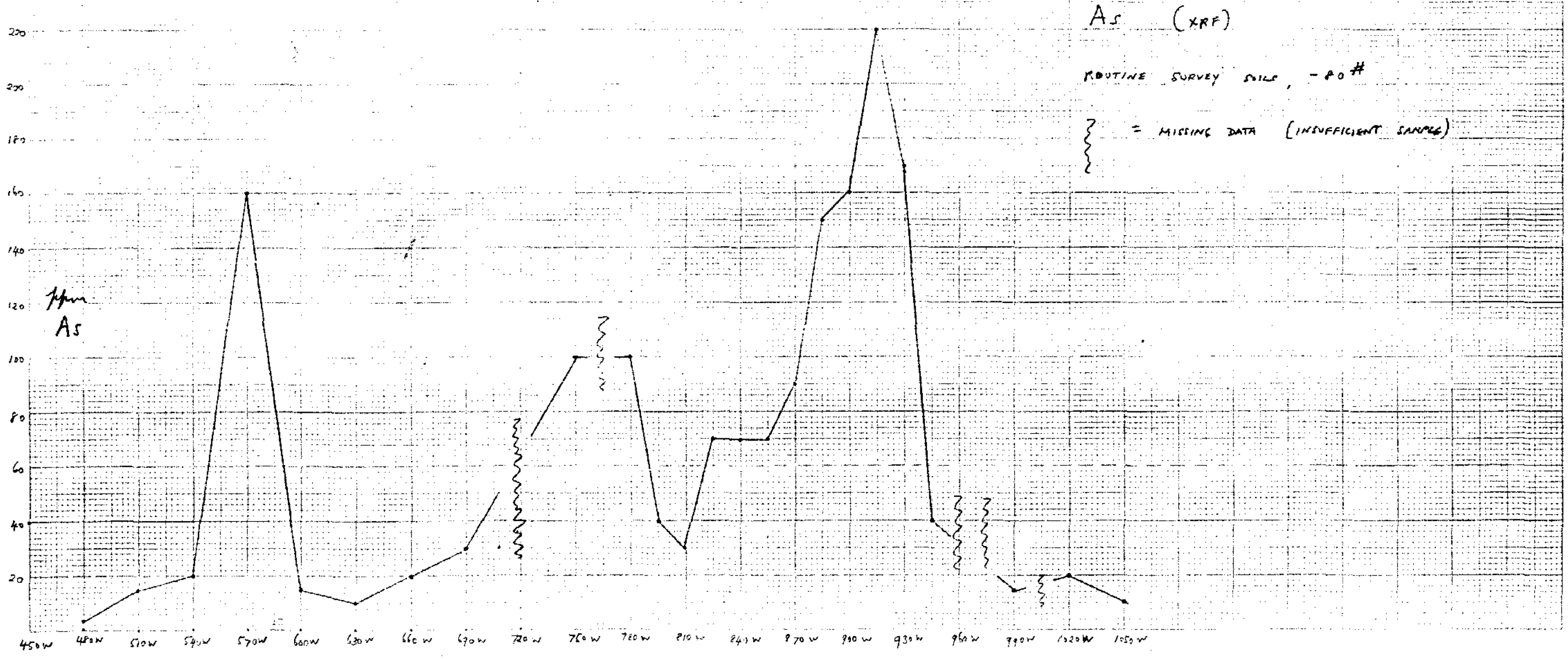


FIG 10 LAKE BEATRICE, LINE 16N

FIG 10e



As (XRF)

ROUTINE SURVEY SOILS, -80#

⌇ = MISSING DATA (INSUFFICIENT SAMPLE)

FIG 11 LAKE BEATRICE LINE 14 N

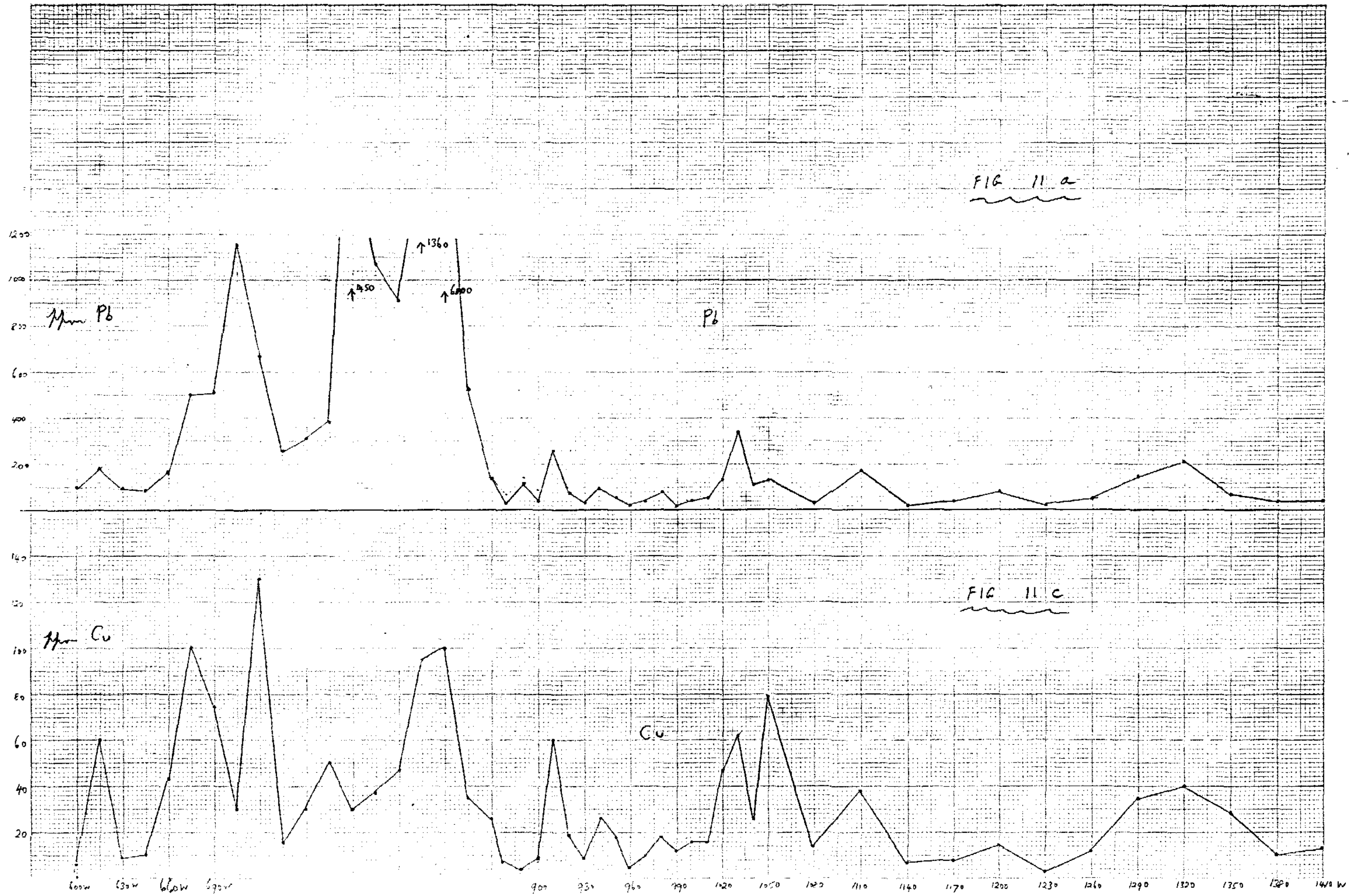
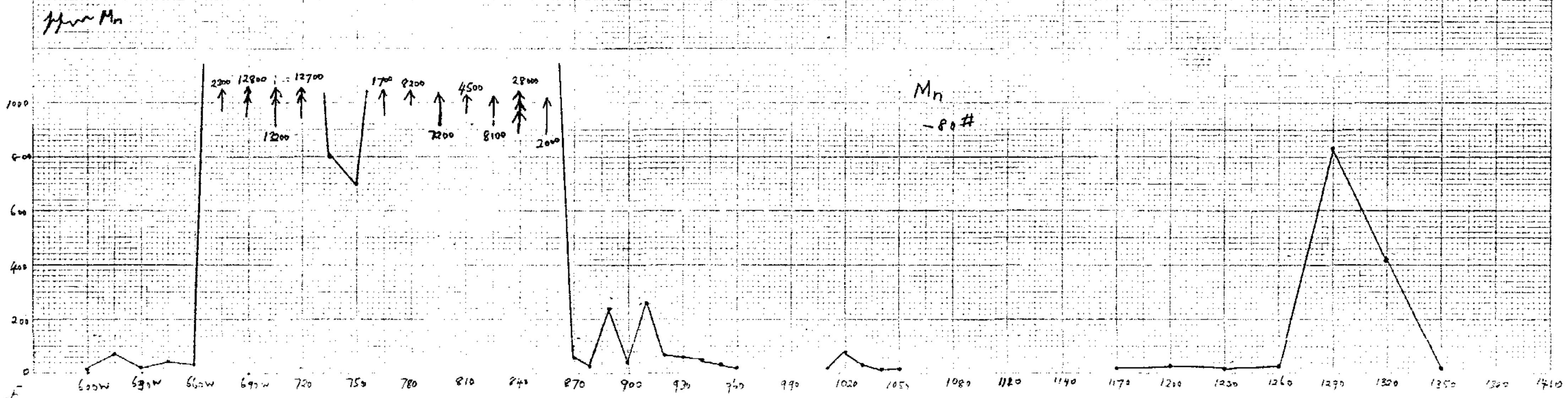


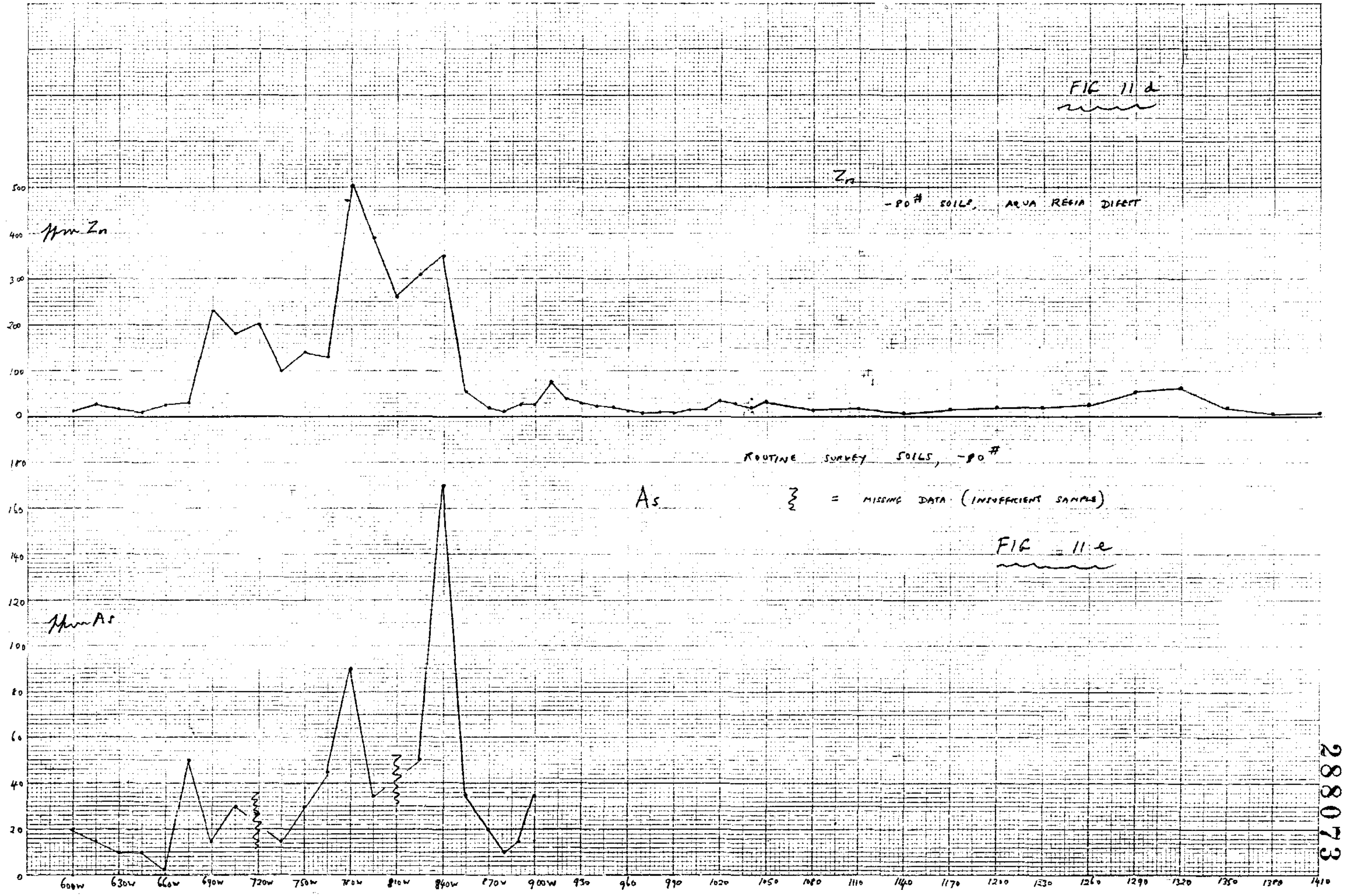
FIG 11 LAKE BEATRICE LINE 14N

FIG. 11 b



T20

FIG 11 LAKE BEATRICE LINE 14N



073

MT. LYELL MINING & RAILWAY CO. LTD. **288074**

GEOCHEMICAL SAMPLE DESPATCH

AREA: Beatrice

PAGE: 1

DATE: 16-2-79

METHOD:

LINE NO: Geochem Recon.

FRACTION: -80# Assay/Analyse AAS

	SAMPLE NO.	CU	Pb	Zn	Co	Mn	Fe
A_0	1600 N/1260 W ~~A~~	370	2000	55	< 5	390	4900
skeletal A_2	1600 N/ 1260 W ~~B~~	55	370	24		90	2800
A_0	1600 N/ 1350 W ~~A~~	90	270	22		40	2300
azonal	1600 N/ 1350 W ~~B~~	20	100	13		20	2900
A_0 from moss in crack	1600 N/ 1355 W	160	350	38		30	4800
azonal	1600 N/ 1860 W	10	90	41		60	2900
A_0	1650 N/ 1470 W ~~A~~	60	220	20		350	6000
azonal	1650 N/ 1470 W ~~B~~	30	160	19		90	4200
azonal	1800 N/ 1800 W	14	70	8		30	2100
azonal	1800 N/ 2010 W	<5	40	7		20	3650

NO. OF SAMPLES: ....10:............

9

074.

288075
Form No. 175.

THE MOUNT LYELL MINING & RAILWAY CO. LTD.

D. D. HOLE NO. BEATRICE ROCK CHIPS — PORPHYRY SAMPLES

From	To	Cu	FeS$_2$	Ag	Au	Sp.Gr.	Pb	Zn	Mo				
✓SRQ 1													
✓SRQ 2													
✓SRQ 3													
✓SRQ 4													
✓SRQ 5													
✓SRQ 6													
		Cu	PS	Zn	Co	Mn	Fe						
✓F 732		150	130	270	<10	250	12,000	LB	0200N/	120W	F(+) Gy	fsp-qtz	
✓F 830		80	20	65	"	280	13,000	LB	1780N/	1770W	Gy	qtz=fsp	
✓F 742		270	30	140	"	550	18,000	LB	1000N	855W	F(+) Gy-gn	fsp=qtz	
✓F 745		320	270	410	"	840	30,000	LB	1000N/	355W	F(+) Gy	f.g. fsp	
✓F 753		150	20	80	"	400	11,500	LB	1600N/	1500W	Gn	fsp-qtz	
✓F 740		110	60	280	"	950	20,000	LB	800N/	(F(+)) 960W	Gn-gy	fsp-qtz c̄ fe-ox	
✓F 754		90	30	135	"	260	16,000	LB	1600N/	1620W	Gn	fsp-qtz	
✓F 765		95	40	45	"	150	12,000	LB	1500N/	615W	Gn	qtz-fsp	
✓F 737		95	40	80	"	1100	7,000	LB	600N/	665W	Fawn	fsp-qtz	
✓F 769 A		50	20	10	"	30	2,000	LB	1960N/	650W	Lt gy	fsp-qtz	
✓F 769 B		70	30	15	"	300	7,500		"	"	Pk	qtz-fsp	
✓F 752		55	20	80	"	240	10,000	LB	1650N/	1380W	Pk	fsp-qtz	
✓F 757		35	10	15	"	30	3,000	LB	1000N/	780W	Whd	pk qtz-fsp	
✓F 744		50	40	55	"	500	8,500	LB	1500N/	(F(+)) 305W	Pk-br	fsp-qtz	
✓F 743		60	20	100	"	400	8,500	LB	1000N/	(F(+)) 270W	Pk	fsp=qtz	
✓F 766		50	90	70	"	410	7,000	LB	1500N/	1110W	Pk	qtz=fsp	
✓F 767		50	20	65	"	370	10,000	LB	1800N/	1320W	Pk	fsp-qtz	
✓22938		40	30	40	"	50	5,000	LB	1600N/	1350W	Whd Pk	fsp-qtz	
✓22939		25	30	25	"	110	10,000	LB	1650N/	1470W	Whd	fsp=qtz	
✓22940		30	30	45	"	140	12,500	LB	1800N/	1500W	Whd	gn fsp-qtz	
✓F 826		25	140	115	"	1450	13,500	LB	1670N/	950W	Fol'd	gn fsp-qtz	
✓22941		370	40	50	10	650	14,000	MS	1	328.7m	Pk	qtz fsp	

Left Core Shed ....23 samples 15-2-79.....

Received Sample Mill ....

Received Assay Office ....

* Please crush in this order

Keep rejects

075.

288076
Form No. 175.

THE MOUNT LYELL MINING & RAILWAY CO. LTD.

D. D. HOLE NO.

BEATRICE ROCK CHIPS

From	To	Cu	FeS$_2$	Ag	Au	Sp.Gr.	Pb	Zn	Mo				
		Cu	Pb	Zn	Co	Mn	Fe						
✓F768		180	1700	1600	20	.30 000	28%	LB	1850N/	(F1H) 850W	Fe-M.	ox.	concret
✓24527		85	5600	1650	130	75 000	12%	LB	1395N/	840W	Mn	wad.	

Left Core Shed ....2.. Samp 48 .....15-2-79....
Received Sample Mill ....
Received Assay Office ....

9

078

MT. LYELL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH

2880

AREA: Beatrice

PAGE: 1

DATE: 15-2-79

~~[illegible]~~

METHOD: Aqua Regia digest.

LINE NO: Stream Seds

FRACTION: -80#

Assay/Analyse AAS

drains QF porph. fabric zone; anom on line 400N/1200-1320 W 1

Beatrice [illegible] 2

Beatrice drill (large [illegible]) 3

sulphide sheet

drains QFP (fault breccia ?) 4

downstream from SS6 — on contact c fabric zone & draining them, not QFP 5 6

porphyry — but most draining fabric zone [illegible] N.

SAMPLE NO. BL	3 CU	8 Pb	6 Zn	0 Co	0 Mn	0 Fe
LB 00/1000W	32	137	64	3	1160	14200
LB 1420N/905W	48	362	475	13	1150	21,500
LB 1400N/835W	24	926	1000	15	5300	23000
LB 1400N/1430W	47	175	144	2	415	15700
LB 1600N/1530W	44	102	28	3	105	7700
LB 1600N/1865W	25	105	44	4	118	18600
+80# -30#	—	—	—	—	—	—
LB 00/1000W	16	71	48	3	500	14400
LB 1420N/905W	36	360	432	13	1100	26400
LB 1400N/835W	35	632	834	14	560	24350
0.2gms taken N. Marshall						
Rock Chips						wt dissolved
Digested c Dil HCl 1		105	54		1140	0.200
" " " 2		360	345		360	
" " Aqua Regia 3		73	222		4300	[illegible]
0.2g/20ml						

NO. OF SAMPLES: 9

[illegible] Not Digested

077

RENISON LIMITED

ASSAY REPORT

Nº 14961

Date	Sample No.	Description	% Sn	% S	% Fe	As	% Cu	Pb	Zn
2-11-78		LB 16N 600 W				15	13	90	8
		630				10	10	125	6
		660				20	20	110	12
		690				30	18	120	34
		720				In Sufficient Sample	5	670	96
		750				100	61	1050	80
		765				In Sufficient Sample	110	1200	155
		780				100	45	640	520
		795 (A)				Insufficient Sample	118	220	150
		795 (C)				40	24	400	340
		810				30	23	420	22
		825				70	54	650	110
		840				70	29	410	145
		855				70	19	2110	200
		870				90	43	740	37
		885				150	68	[illegible]	76
		900				160	115	[illegible]	73
		915				220	104	1000	19
		930				170	40	270	130
		945				40	32	190	125
		960				In Sufficient Sample	61	215	57
		975				"	38	165	24
		990				15	23	112	12
		1005				In Sufficient Sample	350	530	56
		1020				20	42	165	9
		1050				10	65	150	15

Assayer: DC

Chief Analyst:

Date: 2-11-78

5

078

288079

RENISON LIMITED

ASSAY REPORT

№ 14960

Date	Sample No.	Description	% Sn	% S	% Fe	PPM As	Cu	Pb	Zn
2-11-78		LB 14N 600 w				20	6	100	12
		615				15	60	190	28
		630				10	9	95	16
		645				10	10	90	7
		660				<5	43	170	26
		675				50	100	500	31
		690				15	75	[illegible]	[illegible]
		705				30	30	1150	[illegible]
		720	In Sufficient Sample				30	[illegible]	[illegible]
		735				15	16	255	98
		750				30	30	[illegible]	740
		765				45	50	[illegible]	120
		780				90	70	[illegible]	[illegible]
		795				35	37	570	[illegible]
		810	Insufficient Sample				47	[illegible]	200
		825				50	95	[illegible]	[illegible]
		840				170	[illegible]	[illegible]	[illegible]
		855				35	35	[illegible]	55
		870				20	26	140	19
		880				10	7	35	10
		890				15	4	[illegible]	21
		900				35	60	[illegible]	75
		LB 16N 450 w				40	13	400	18
		480				55	13	125	10
		510				15	15	330	13
		540				20	14	510	12
		570				160	9	440	22

Assayer: DC

Chief Analyst:

Date: 2-11-78

5

R-W 74/4812

APPENDIX 111

Basin Lake Grid.

Sampled with A. Walter, G. Drake, 12.2..79

Earlier work by Pickands Mather had found a Turam anomaly which on subsequent drilling showed weak Pb-Zn mineralization.

Subsequently, Mt Lyell carried out gradient array IP and " A horizon " routine auger soil geochemistry on a grid basis, and drilled a weak IP/ geochemical anomaly on line 7500 S. The area is covered by glacial moraine with large boulders of Owen Conglomerate from the foot of the range, and moraine is 37 meters thick in the Pickands Mather drill BL1.

Geochemical values are rather spotty; soil development consists essentially of rather uniform A_0 black peaty humus and A_1 dark brown-grey organic clay over thick unconsolidated glacials of boulders and sandy clay. (azonal transported).

Relative soil conductivity readings were taken by using an arbitrary level teaspoon scoop measure dispersed in 80 ml of distilled water.

Conductivities were read with a Townson portable conductivity meter using the K= 0.1 probe and B scale (ie. most sensitive setting) and are reported as relative milli-mhos per cm.

Because of the glacial boulders it was rarely possible to penetrate below the A_1/A_0 layer with the auger, although the interface could be observed in road cuttings.

1) LINE BL 7500 S. (in feet)

5800E gentle downslope to W.

A_0, black organic clay, variable thickness to absent; C = 0.029

A_1, dark brown-grey organic clay; C = 0.019

5850E gentle downslope to W.

A_0, C = 0.027

A_1 C = 0.024

5900E gentle downslope to W

A_0, C = 0.013

A_1 C = 0.017

5950E gentle downslope to W.

A_0, C = 0.022

A_1 C = 0.012

NB. Very poor A_0/A_1 differentiation - mostly thin, organic rich A_1 on boulders of Owen Conglomerate.

6000E gentle downslope to W
A_0 C = 0.016
A_1 C = 0.014

6050E gentle downslope to W
A_0 C = 0.014 ; pale not much darker than A_1, thin, variable.
A_1 C = 0.039

6100E gentle downslope to W
A_0 C = 0.024 ; black peat, very thin to absent in places.
A_1 C = 0.023

6150E gentle downslope to W
A_0 C = 0.016 ; 10 cm thick
A_1 C = 0.020 ; poorly differentiated from A_0

6200E slight flattening of slope
A_0 C = 0.014 ; some sandy component.
A_1 absent

6250E downslope W
A_0 C = 0.019 ; black humus
A_1 absent - but profile in bank of nearby road-cut shows some A_1 development but many large boulders. Hence auger sampling problem. (Spring discharge in road-cut 100 ft below drill collar has C = 0.029

6300E downslope W
A_0 = o.007 ; black organic humus
A_1 = 0.020 ; poorly differentiated from A_0 but more clay rich, and dark chocolate brown

6350E downslope W ; 50 ft S of drill collar.
A_0 = 0.016 ; dark brown
A_1 = not available by augering (boulders)

6400E downslope W increases

A_0 = 0.015

A_1 absent

6450E moderate downslope W

A_0 =0.014 black humus

A_1 absent

6500E on level small flat (break in slope)

A_0 = 0.030 nearly black

6550E downslope W

A_0 =0.046

6600E on local flat (break in slope)

A_0 =0.013

small creek nearby has C = 0.027 in water

6650E downslope W

A_0 = 0.027

6700E downslope W

A_0 = 0.012 , still consistent dark chocolate brown to black

"A_1" Actually sandy, bleached glacial grit, low in clay and virtually no organic matter, at 28 cm depth
C = 0.006 (small creek nearby gave C = 0.027)

6750E downslope W

A_0 = 0.021

6800E on S downslope of small moraine spur

A_0 = 0.010

6850E on S downslope of small moraine spur

A_0 = 0.016

6900E on S downslope of small moraine spur

A_0 = 0.014

6950E on N downslope of small moraine spur

A_0 = 0.029
(different creek nearby gave C = 0.028)

7000E

A_0 = 0.024

Some very weak, incipient A_1 development

5750E paced off end of line, gentle downslope W (flattening)

A_0 = 0.021 to 20 cm depth

A_1 = 0.013 dark grey sandy clay

5700E flat area (break in slope)

A_0 brown (less organic) humus clay = 0.033

5650E slight downslope W

A_0 = 0.015 , brown

5600E A_0 absent , slight downslope W

A_1 = 0.020 , sandy brown-grey clay with organics over azonal glacial gravel

5500E slight downslope W (toward Langdon R.)

A_0 absent

A_1 = 0.012 , as at 5600E

5350E in small depression near flattening of W downslope

A_0 = 0.044 ,brown humus on glacial gravel

5200E on small flat (break in slope)

A_0 = 0.018 , brown humus, slightly sandy, on glacial gravel

5100E on flat area (further break in W downslope)

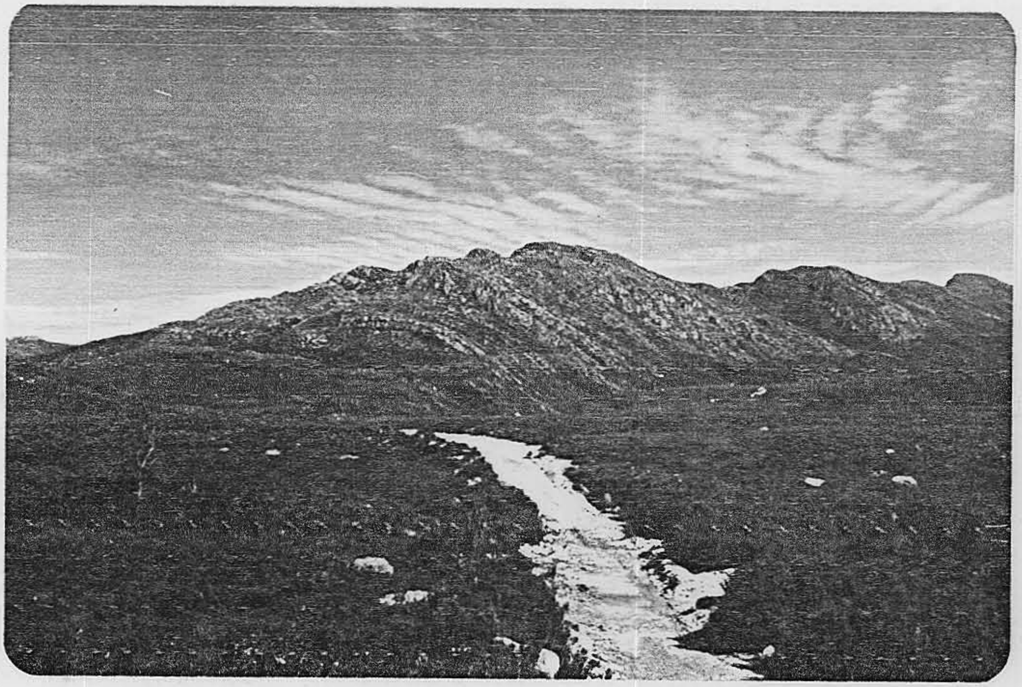
A_0 = 0.022 , black, claey, with some sand

2) Mn/Fe stained glacial pebbles from seeps in roadside (break in slope) were collected at the following localities.

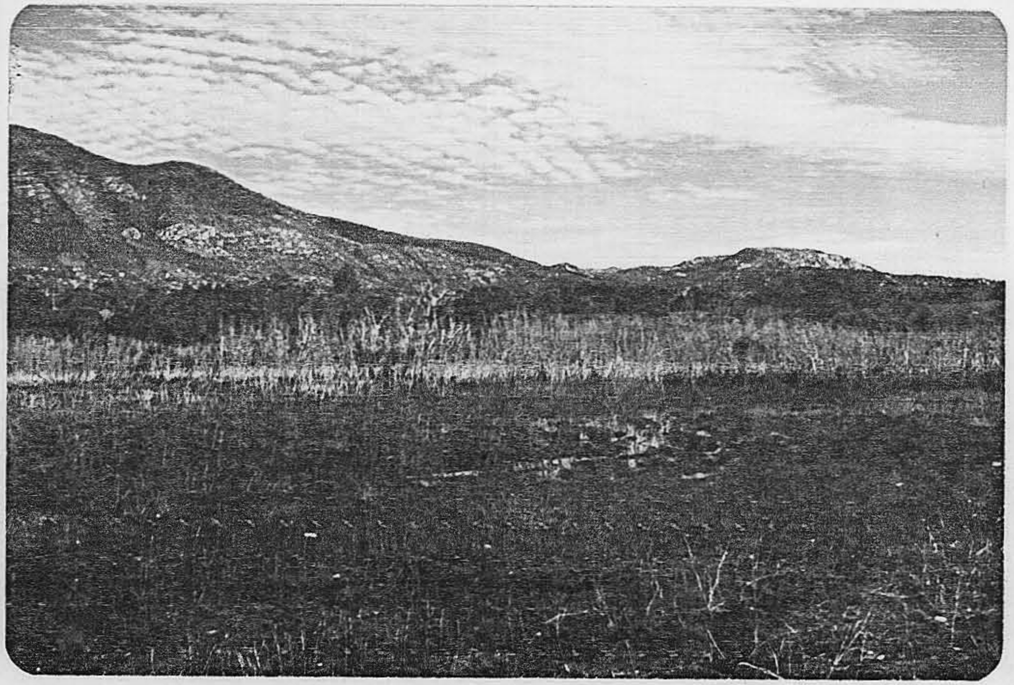
Sample no.	locality
24529	7500 S/ 5700E
24530	4800 S/ 6500E
24532	2400 S/ 8250E

3) Rock sample of ferricrete cementing Owen Conglomerate, from small roadside seepage was also collected as 24531 at 2400 S/ 8250 E, adjacent to sample 24532.

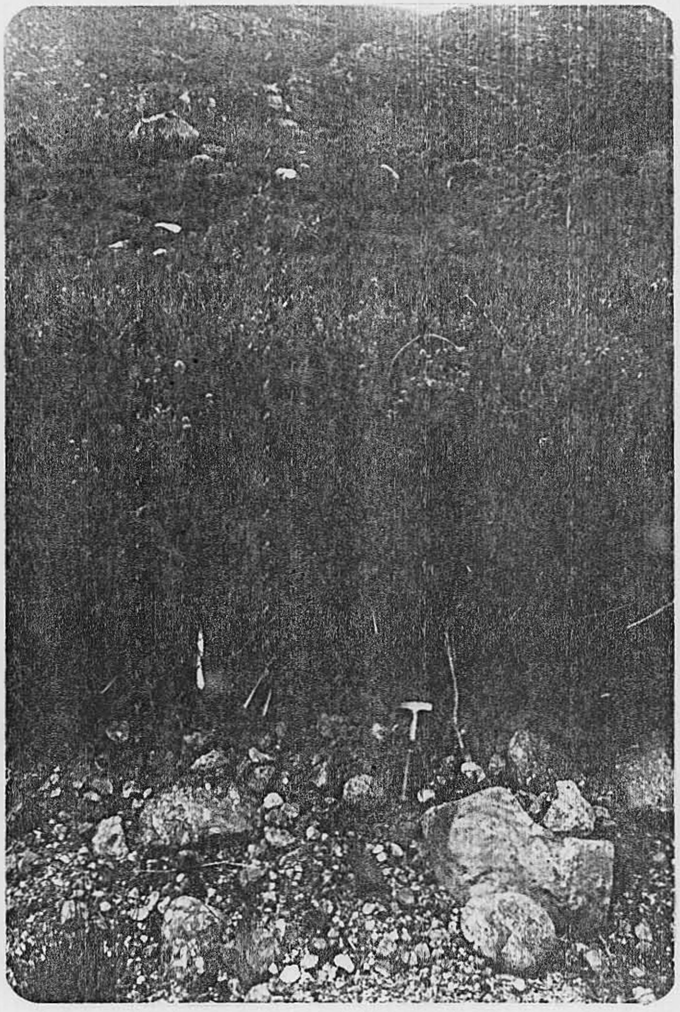
4) Tyndall Ck. at road bridge near drillers' camp gave C = 0.041. Re-read 3 days later after heavy rains (in flood) C = 0.041 - no change.



III.1. foreground: Moraine Ridge, E.Tyndall Grid erratics of Owen Conglomerate (ex range). Button grass and heath vegetation on grey swampy fluvioglacial boulder clays - rather impervious.



III.2. N W Basin Lake Grid. Typical peat bog with moraine in middle distance and Tyndall Range (Owen Conglomerate) in background. Routine Sampling done on -80# (scarcity of -80# in sample) from full depth of auger in peat bog.



III.3. Basin Lake Grid. Swamp heath (impervious boulder clay soils) and ti-tree scrub forming A_0 soil, poorly differentiated into a less organic, more sandy A_1, directly on glacial moraine.

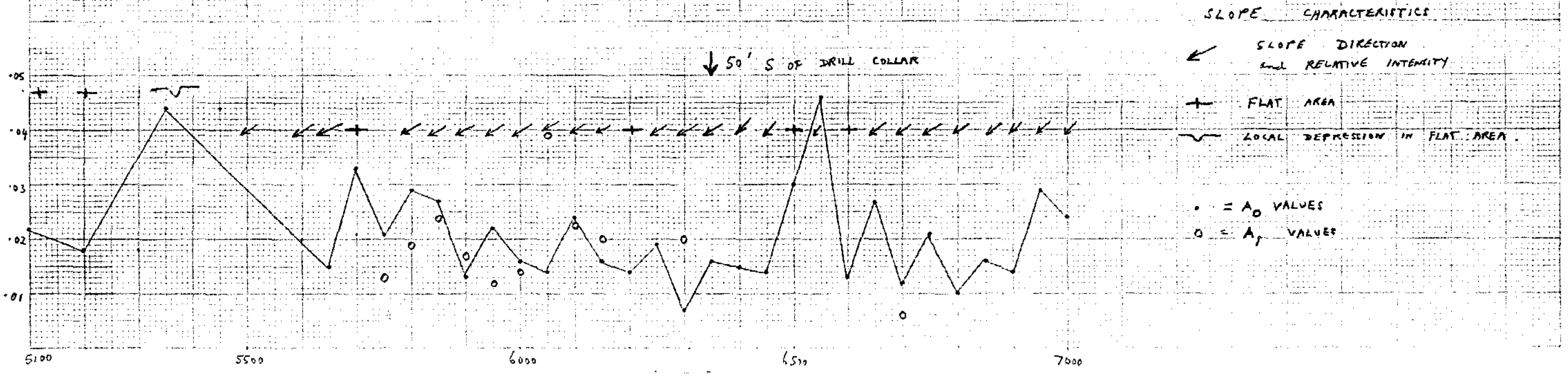
BASIN LAKE, LINE 75 S

FIG 1.

RELATIVE SOIL CONDUCTIVITIES

FIG 1.

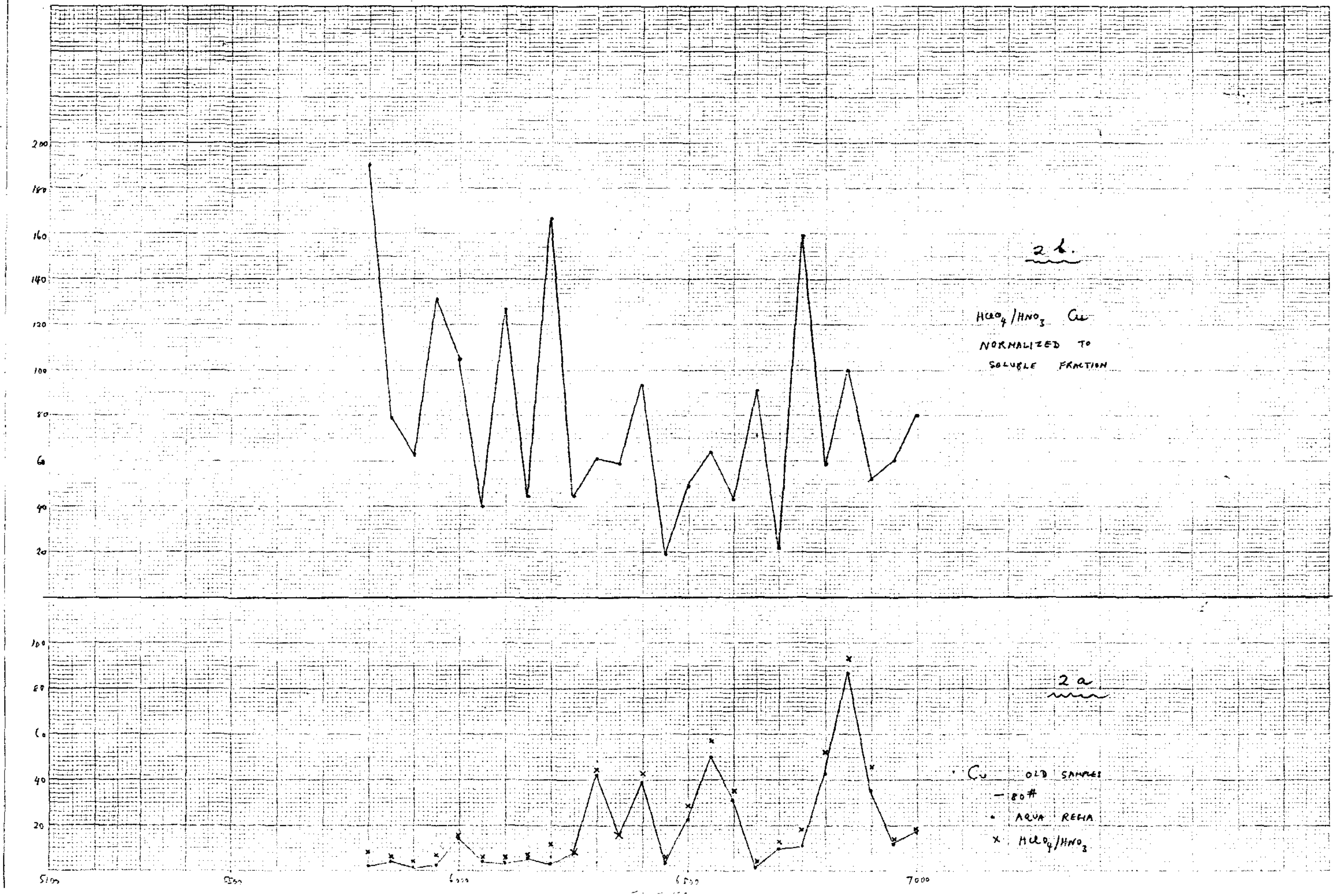
m-mhos/cm.



288087

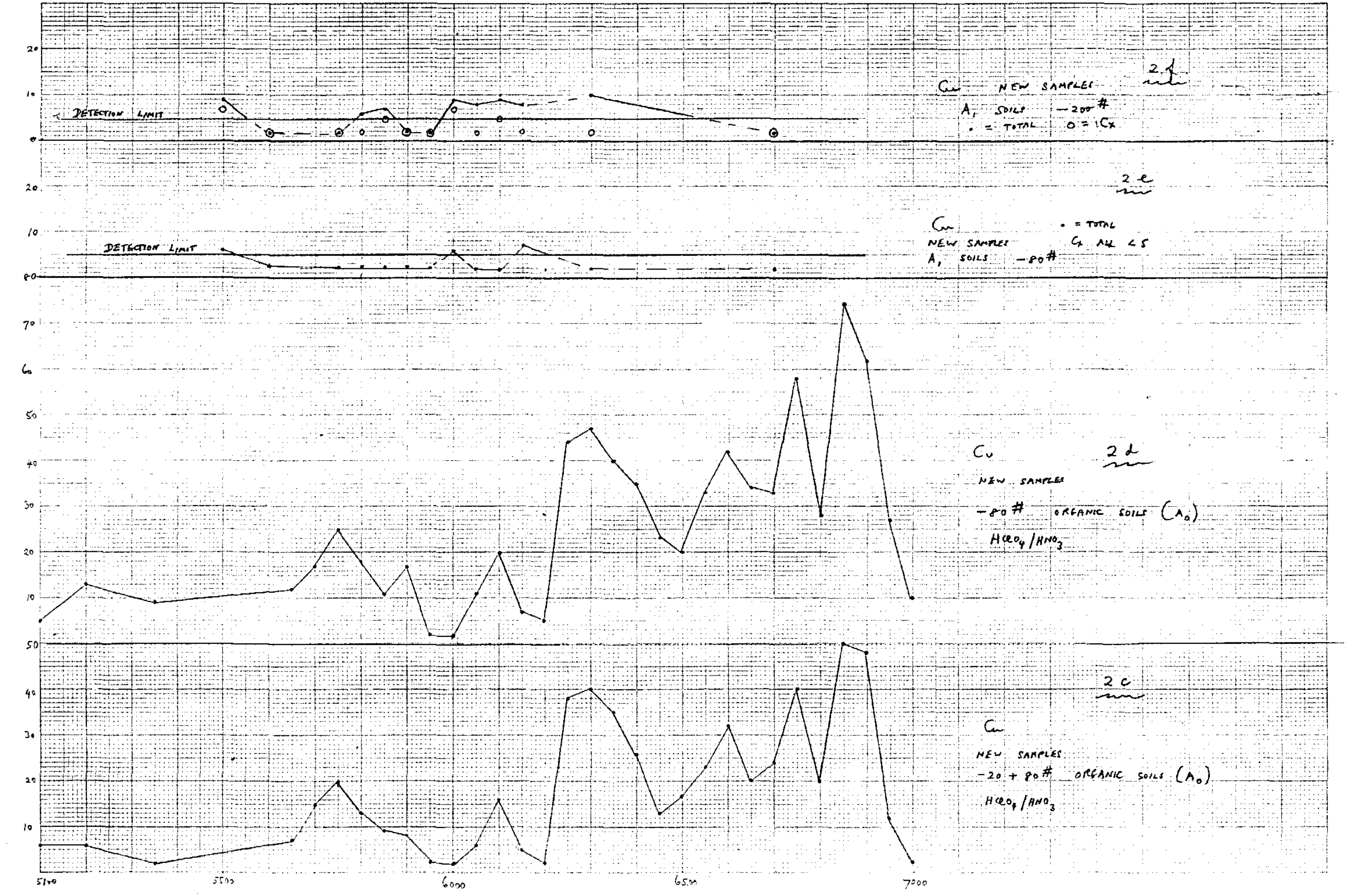
BASIN LAKE, LINE 75 S, ppm Cu

FIG 2.



980

BASIN LAKE, LINE 75 S, ppm Cu



BASIN LAKE, OLD SAMPLES, -80#

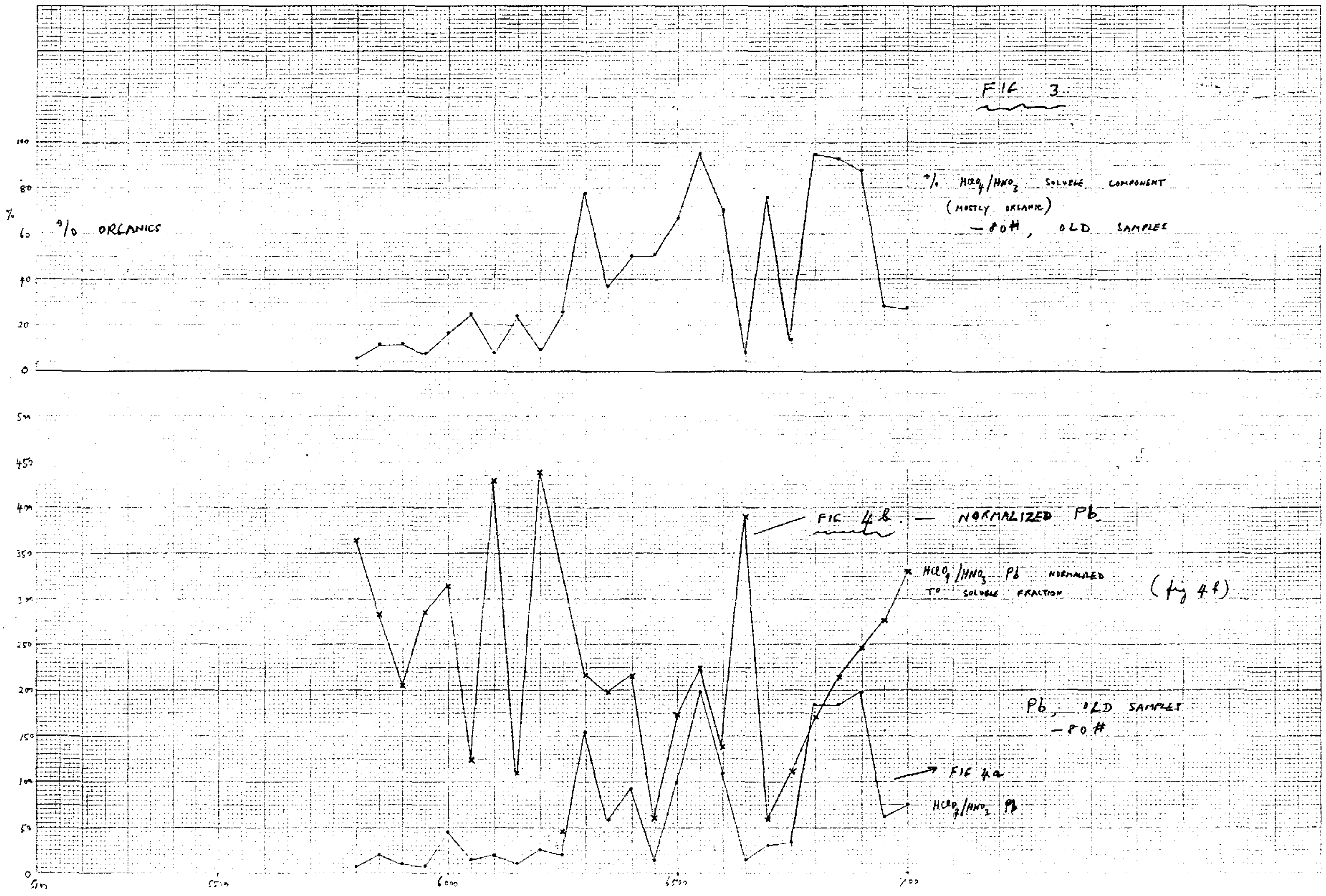


FIG 3

288090

BASIN LAKE
LINE 75 S, OLD SAMPLER, -80#

Pb.

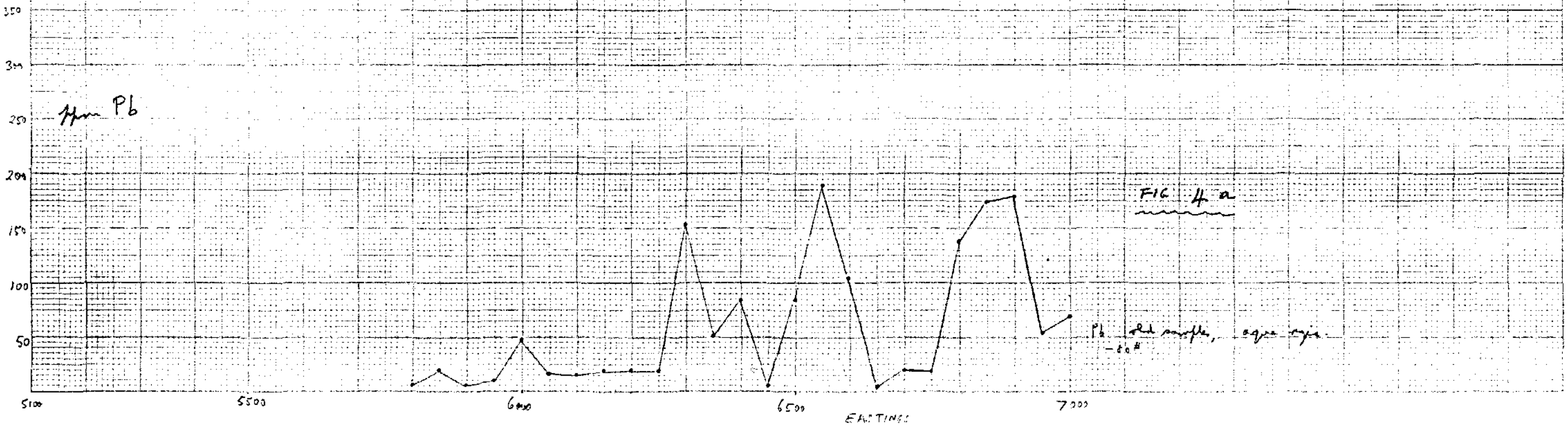


FIG 4 a

BASIN LAKE, LINE 75 S, ppm Pb

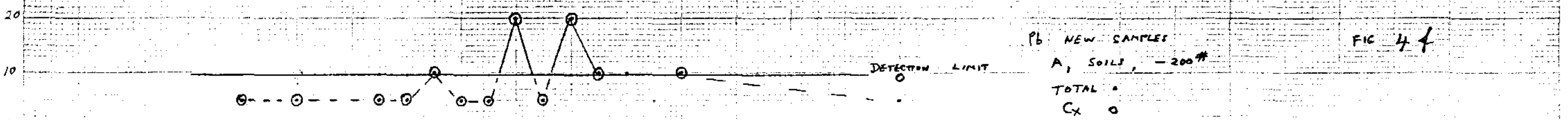


FIG 4f

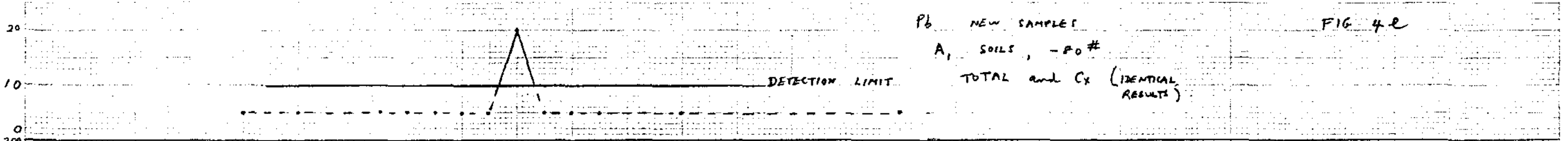


FIG 4e

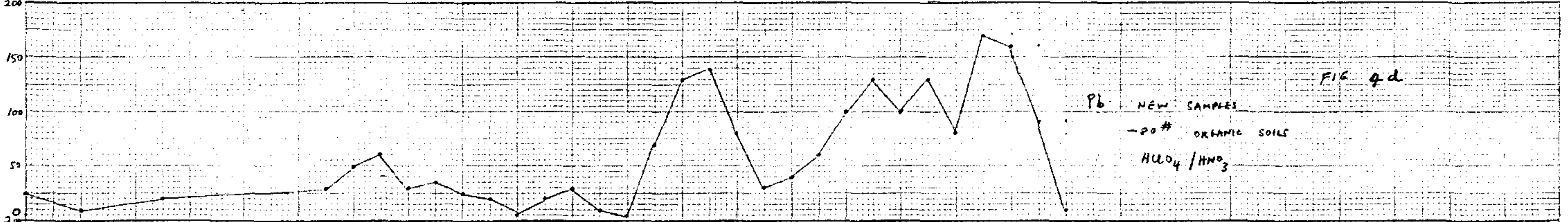


FIG 4d

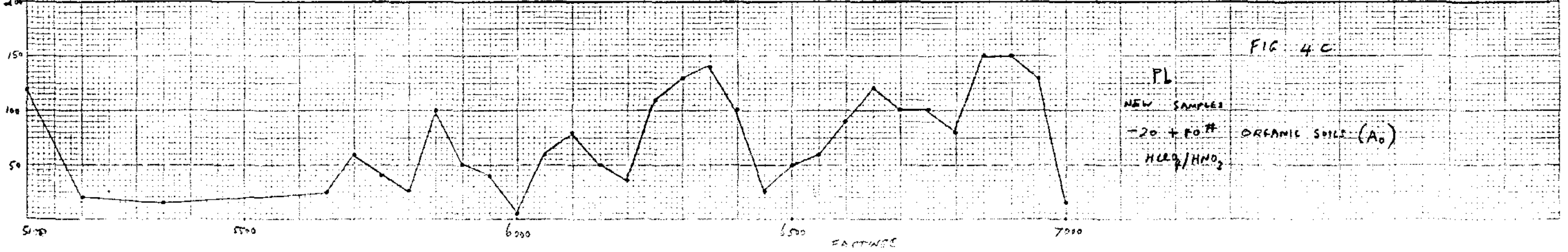


FIG 4c

BASIN LAKE, LINE 75 S. ppm Zn

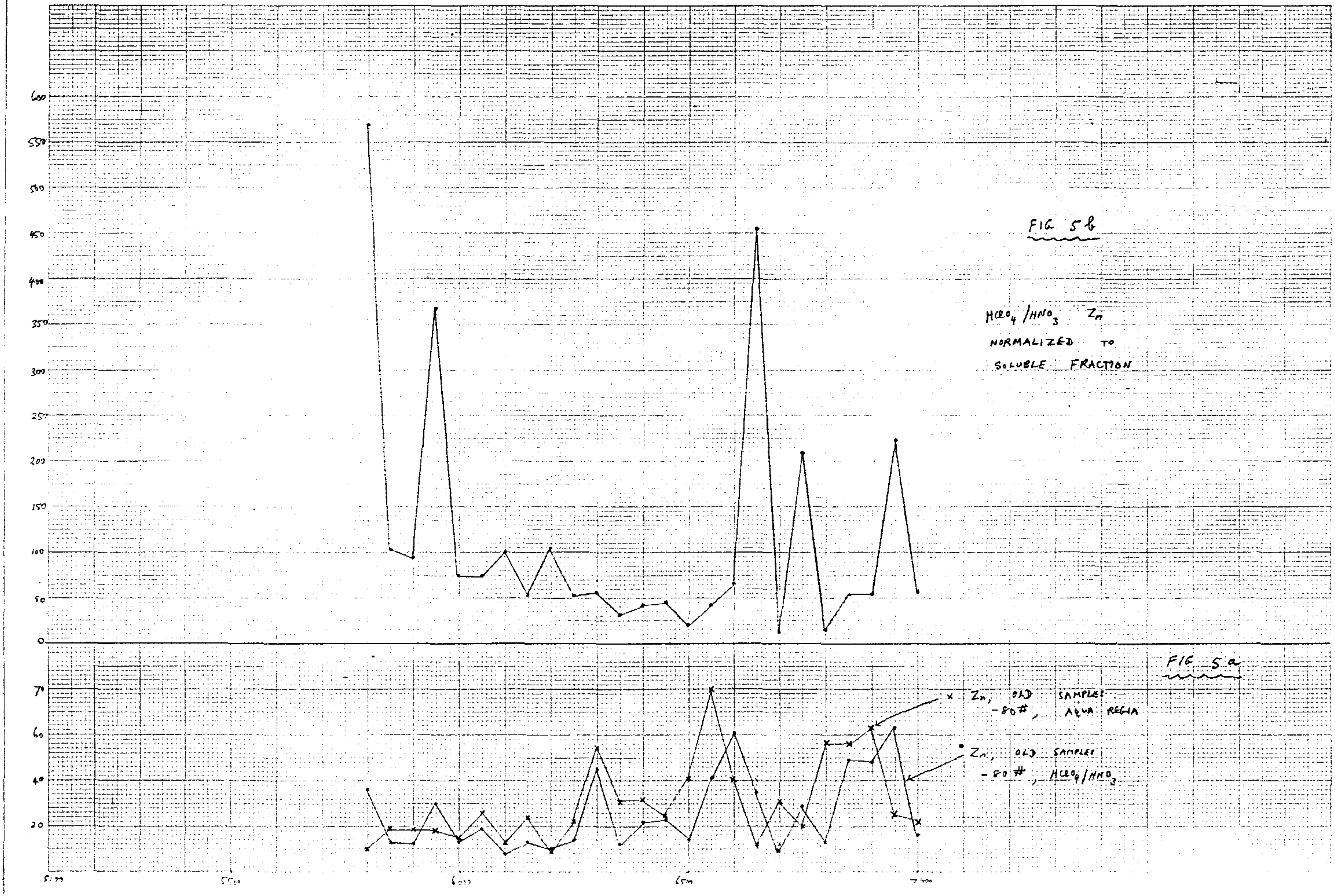
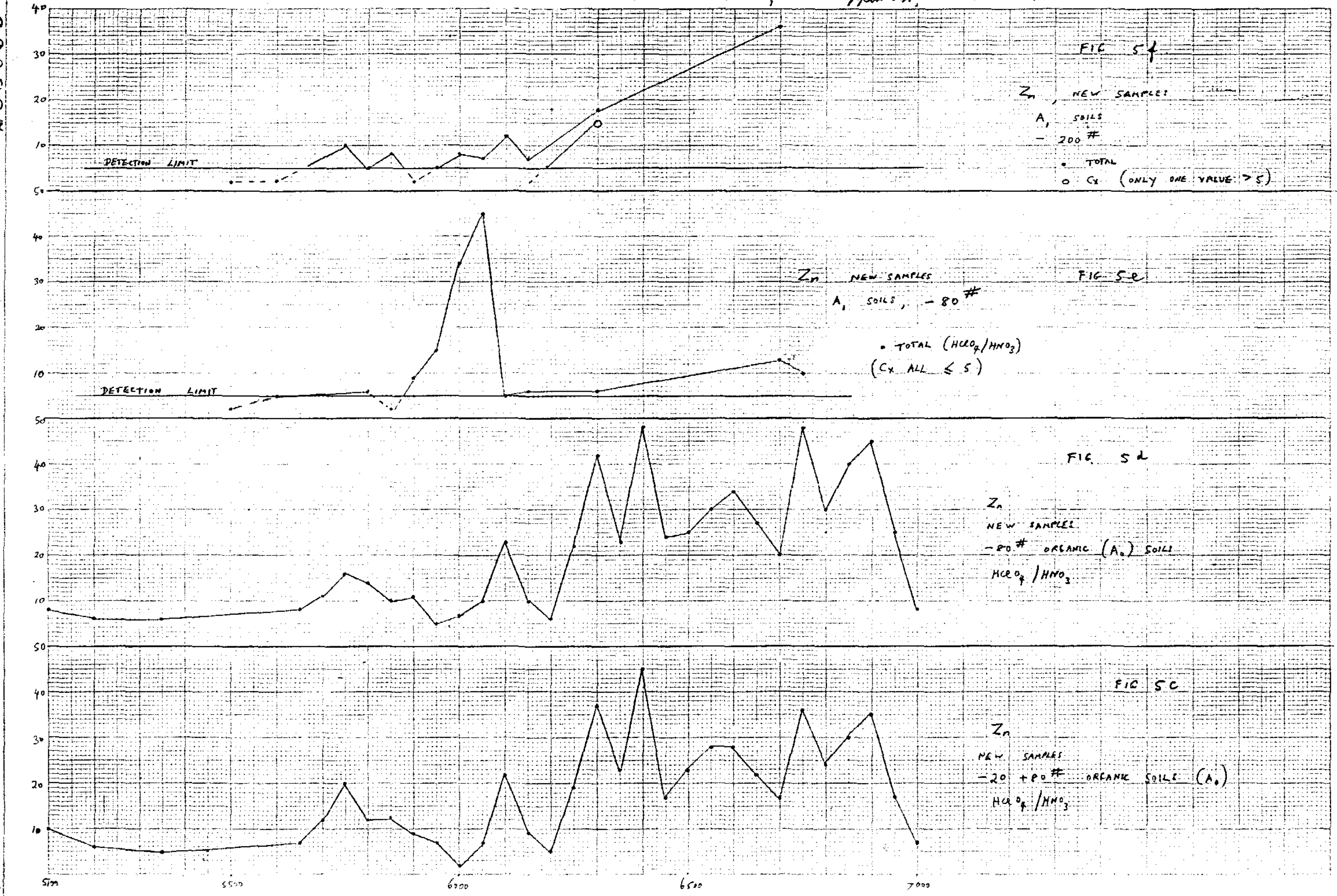


FIG 5b

HClO$_4$/HNO$_3$ Zn NORMALIZED TO SOLUBLE FRACTION

FIG 5a

BASIN LAKE, ppm Zn, LINE 75 S



BASIN LAKE

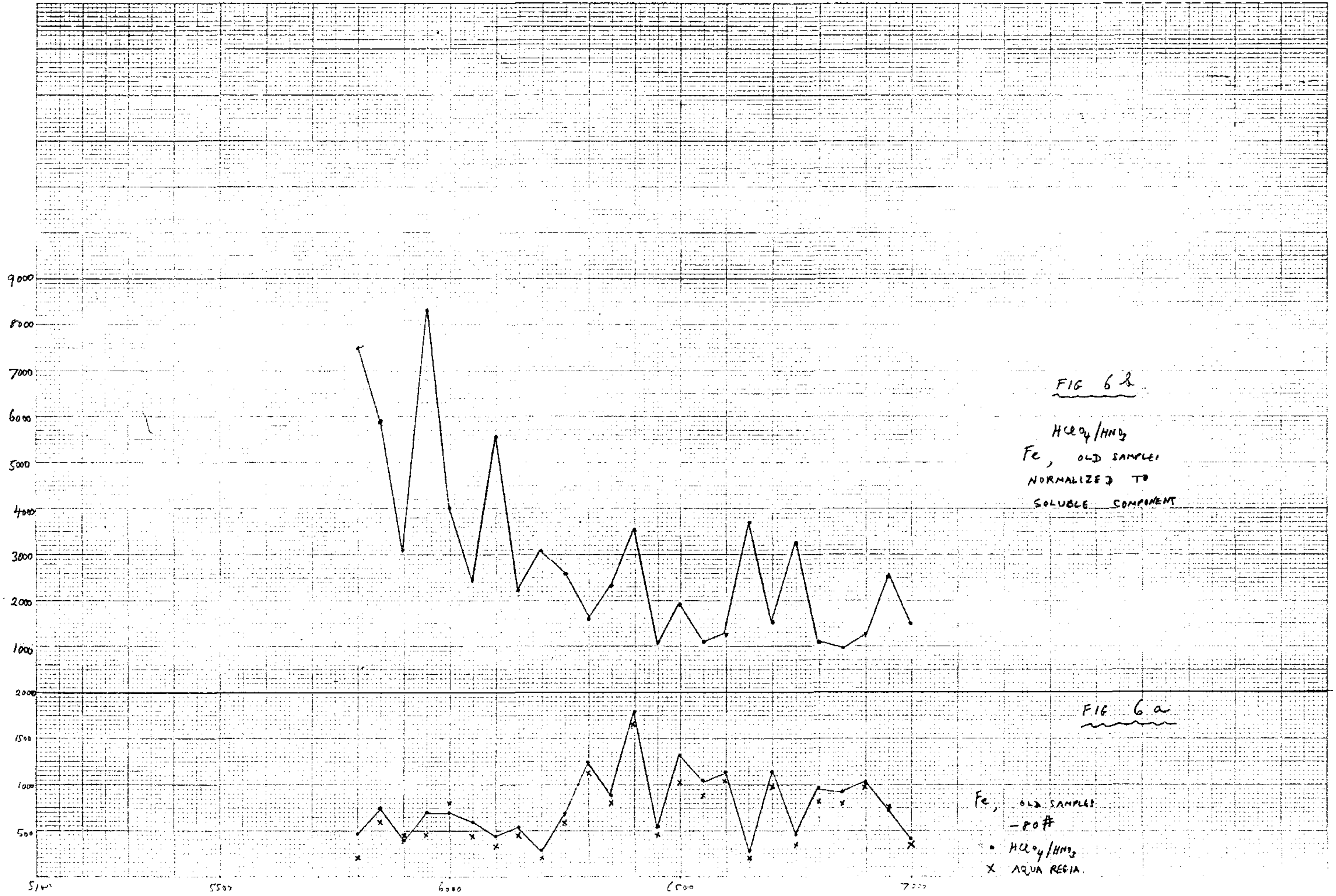


FIG 6 b

HClO4/HNO3
Fe, OLD SAMPLES NORMALIZED TO SOLUBLE COMPONENT

FIG 6 a

Fe, OLD SAMPLES -80#
• HClO4/HNO3
X AQUA REGIA

BASIN LAKE, LINE 75S, ppm Fe.

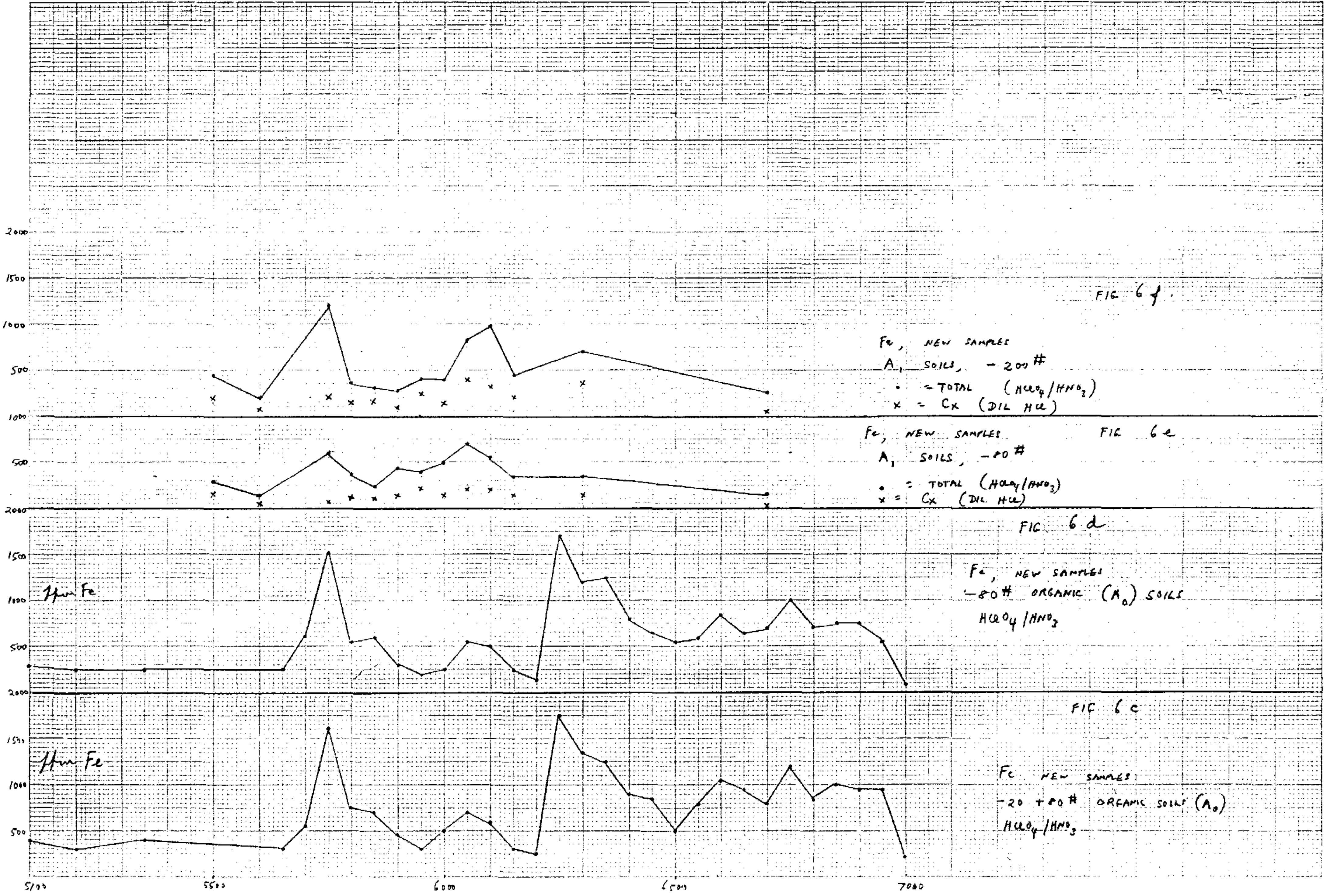


FIG 6f.

FIG 6e

FIG 6d

FIG 6c

095

MT. LYELL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH

288096

AREA: BASIN LAKE

PAGE: 1

DATE: 14.2.79

METHOD: AQUA REGIA → AAS

LINE NO: 75 SOUTH (OLD SAMPLES)

FRACTION: -80#

Assay/Analyse

SAMPLE NO.	CU	Pb	Zn	Mn	Fe	Co
5800E	2	4	10	<5	200	<5
5850E	4	19	19	"	600	"
5900E	1	6	19	"	450	"
5950E	2	9	18	"	450	"
6000E	14	47	15	"	800	"
6050E	4	17	26	"	430	"
6100E	3	16	13	"	310	"
6150E	6	19	24	"	480	"
6200E	3	20	10	"	210	"
6250E	8	18	22	"	570	"
6300E	42	153	54	11	1130	"
6350E	16	53	31	<5	810	"
6400E	39	85	32	"	1680	"
6450E	3	5	22	"	440	"
6500E	23	85	41	"	1020	"
6550E	50	190	70	5	880	"
6600E	31	105	40	<5	1030	"
6650E	<1	3	12	"	210	"
6700E	10	21	31	"	990	"
6750E	11	18	20	"	360	"
6800E	43	137	57	"	820	"
6850E	87	175	56	7	790	"
6900E	36	180	63	<5	1010	"
6950E	12	55	25	"	800	"
7000E	17	70	22	"	350	"
STANDARD SOIL						33

NO. OF SAMPLES: 25

zero is on blank

096

288097

TAKEN [illegible]
in 20 ml
(×10+)

GEOCHEMICAL SAMPLE DESPATCH

AREA: BASIN LAKE

PAGE: 1

DATE: 14.2.79

METHOD: PERCHLORIC/NITRIC → AAS

LINE NO: 75 SOUTH (OLD SAMPLES) Assay/Analyse

FRACTION: -80#

SAMPLE NO.	CU	Pb	Zn	Mn	Fe	Co
Co 5800E	12	33	36	15	470	6
5850E	10	36	13	9	750	3
5900E	8	26	12	5	395	7
5950E	11	24	30	12	700	7
6000E	18	54	13	6	620	9
6050E	10	31	19	6	615	9
6100E	10	34	8	5	440	11
6150E	11	27	13	7	545	10
6200E	16	42	10	5	335	11
6250E	12	35	14	6	700	12
6300E	48	170	45	16	1245	10
6350E	22	74	12	8	335	10
✗ 6400E	47	109	22	12	1300	10
6450E	10	30	23	6	555	9
6500E	33	115	14	11	1330	12
6550E	61	213	41	11	1050	12
6600E	39	125	61	8	1160	10
6650E	7	30	35	4	235	11
6700E	17	46	9	9	1150	10
6750E	22	49	29	5	450	13
6800E	56	162	13	7	985	12
6850E	93	200	49	12	920	15
6900E	46	214	48	9	1120	14
6950E	17	78	63	6	785	12
7000E ~~6900E~~	22	91	16	11	415	12
STANDARD soil 48 (4/33 [illegible])	300	170	18			48
BLANK	4	16	0	1	"0"	0

NO. OF SAMPLES: 25

Blanks NOT subtracted

097

288098

MT. LYELL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH Organic soils

AREA: BASIN LAKE. ([illegible]) L75S.

2 fractions: 1) -20 +80# (mostly organics)
2) -80# (organics + sand)

TOTAL ONLY

PAGE: 1

DATE: 17/2/7[illegible].

METHOD: ASSAY.
$HClO_4/HNO_3$ "wet ash"

LINE NO: L.75.S.

FRACTION: ~~[illegible]~~ -20 +80 #. Assay/~~Analyse~~

SAMPLE NO.	CU ✓	Pb ✓	Zn ✓	Co	Mn	Fe ✓
5800. E.	13	25	12	0	<10	750
5850. E.	9	100	13			700
5900. E.	8	50 ~~25~~	9			450
5950. E.	<5	40	7			300
6000. E.	<5	<10	<5			500
6050. E.	6	60	7			700
6100. E.	16	80	22			600
6150. E.	5	50	9			300
6200. E.	<5	35	5			250
6250. E.	38	110	19		10	1,750
6300. E.	40	130	37		20	1,350
6350. E.	35	140	23		<10	1,250
6400. E.	26	100	45		10	900
6450. E.	13	25	17		<10	850
6500. E.	17	50	23			500
6550. E.	23	60	28		20	800
6600. E.	32	90	28		10	1050
6650. E.	20	120	22		10	950
6700. E.	24	100	17		<10	800
6750. E.	40	100	36		40	1200
6800. E.	20	80	24		<10	850
6850. E.	50	150	30			1,000
6900. E.	48	150	35		10	950
6950. E.	12	80	17		<10	950
7000 E.	<5	15	7			200
for As via wet ash.						

NO. OF SAMPLES: 25

098

288099

MT. LYELL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH

AREA: Basin Lake

A_0 Soils

PAGE: 1

DATE: 21/2/79

METHOD: Assay $HClO_4/HNO_3$

LINE NO: 75S

FRACTION: -80#

Assay/Analyse

SAMPLE NO.	CU ✓	Pb ✓	Zn ✓	Co	Mn	Fe ✓
5800 E	18 ~~25~~	30	14 ~~25~~	0	<10	550 ~~1500~~
5850E	11	40	10			600
5900E	17	25	11			300
5950E	<5	20	5			200
6000E	<5	<10	7			250
6050E	11	20	10			550
6100E	20	30	23			500
6150E	7	10	10			250
6200E	5	<10	6			150
6250E	44	70	22		10	1700
6300E	47	130	42		20	1200
6350E	40	140	22		10	1250
6400E	35	80	48		10	800
6450E	23	30	24		<10	650
6500E	20	40	25			550
6550E	33	60	30		10	600
6600E	42	100	34		<10	850
6650E	34	130	27		10	650
6700E	33	100	20		<10	700
6750E	58	130	48		30	1000
6800E	28	80	30		<10	700
6850E	74	170	40			750
6900E	62	160	45		20	750
6950E	27	90	25		<10	550
7000E	10	10	8			100

NO. OF SAMPLES: ....(25)...............

9

099

288100

MT. LYELL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH

Dil HCl Extn.

AREA: BASIN LAKE

PAGE: 1

DATE: 22-2-79

METHOD:

A1

LINE NO: L.75.5.

FRACTION: -200#

Assay/A~~naly~~se

SAMPLE NO.	CU ✓	Pb ✓	Zn ✓	Co	Mn	Fe
5800E	<5	<10	<5	0	<10	150
5850E	5	10				170
5900E	<5	<10				110
5950E	<5	<10				240
6000E	7	20				160
6050E	<5	<10				390
6100E	5	20				320
6150E	<5	10				200
6300E	<5	10	15			340
6700E	<5	<10	<5			40
5750E	<5	<10				200
5600E	<5	<10				70
5500E	7	<10				200

NO. OF SAMPLES: ....(13)..........

9

100

288101

MT. LYELL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH

$4HNO_3 + HClO_4$

AREA: BASIN LAKE.

PAGE: 1

DATE: 22/2/79.

A1

METHOD:

LINE NO: LINE .75.S

FRACTION: -200.#. Assay/Analyse ASSAY.

SAMPLE NO.	CU ✓	Pb ✓	Zn ✓	Co.	Mn.	Fe. ✓
5800 .E.	6	<10	5	0	<10	370
5850.E.	7	10	8			320
5900.E .	<5	<10	<5			280
5950.E .	<5	<10	5			410
6000.E.	9	20	8			390
6050.E.	8	<10	7			830
6100.E .	9	20	12			970
6150.E.	8	10	7			440
6300.E.	10	10	18		10	700
6700.E.	<5	<10	36		<10	260
5750.E .	<5	<10	10			1200
5600.E.	<5	<10	<5			260
5500.E .	9	<10	<5			440

NO. OF SAMPLES: ....13..........

9

101

288102

(A1) MT. LYELL MINING & RAILWAY CO. LTD.

HNO3 + HClO4

GEOCHEMICAL SAMPLE DESPATCH

AREA: [illegible] — [illegible]

PAGE: 1.

A TOTAL :- either aqua-regia or perchloric/nitric
1) −80 #
2) −200 #

DATE: 19/2/79

METHOD:

B COLD EXTRACT: 0·5N HCl, both fractions, [illegible]

LINE NO: 675.S.

FRACTION: −80 #. Assay/Analyse Assay.

SAMPLE NO.	CU	Pb	Zn	Co	Mn	Fe
5800.E.	<5	<10	6	0	<10	370
5850.E.	<5		<5			240
5900.E.	<5		9			430
5950.E.	<5		15			400
6000.E.	6	20	34		10	500
6050.E.	<5	<10	45		<10	700
6100.E.	<5		5			550
6150.E.	7		6			350
6300.E.	<5		6			350
6700.E.	<5		13			160
5750.E.	<5		10			600
5600.E.	<5		5			150
5500.E.	6		<5			300

NO. OF SAMPLES: (13)

102

288103

1.

MT. LYLLL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH

DIL HCl EXTR.

AREA: BASIN LAKE

PAGE: 1

DATE: 19-2-79

METHOD:

A1

LINE NO: L.75S.

FRACTION: -80#

Assay/~~Analyse~~

SAMPLE NO.	CU ✓	Pb ✓	Zn ✓	Co	Mn	Fe ✓
5800 E	<5	<10	<5	0	<10	110
5850E						90
5900 E						120
5950 E						200
6000 E		20				150
6050E		<10				210
6100 E			5			210
6150 E			<5			150
6300E			5			160
6700 E			<5			10
5750E						70
5600 E						50
5500. E						160.

NO. OF SAMPLES: ....(13)..........

9

MT. LYELL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH

AREA:
Bosun Lake

A₀ Soils

PAGE: 2

DATE: 21/2/79

METHOD: Assay
$HClO_4/HNO_3$

LINE NO: L.75.S

FRACTION: -80#

Assay/Analyse

SAMPLE NO.	CU ✓	Pb ✓	Zn ✓	Co	Mn	Fe ✓
5750E	25	60	16	0	<10	1500
5700E	17	50	11			600
5650E	12	30	8			250
5350E	9	20	6			250
5200E	13	10	6			250
5100E	5	25	8			300

NO. OF SAMPLES: ⑥

9

104

288105

MT. LYELL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH — Organic Silts.

AREA: BASIN LAKE [illegible]

PAGE: 2

2 fractions 1) -20+80#
2) -80#

DATE: 19/2/71

METHOD: $HClO_4/HNO_3$

TOTAL ONLY

LINE NO: L.75.S.

FRACTION: -20+80.#. Assay/Analyse ASSAY.

SAMPLE NO.	CU ✓	Pb ✓	Zn ✓	Co	Mn	Fe ✓
5750.E.	20	40	20	0	<10	1600
5700.E.	15	60	12			550
5650.E.	7	25	7			300
5350.E.	<5	15	5			400
5200.E.	6	20	6			300
5100.E.	6	120	10			400

NO. OF SAMPLES: ....(6)................

9

Form No. 535

THE MOUNT LYELL MINING AND RAILWAY COMPANY LIMITED

Basin Lake L.75.S. -80#
(Old Samples)

~~TUNNEL YARD~~ SAMPLING

HNO_3 + $HClO_4$ digest. 0.2gm/20mls.

DAY: ....

DATE: 14-2-79.

SAMPLE NUMBER	normalising ~~TRUCKS~~ values				~~WORKING PLACE~~	~~SHIFT~~	% SiO_2 Residue	% soluble matter.
	Cu ✓	~~NUMBER~~ Pb ✓	Zn ✓	~~TYPE~~ Fe				
5800 E	190	365	571	7460			93.7	6.3
5850 E	74	283	102	5905			87.3	12.7
5900 E	63	205	94	3110			87.3	12.7
5950 E	131	286	357	8333			91.6	8.4
6000 E	105	316	76	4035			83.9	17.1
6050 E	40	124	76	2450			74.9	25.1
6100 E	127	430	101	5570			92.1	7.9
6150 E	45	111	53	2243			75.7	24.3
6200 E	167	438	104	3073			90.4	9.6
6250 E	45	46	53	2642			73.5	26.5
6300 E	61	217	58	1592			21.8	78.2
6350 E	54	198	32	2373			62.7	37.3
6400 E	93	215	42	3557			49.4	50.6
6450 E	19	58	45	1076			48.4	51.6
6500 E	49	173	21	1473			33.1	66.9
6550 E	64	224	43	1117			5.1	94.9
6600 E	43	138	67	1282			9.5	90.5
6650 E	9.1	390	455	3701			92.3	7.7

Form No. 635

THE MOUNT LYELL MINING AND RAILWAY COMPANY LIMITED

BASIN LAKE L.75.S. -80#

~~TUNNEL, YARD SAMPLING~~

(OLD SAMPLES) HNO_3 + $HClO_4$ DIGEST 0.2gm/20mls.

DAY: ....

DATE: .....14.-2-79.............

SAMPLE NUMBER	[illegible] values ~~TRUCKS~~				WORKING ~~PLACE~~	~~SHIFT~~	% SiO_2 RESIDUE.	% soluble matter
	Cu ~~NUMBER~~	Pb	Zn ~~TYPE~~	Fe				
6700E	22	60	12	1505			23.6	76.4
6750E	159	112	210	3261			86.2	13.8
6800E	59	171	14	1039			5.2	94.8
6850E	100	215	53	989			7.0	93
6900E	52	244	55	1276			12.2	87.8
6950E	60	276	223	2561			71.7	28.3
7000E	80	331	58	1509			72.5	27.5
ROCK CHIP Nº 2 (FOR. RHODOCHROSITE)							81.6	18.4

APPENDIX IV.

Howards Anomaly.

Sampled by N.J. Marshall, G. Drake 12.2.79

Road cutting N of line 2300 N

24533 Mn rich sheared tuff with vugs after possible carbonate. Sampled for analysis for Cu Pb Zn Mn Fe, As, Co, Ba B F Hg

24533A duplicate for thin section description.

The costean exposes variably sheared volcanics (near vertical cleavage) with variable secondary Mn development.

Continuous bedrock exposure (or its C horizon equivalent where shearing and weathering is intense) is available, and the general soil profile consists of fresh rock (R) or weathered rock (C horizon) rust-red B horizon clay, A_2 leached soils, and rain-forest litter. A_0 and A_1 soils (decomposed humus rich) are generally absent, leaching of forest litter producing downward percolating humic acid solutions with maximum eluvaition (leaching) in the light colored A_2 horizon immediately below.

Sampled by N.J. Marshall, A. Walter, G. Drake 15.2.79

Road cutting N of line 2300 N

Composite samples taken over 10 ft intervals, plus several spot sample of rock, were collected from the start of the rock cutting, around the corner to the end towards the creek. Sample intervals were marked with red flagging tape. (Samples tagged erroneously as "A_1" are actually A_2)

HA (NM) 0 - 10 ft

L litter

A_2 leached A horizon: pale grey clay

B mottled zone: rust-colored and grey clays

R rock: Pale grey well foliated sericitic fine grained tuff ? with occassional pale brown-orange stained cavities.

10 - 20 ft

L

A_2

B

R ; Grey and purple/brown sericitic fine grained tuff with heavy Mn staining and infill; brown stained cavities and smears common.

20 - 30 ft

L
A_2
B
C C horizon: with fragments of above rock type (10-20 ft) also showing dark grey smears on foliation partings (flattened lithic fragments).

30 - 40 ft

L
A_2
B
R dark grey and purple/brown manganiferous fine grained tuff with areas of Mn wad and pyrolusite ? on foliation partings.

40 - 50 ft

L
A_2
B
C with fragments of well foliated fine grained sericite - Mn tuff with cavities, and black heavily manganiferous rocks with red-brown colors.

50 - 60 ft

L
A_2
B
R dark grey-black manganiferous fine grained tuff with wad patches.

60 - 70 ft

L
A_2
B
C with fragments of well foliated grey sericitic fine grained tuff.

70 - 80 ft

L
A_2
B
C as for 60 - 70 ft

"HA (NM) 39 ft " Non - Mn ": R (rock sample) pale grey Pyritic and dark purple-grey well foliated fine grained tuff with variable (low to Nil) Mn content.
"HA (NM) 39 ft "Mn": R (rock sample) heavily manganiferous well foliated fine grained tuff; wad; and wad plus quartz (vein material).

"HA (NM) 44 ft Mn" R (rock sample) black Mn wad, with pale yellow clay smears.

"HA (NM) 44 ft "non-Mn" R (rock sample) grey and brown well foliated fine grained tuff, possible limonitic boxworks (after sulphides).

HA (NM) 19 N 120 W
L
A_2 grey sand with grey clay and rounded quartz grains, minor organics. Glacial origin.
R as for 180 W (below).

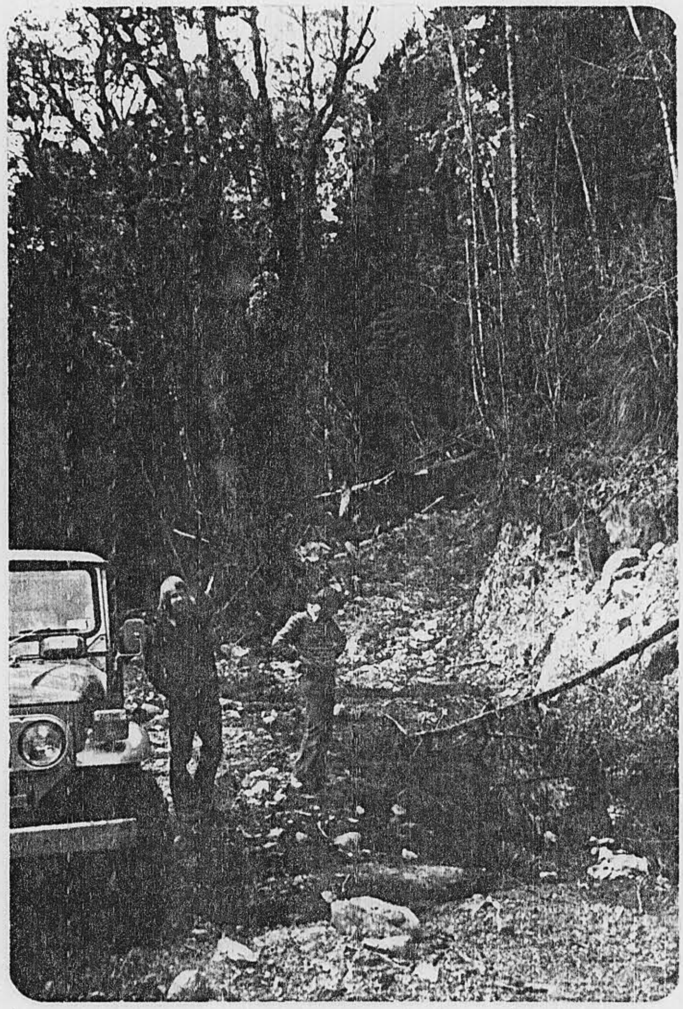
HA (NM) 19 N 180 W
L
A_2 purplish-grey clay with minor organics.
B orange and brown (Fe rich?) clay (treat as B sample soil).
C brown and dark brown clay (treat as B sample soil)
R large pink quartzo-feldspathic segregations with diffuse boundaries in a medium grained groundmass of pink feldspar and dark green chlorite (after ferromag?). Pink segregations contain fragments of silicified dark green chlorite: Medium-coarse grained crystal(?) lithic tuff.

Follow-up of "suspect" Pb-Zn anomaly from previous survey. Possible contamination noted (logging machinery etc.) In glacials, including varves; up to 6 m thick.

HA (NM) 19 N 800 W (site beside creek, washed by high water levels).

L
A grey clay with medium grained waterworn quartz grains; minor organics. - glacial

HA (NM) 19 N 850 W
L
A_1 grey-brown clayey sand (treated as A_1 soil despatch)
A_0 chocolate brown organic matter (treated as A_1 soil despatch)
G glacial gravels: pale grey silty clay with water-worn quartz and Owen Conglomerate fragments. (treated as B soil despatch)



IV. 1. Howards Anomaly. Costean line 22 S well drained soils. thin litter (A_{00}) and A_2 over B on bedrock. Profile similar to Henty Gorge grid.

– HOWARDS ANOMALY, ~~Mn~~ Cu

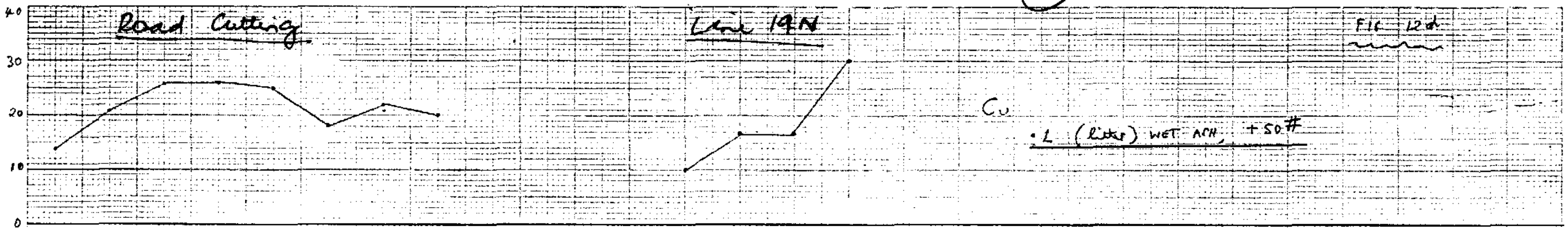


FIG 12d

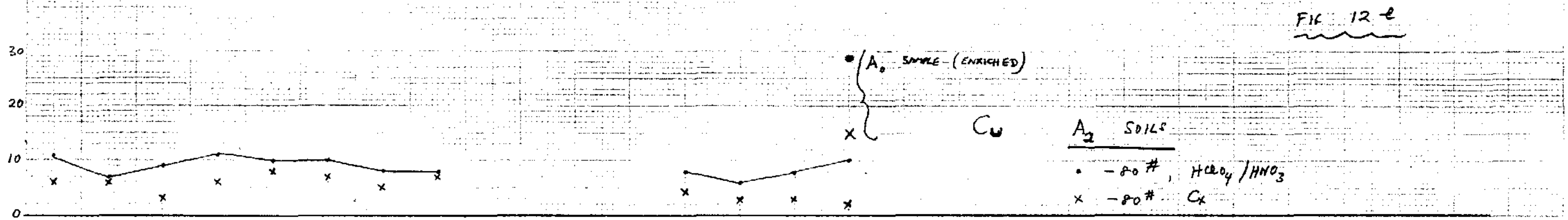


FIG 12 c

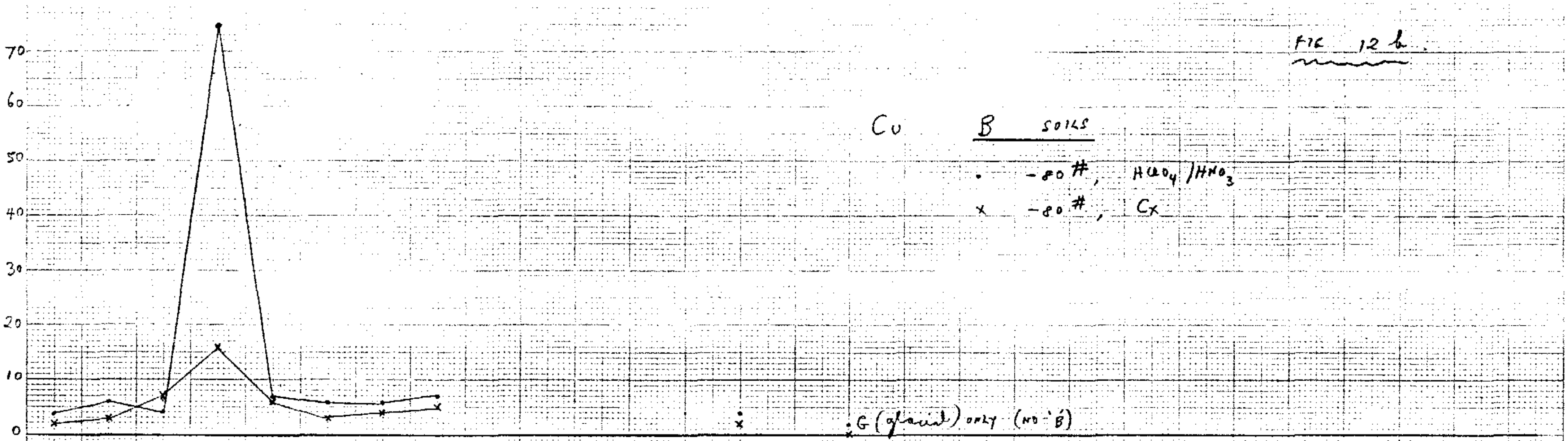


FIG 12 b

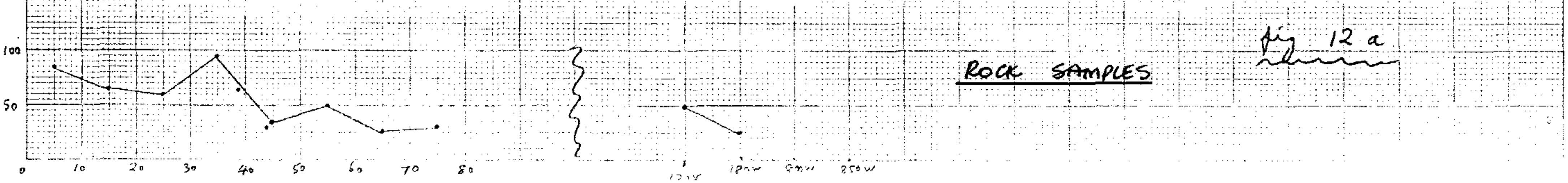
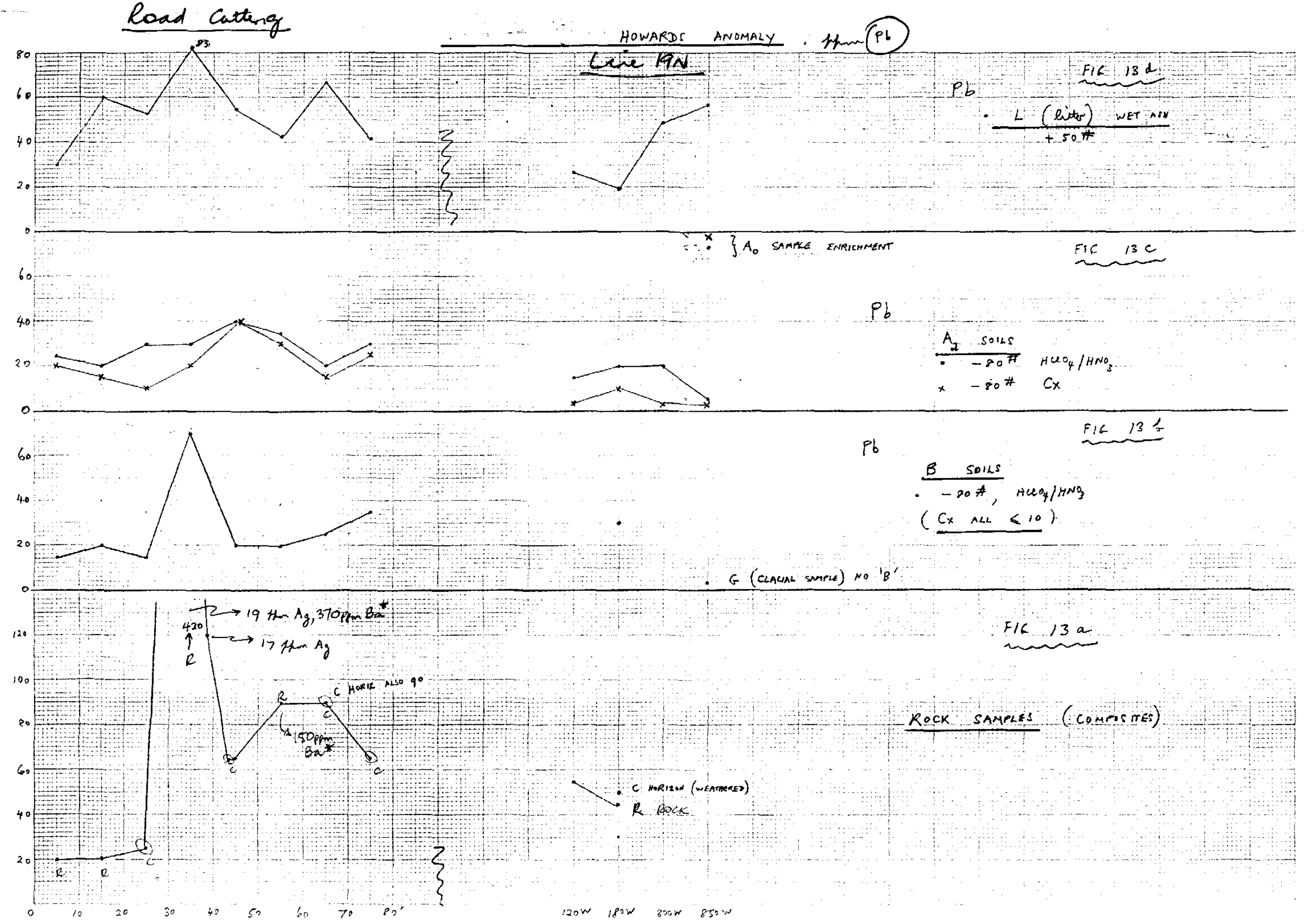
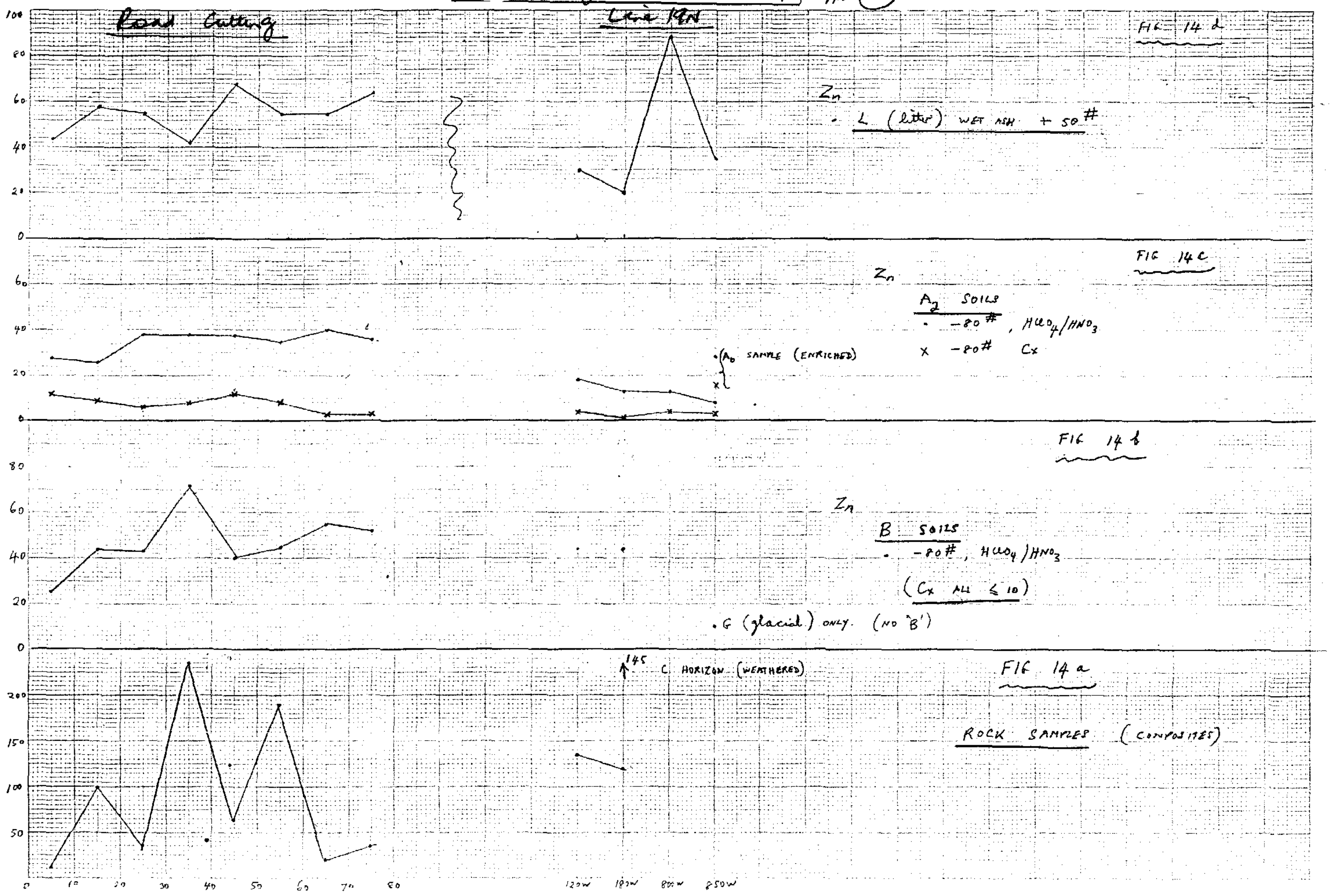


fig 12 a


Road Cutting
HOWARDS ANOMALY ppm Pb
Line 19N
FIG 13 d
Pb
• L (litter) WET ASH
+ 50 #
83
80
60
40
20
0
} A_0 SAMPLE ENRICHMENT
FIG 13 C
Pb
A_2 SOILS
• −80 # $HClO_4/HNO_3$
× −80 # Cx
FIG 13 b
Pb
B SOILS
• −80 #, $HClO_4/HNO_3$
(Cx ALL < 10)
G (GLACIAL SAMPLE) NO 'B'
FIG 13 a
420
R
→ 19 ppm Ag, 370 ppm Ba*
→ 17 ppm Ag
C HORIZ ALSO 90
R
C
150ppm Ba*
C
C
R
R
C
ROCK SAMPLES (COMPOSITES)
• C HORIZON (WEATHERED)
R ROCK
120
100
80
60
40
20
0
10
20
30
40
50
60
70
80'
120W
180W
800W
850W

HOWARDS ANOMALY Zn



114 *OUTSIDE EXPLORATION

ROCK CHIP SAMPLES

$HClO_4/HNO_3$

HOWARDS ANOM. – cutting N of L 23N **Form No. 175.**

THE MOUNT LYELL MINING & RAILWAY CO. LTD.

19/2/79

D. D. HOLE NO. ALL HA (NM) SERIES, dist. in ft.
Both R and C samples included – count all.

semiquantitative and extractable only.

From	To	Cu ✓	~~Fe%~~ ✓S	Ag ✓	Au	Sp.Gr.	Pb ✓	Zn ✓	Mo	Mn	Fe	Co	Ba
HA(NM) 1. ✓ 0 (R)	10' (R)	85	<0.1	<2			20	12		60	10,300	<5	<50
2. ✓ 10' (R)	20' (R)	65	0.1	<2			20	100		540	48,000	17	<50
3. ✓ 20' (C)	30' (C)	60	<0.1	<2			25	35		180	19,200	<5	<50
4. ✓ 30' (R)	40' (R)	95	<0.1	19			420	235		41,000	31,000	15	370
5. ✓ 40' (C)	50' (C)	35	<0.1	2			65	65		8,200	64,000	12	<50
6. ✓ 50' (R)	60' (R)	50	<0.1	2			90	190		49,000	38,000	18	150
7. ✓ 60' (C)	70' (C)	25	<0.1	<2			90	20		650	32,000	5	<50
8. ✓ 70' (C)	80' (C)	30	<0.1	<2			65	34		800	51,000	8	<50
9. ✓ 39' Mn		65	0.1	17			250	350		78,000	59,000	33	600
10. ✓ 39' NON-Mn		100	<0.1	8			120	42		1,380	30,000	14	80
11. ✓ 44' Mn		120	<0.1	2			530	95		94,000	69,000	74	110
12. ✓ 44' NON-Mn		35	<0.1	<2			65	125		4,300	125,000	23	<50
13. HA(NM) 19N ✓ 120 W (R)		50	<0.1	<2			55	135		1,900	51,000	20	<50
14. HA(NM) 19N ✓ 180 W (R)		25	<0.1	<2			45	120		1,000	46,000	20	<50
24533		500		230			1150	480		10%	5.7%	26	200

LINE 19 N

Also to be submitted to outside lab for TOTAL (HF)
As, Ba, B, K_2O, Na_2O, Rb, Sr, F^-; (HgO, CaO)
Hg. F^-
fusion emiss. spec.

Follow with selected elements in soil pending rock results, eg) As Ba, Hg.

Left Core Shed .... 14 samples .... R. Mears 8/3/79

Received Sample Mill ....

Received Assay Office ....

*PLEASE KEEP REJECTS

288115

10

115

288110

MT. LYELL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH OKRANICS

AREA: Howards Anomaly
L 23 N cutting
L (Pitts) w/ marble

PAGE: 1.

DATE: 19/2/79.

METHOD: ASSAY.

Dry at 120°c; Comminute;

LINE NO: L.23.N.

FRACTION: +50.#.

Assay/Analyse $HClO_4/HNO_3$ wet [illegible]

SAMPLE NO.	CU ✓	Pb ✓	Zn ✓	Co	Mn	Fe
9 HA(NM) 0'-10'.	14	30	44	3	1700	2900
10 " 10'-20'.	21	60	58	4	2100	6500
11 " 20'-30'.	26	53	55	2	2200	6700
12 " 30'-40'.	26	83	42	2	490	8000
13 " 40-50'.	25	55	68	1	940	5000
14 " 50-60.	18	43	55	2	1600	6300
15 " 60'-70'.	22	67	55	2	1200	5200
16 " 70'-80'.	20	42	64	2	2800	8000
17 " 19N/120.W.	10	27	30	3	150	8100
18 " 19N/180W.	17	20	20	0	160	1020
19 " 19N/800.W.	17	49	88	0	220	880
20 " 19N/850W.	30	57	35	0	120	520

NO. OF SAMPLES: ....12........

116

288117

MT. LYELL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH

AREA: [illegible] anomaly
A, soils

PAGE: 1

DATE: 7/2/71

1) TOTAL — [illegible]
2) COLD EXTRACTABLE : 0.5N HCl, 4 hrs to [illegible]

METHOD: $HNO_3 + HClO_4$

LINE NO:

FRACTION: − 80.#. Assay/Analyse ASSAY.

SAMPLE NO.	CU ✓	Pb ✓	Zn ✓	Co	Mn	Fe
HA([illegible]) 0'-10'	11	25	28	4	220	4,900
10'-20'	7	20	26	4	90	6000
20'-30'	9	30	38	7	520	9,000
30'-40'	11	30	38	8	180	16,000
40'-50'	10	40	38	6	170	10,800
50'-60'	10	35	35	5	130	11,000
60'-70'	8	20	40	5	90	9,000
70'-80'	8	30	36	5	50	8600
HA([illegible]) 19N/120W	8	15	18	3	100	5,500
19N/180W	6	20	13	3	200	7,100
19N/850W	6	20	13	1	13	900
19N/850W(A_2)	29	75	28	1	18	650
19N/850W(A_1)	10	<10	8	2	10	450

NO. OF SAMPLES: .... (13) ....

9

117

288118

MT. LYELL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH

AREA: Howards Anomaly
A, soils
Cold extractable

PAGE:

DATE:

METHOD: AAS
(cold extractable)
0.5N HCl.

LINE NO:

FRACTION: - 80 #

Assay/Analyse Assay

SAMPLE NO.	CU ✓	Pb	Zn ✓	Co	Mn	Fe
HA (NM) 0'-10'	6	20 ✓	12	0	180	180
10'-20'	6	15	9	0	70	180
20'-30'	3	10	6	0	65	180
30'-40'	6	20	8	0	110	1,500
40'-50'	8	40	12	0	85	1,300
50'-60'	7	30	8	0	80	700
60'-70'	5	15	3	0	60	650
70'-80'	7	25	3	0	23	950
HA (NM) 19N/120 W	4	<10	4	0	3	1,200
19N/150 W	3	10	1	0	1	3,800
19N/300 W	3	<10	4	0	3	230
19N/350W(A$_2$)	15	80	16	0	9	170
19N/350W(A$_1$)	2	<10	3	0	2	100

NO. OF SAMPLES: ......13......................

9

MT. LYELL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH

AREA: [illegible] [illegible] [illegible]
B [illegible]

PAGE: 1

1) TOTAL – [illegible]

DATE: 19/2/79

2) COLD EXTRACTABLE in 0.5N HCl 4 hrs to [illegible]

METHOD: HNO3 + HClO
ASSAY.

LINE NO:

FRACTION: – 80 #.

Assay/Analyse

SAMPLE NO.	CU ✓	Pb ✓	Zn ✓	Co	Mn	Fe
HA(NM) 0'-10'	4	15	26	7	60	9,200
10'-20'	6	20	44	12	160	26,000
20'-30'	4	15	43	12	30	32,000
30'-40'	75	70	72	11	120	52,000
40'-50'	7	20	40	9	165	37,000
50'-60'	6	20	45	9	130	31,000
60'-70'	6	25	55	11	130	48,000
70'-80'	7	35	52	8	80	32,000
19N/180W [illegible](B)	4	30	44	7	270	43,000
19N/180W(C)	4	50	145	20	820	48,000
19N/850W(G)	2	<10	10	2	12	750

[Also Ba – semiquant, acid extractable only]
Also As. later

NO. OF SAMPLES: (11)

9

MT. LYELL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH

AREA: Howards Anomaly
B soils
cold extractable

PAGE:

DATE:

METHOD: A.A.S. (cold extractable) (0.5N HCl

LINE NO:

FRACTION: -80#

Assay/Analyse Assay

SAMPLE NO.	CU ✓	Pb ✓	Zn ✓	Co	Mn	Fe
HA (NM) 0'-10'	2	<10	0	0	50	450
10'-20'	3	<10	0	0	85	1,200
20'-30'	7	<10	0	0	8	2,700
30'-40'	16	<10	0	0	17	1,700
40'-50'	6	<10	0	0	17	1,000
50'-60'	3	<10	0	0	18	1000
60'-70'	4	<10	0	0	8	900
70'-80'	5	<10	0	0	9	1,250
19 N/180 W (B)	2	<10	0	0	3	4,300
19N/180 W (C)	1	10	0	0	1	3,700
19 N/350W (G)	0	<10	0	0	2	100

NO. OF SAMPLES: 11

APPENDIX V.

Henty Fault Zone Area

Sampled with A. Walter, G. Drake.   6.2.79

1\.

24524 Henty Fault Zone; line 4900 N costean.

Sample taken of recently black Mn coated (thin coating) barren silicified volcanic rubble from floor of costean, for selective Mn leaching studies.

24525 400 m E of Henty R. - near Henty Camp.

Sample of ferricrete near top of rise. (ferricretes are rare in area) - possible "plumbing system sample"

2\. Sampled with A. Walter. 16.2.79
Line 4900 N costean, exposing massive sulfide zone in sheared volcanics overlain by thin cover (up to 1½ m) of water worn glacial gravel and boulders of Owen Conglomerate, overlain in turn by A_1 / A_0 soils and rain forest litter. The upper soils are disturbed, so systematic soil sampling was undertaken on pegged lines in rain forest on strike extension of the mineralization (uphill of costean).
Only undisturbed profiles were taken from the wall of the costean, whose primary function was to provide rock sampling for mineralization elements and wall-rock alteration studies.
The pegged soil lines in rain forest provided a continuous series of undisturbed samples, but because of glacial boulders augering into bedrock was not possible.

1) Line 4900 N costean

Reference 00 is peg 4900 N (-100 S) /160 W on downhill end of costean. Composite samples were taken along E wall of costean, at taped intervals running N from this peg, at lithologic boundaries.
Strike of mineralization = 170°magnetic
Strike of costean = 215°magnetic
Dip of rock cleavage = vertical to 85° W.
Relative soil conductivity readings were taken the following day on wet samples, weighing 20 gm of soil (minus larger fragments) dispersed in 80 ml distilled water.

121

0 - 12.5 meters

glacial rubble from bulldozing -- not sampled.

12.5 - 14.0 m

1) "R" (= rock sample); very weathered, banded grey and white kaolinized tuff, V. minor pyrite. Chocolate brown Mn staining throughout.
2) "G" (= glacials sample); grey clay with predominance of water-worn quartz gravel 40 cm above bedrock.

C = 0.018

14.0 - 15.1 m

1) banded, silicified tuff containing grey bands with variable fine grained pyrite and white kaolinitic bands.
2) "G" sample as before, 40 cm above bedrock,

C = 0.014

15.1 -18.1 m

1) semi-massive banded f.g to m.g pyrite with minor galena, sphalerite and chalcopyrite, and occassional 5 cm quartz veins. Includes some siliceous bands and occassional blebs of red jasper.
2) "A" rock sample of "cover rock". (see photo) Capping of foliated f.g barren quartzo-feldspathic tuff over same interval which envelopes and caps the sulfide zone, and may form a geochemical barrier. Thickness is variable, 0 - 60 cm.
3) "G" sample of glacials 20 cm above cover rock

C = 0.010

18.1 - 18.5 m

1) shear zone in white f.g quartzo-feldspathic tuff with Mn stains along water seepages and thin (0.5 - 3 cm) bands and lenses of massive f.g pyrite. These occur in highly weathered kaolinized rock (pug).
2) "G" glacials 20 cm above rock.

C = 0.020

18.5 - 20.3. m

1) highly siliceous, blocky fractured, aphanitic quartzo-feldspathic unit with diffuse grey bands containing f.g pyrite.
2) "G" sample, 20 cm above bedrock

C = 0.021

20.3 - 21.6 m

1) shear zone as per 18.1 - 18.5 m interval.
2) "G" sample,
C = 0.018

21.6 - 23.0 m

Blocky fractured white, aphanitic volcanic (rhyolite ?) with possible grey flow bands.

23.0 - 25.0 m

m.g., variably sheared quartz-feldspar tuff with occassional cavities and minor limonite stained patches.

25.0 - 27.0 m

as above.

27.0 - 29.0 m

as above.

29.0. -30.6 m

as above.

30.6 - 33.0 m

grey siliceous tuff with f.g disseminated pyrite bands and lenses in above rock type. Foliated but not as sheared (see photo)

33.0 - 34.0 m

as for 30.6 - 33.0 m End of costean.

2) Line Sampling of Soils in Rain Forest

Commenced opposite S end costean at 4900 N - 100 (ie 100' S of "line 49 N"), from 140 W to 00 W at 20 ft intervals, taking litter ("L" sample), A_0 where available, and glacials ("G" sample).
Glacials are pale grey gravels of rounded quartz fragments with a clay component.
Samples are uphill from costean, and terrain has gentle slope downhill toward costean (ie downslope W)

Line (49 N - 100)

00 W

1) "L" sample rain-forest litter
2) "G" sample glacial gravel
C = 0.041

20 W

1) L
2) A_0, chocolate brown humic clay.
C = 0.061
3) G, C = 0.054

40 W

1) L

2) G, C = 0.041

60 W

1) L

2) G, C = 0.027

80 W

1) L
2) A_0, C = 0.056

3) G, C = 0.043

100 W

1) L
2) A_0, C = 0.055

3) G C = 0.020

120 W

1) L
2) G, C = 0.029

140 W (costean end S)

1) L
2) G, C = 0.018 , (has low organic content)

Line 49 N (background line

1600 E

1) L
2) G, bleached, very gravelly, organic poor.
C = 0.046

1550 E

1) L
2) G, C = 0.012 as above

1500 E (costean end, N)

1) L

2) G, C = 0.022

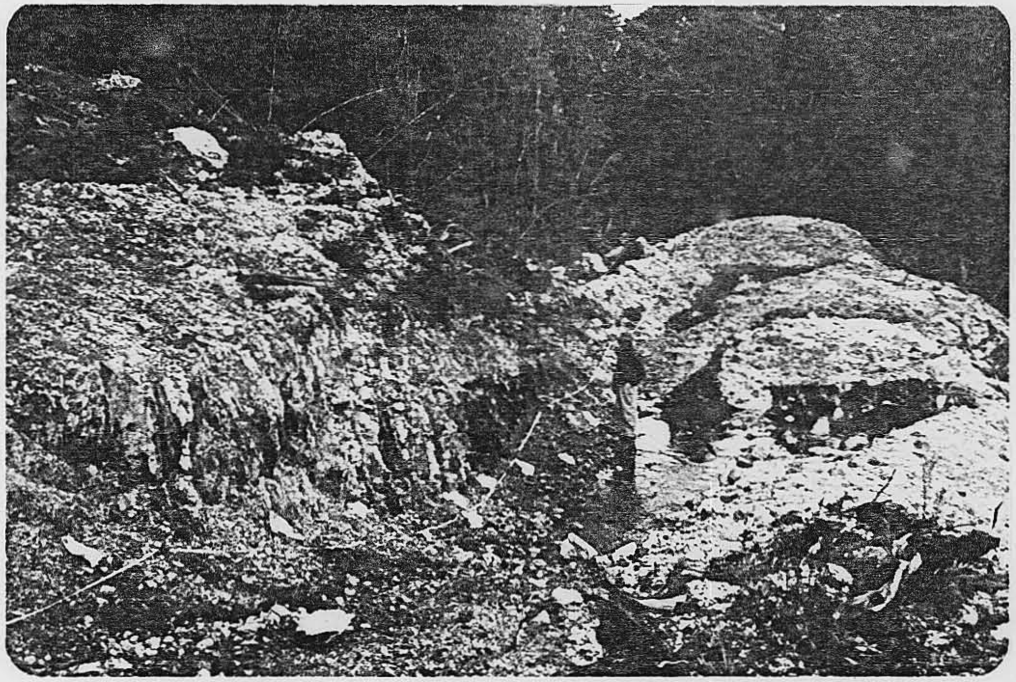
3. Sampled with A. Walter. 16.2.79

24535 "Drillers Ck" crossing on access road, 150 ft S of Line 52 N, 300 W.

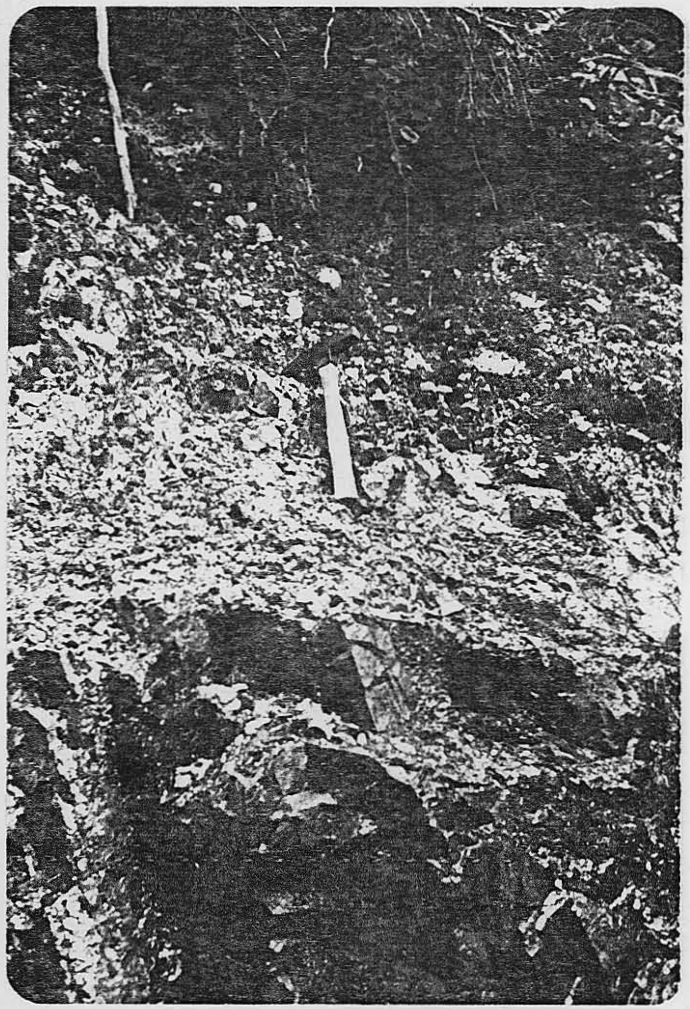
Sample for Mn leaching studies. Abundant friable black MnO_2 cementing pebbles, cobbles and sand in creek bed. This is common in the area and provides a potential sampling medium in drainage basin surveys.

<u>24536</u> On access road, 300 ft S of line 51 N / 100 E

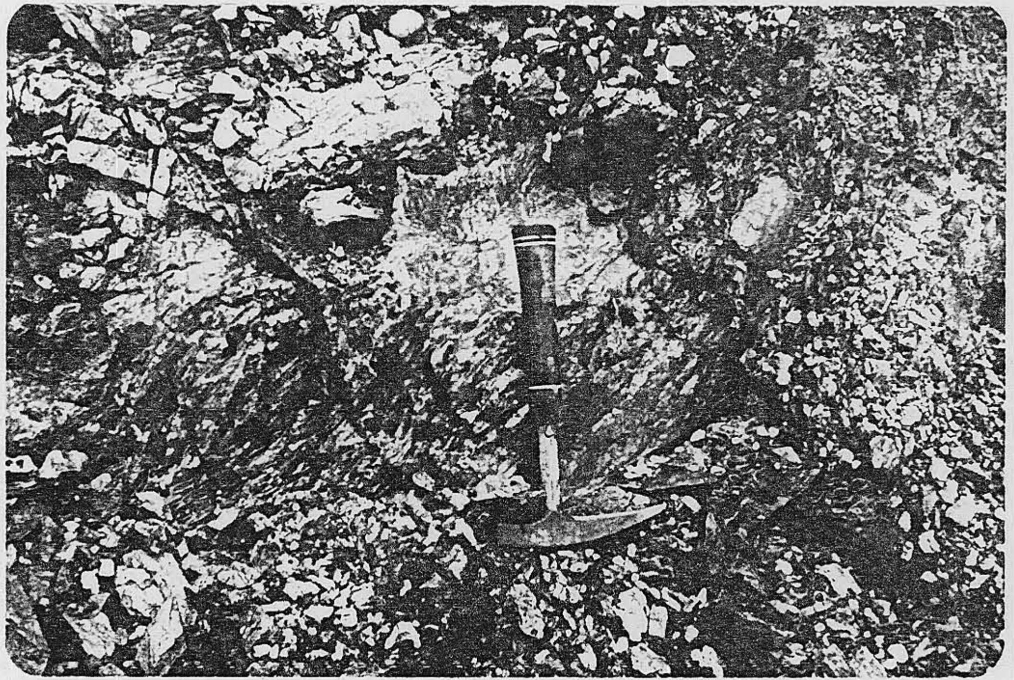
Rock sample of sheared, brown (limonite impregnated) and highly weathered m.g. tuff outcrop with abundant fractures filled with Mn veinlets. "plumbing system sample". - see photo. V.5.



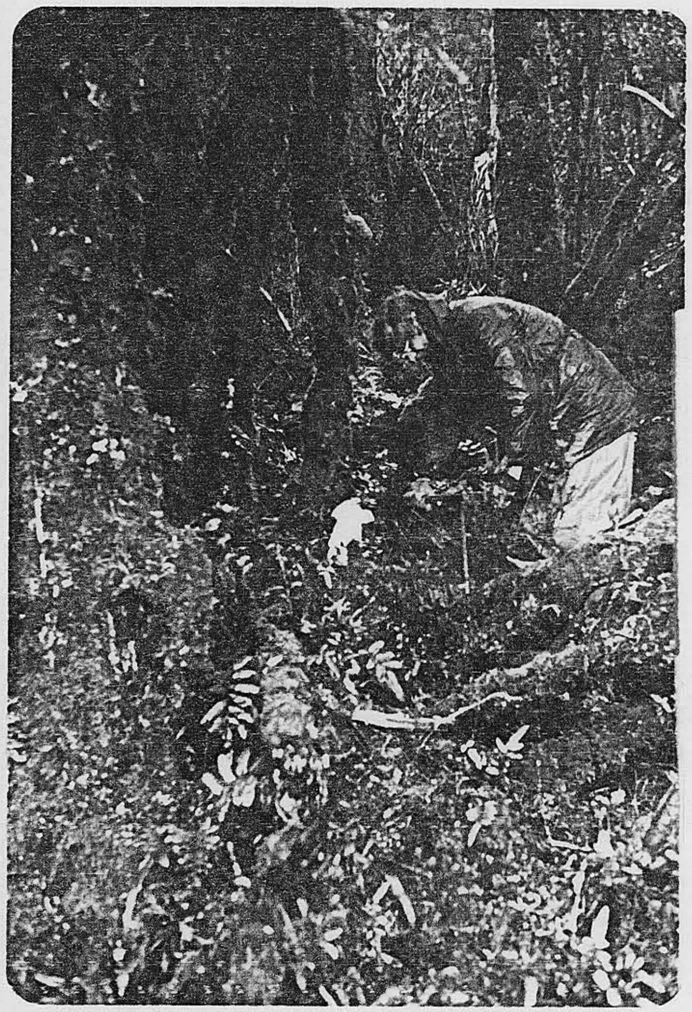
V.1. Henty Fault Zone line 49 N costean, looking S. Note massive Sulfide zone thin glacial cover (Owen conglomerate erratics) and Mn stained rubble on floor of costean.



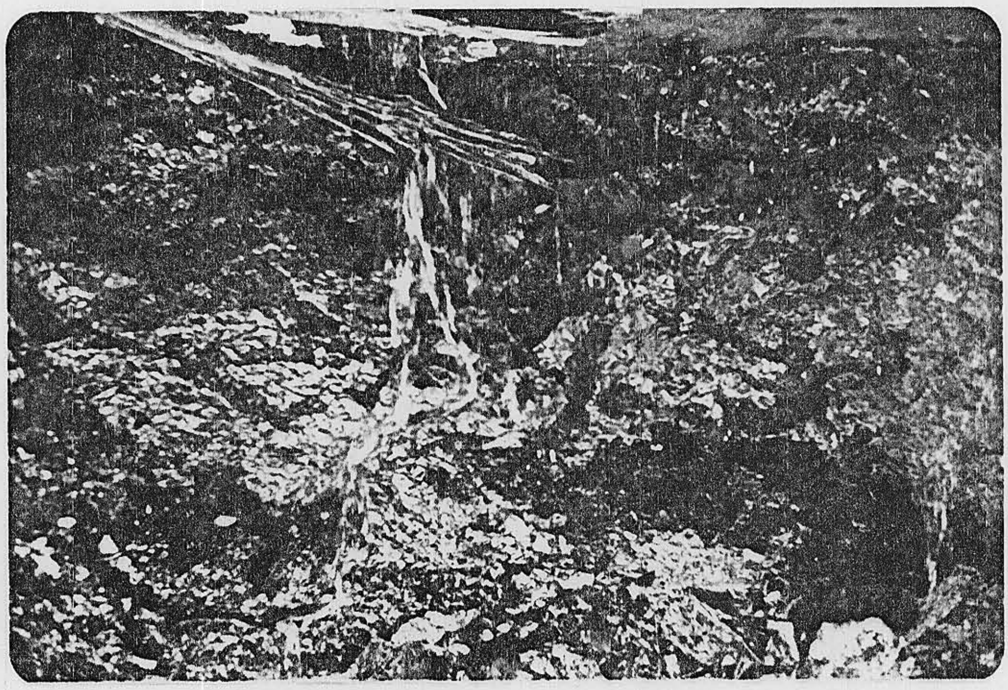
V.2. Henty Fault Zone Costean. Massive sulfide zone overlain by cover rock (below hammer) and glacials (above head of hammer), followed by A_0 and litter. Note wall rock contact on left



V.3. Henty Fault Zone line 49 N costean Sample point 32.5 meters. Disseminated pyrite forming grey bands in quartzo-feldspathic volcanic.



V.4. Henty Fault Zone. Auger sampling in rain forest. Typical problem is obstruction of auger by tree roots.



V.5. Henty Fault Zone
Sample 24536 - plumbing system sample of sheared tuff with fracture-filled Mn wad veins.

HENTY FAULT ZONE COSTEAN L49N COMPOSITE SAMPLES

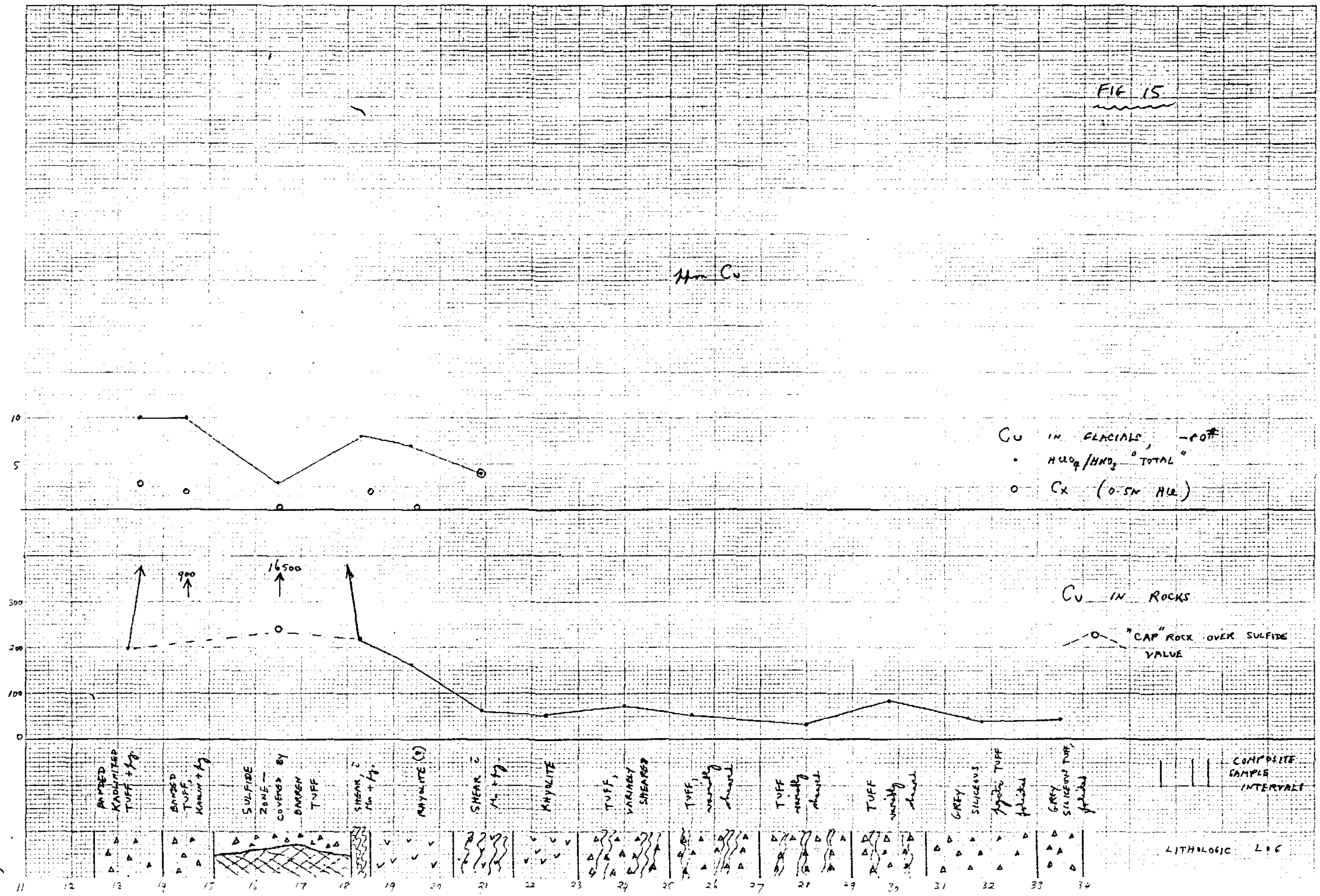
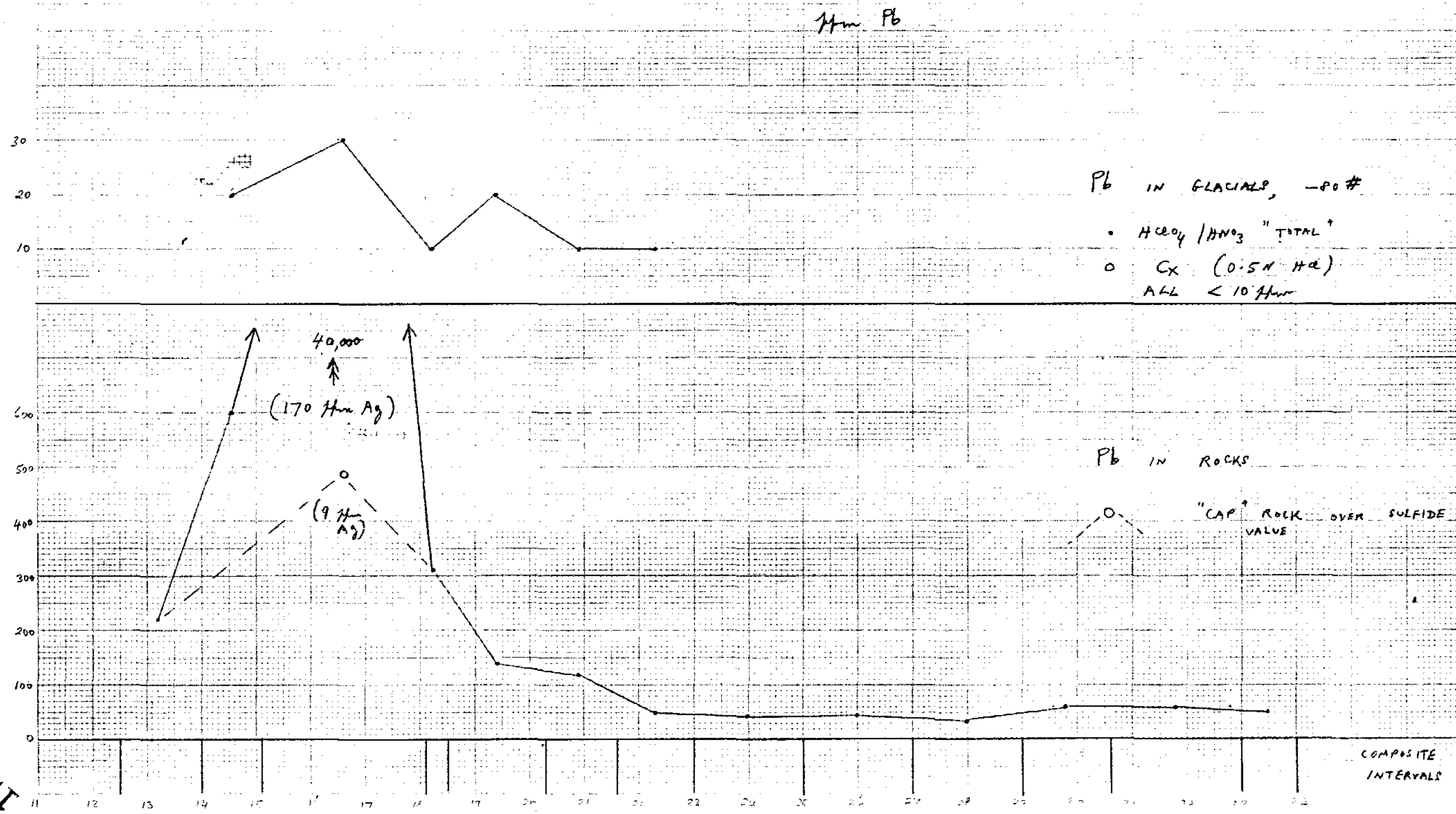


FIG 15

HENTY FAULT ZONE COSTEAN L 49N COMPOSITE SAMPLES

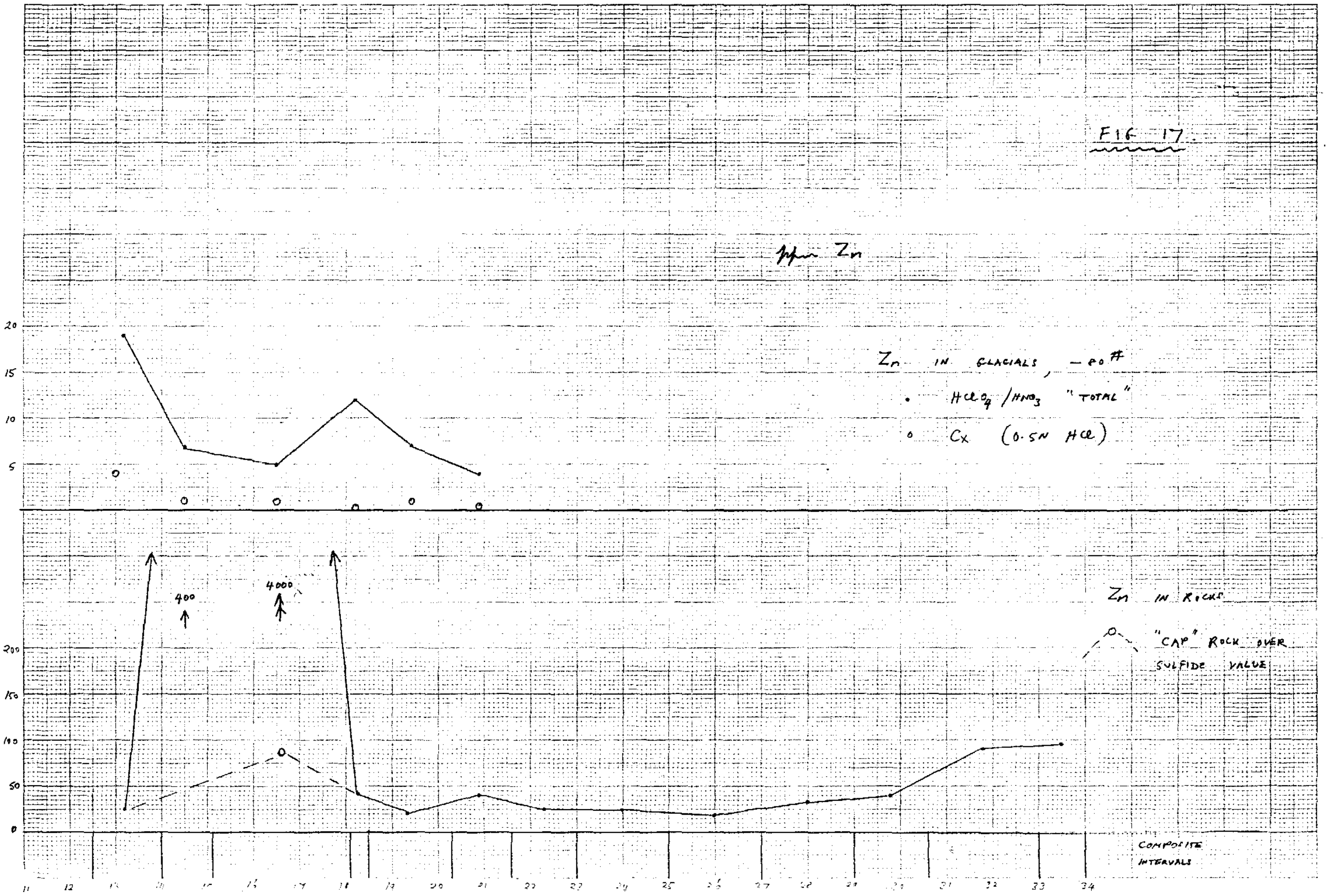
288130

FIG 16



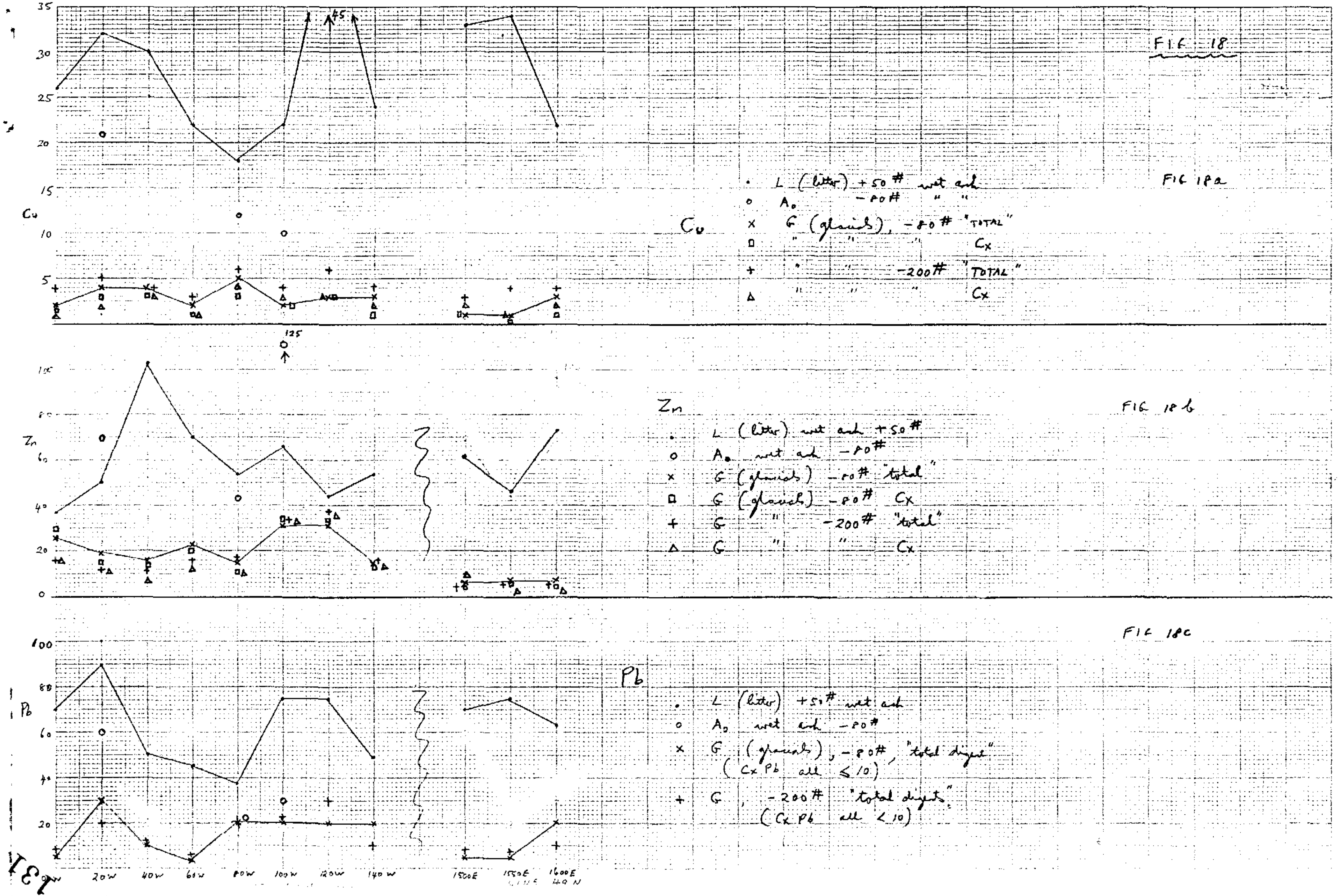
HENTY FAULT ZONE COSTEAN L 49N COMPOSITE SAMPLES

FIG 17.



HENTY FAULT ZONE — SAMPLES OVER GLACIALS

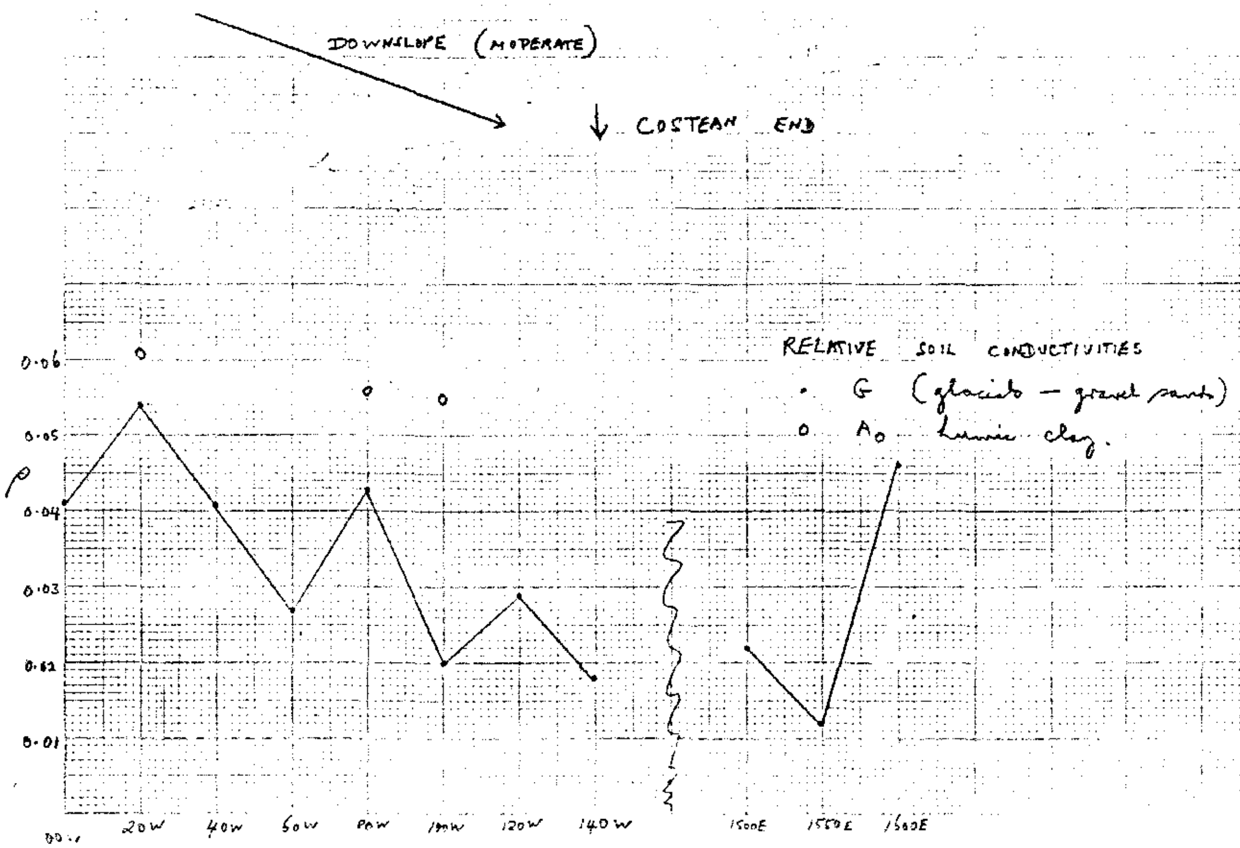
FIG 18



HENTY FAULT ZONE.

FIG 19.

RELATIVE SOIL CONDUCTIVITIES OVER GLACIALS



288134

MT. LYELL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH

AREA: HFZ Lo.

PAGE: 1

Dry
Sieve (-30#); discard Sand
Send to lab.: redry 120°c
comminute to powder
[illegible] — nitric

DATE: 19.2.79

METHOD:

LINE NO 49N.

FRACTION: +.50.#.

Assay/Analyse ASSAY.

SAMPLE NO.	CU ✓	Pb ✓	Zn ✓	Co	Mn	Fe
21 1500 E L	33	70	62	0	300	760
22 1550 E L	34	75	46 ~~[illegible]~~	0	1300	620
23 1600 E L	22	63	73 ~~[illegible]~~	1	190	620.

NO. OF SAMPLES: ....3..........................

9

134

288135

/

MT. LYELL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH

AREA: HFZ

PAGE: 1

DATE: 13·2·79

Dry
Sieve out sand grains (coarsest -30 #)
Send to lab. : redry 120°C ; comminute to powder

METHOD: perchloric-nitric ASSAY.

LINE NO: L 49-100.

FRACTION: LITTER +50 #.

Assay/Analyse

SAMPLE NO.	CU ✓	Pb ✓	Zn ✓	Co	Mn	Fe
1 00W L	26	70	37	0	400	540
2 20W L	32	90	50	2	210	680
3 40W L	30	50	103	1	1600	450
4 60W L	22	45	70	1	1000	470
5 90W L	18	38	54	1	900	350
6 100W L	22	75	66	2	620	580
7 120W L	45	75	44	0	90	820
8 140W L	24	49	54	0	780	530

NO. OF SAMPLES: 8

135

288136

MT. LYELL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH

HClO$_4$

AREA: HFZ

PAGE: 1

DATE: 19-2-1979

METHOD: ASSAY

LINE NO: 49N -100'

FRACTION: -80#

Assay/Analyse (1.) total (2.) cold extraction

SAMPLE NO.	CU ✓	Pb ✓	Zn ✓	Co	Mn	Fe
00 W G	2	<10	26		<10	570
20 W G	4	30	19		20	470
40 W G	4	10	16		30	440
60 W G	2	<10	23		<10	330
80 W G	5	20	15		20	670
100 W G	2	20	31		10	340
120 W G	3	20	31		<10	1000
140 W G	3	20	15		<10	750
L 49N						
1500 E G	1	<10	6		<10	330
1550 E G	1	<10	7		<10	320
1600 E G	3	20	7		<10	440
CONSTEAN L49N						
12·5 - 14·0 G	10	20	19		<10	1670
14·0 - 15·1 G	10	30	7		10	1570
15·1 - 18·1 G	3	10	5		<10	560
18·1 - 18·5 G	8	20	12		<10	1250
18·5 - 20·3 G	7	10	7		<10	750
20·3 - 21·6 G	4	10	4		<10	790

NO. OF SAMPLES: ....

136

288137

MT. LYELL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH

D.L. HLX EXTN.

AREA: HFZ

PAGE: 1

DATE: 19-2-79

METHOD: ASSAY

LINE NO: 49N-100'

FRACTION: -80#

Assay/Analyse

SAMPLE NO.	CU ✓	Pb ✓	Zn ✓	Co	Mn	Fe
00W G	2	<10	30		<10	
20W G	3	<10	15		15	
40W G	3	<10	14		30	
60W G	1	<10	20		<10	
80W G	3	10	11		20	
100W G	2	10	33		10	
120W G	3	<10	30		<10	
140W G	1	<10	13		<10	
L.49N.						
1500E G	1	<10	4		<10	
1550E G	0	<10	6		<10	
1600E. G	1	10	4		<10	
CONSTEAN L.49N						
12.5-14.0 G	3	<10	4		<10	
14.0-15.1 G	2	<10	1		<10	
15.1-18.1 G	0	<10	1		<10	
18.1-18.5 G	2	<10	0		<10	
18.5-20.3 G	0	<10	1		<10	
20.3-21.6 G	4	<10	0		<10	

NO. OF SAMPLES: 17

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288138

MT. LYELL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH

AREA: HFZ

PAGE: 1

DATE: 19-2-1979.

METHOD: ASSAY

Assay/Analyse (1.) total extr.
(2.) cold extr.

LINE NO: 49N-100'

FRACTION: -200#

SAMPLE NO.	CU ✓	Pb ✓	Zn ✓	Co	Mn	Fe
00 W G	4	<10	16		<10	450
20 W G	5	20	12		10	350
40 W G	4	10	12		25	400
60 W G	3	<10	16		<10	360
80 W G	6	20	16		20	560
100 W G	4	20	33		15	400
120 W G	6	30	37		<10	1140
140 W G	4	10	16		<10	940
L 49N						
1500 E G	3	<10	4		<10	240
1550 E G	4	<10	5		<10	330
1600 E G	4	10	5		<10	320
CONSTEAN L49N						
12.5 - 14.0 G	14	30	20		<10	2450
14.0 - 15.1 G	10	40	9		<10	1570
15.1 - 18.1 G	4	20	7		<10	820
18.1 - 18.5 G	10	30	14		<10	1650
18.5 - 20.3 G	4	10	8		<10	820
20.3 - 21.6 G	4	10	6		<10	940

NO. OF SAMPLES: 17

288139

MT. LYELL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH

Dil HCl EXTR.

AREA: HFZ

PAGE: 1

DATE: 19-2-79

METHOD: ASSAY

LINE NO: 49N-100'

FRACTION: -200 #

Assay/Analyse

SAMPLE NO.	CU ✓	Pb ✓	Zn ✓	Co	Mn	Fe
00 W G	1	<10	16		<10	
20 W G	2	<10	11		<10	
40 W G	3	<10	7		20	
60 W G	1	<10	12		<10	
80 W G	4	<10	10		15	
100 W G	3	<10	33		10	
120 W G	3	<10	36		<10	
140 W G	2	<10	13		<10	
L 49N						
1500 E G	2	<10	9		<10	
1550 E G	1	<10	3		<10	
1600 E G	2	<10	3		<10	
COSTEAN L49N						
12.5 - 14.0 G	6	<10	11		<10	
14.0 - 15.1 G	4	<10	2		<10	
15.1 - 18.1 G	2	<10	3		<10	
18.1 - 18.5 G	4	10	4		<10	
18.5 - 20.3 G	2	<10	2		<10	
20.3 - 21.6 G	3	<10	0		<10	

NO. OF SAMPLES: 17

288140

MT. LYELL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH

p1.

AREA: HF2

PAGE: 19-2-79

DATE: Alan

METHOD: ASSAY
Perchloric-nitric digest

LINE NO: 69N - 100

FRACTION: A0 - 80#

Assay/Analyse

SAMPLE NO.	CU ✓	Pb ✓	Zn ✓	Co	Mn	Fe
20 W A0	21	60	70	0	150	
80 W A0	12	20	43	0	110	
100 W A0	10	30	125	0	70	

NO. OF SAMPLES ..3...............

* OUTSIDE EXPLORATION

288141

ROCK CHIP SAMPLES

Form No. 175.

THE MOUNT LYELL MINING & RAILWAY CO. LTD.

$HClO_4/HNO_3$

D. D. HOLE NO. HENTY FAULT ZONE — COSTEAN L 4.9N

semiquantitative and [illegible]

All *HFZ

	From	To	Cu	S %	Ag	~~Au~~	~~Sp. Gr.~~	Pb	Zn	~~Mo~~	Mn	Fe	Co	Ba
[illegible]	12.5 m	14.0	190	0.4	2			220	25		20	7,700	6	<50
16	14.0 m	15.1	900	2.3	3			600	400		40	19,600	17	<50
17	15.1 m	18.1	16,500	30.3	170			40,000	4,100		180	250,000	NB 185 THOROUGHLY	HIGH <50
18	15.1 A m	18.1 A	245	0.3	9			490	75		30	5,100	6	<50
19	18.1 m	18.5	220	0.4	3			310	43		30	8,300	<5	<50
20	18.5 m	20.3	165	0.3	<2			140	22		20	6,800	<5	<50
21	20.3 m	21.6	65	1.4	<2			120	40		20	15,400	8	<50
22	21.6 m	23.0	55	0.1	<2			50	25		20	2,800	<5	<50
[illegible]	23.0 m	25.0	75	<0.1	<2			45	24		<10	2,500	<5	<50
[illegible]	25 m	27	55	<0.1	<2			45	19		<10	1,700	<5	<50
25	27 m	29	35	<0.1	<2			35	33		<10	1,700	<5	<50
26	29 m	30.6	85	0.2	<2			60	40		<10	4,600	6	<50
27	30.6 m	33.0	40	1.1	<2			60	90		<10	11,500	13	<50
28	33.0 m	34.0	45	1.7	<2			50	95		<10	17,800	16	<50
[illegible] sample	24536		80	<0.1	<2			50	280		23,500	87,000	200	300

— C[illegible]

Also As

Also (outside lab) total (HF) Ba, B, K_2O, Na_2O, Rb, Sr, F^- (fusion
(MgO) (CaO) Hg.

emiss. spec.

Follow c̄ selected elements in soil pending results

Left Core Shed ....15 samples R. Moores 8/3/79
Received Sample Mill ....15 [illegible]........
Received Assay Office ....

* PLEASE KEEP REJECTS

APPENDIX V I

Henty Gorge

This area was visited with R. Mears on 13.2.79. Time did not permit an orientation survey to be carried out, but the adits had previously been thoroughly sampled by R. Mears, and assay pulps are available for further work. Some whole stream sediment samples had previously been collected and provided material for Mn leach studies by hand-picking of pebbles, as well as - 20 + 80 mesh material.

This was done subsequently in the sample preparation area at Mt. Lyell.

Several outcrop rock chip samples were collected above the adits.

Soil profiles, drainage characteristics and mineralized and barren rock outcrops were examined.

Generally, the soils over the Henty Gorge grid occur on very steep (30-35° average) slopes in thick rain forest. They usually consist of chocolate brown A_0 humus under leaf mold and forest litter (A_{00}). This A_0 is variable in development, but usually thin (20 cm), and is underlain by clayey, brown to rust-red (well-drained) B horizon with rock scree, over bedrock.

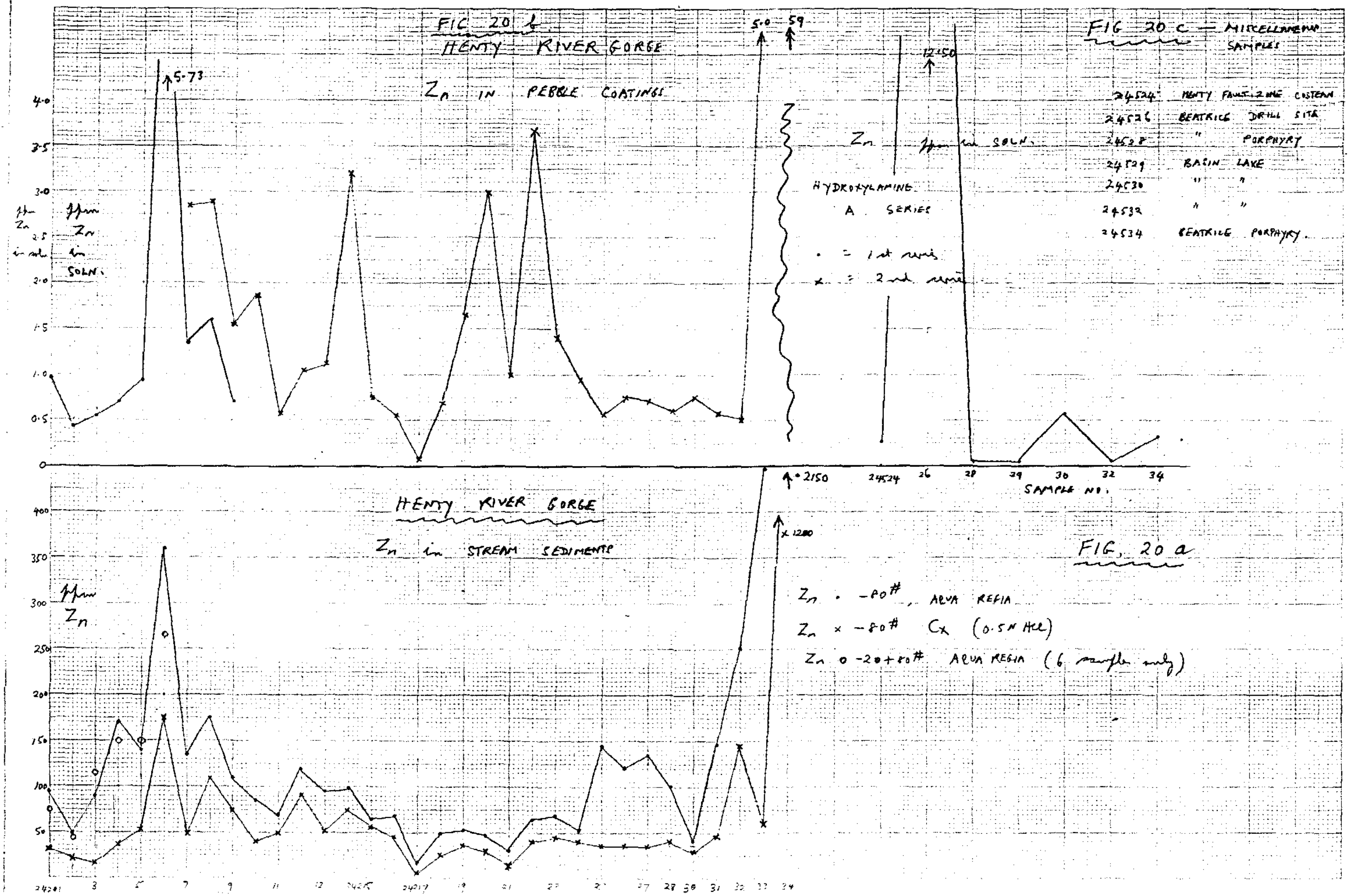


FIG 20 b
HENTY RIVER GORGE
Zn IN PEBBLE COATINGS
ppm Zn in soln
ppm Zn in SOLN.
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0
5.73
5.0
59
12.50
Zn ppm in SOLN.
HYDROXYLAMINE
A SERIES
• = 1st series
x = 2nd series
FIG 20 C — MISCELLANEOUS SAMPLES
24524 HENTY FAULT ZONE COSTEAN
24526 BEATRICE DRILL SITE
24528 " PORPHYRY
24529 BASIN LAKE
24530 " "
24532 " "
24534 BEATRICE PORPHYRY.
2150
24524
26
28
29
30
32
34
SAMPLE NO.
HENTY RIVER GORGE
Zn in STREAM SEDIMENTS
ppm Zn
400
350
300
250
200
150
100
50
x 1280
FIG, 20 a
Zn • -80#, AQUA REGIA
Zn x -80# Cx (0.5N HCl)
Zn o -20+80# AQUA REGIA (6 samples only)
24201
3
5
7
9
11
13
24215
24217
19
21
23
25
27
28
30
31
32
33
34

HENTY RIVER DRAINAGE ORIENTATION.

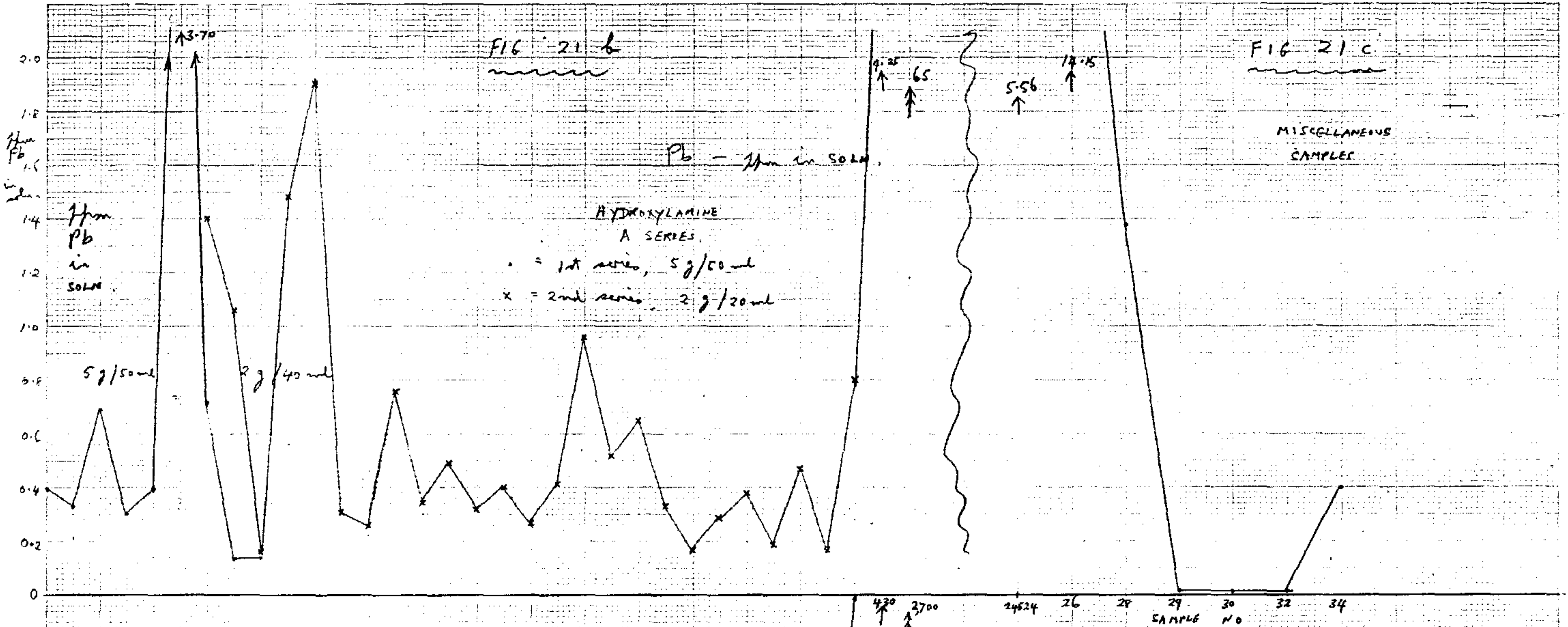


FIG 21 b

FIG 21 c

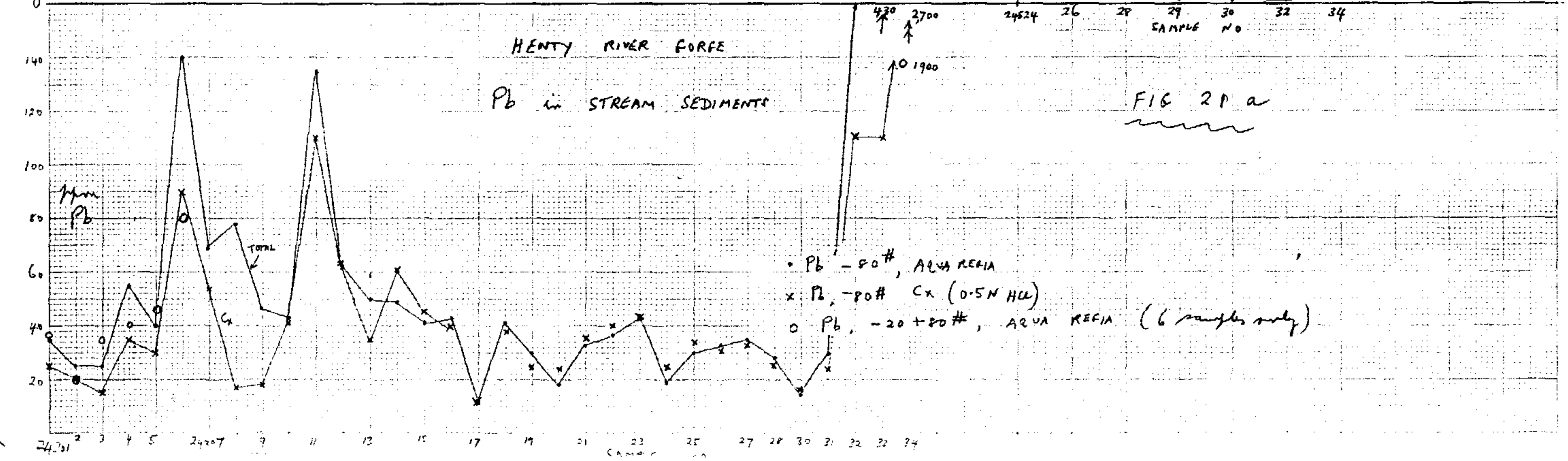


FIG 21 a

HENTY RIVER GORGE

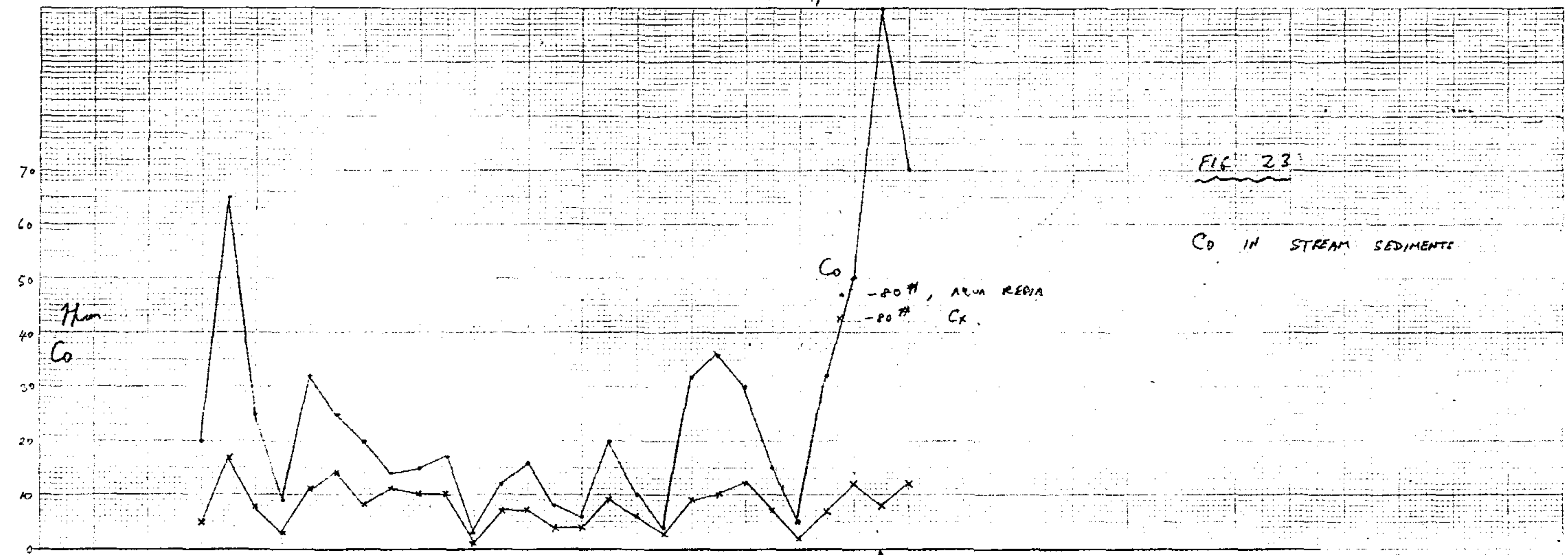


FIG 23

Co IN STREAM SEDIMENTS

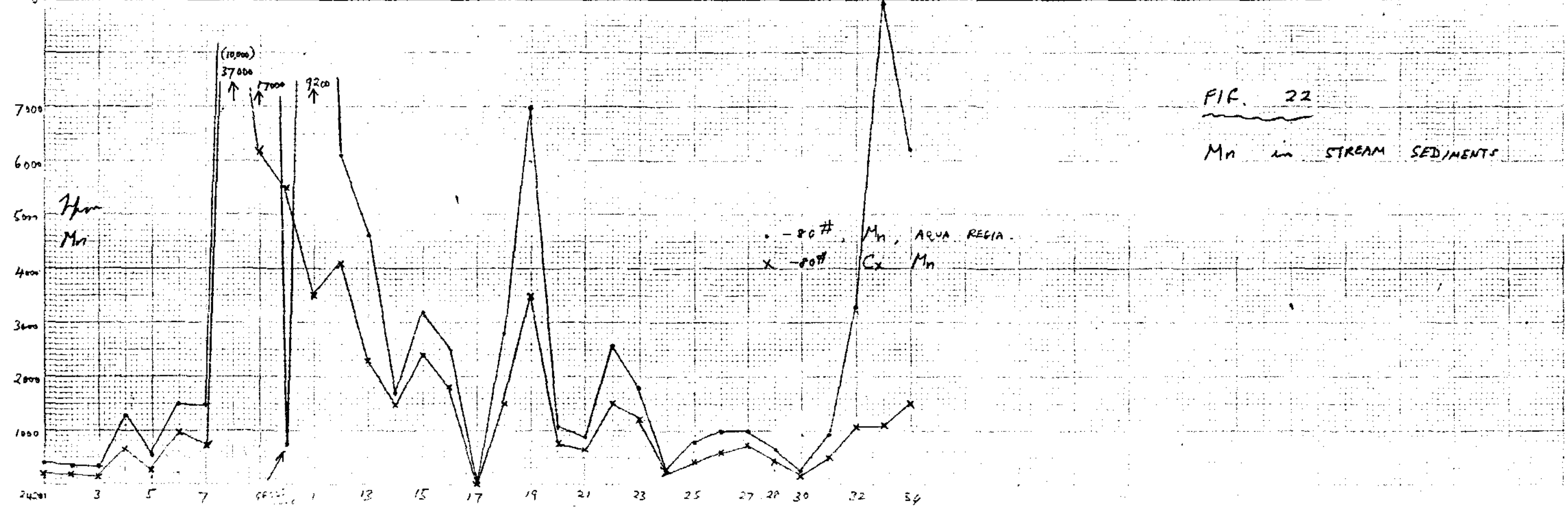


FIG. 22

Mn in STREAM SEDIMENTS

HENTY RIVER GORGE

FIG. 24

RATIO $Zn/(Mn+Fe) \times 10^3$ IN PEBBLE COATINGS

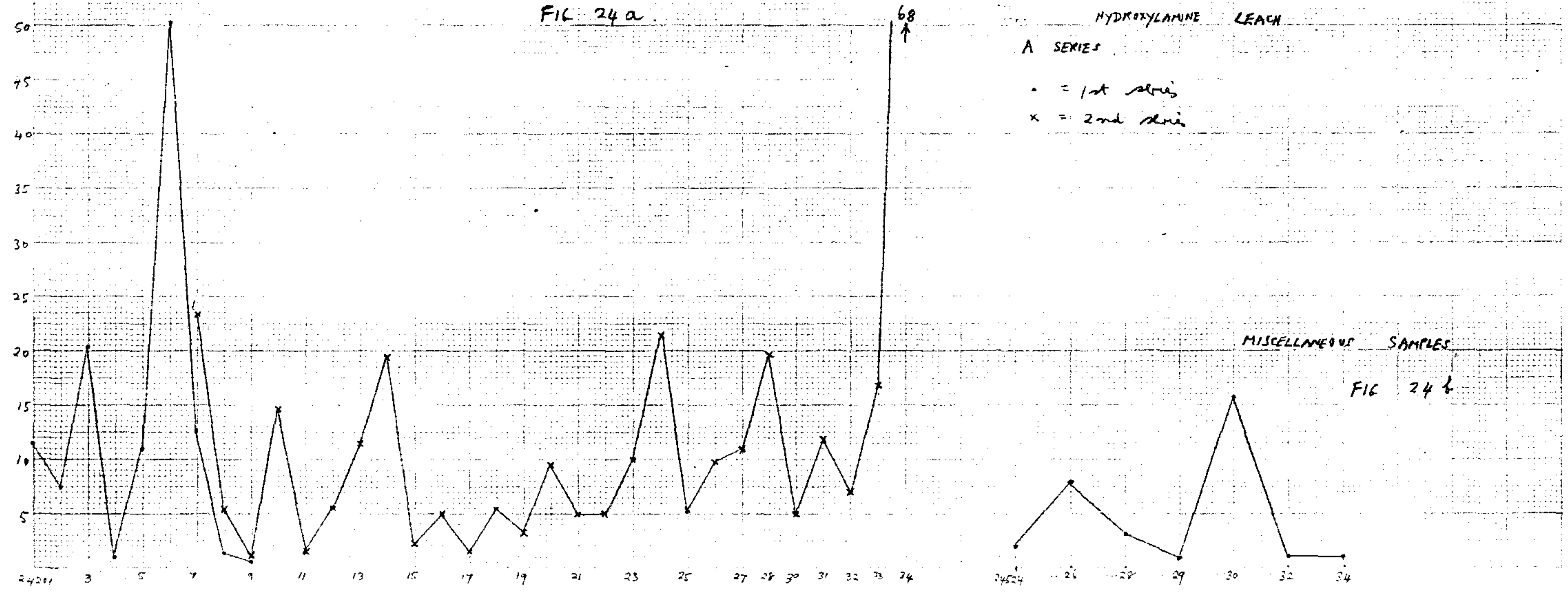


FIG 24a.

HYDROXYLAMINE LEACH

A SERIES

• = 1st series

x = 2nd series

MISCELLANEOUS SAMPLES

FIG 24 b

HENTY RIVER GORGE

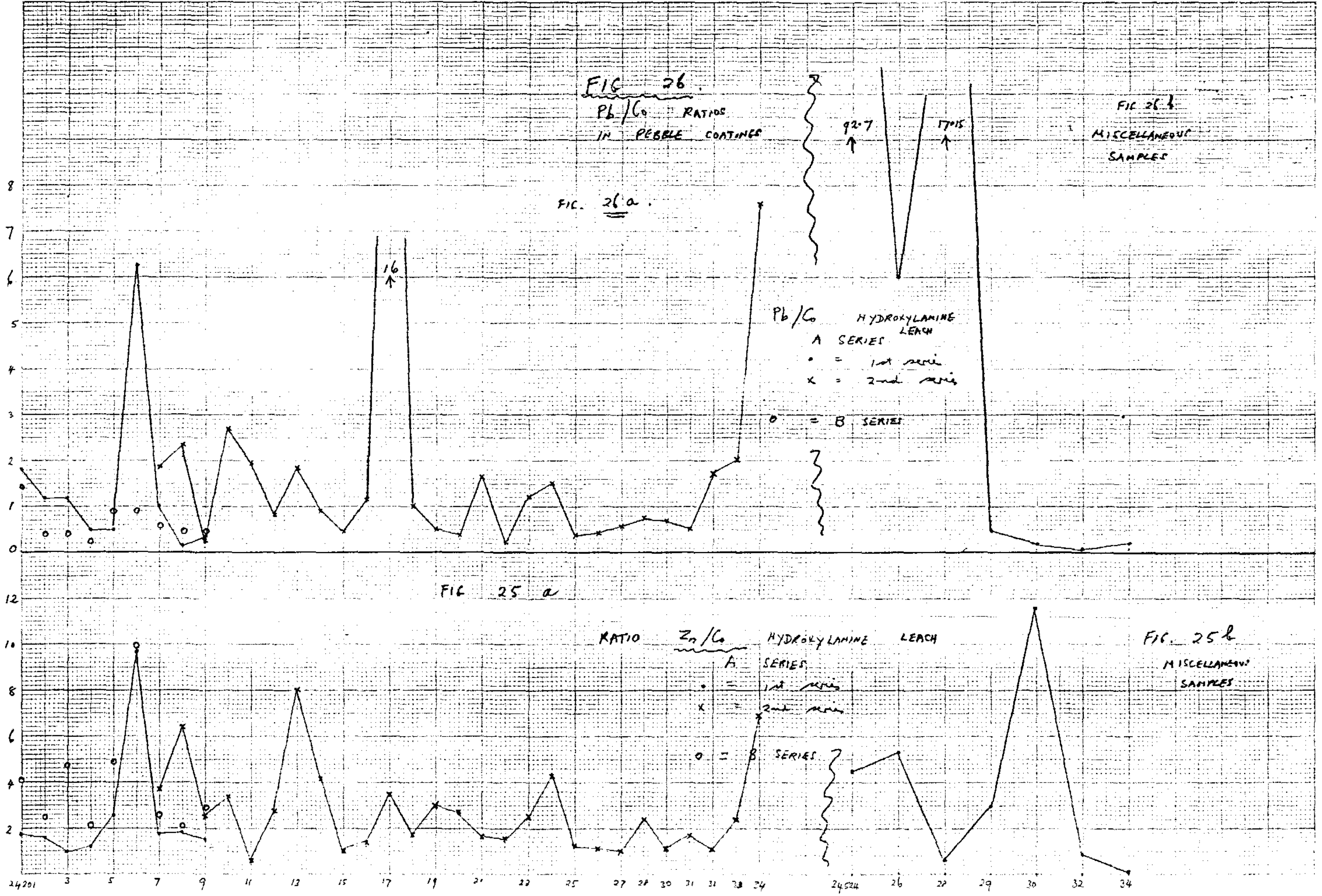
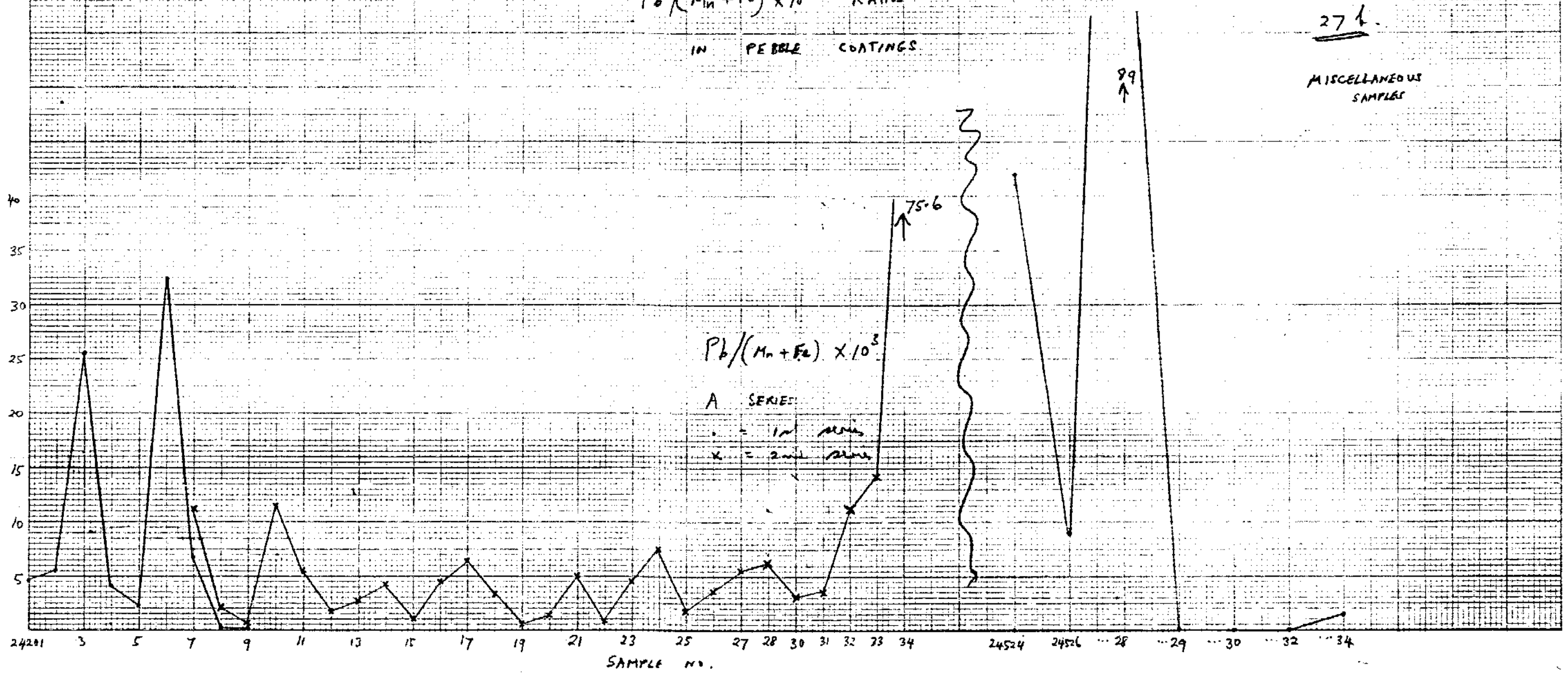


FIG. 27.

Pb/(Mn + Fe) x 10³ RATIOS

IN PEBBLE COATINGS

27b.



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MT. LYELL MINING & RAILWAY CO. LTD. 288149

GEOCHEMICAL SAMPLE DESPATCH

AREA: Henry River

PAGE: 1

DATE: 5-1-79

METHOD:

LINE NO: STREAM SEDIMENTS

FRACTION: -10#+80#

Assay/Analyse ASSAY

SAMPLE NO.	CU	Pb ✓	Zn ✓	Ag	Mn	
24201	10	35	75	<1	440	
24202	22	20	45		270	
24203	20	35	115		540	
24204	18	40	150		1030	
24205	16	45	150		530	
24206	26	80	265		1140	

NO. OF SAMPLES: 6

blanks already deducted

8

Zots

Zn/Mn
0.170
0.167
0.213
0.146
0.282
0.232

Pb/Mn
0.080
0.074
0.065
0.039
0.085
0.070

∴ no Pb/Mn contn.

need 7, 8, 9 results.

* ~~[illegible] -80# att~~

See also -80# next page.

-10+80#

MT. LYELL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH

AREA: Henty River

PAGE: 1

DATE: 5-1-79

METHOD:

LINE NO: Stream Sediments

FRACTION: -80#

Assay/Analyse ASSAY

SAMPLE NO.	CU	Pb ✓	Zn ✓	Ag	Mn	
24201	30	35	95	<1	400	
24202	20	25	50		330	
24203	30	25	90		350	
24204	50	55	170		1300	
24205	30	40	140		550	
24206	30	140	360		1500	

NO. OF SAMPLES: 6

Blanks already deducted

Zold

Zn/Mn
0.24
0.15
0.21
0.13
0.25
0.24
← no clear pattern

Pb/Mn
~~0.088~~
~~.12~~
~~0.24~~
.088
.076
.071
.042
0.254
0.24
} samples 5, sample 6 ≈ 3+

Pb is 3x in sample 6 only.

-80 = more Mn than +80

-80#, Zn/Mn, Pb/Mn no diff.

MT. LYELL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH

AREA: HENTY RIVER GORGE.
STREAM SEDIMENTS.

PAGE: 1.

DATE: 26./2/79.

METHOD: ASSAY.
AQUA REGIA DIGESTION

LINE NO:

FRACTION: −80.#.

Assay/Analyse

SAMPLE NO.	CU	Pb ✓	Zn ✓	Mn.	Fe.	Co.
24207.	20	69	135	1480	27000	20
24208.	21	78	176	37000	68000	65
24209.	14	47	110	17000	21,000	25
24210.	13	43	85	750	17000	9
24211.	13	135	71	9200	27000	32
24212.	18	62	120	6100	25000	25
24213.	13	50	95	4600	32000	20
24214.	11	49	98	1700	17000	14
24215.	10	41	65	3200	18000	15
24216.	17	43	68	2500	22000	17
24217.	3	12	17	80	7300	3
24218.	7	41	49	2800	20000	12
24219.	9	30	53	7000	26000	16
24220.	4	18	47	1100	14000	8
24221.	4	33	32	900	12500	6
24222.	9	37	66	2600	26000	20
24223.	9	43	69	1800	15,500	10
24224.	6	19	54	260	8400	4
24225.	24	30	143	800	37000	32
24226.	15	33	124	1000	35000	36
24227.	22	35	135	1000	44000	30
24228.	29	28	100	650	31000	15
24230.	4	14	41	220	7500	5
24231.	20	30	147	930	39000	32

no sample
~~24~~ 2429

NO. OF SAMPLES: 24.

MT. LYELL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH

AREA: HENTY RIVER GORGE.
STREAM SEDIMENTS.

PAGE: 2.

DATE: 26/2/79.

METHOD: 0.5N cold HCl for 4hrs
Assay.

LINE NO:

FRACTION: −80.#. Assay/Analyse Cx

SAMPLE NO.	CU	Pb	Zn	Mn	Fe	Co
NO SAMPLE. ~~24206.~~	—	—	—	—	—	—
24207.	6	54	48	720	2,300	5
24208.	12	17	111	10000	15,200	17
24209.	10	18	76	6200	3,850	8
24210.	7	41	41	5500	2,350	3
24211.	6	110	50	3500	3,700	11
24212.	14	63	92	4100	7,000	14
24213.	8	35	52	2300	5,300	8
24214.	7	61	75	1500	6,200	11
24215.	6	45	56	2400	4,400	10
24216.	6	40	46	1800	5,000	10
24217.	1	12	5	20	1,600	1
24218.	3	38	26	1500	3,600	7
24219.	7	25	34	3500	5,600	7
24220.	5	25	29	740	3,000	4
24221.	5	36	16	640	2,300	4
24222.	2	40	39	1500	6,000	9
24223.	4	42	44	1200	3,550	6
24224.	3	25	39	250	1,300	3
24225.	9	34	35	430	2,250	9
24226.	6	31	34	570	3,070	10
24227.	7	33	34	720	3,000	12
24228.	7	26	39	450	2,650	7
NO SAMPLE. ~~24229.~~	—	—	—	—	—	—
24230.	1	16	28	140	1,430	2
24231.	7	24	45	500	2,800	7

NO. OF SAMPLES: ....24..........

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288153

MT. LYELL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH

AREA: VARIOUS
MANGANESE COATED
STREAM SEDIMENTS

PAGE: 1
DATE: 14.2.79
METHOD:
MARSHALL
METHOD
* HYDROX / HCL EXT

LINE NO: —

FRACTION: BL = 0.03 0.00 0.00

Assay/Analyse

	SAMPLE NO.	CU	Pb	Zn	0.09 Mn	0.08 Fe	0.04 Co	
Henty Fault	Ba 24524	0.18	5.56	0.27	0.34	132	0.10	HF2 cost
Beatrice drill	24526 2 thru Ba	0.03	14.15	12.50	1560	9.2	2.40	LB
Beatrice Pothglyg	24528	0.09	1.38	0.35	7.6	8.0	0.12	LB
Basin" Lake	24529	0.05	0.01	0.06	0.20	54	0.06	BL
Basin Lake	24530	0.05	0.01	0.58	0.04	37	0.09	BL
Basin Lake	24532	0.02	<0.01	0.06	0.71	52	0.11	BL
Pothglygll - Beatrice	24534	0.03	0.40	0.38	250	18.8	1.92	LB
	1 24201 A	0.05	✓ 0.40	✓ 1.04	78	7.3	0.57	
	11 24201 B	0.05	0.21	0.52	15	2.7	0.11	
	2 24202 A	0.10	✓ 0.33	0.51	18	4.1	0.28	
	12 24202 B	0.04	0.13	0.57	14	3.0	0.20	
	3 24203 A	0.12	0.69	0.62	19	8.1	0.58	
	13 24203 B	0.04	0.11	0.69	15	2.5	0.13	
	4 24204 A	0.05	0.30	0.77	67	8.1	0.59	
	14 24204 B	0.02	0.10	0.48	19	4.0	0.19	
	5 24205 A	0.04	0.39	2.00	161	9.7	0.73	
	15 24205 B	0.03	0.15	0.61	17	2.0	0.11	
	6 24206 A	0.06	3.70	5.80	105	9.1	0.59	
	16 24206 B	0.02	0.31	2.85	46	3.1	0.28	
	7 24207 A	0.05	0.72	1.42	93	13.5	0.70	
	17 24207 B	0.02	0.27	1.07	42	6.5	0.38	
	8 24208 A	0.01	0.13	1.66	1,220	31.0	0.84	
	18 24208 B	0.02	0.21	0.78	450	14.6	0.33	
	9 24209 A	0.00	0.14	0.78	1,950	6.3	0.46	
	19 24209 B	0.02	0.15	0.74	505	5.5	0.23	
	10 BL (A)	0.00	0	0.07	0.0	0.0	0.00	
	20 BL (B)	0.02	.05	0.07	0.0	0.0	0.00	

NO. OF SAMPLES: 25

(-10 +10#) A = a 5g / 50 ml

B = 5 gm

Henty Gorge →
Lena

we need map location
flat + -80# SS
results.

Has used hydrazine

Zn/Co

A aris good
B not so good

Co

1.6 Henty FZ
1.90 - Beatrice drill
1.50 Pothglyg
0.17
0.11
0.09
0.21

A = good
B = not

~~76~~ A }1
~~8~~ B

1.82 A }1
1.45 B

1.18 A }2
0.40 B

1.19 A }3
0.46 B

0.51 A }4
0.26 B

0.53 A }5
0.91 B

6.27 A }6
0.93 B

1.03 A }7
6.58 B

0.15 A }8
0.46 B

0.30 A }9

2.70 Henty FZ
5.21 Beatrice drill
0.42
1.00
~~1.44~~
0.55
0.17

1.70 A }1
4.09 B

1.57 A }2
2.50 B

0.95 A }3
4.77 B

1.19 A }4
2.16 B

2.64 A }5
4.41 B

9.71 A }6
9.93 B

1.93 A }7
2.13 B

1.92 A }8
2.15 B

1.54 A }9
2.91 B

Co Henty anom
not
anom

B = 2g

153

288154

Old basis

	Zn(Mn+Fe)	Pb(Mn+Fe)	Zn/G	Pb/G
1	0.0114	0.0047	1.70	0.70
2	0.0075	0.0056		
3	0.0202	0.0255		
4	0.0093	0.0040		
5	0.0113	0.0023		
6	0.0502	0.0324	9.71	6.27
7	0.0127	0.0068		
8	0.0013	0.0001		
9	0.0004	<0.0001		

Zn/(Mn+Fe)	Pb/(Mn+Fe)	Zn/G	Pb/G ratio
0.0234	0.0185	3.84	1.89
0.0057	0.0021	6.42	2.36
0.0009	0.0001	2.47	0.26
0.0145	0.0116	3.38	2.69
0.0016	0.0054	0.59	1.96
0.0057	0.0017	2.76	0.82
0.0115	0.0027	8.00	1.86
0.0196	0.0043	4.16	0.92
0.0023	0.0010	1.03	0.46
0.0051	0.0044	1.36	1.17
0.0014	0.0065	3.50	16
0.0056	0.0033	1.74	0.98
0.0032	0.0005	3.00	0.49
0.0195	0.0013	2.75	0.38
0.0052	0.0050	1.71	1.66
0.0051	0.0007	1.56	0.22
0.0100	0.0046	2.59	1.20
0.0214	0.0075	4.27	1.50
0.0054	0.0017	1.22	0.38
0.0097	0.0037	1.12	0.43
0.0109	0.0057	1.09	0.57
0.0194	0.0061	2.40	0.76
0.0051	0.0021	1.13	0.70
0.0118	.0035	1.73	0.52

MT. LYELL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH

AREA: HENTY RIVER GORGE. STREAM. SEDIMENTS.

PAGE: 1.

DATE: 26/2/79.

METHOD: ASSAY* HYDROCHLORIC HYDROCHLORIDE [illegible]

LINE NO:

FRACTION: MN COATED PEBBLES. Assay/Analyse*

SAMPLE NO.	CU	Pb	Zn	Mn	Fe	Co
24207.	·14	1·40	2·84	103	18·5	·74
24208.	·08	1·06	2·89	481	26·5	·45
24209.	0	·16	1·53	1620	13·3	·62
24210.	·02	1·48	1·86	108	20·0	·55
24211.	·11	1·90	0.57	314	36·0	·97
24212.	·04	·31	1·05	170	14·5	·38
24213.	·06	·26	1·12	881	9·1	·14
24214.	·04	·76	3·45	159	17·3	·83
24215.	·08	·34	0·76	310	27·0	·74
24216.	·13	·49	0·57	93·8	17·5	·42
24217.	·03	·32	0·07	1·4	48·0	·02
24218.	·06	·40	0·68	107	15·0	·39
24219.	·09	·27	1·65	461	47·0	·55
24220.	·10	·41	2·97	271	40·0	1·08
24221.	·05	·96	0·99	167	24·0	·58
24222.	·05	·52	3·67	655	62·0	2·35
24223.	·06	·65	1·40	123	17·5	·54
24224.	·08	·33	0·94	39·6	4·4	·22
24225.	·11	·17	0·55	92·8	8·7	·45
24226.	·03	·29	0·76	66·0	12·0	·68
24227.	·01	·38	0·73	52·7	14·0	·67
24228.	·03	·19	0·60	24·2	6·7	·25
24230.	·09	·47	0·76	114	36·0	·67
24231.	·05	·17	0·57	40·5	7·8	·33

NO. OF SAMPLES: 24.

9

* All Results are P.P.M. in Solution

288155

MT. LYELL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH

AREA: VARIOUS

MANGANESE COATED
STREAM SEDIMENTS
Hydrazine
ppm in soln.

PAGE: 1

DATE: 14.2.79

METHOD:
MARSHALL METHOD
* HYDRAZINE/SO4
EXTRACT

LINE NO: –

FRACTION: – 0.02 0.27 0.07 0.02 0 –

Assay/Analyse

SAMPLE NO.	CU	Pb	Zn	Mn	Fe	Co
24524	0.40	7.50	0.50	0.47	3140	0.39
24526	0.54	14.70	35.0	3700	780	7.1
24528	0.43	4.03	5.00	17.2	600	0.18
24529	0.10	1.50	0.16	0.50	3700	0.41
24530	0.05	1.30	0.33	0.21	2600	0.36
24532	0.05	0.94	0.26	0.80	5080	0.55
24534	0.33	3.85	2.08	1050	1540	5.50
24201 A	0.14	1.86	1.98	126	435	1.33
24201 B	0.16	1.7	1.20	10	182	0.17
24202 A	0.02	1.59	1.45	82	660	0.97
24202 B	0.17	1.8	1.30	15	260	0.21
24203 A	0.55	0.88	1.57	120	390	0.72
24203 B	0.20	1.6	2.07	13	272	0.20
24204 A	0.01	1.03	1.59	169	900	1.14
24204 B	0.21	2.1	1.65	34	368	0.31
24205 A	0.02	0.22	6.30	900	700	1.83
24205 B	0.19	1.8	2.37	46	267	0.27
24206 A	0.02	0.37	1.80	142	665	0.50
24206 B	0.22	2.6	5.60	36	242	0.39
24207 A	0.02	1.60	1.95	253	1200	1.66
24207 B	0.22	3.3	2.00	42	380	0.44
24208 A	0.06	0.58	3.75	2700	1900	2.90
24208 B	0.18	1.5	2.45	1.00	550	0.73
24209 A	0.04	0.61	0.08	5550	100	0.31
24209 B	0.14	0.8	3.31	1400	410	1.00
Blank A Blank B	0.15 0.12	0.23 1.2	0.20 0.32			0 0

NO. OF SAMPLES: 25

Pb/Cu – [illegible]

~~14.5~~
~~7.1~~
~~20.7~~
~~3.65~~
~~3.6~~
good 1.7

18.2
2.1
21.2
3.0
2.9
1.2
0.65

HFZ
Best.

1.2 } A
8.6 } B 1

1.4 } A
7.5 } B 2

0.90 } A
6.65 } B #3

0.75 } A
6.0 } B 4

0.07 } A
5.8 } B 5

0.28 } A
6.1 } B 6

0.83 } A
7.0 } B 7

0.12 } A
1.74 } B 8

1.23 } A
0.57 } B 9

/Cu [illegible] ~~1.70~~ ~~1.27~~ 1.29 } 1
5.18

~~12.0~~
27.4
0.22
2.11
0.35
0.37
1.38 A } 1
6.65 B
1.42 } A B 2
5.86
2.08 } A B 3
10.00
1.33 } A B 4
5.10
3.40 } A B 5
8.57
3.4 } A B 6 → 3.2 } A 13.5 } B 6
14.13 } A B 7
1.39
4.39 } A B 8
1.27
3.26
3.03 } A B 9
3.24

A coated
wrong
B [illegible]

7 A B { 1.05 4.49
8 A B { 1.22 2.92
9 A { < 0.04

1.90
0.75

1.22
4.29

3.53
7.69

3.2
25.8

1:55

288156

MT. LYELL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH

AREA: HENTY RIVER
GORGE.
STREAM SEDIMENTS.
pebbles only. Hydro-ferric oxides, Mn coated

PAGE: 1.
DATE: 26/2/79.
METHOD: Assay.

LINE NO:
FRACTION: −20:+80.#. Assay/Analyse 2gm in 20ml

SAMPLE NO.	CU	Pb*	Zn	Mn	Fe	Co
NO SAMPLE. ~~24206.~~	—	—	—	—	—	—
24207.	·09	·84	1·31	47.0	14.4	·40
24208.	0	·10	1·56	1000	30.5	·95
24209.	0	·05	1·46	960	10.0	·36
24210.	·01	·36	1·08	34·1	9.5	·16
24211.	.04	1·25	0·27	133	30.0	·46
24212.	·02	·09	1·07	135	11·6	·32
24213.	·01	·10	1·18	148	17·5	·33
24214.	·02	·15	1·27	46.5	16·0	·25
24215.	·03	·17	0.69	73·8	9·5	·25
24216.	·04	·23	0·45	41·6	15·0	·23
24217.	·03	·22	0·12	2·1	33.0	·03
24218.	·02	·20.	0·44	43·6	11·3	·17
24219.	·03	·11	1·02	294	30.0	·38
24220.	·03	·15	1·11	50.4	17·0	·30
24221.	·02	·43	0·42	35·6.	11·5	·15
24222.	·02	·12	0·58	58·0	17·5	·33
24223.	·02	·23	0·80	45·1	11·0	·22
24224.	0	·11	0·75	11·4	4·8	·09
24225.	·04	·20	0·53	18·2	6·5	·32
24226.	·03	·22	0·54	33·6	10·7	·57
24227.	·04	·13	0·68	26·9	10·5	·45
24228.	·02	·09	0·63	18·9	9.0	·21
NO SAMPLE. ~~24229.~~	—	—	—	—	—	—
24230.	·04	·03	0·51	4·1	9·5	·06
24231.	·05	·09	0·62	26·7	8·8	·43

NO. OF SAMPLES: 24

* All Results are PPM In Solution.

9

156

288157

MT. LYELL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH

random ok
duplicate good

AREA: HENTY RIVER

PAGE: 1

SOILS (REPEAT OF OLD SAMPLES)

DATE: 14.2.79

METHOD: AQUA REGIA → AAS ✓

LINE NO: 3N

FRACTION: -80#

Assay/Analyse

SAMPLE NO.	CU	Pb	Zn	Mn	Fe	Co
3200E	26	26	44	2,030	64,500	28
3250E	21	22	44	18,200	63,000	39
3300E	33	43	53	1,490	100,000	36
3350E	15	12	24	130	18,700	7
3400E	12	24	81	58,000	69,000	82
3450E	19	38	139	43,000	61,000	115
3500E	17	39	156	44,000	57,500	180
3550E	15	25	24	1,020	10,200	12
BL	4	0	4	0	0	0
BASIN LAKE L 75 S# 6400E -80#						
(All same sample)		Pb	Zn			
1		96	33			
σ² check. 2		93	32			
3		95	40			
4		96	29			
5		103	33			
6		97	31			
7		92	30			
8		96	31			
9		97	30			
10		96	36			
BLANK		0	1			

see field note book for earlier results.

Pb

$\sigma_{n-1} = 2.923$

$\sigma_n = 2.773$

$\bar{x} = 96.1$

$n = 10$

$\Sigma x = 961$

$\Sigma x^2 = 92429$

$CV = \frac{\sigma_{n-1}}{\bar{x}} \times 100 = \pm 3.0\%$

Zn (blank subtracted)

$\sigma_{n-1} = 3.308$

$\sigma_n = 3.138$

$\bar{x} = 31.500$

$n = 10$

$\Sigma x = 315$

$\Sigma x^2 = 10121$

$CV = \frac{\sigma_{n-1}}{\bar{x}} \times 100 = \pm 10.5\%$

NO. OF SAMPLES: 8

157

288158

MT. LYELL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH

AREA: HENTY RIVER

SOILS (REPEAT OF OLD SAMPLES)

PAGE: 1

DATE: 14.2.79

METHOD: AQUA REGIA → AAS ✓

LINE NO: 3N

FRACTION: − 80#

Assay/Analyse

SAMPLE NO.	CU	Pb	Zn	Mn	Fe	Co
3200E	26	26	44	2,030	64,500	28
3250E	21	22	44	17,200	63,000	39
3300E	33	43	53	1,490	100,000	36
3350E	15	12	24	130	18,700	7
3400E	12	24	91	58,000	69,000	82
3450E	19	38	139	43,000	67,000	115
3500E	17	39	156	44,000	57,500	180
3550E	15	25	24	1,320	19,200	12
BL	4	0	4	0	0	0
BASIN LAKE L75 S 6400E -80#						
(All same sample)		Pb	Zn			
1		96	33			
2		93	32			
3		95	40			
4		96	29			
5		103	33			
6		97	31			
7		92	30			
8		96	31			
9		97	30			
10		96	36			
BLANK		0	1			

NO. OF SAMPLES: 8

9

BLANKS NOT SUBTRACTED

MT. LYELL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH

AREA - HENTY RIVER STREAM SEDIMENTS

PAGE -

DATE -

METHOD -

[redacted] - SAMPLE No: 24233

[redacted]ON - Assay / Analyse

METHOD [redacted]	CU	Pb	Zn	Mn	Fe	Co
AQUA REGIA	55	430	450	9000	67,000	100
COLD EXTRACTION	13	110	60	1100	3,500	8
Mn-coated weighed 2gm in 20ml (-20+80#)	0.01	2.0	2.6	160	52	1.63
Mn-coated HAND-PICKED HYDROXYLAMINE HYDROCL	0.09	4.25	5.0	250	48	2.1
SAMPLE 24232 — in Henty River at flying fox						
-80# AQUA REGIA	42	160	250	3300	42,500	50
(0.5N HCl) COLD EXTRACTION	11	110	145	1070	3800	12
HYDROXYLAMINE -20+80# LEACH	0.12	0.75	0.45	30.5	12.5	0.32
PEBBLE LEACH	0.32	0.60	0.50	59	12.3	0.47

NO. OF SAMPLES ....

MT. LYELL MINING & RAILWAY CO. LTD.

GEOCHEMICAL SAMPLE DESPATCH.

AREA - HENTY RIVER STREAM SEDIMENTS

PAGE -

DATE -

METHOD -

[redacted] - SAMPLE No: 24234

[redacted]ON - Assay/Analyse

METHOD [redacted]	CU	Pb	Zn	Mn	Fe	Co
AQUA REGIA	60	2700	2150	6,200	53,000	70
COLD EXTRACTION	30	1900	1200	1500	3,400	12
Mn-coated weighed 2gm in 20ml (20+80)	0.00	23	60	220	26	1.87
Mn-coated HAND-PICKED HYDROXYLAMINE HYDROCL	0.37	65	59	820	39	8.5

NO. OF SAMPLES ....