

BRENDA MINES LTD.
EXPLORATION GROUP

REPORT on
GEOLOGICAL and GEOCHEMICAL SURVEYS
on the
SIWASH CREEK COPPER PROPERTY
COPPER ~~XX~~ CLAIM GROUP
I and II

Lat. $49^{\circ} 50'$, Long. $120^{\circ} 20'$

Similkameen Mining Division
N.T.S. 92H/16 W/

Paul C. Bankes

April, 1980

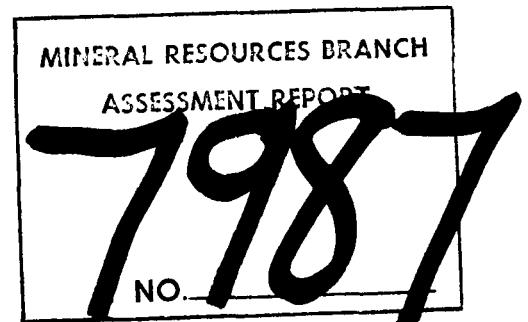


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I INTRODUCTION

Since the early 1900's, the Siwash Creek area has been well prospected for placer and vein type mineralization. Several small copper showings on the north end of Siwash Creek were largely ignored until Don Agur staked the area in 1968. Staking preceded detailed prospecting and a short trenching program.

Since that time, several companies have been involved with the property. The Phelps Dodge Corporation of Canada Ltd., under a pre-option agreement, conducted preliminary geochemical, geophysical and geological surveys in 1972. In 1974, Utah Mines Ltd. optioned the property from Don Agur and completed a more extensive geochemical, geophysical, geological and sampling program.

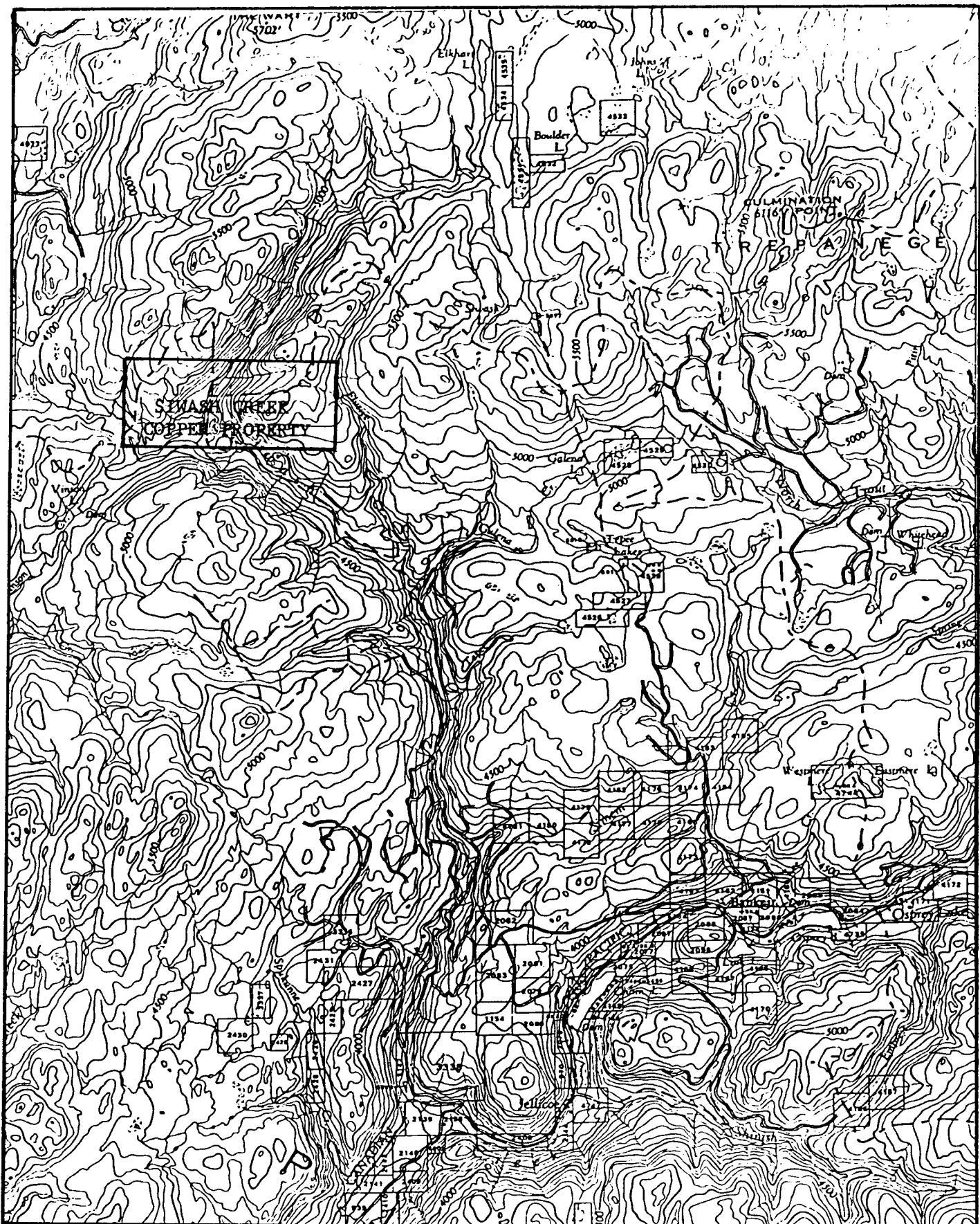
In view of rising copper prices, Brenda Mines Ltd. optioned the property from Mr. Agur in 1979 and staked 40 additional units.

II PROPERTY DESCRIPTION

a) Location and Access

The Siwash Creek Copper Property is located in central British Columbia, 40 kilometres (by air) north - northeast of Princeton, B.C. The claims are situated around Siwash Creek, between Thumb Lake and Elusive Creek.

There are presently two access roads to the property. The first follows a 17 kilometre forestry access road, which



LOCATION MAP

Miles 1 2 4 6 8 10 Miles

Scale of Kilometres

0 2 4 6 8 10 12 14 16

Figure 1

branches north from the Princeton - Summerland road near Osprey Lake. The second follows a western extension of the Trout Creek logging road, 65 kilometres west of Peachland, B.C.

b) Topography and Vegetation

The property occupies a large, gently rolling plateau which has been transected by three major southerly draining ravines. Ravines range from 100 to 600 feet in depth and are frequently flanked by steep talus slopes.

At higher elevations, the plateau is covered by mature stands of spruce and jackpine. Tag alder and devil's club are common to ravine bottoms and lower elevations.

c) Claim Statistics

Copper I Claim Group

<u>Claim Name</u>	<u>Record No.</u>	<u>Units</u>	<u>Record Date</u>
Siwash #77	237	2	July 13/77
Siwash 3	568	20	May 7/79

Copper II Claim Group

<u>Claim Name</u>	<u>Record No.</u>	<u>Units</u>	<u>Record Date</u>
Siwash #2	33821	1	July 5/71
Siwash #4	33823	1	July 5/71
Siwash 4	567	20	May 7/79

All claims are located in the Similkameen Mining District.

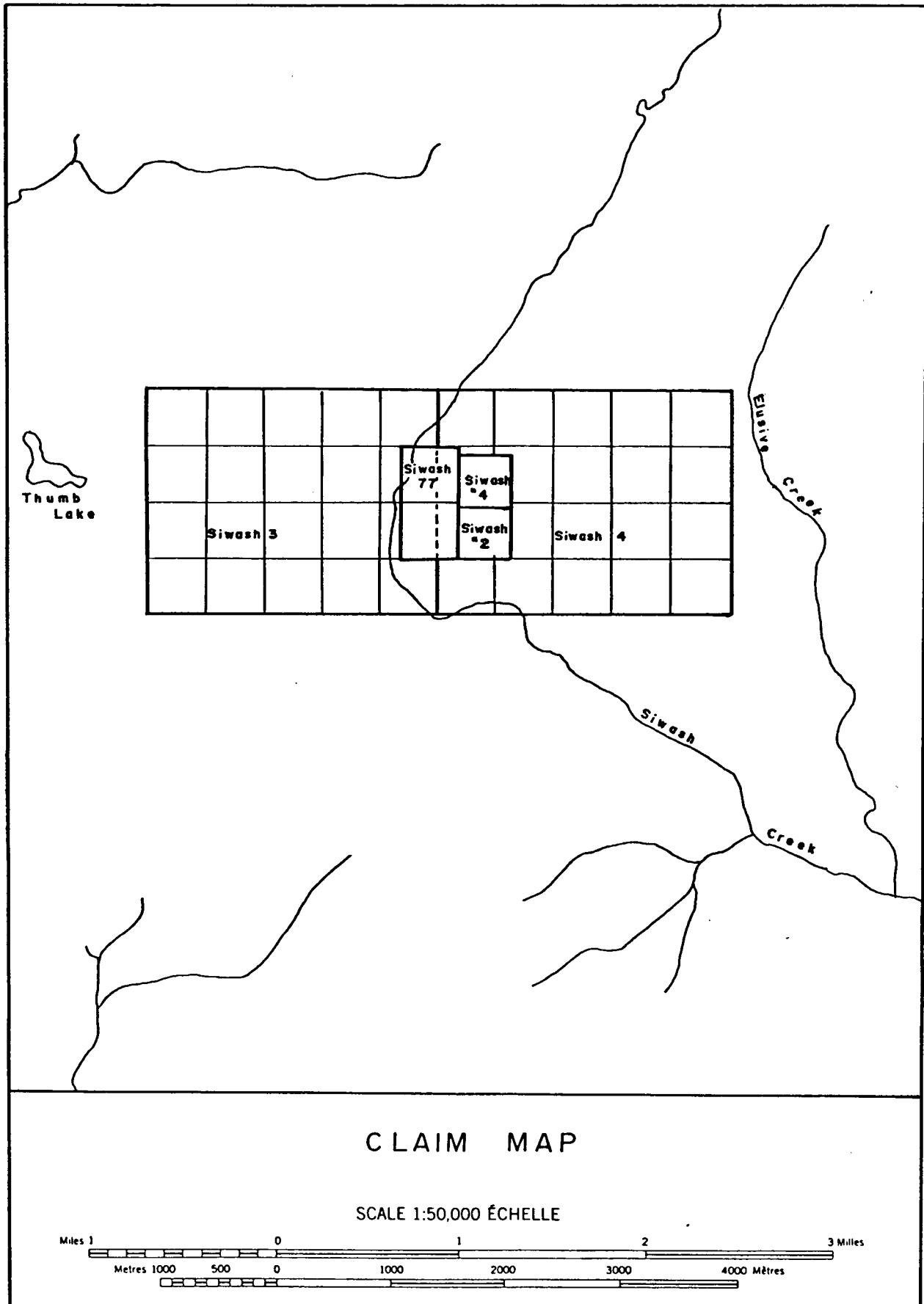


Figure 2

III GRID ESTABLISHMENT

A two kilometre baseline was cut along the common, north-south claim boundary between the Siwash 3 and Siwash 4 claim blocks. East-west location lines were established at 200 metre intervals across the property. Greater control was achieved on the central map area (10 + 00W to 10 + 00E, 7 + 00N to 7 + 00S) by decreasing line intervals to 100 metres. All lines were well blazed and flagged, surveyed with compass and topofil and marked at 50 metre stations for later geochemical and geological surveys.

IV REGIONAL GEOLOGY

The regional geology has been described by H.M.A. Rice in the Geological Survey of Canada Memoir 243 (1960). He suggests that the area is predominantly underlain by volcanic and metasedimentary units of the Nicola Group (Upper Triassic). These units are sharply intruded by large granodiorite batholiths of the Coast Intrusives (Jurassic).

Several small granite to diorite stocks of the Otter Intrusives (Mesozoic) occur south of the property.

V PROPERTY GEOLOGY

a) Introduction

Geological mapping on the Siwash Creek Copper Property (1,000 hectares) was done between June 12 and June 18, 1979. All available outcrops were mapped on either a 1:5,000 or 1:2,500 scale. Emphasis was placed on rock type, alteration and mineralization.

With exception to a large elliptical diorite body intruding much of the central map area, andesite and andesite porphyry appear to be the dominant lithologies on the property.

b) Andesite

Fine grained andesite varies from gray to green as a function of chlorite alteration. Outcrops are frequently silicified and well jointed along the following orientations:

	<u>Strike</u>	<u>Dip</u>
1)	60°	75° south
2)	130°	90°
3)	50°	20° south

Fine grained pyrite and minor magnetite are weakly disseminated throughout.

Several small zones of strong chalcopyrite, malachite and/or pyrite mineralization occur near the andesite porphyry contact, adjacent to the diorite intrusive. Fracturing frequently increases near these contacts. The unit is crosscut by narrow 5 mm to 10 mm quartz, epidote and calcite veins. Limonite staining occurs locally across the area.

c) Andesite Porphyry

Andesite porphyry outcrops over much of the eastern and western portions of the property, and occurs as an intermediate unit between andesite and diorite lithologies on the central map area. The unit's fine grained microcrystalline matrix is gray in colour and hosts euhedral hornblende and k-feldspar phenocrysts. Several outcrops on the southern map area contain small (5 to 10 mm) volcanic fragments. On the east side of Siwash Creek, texture appears to grade from fine grained porphyritic to medium grained equigranular. Olivine, a minor constituent of the rock, increases in concentration with grain size.

Jointing is distinct (140° dipping 90° , 170° dipping 90° and 60° dipping 20° south) and hosts minor calcite, epidote and garnet veining. Outcrops contain fine disseminated magnetite and pyrite, are frequently silicified and host minor chlorite alteration.

Occasional malachite and chalcopyrite occurs locally on the eastern and western map areas.

d) Marble

A small marble outcrop located (8 + 00S, 00E) on the south central map area is fine to medium grained and gray to buff in colour. Small 2 to 4 millimetre blebs of malachite staining occur throughout the zone. The marble most likely occurs as an isolated metasedimentary unit within the Nicola Group Volcanics.

e) Diorite

A large elliptical shaped diorite body is situated within the central map area forming a steep sided ridge. The diorite is gray to black in colour and ranges from fine to medium grained equigranular. Outcrops are slightly chloritized and generally magnetic.

Jointing follows 90° and 120° (vertical) and frequently hosts narrow seams of pyrite and magnetite. Limonite staining occurs locally across the unit.

f) Rhyolite Porphyry

The andesite porphyry, andesite and diorite lithologies are cut by a series of narrow rhyolite porphyry dykes. Dykes dip steeply, range from 15 to 20 centimetres in width and strike along 70° and 85°. The rhyolite porphyry is blocky, well jointed and pink to orange in colour. Euhedral phenocrysts of k-feldspar occur throughout a fine grained aplitic matrix. Phenocrysts range from 3 to 7 millimetres in size and compose 5% to 20% of the unit's composition. Trace amounts of fine grained pyrite are disseminated throughout.

g) Monzonite

Monzonite occurs as a small outcrop located at 4 + 00S, 4 + 00E and as narrow (15 centimetre) dykes along the andesite, andesite porphyry contact. Rocks of this unit are pink to gray in colour and host slightly porphyritic k-feldspar, hornblende and augite in a medium grained equigranular matrix. Fine grained pyrite and 3 to 10 millimetre chlorite blebs are common constituents of the unit.

h) Structure

The overall geology shows volcanics of the Nicola Group intruded by a diorite stock. Andesite porphyry occurs intermediately between andesite and diorite lithologies. It is difficult to determine at this time whether this unit is related to the andesite (Nicola) or whether it is a border phase of the diorite intrusive. The property has been cross-cut by a series of rhyolite porphyry and monzonite dykes.

Jointing and fracturing are widespread and appear to increase peripheral to both andesite porphyry and diorite units. Trenching on the central map area has exposed several subvertical fault and shear zones striking 10° and 90° . The large north-south ravines which transect the property may have occurred in response to regional faulting.

i) Mineralization

Mineralization on the property is generally restricted to two main copper showings on the central map area. Both occur within the andesite unit close to andesite porphyry and diorite lithologies. Chalcopyrite, which is finely disseminated throughout these zones, also occurs as narrow fracture fillings and as small,.5 to 2 centimetre lenses. Malachite is common to both occurrences and is restricted to surface fracture and jointing plains. The northern showing (25N, 75E) is better mineralized and more silicified than the southern mineral occurrence at 25W, 3+ 75S, which appears slightly more chloritized.

Channel sampling done by Utah Mines Ltd. averaged .39% Cu over the northern showing and .15% Cu over the southern showing.

Andesite and andesite porphyry talus slopes on the eastern and western map area frequently host small isolated zones of malachite and chalcopyrite mineralization.

VI GEOCHEMICAL SURVEY

a) Introduction

Where possible, soil samples were taken from the "B(f)" horizon, at 50 metre intervals over the entire grid. Silt samples were collected wherever grid lines intersected streams. A total of 1,065 samples were collected and analysed at the Brenda Mines Assay Lab for Cu, Mo, Pb and Zn in ppm.

Figure 3

Soil Geochem Parametres

<u>Element</u>	<u>Background Value</u>	<u>Low Anomalous</u>	<u>Anomalous Threshold</u>	<u>High Anomalous</u>
Cu	36 ppm	59 ppm	96 ppm	136 ppm
Mo	2 ppm	3 ppm	6 ppm	8 ppm
Pb	9 ppm	12 ppm	16 ppm	18 ppm
Zn	55 ppm	80 ppm	116 ppm	152 ppm

Treatment of Results

1. Statistical Analysis

Statistical presentation of the various sample types were made so as to better compare bulk characteristics of the geochemical data. The two statistical formats used in this report are cumulative frequency distribution and histogram frequency. The histogram is the more obvious of the two, enabling the reader to make quantitative observations regarding data grouping made etc., while the cumulative frequency plot may be used to graphically derive qualitative information such as standard deviations, background values, low anomalous values and threshold values.

The following is not meant to be a definitive treatment of the statistical analysis of geochem data, but rather a guide to the more important statistical parameters considered in this report.

2. Distribution

In beginning the treatment of a large body of geochemical data, it is necessary to determine the distribution which best fits the data. It has been determined (by concentration vs. frequency plots) that most geochemical data follows a lognormal distribution often referred to as the bell-shaped curve. Natural geochemical values

often tend to form negatively skewed distribution curves when plotted. This results from the fact that it is more common to have low values in geochemical data, than high values. If, instead of the actual value itself, its logarithm is plotted in the abscissa, the frequency curve takes a symmetrical, bell-shaped form, typical of the normal distribution. Plotting the actual geochemical values on a logarithmic graph will achieve the same results. This is the procedure used for the data considered.

3. Histogram

The histogram used in preparing this report is a plot of the interval frequency vs. interval (see Figure). Several important statistical parameters may be determined such as the total range of data in sample, modes, and the range with the highest frequency of values. Finally, the general form of the density distribution of the data can be determined quickly.

4. Cumulative Frequency

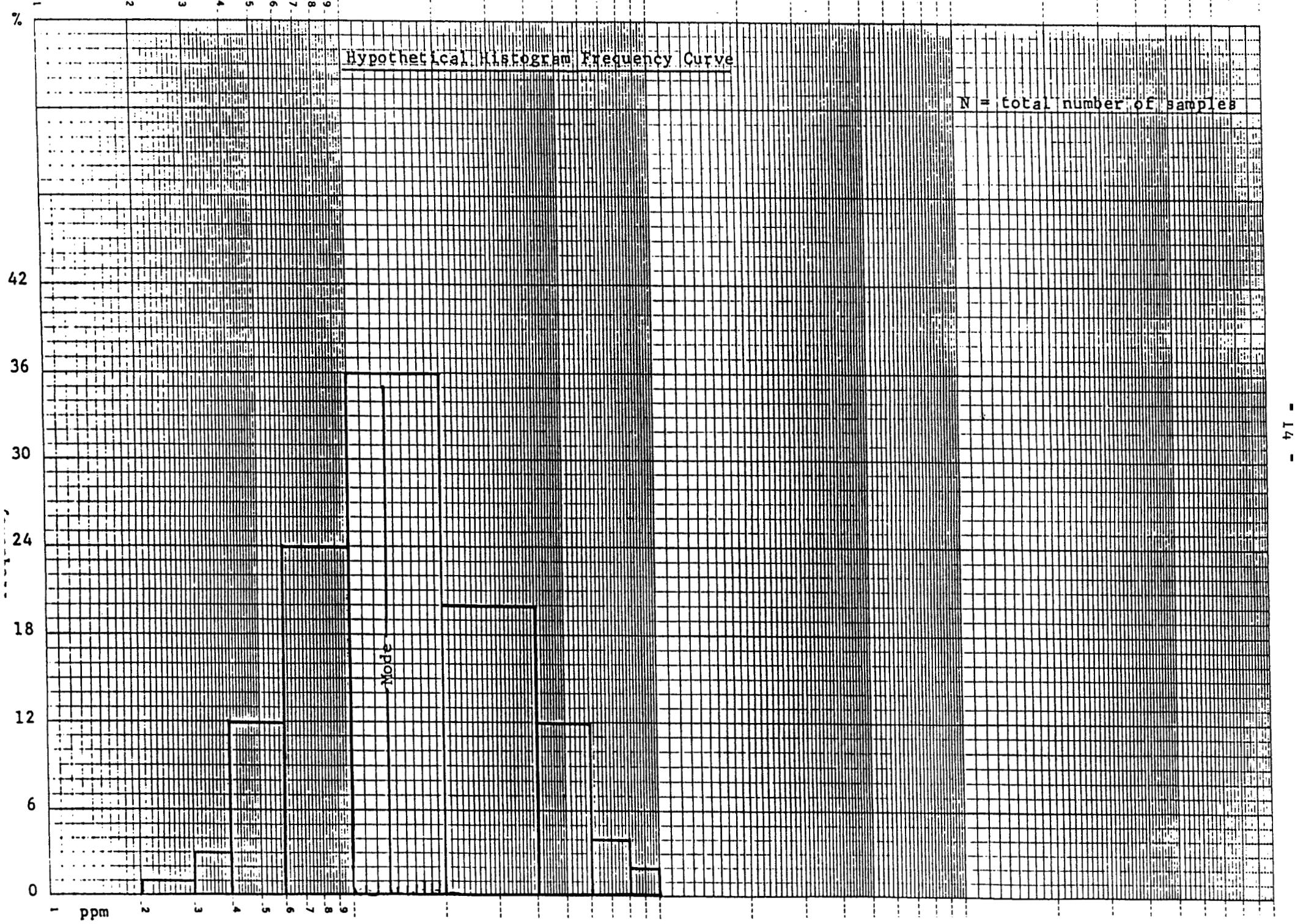
Cumulative frequency paper is generally constructed with a probability scale as the ordinate and a logarithmic scale as the abscissa (Figure). By replacing the arithmetic ordinate scale of the histogram with a probability scale, the cumulative frequency curve is represented by a straight line or a line of "best fit". This line joins

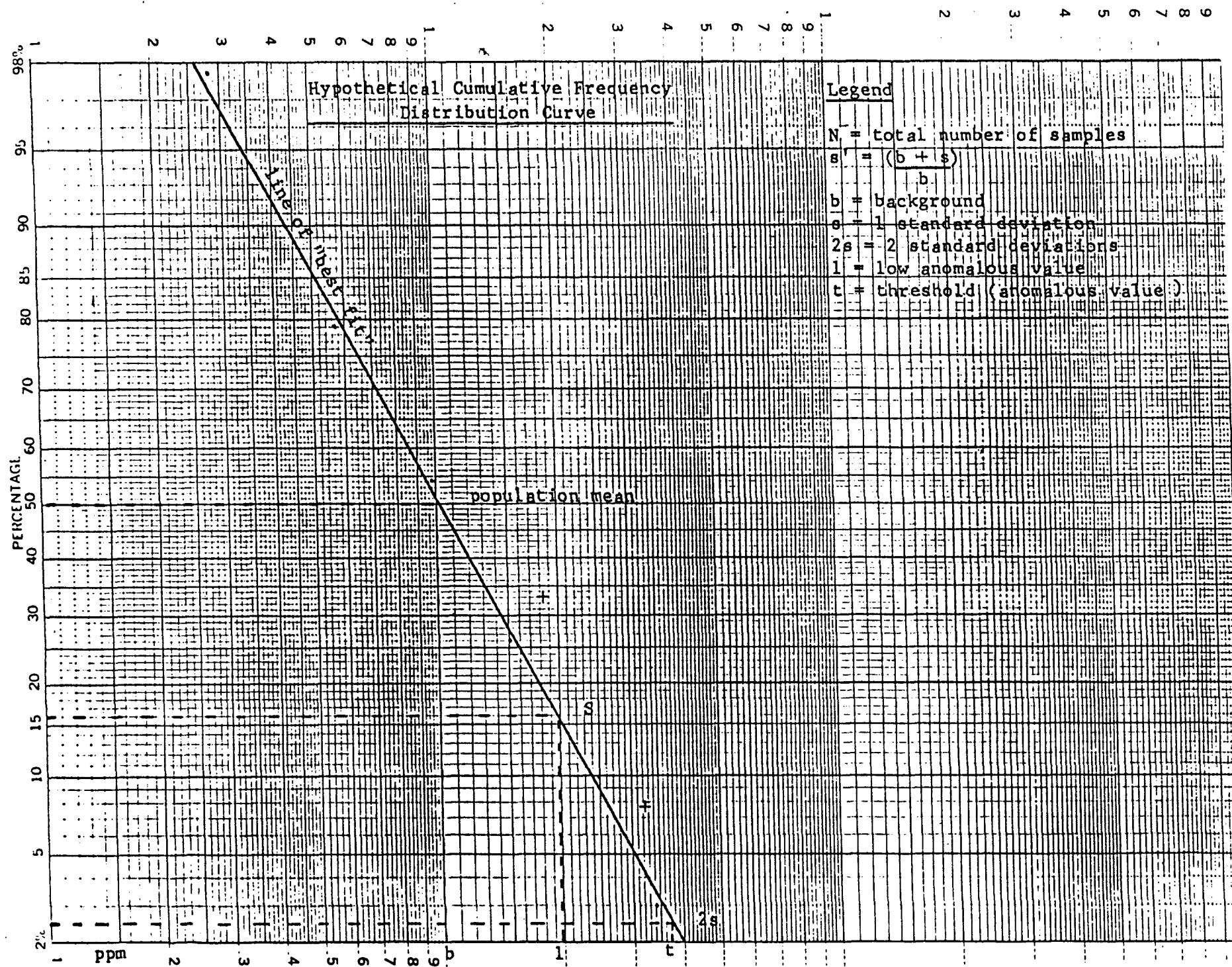
points calculated from frequencies, cumulated from the highest to the lowest values; thus the 100% will correspond to the lowest class and can be eliminated.

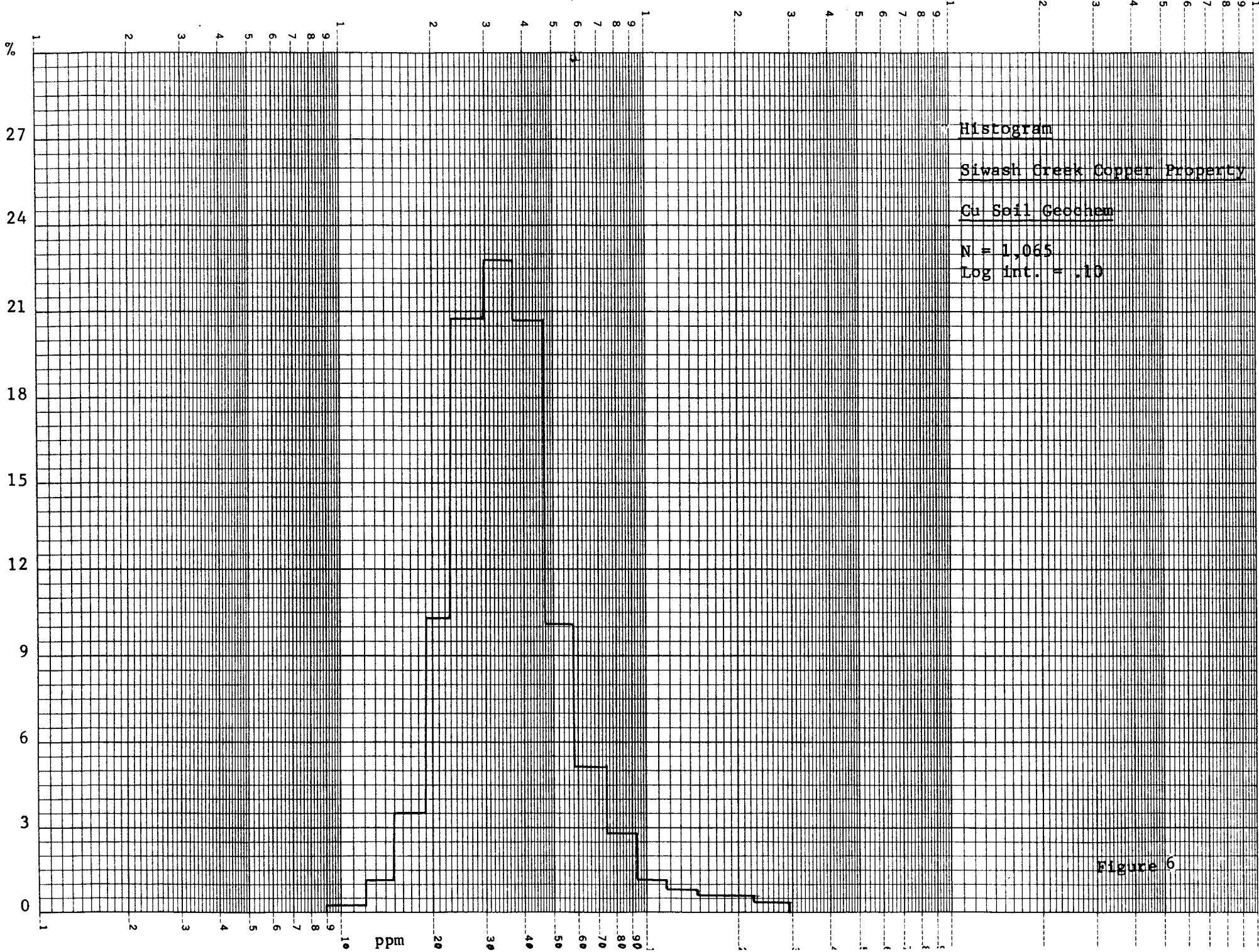
There are essentially three parameters defining the geochemical population, which may be obtained graphically, using the cumulative probability plots. These are:

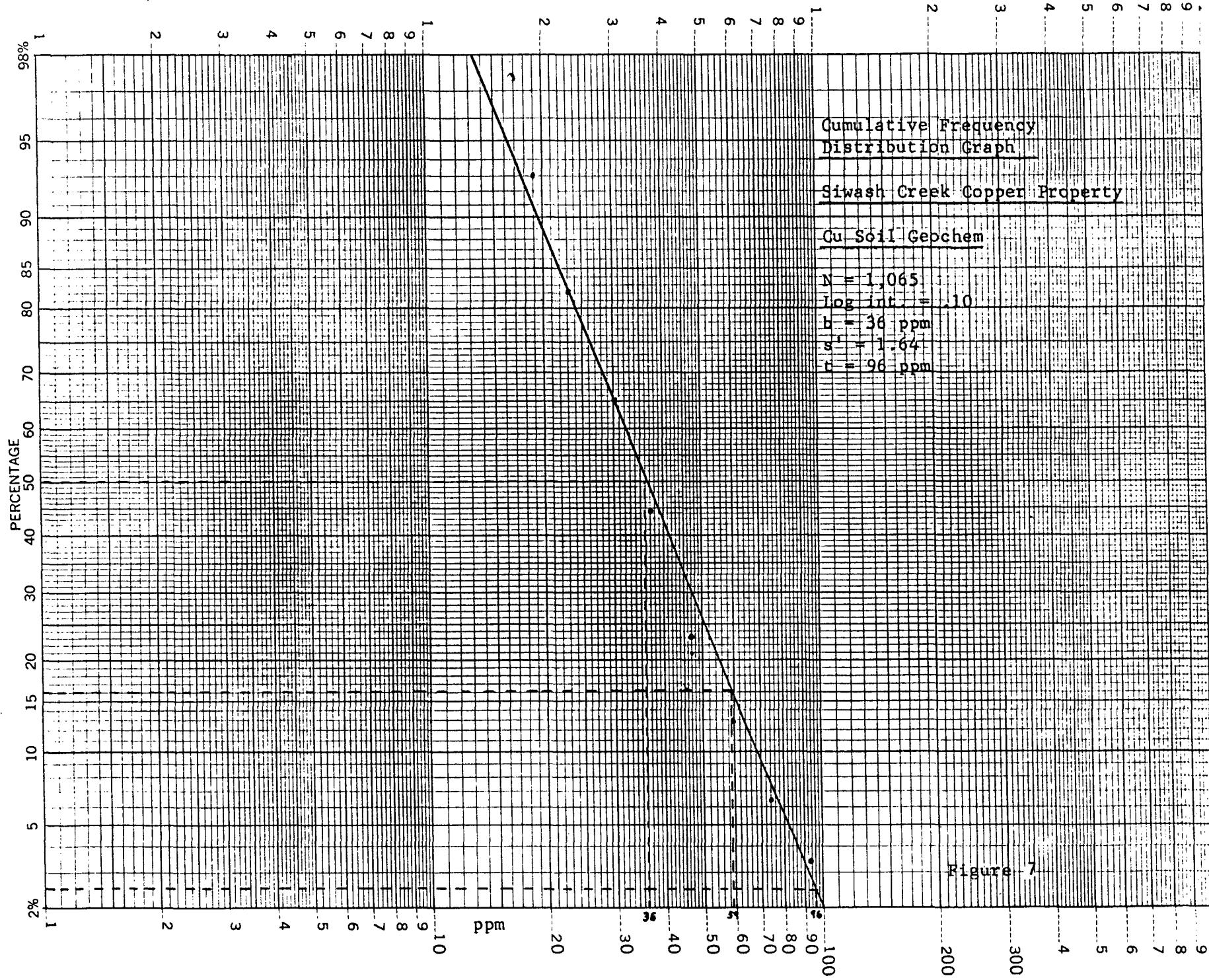
- 1) Geometric mean or background value (b) located by the intersection of the cumulative frequency curve at the population mean (50%). Trace intersection down to ppm scale.
- 2) Low anomalous value (l) located by the intersection of the cumulative frequency curve at the 16%. Trace intersection down to ppm scale. The 16% line expresses the scatter of the values around the population mean, incorporating the addition of one standard deviation (s) to the mean.
- 3) Anomalous or threshold value (t) located by the intersection of the cumulative frequency curve at the 2.5%. Trace intersection down to ppm scale. The threshold value is a fairly complex geochemical parameter and is supposed to be the upper limit of the background fluctuation (b). This incorporates the addition of two standard deviations ($2s$) to the mean.

Geochemical results for each element have been plotted on accompanying maps and contoured to correspond with element distributions.



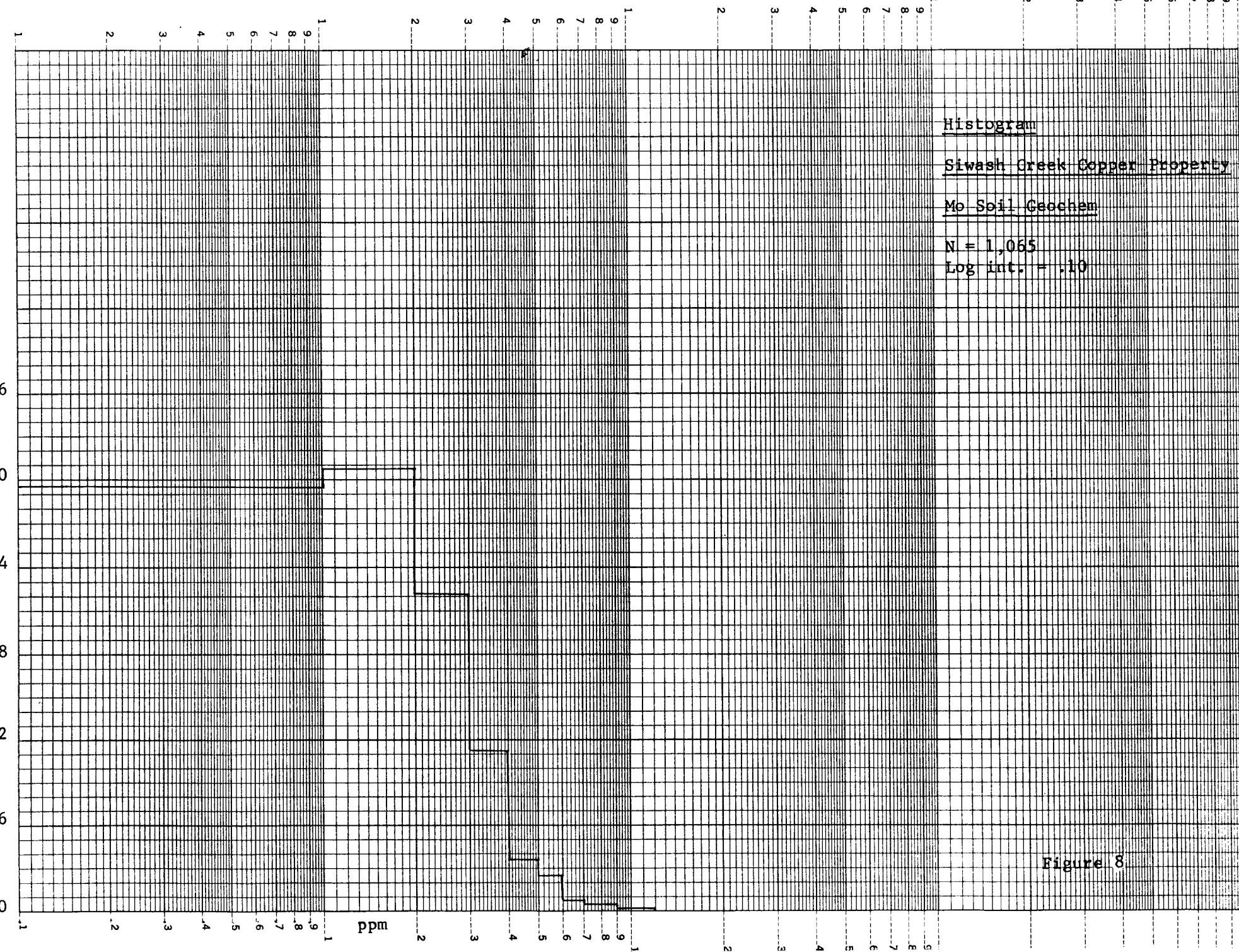


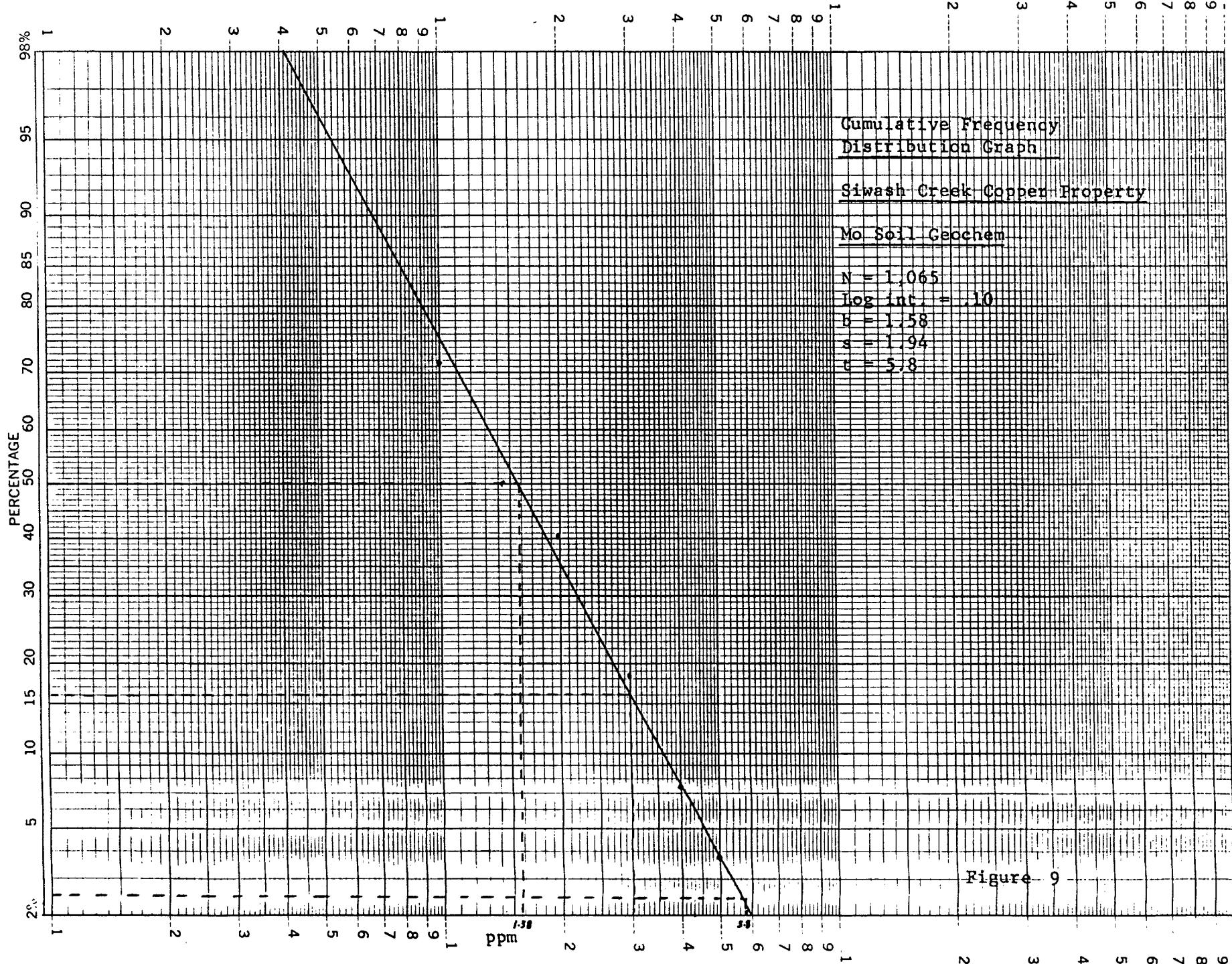




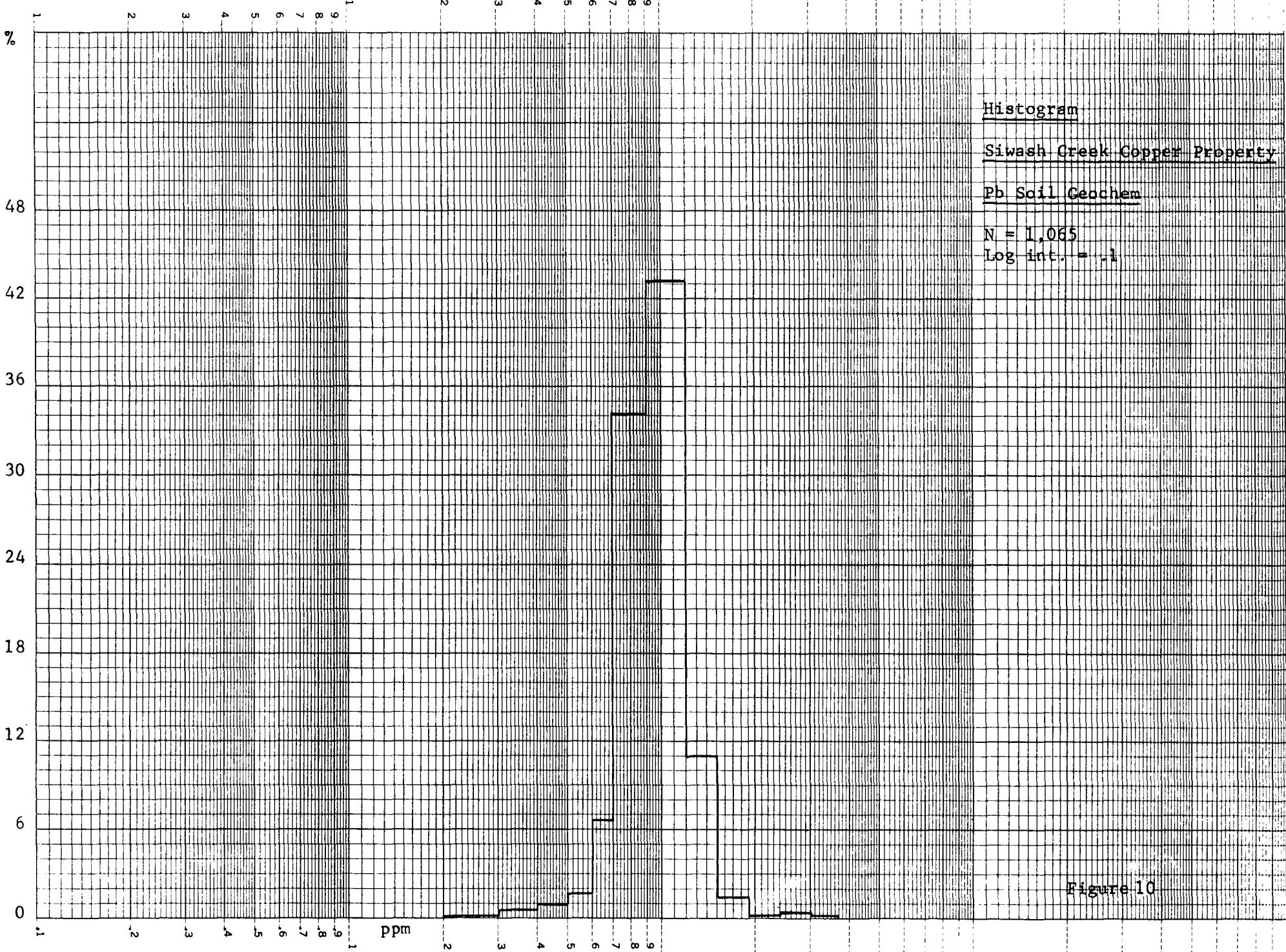
K+E SEMI-LOGARITHMIC 4 CYCLES x 60 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

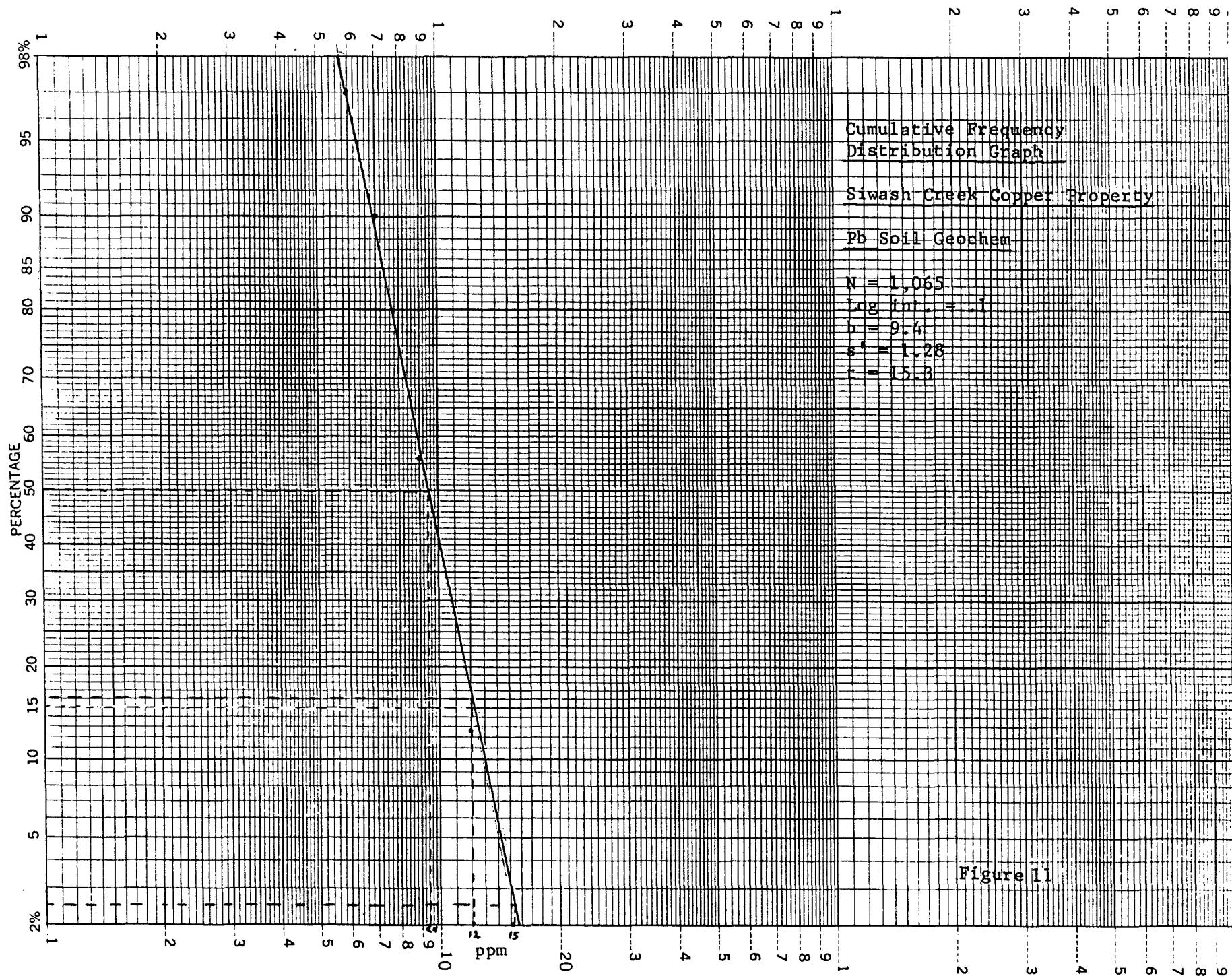
46 5890





46 5890





K+E SEMI-LOGARITHMIC 4 CYCLES x 60 DIVISIONS
KEUFFEL & ESSER CO. MADE IN U.S.A.

46 5890

%

27

24

21

18

15

12

9

6

3

0

1

2

3

4

5

6

7

8

9

10

20

30

40

50

60

70

80

90

1

2

3

4

5

6

7

8

9

10

ppm

Histogram

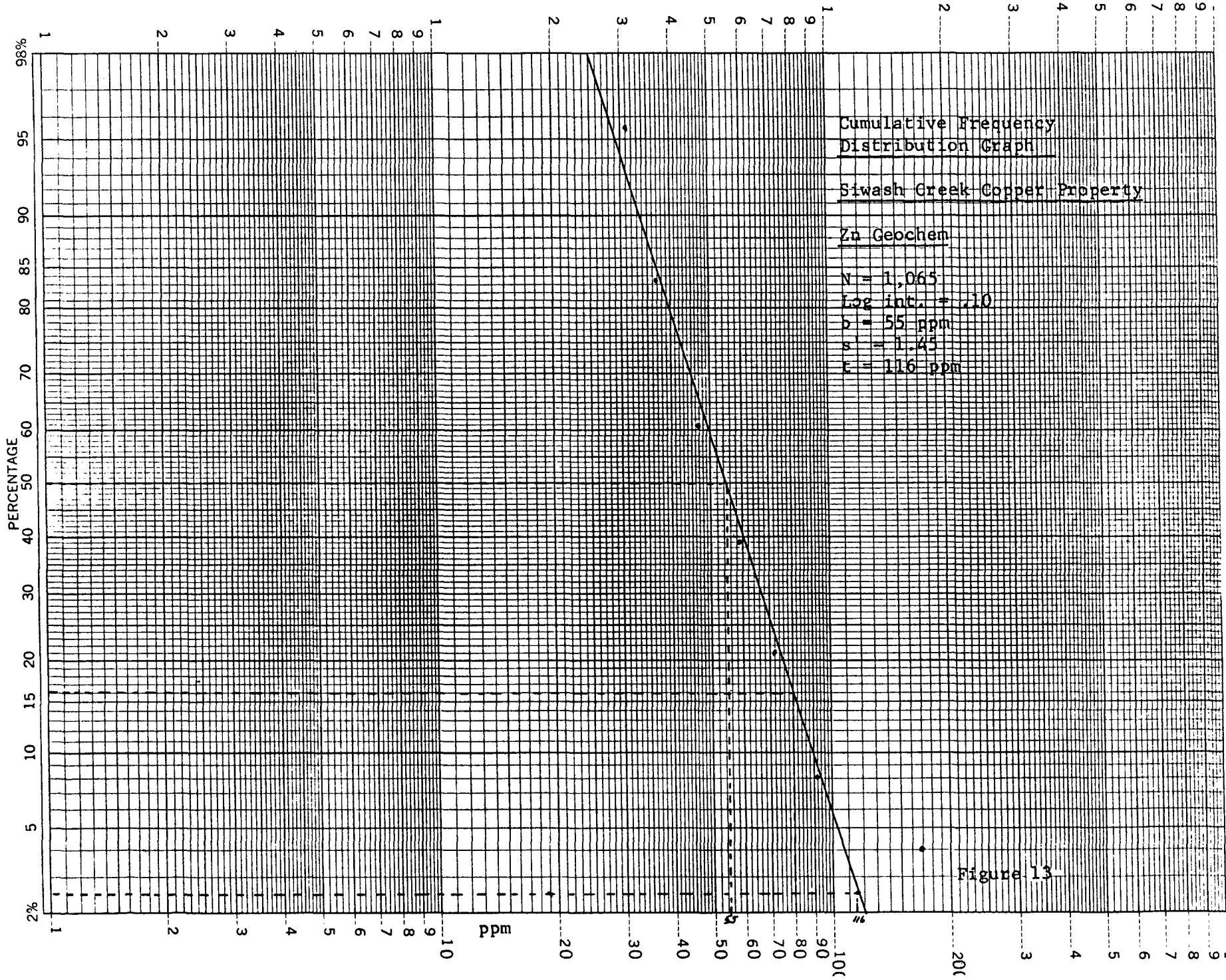
Siwash Creek Copper Property

Zn Geochem

N = 1,065

Log int. = .1

Figure 12



c) Discussion of Results

The geochemical survey has identified three copper anomalies. Two of these were previously identified by Utah Mines Ltd. and the third occurred further to the east. With the exception of several high copper values, these anomalies are considered low. This, however, could be a result of the variation of soil cover over the property. Low lead and zinc values generally correspond with the copper anomalies.

Zone I

A series of small copper anomalies occur along the east side of Siwash Creek between 4 + 00N and 5 + 00S. Two of these correlate with malachite - chalcopyrite mineralization. A larger copper anomaly surrounds a trenched area showing only pyrite mineralization.

Zone II

Zone II follows the western slope of a south-easterly trending ravine located between 6 + 00N and 9 + 00S. The strongest and most widespread Cu anomaly on the property appears to be restricted to the talus within this zone. Geological mapping has identified several small copper occurrences within the area.

Zone III

Several minor Cu anomalies occur within a large ravine on the eastern map area (8 + 00S and 8 + 00N, 10 + 00E and 13 + 50E). Only malachite staining is present within this zone.

Sporadic molybdenum anomalies along the northern and southern margins of the property appear to be unaffected by topography or soil thickness. Anomalies are weak (3 to 8 ppm) and unconfirmed by geological mapping.

As with most soil surveys, several small anomalies and isolated anomalous values occur across the area. These values were plotted and contoured, but have been largely ignored in the geochemical interpretation.

VII CONCLUSIONS

The Siwash Copper Property to date consists of two trenched showings within the andesite. Both of these occur near the diorite intrusive, one to the north and one to the south. The 1979 geology survey located several smaller malachite occurrences in the survey region. The geochemical survey showed three main anomalies which surround the diorite to the north, east and south. These soil anomalies are separated by areas of low soil values which may be a result of the irregular soil cover as mentioned in this report.

Both the geology and geochemical surveys support the possibility that a zone of mineralization may occur as an aureole around the eastern half of the intrusive. Due to the nature of this property, surface surveys appear to be affected by: a) steep, irregular topography, b) variation in soil cover and soil development, c) surface leaching of fracture related sulphides. For this reason the effectiveness of the 1979 surveys was marginal.

APPENDIX I

PREPARATION of SOILS and SILTS for GEOCHEMICAL ANALYSIS

1. Empty soil sample into the pan and then place the sample packet into the pan with the sample.
2. Place the pan containing the sample into the oven (Temp=105 C) and leave until dry approx. 2 hours.
3. Remove from the oven when dry and remove rocks and twigs etc.
4. Break up the clay lumps with a rubber bung and then transfer the sample to an 80 mesh screen.
5. Screen approx. 50 - 100 grams of sample through the screen and transfer to the original packet and seal.
6. Discard the +80 mesh fraction of the sample.

ANALYSIS by A.A. for Cu, Pb, Zn, Ag and Mo.

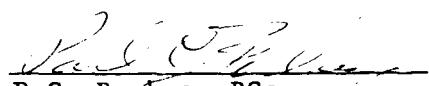
1. Weigh 2.00 GM on the top pan balance into a 150 ML beaker (check that beaker No. is the same as written on work sheets)
2. Add 15 MLS Nitric Acid, cover with watchglass and heat on low heat until brown Nitrous fumes are gone.
3. Remove beakers from hot plate, cool for 5 minutes.
4. Add 10 ML Hydrochloric Acid. Place on hot plate. When all brown Nitrous fumes are gone, remove watchglasses and take just to dryness on a low plate.
5. Remove from plate, cool, add 20 MLS distilled water, 5 MLS Conc. Hydrochloric Acid and boil salts into solution.
6. Cool in water bath, when cold transfer to 100 MLS Volumetric flask, add 1 MLS Superfloc solution and dilute to 100 MLS with distilled water.
7. Mix thoroughly and then transfer to original beaker.
8. When all samples ready, transfer to A.A. room for reading.
9. If Mo is required, 10.00 MLS of this solution is transferred to a test tube and 1.00 MLS of ALC_3 solution added.

APPENDIX II

STATEMENT OF QUALIFICATIONS

I, Paul Bankes, of the town of Peachland, Province of British Columbia,
do hereby certify that:

- 1) I am a geologist residing in Peachland with Post Office Box 9 as my address.
- 2) I am a graduate of the University of Western Ontario, with a BSc in geology (1978).
- 3) I have been employed as an exploration geologist by Brenda Mines Ltd. since April 1978.

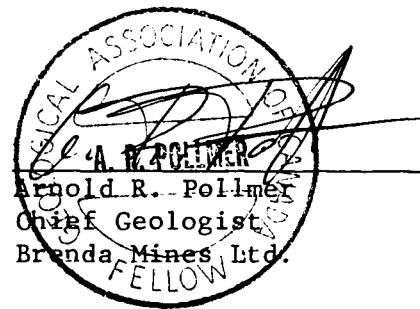

P.C. Bankes, BSc
Exploration Geologist
Brenda Mines Ltd.


Date

STATEMENT of QUALIFICATIONS

I, Arnold R. Pollmer of Peachland, Province of British Columbia,
do certify that:

- 1) I have been employed as a geologist by Noranda Mines Limited from December 1973 to June 1977; I am presently employed as the chief geologist by Brenda Mines Ltd.
- 2) I am a graduate of the University of Wisconsin with a Bachelor of Science Degree in Geology (1972).
- 3) I am a member of the Canadian Institute of Mining and Metallurgy.
- 4) I am a fellow of the Geological Association of Canada.



APPENDIX III

Personnel and Time Allotment

Work was performed on the property between June 12 and June 18, 1979 and between September 21 and September 22, 1979.

Crew members were:

		<u>Man Days</u>
Paul C. Banks	Project Geologist	9
Del W. Ferguson	Exploration Geologist	7
Ralph Allen	Field Assistant	7
Tim Henneberry	Student	7
Tim Charman	Student	7
Norm Bussolaro	Student	7
Graham Davidson	Student	7
Herb McAleenan	Student	7

APPENDIX IV

STATEMENT of COSTS on the COPPER I CLAIM BLOCK

1) Line Cutting

June 12 - 18, 1979; seven days;
22 kilometres at \$33/line kilometre 762.00

2) Geochem Survey

June 12 - 18, 1979; seven days; 533 soil samples;
\$23.73/man day for 26 man days 617.20

3) Geology

June 15 - 16, 1979; two days;
\$60/day for one geologist 120.00

4) Transportation

Truck Rental
June 12 - 18, 1979; seven days @ \$14.25/day 99.75

Fuel Cost
June 12 - 18, 1979; seven days @ \$7/day 49.00

5) Road Upgrading

September 21 - 22, 1979; 2 days, 18 hours @ \$73.61/hour
for a D8 Cat 1,325.00

6) Assay Costs

533 soil samples analysed for Cu, Mo, Pb, Zn
@ \$3.69/sample 1,967.73

7) Food and Camp Expenses

June 12 - 18, 1979; seven days; \$16.57/man/day for
a four man crew 463.95

8) Report Preparation

a) Writing and Drafting
March 3 - 12, 1980; 8 days @ \$80/day 640.00

b) Typing
April 1 - 2, 1980; 2 days @ \$50/day 100.00

c) Supplies
Paper, etc. 45.00

Total \$6,153.64

STATEMENT of COSTS on the COPPER II CLAIM BLOCK

1)	<u>Line Cutting</u>	
	June 12 - 18, 1979; seven days; 26 kilometres @ \$33/line kilometre	858.00
2)	<u>Geochem Survey</u>	
	June 12 - 18, 1979; seven days; 533 soil samples; \$23.73/man day for 26 man days	617.20
3)	<u>Geology</u>	
	June 17 - 18, 1979; two days; \$60/day for two geologists	240.00
4)	<u>Transportation</u>	
a)	<u>Truck Rental</u> June 12 - 18, 1979; seven days @ \$14.25/day	99.75
b)	<u>Fuel Costs</u> June 12 - 18, 1979; seven days @ \$7/day	49.00
5)	<u>Assay Costs</u>	
	533 soil samples analysed for Cu, Mo, Pb and Zn @ \$3.69/sample	1,967.73
6)	<u>Food and Camp Expenses</u>	
	June 12 - 18, 1979; seven days; \$16.57/man/day for a four man crew	463.96
7)	<u>Report Preparation</u>	
a)	<u>Writing and Drafting</u> March 17 - 26, 1980; 8 days @ \$80/day	640.00
b)	<u>Typing</u> April 3 - 4, 1980; 2 days @ \$50/day	100.00
c)	<u>Supplies</u> Paper, etc.	<u>45.00</u>
	Total	\$5,080.61

LEGEND

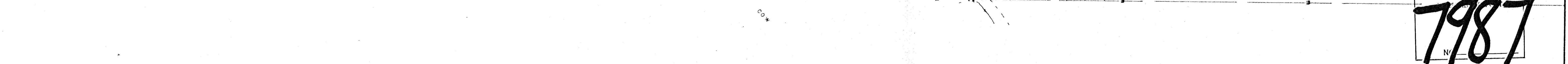
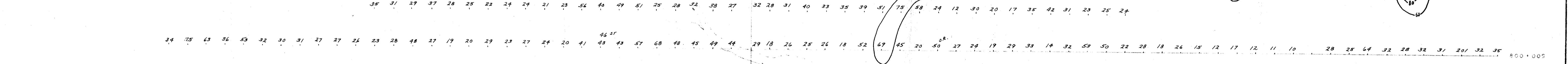
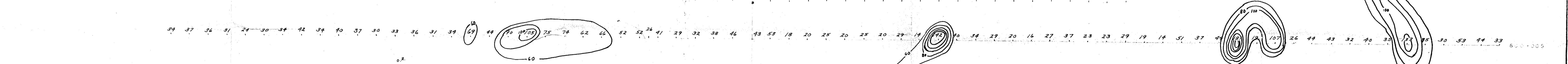
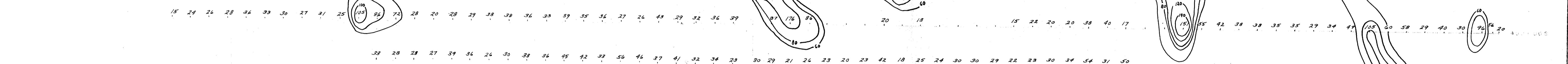
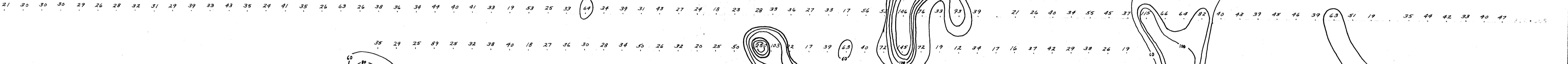
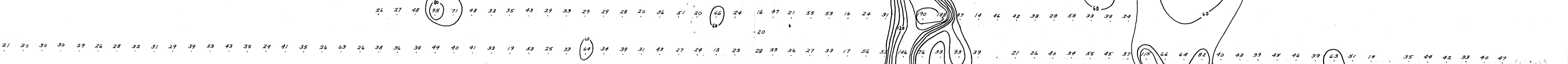
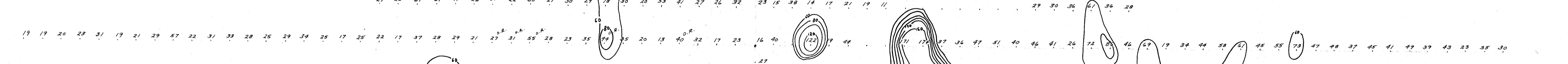
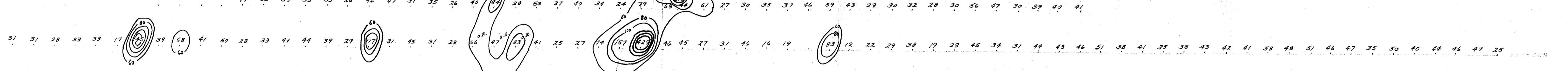
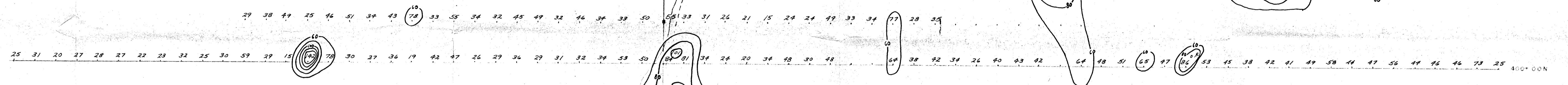
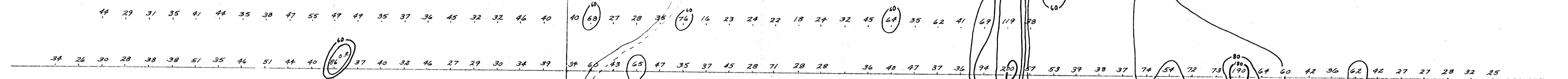
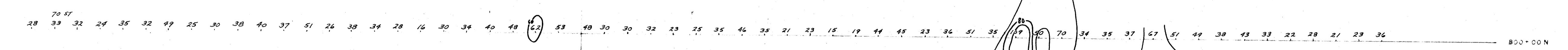
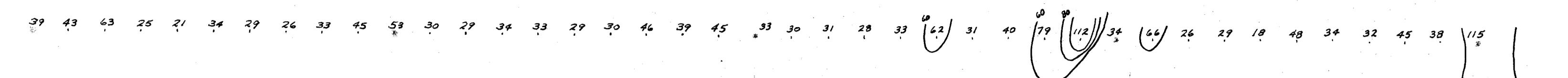
Contour Interval 20 ppm

Contour Interval 100ppm

Low Anomalous

Anomalous

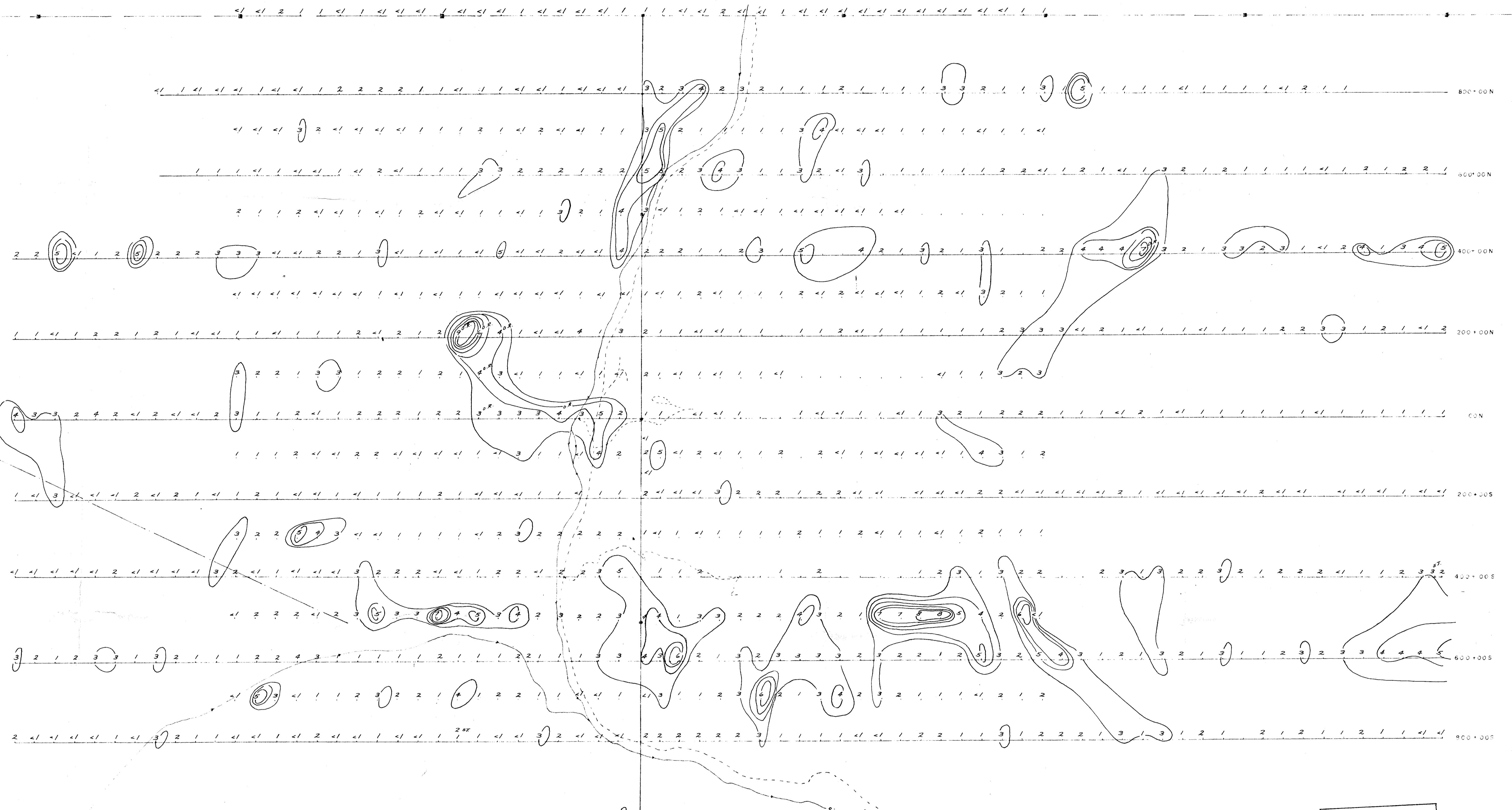
High Anomalous



MINERAL RESOURCES BRANCH

7987
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BRENDA MINES LTD.	
Design	SIWASH CK. COPPER PROPERTY
Drawn	Cu - Geochem
Check	Approv.
Rev. No.	SCALE: 1:5000
Revision	DWG. No. Figure 15



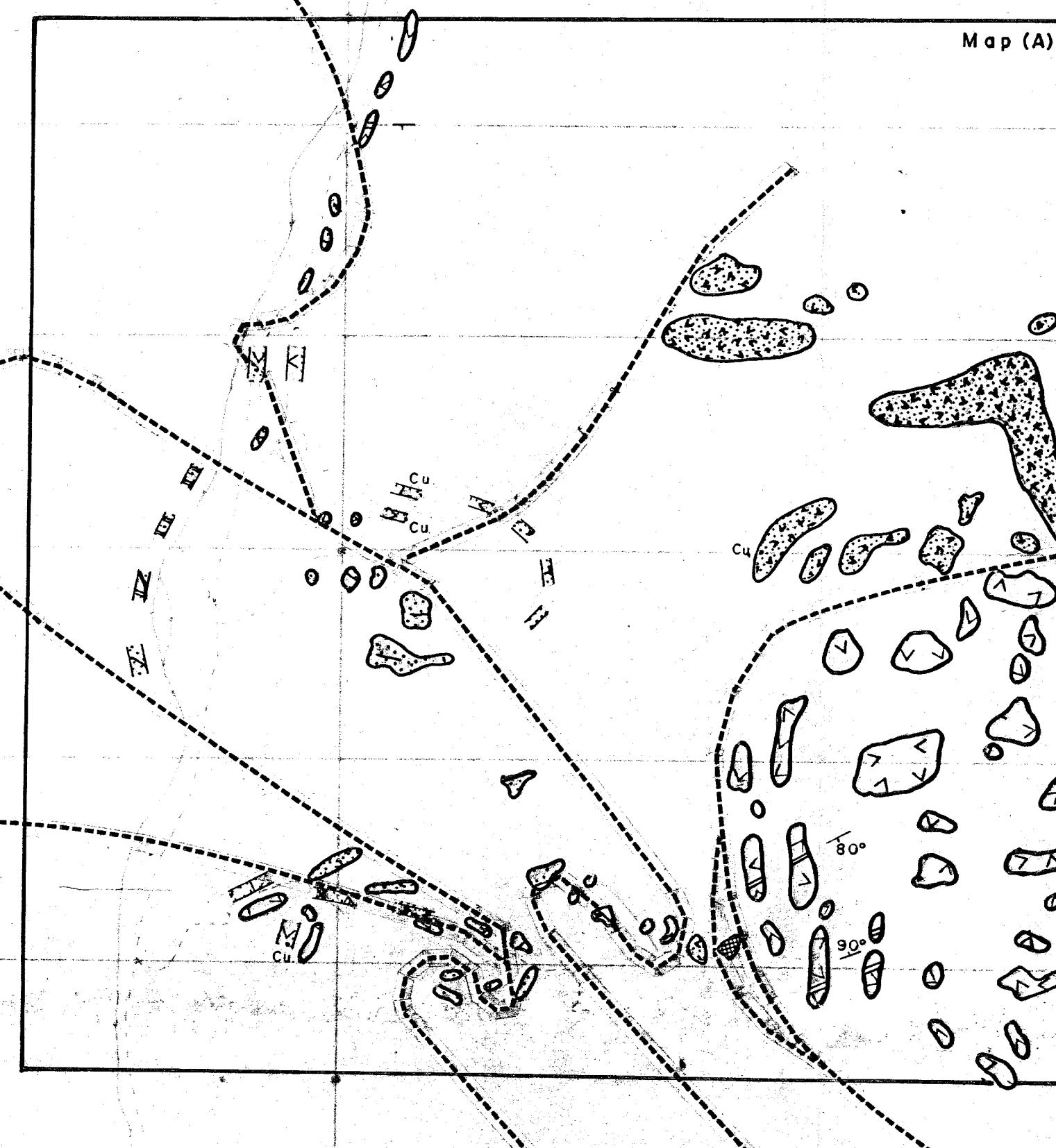
MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
1981
NO.

B R E N D A M I N E S L T D .	
Design	SIWASH CK. COPPER PROPERTY
Drawn	
Check	Mo - Geochem
Approved	SCALE: 1:5000 DWG. No. Figure 16
Rev. No.	Revision

LEGEND

- RYHOLITE PORPHYRY
- MONZONITE
- DIORITE
- ANDESITE PORPHYRY
- ANDESITE
- MARBLE

- Outcrop.....
Mineralization.....
Geological Boundary.....
Strike and Dip.....
Trench.....
Road.....
Trail.....
Stream.....
Marsh.....



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BRENDA MINES LTD.		SIWASH CK. COPPER PROPERTY	GEOLGY	SCALE 1:5000	DWG. NO. Figure 14
Design	Drawn	Check	Approved	Rev. No.	Revision

5-00N

4-00N

3-00N

2-00N

1-00N

0-00N

1-00S

2-00S

3-00S

4-00S

5-00S



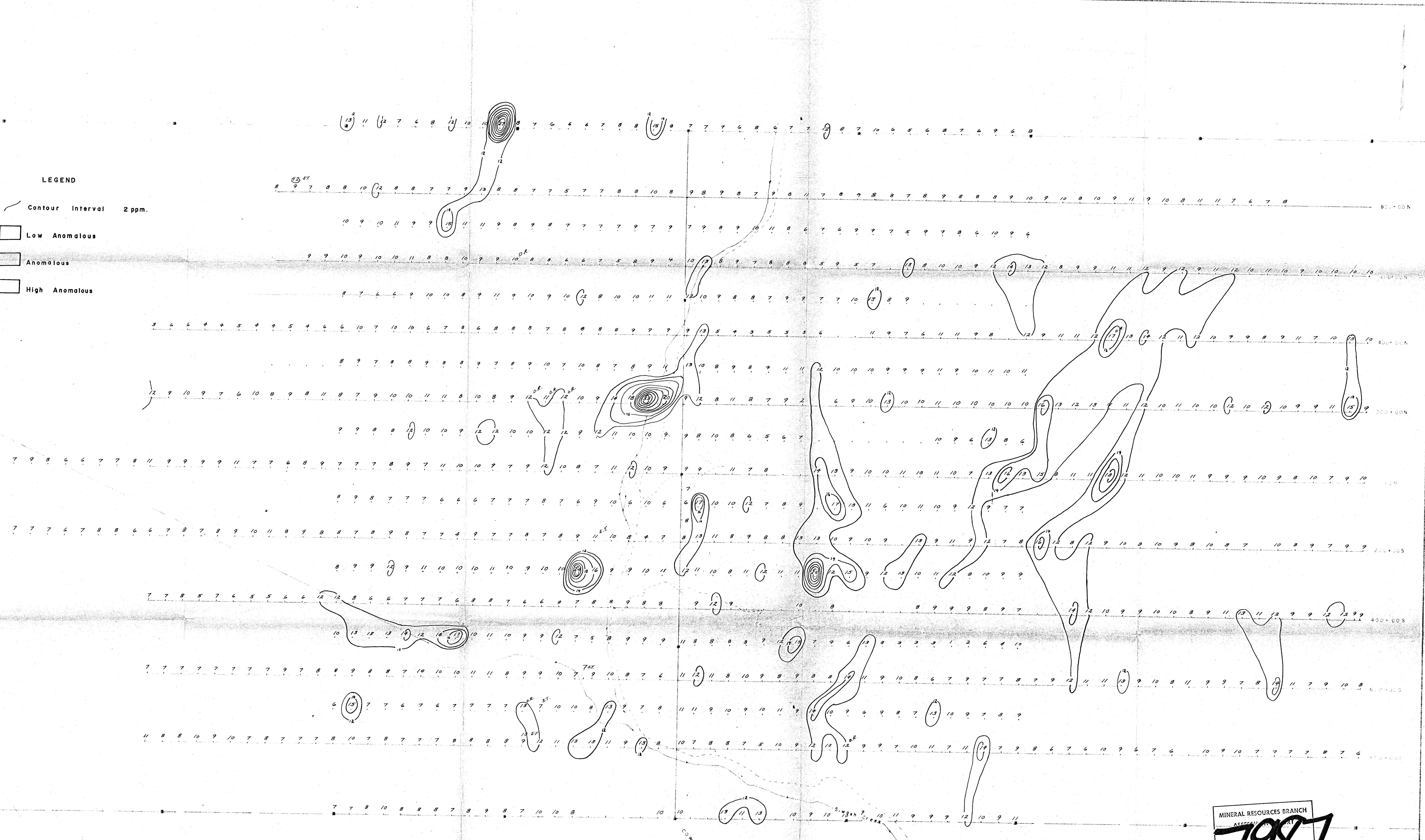
LEGEND

- RYHOLITE PORPHYRY
- MONZONITE
- DIORITE
- ANDESITE PORPHYRY
- ANDESITE

- Outcrop.....○
- Mineralization.....Cu.
- Geological Boundary.....---
- Strike and Dip.....↑↓
- Trench.....VV
- Road.....—
- Trail.....—
- Stream.....()

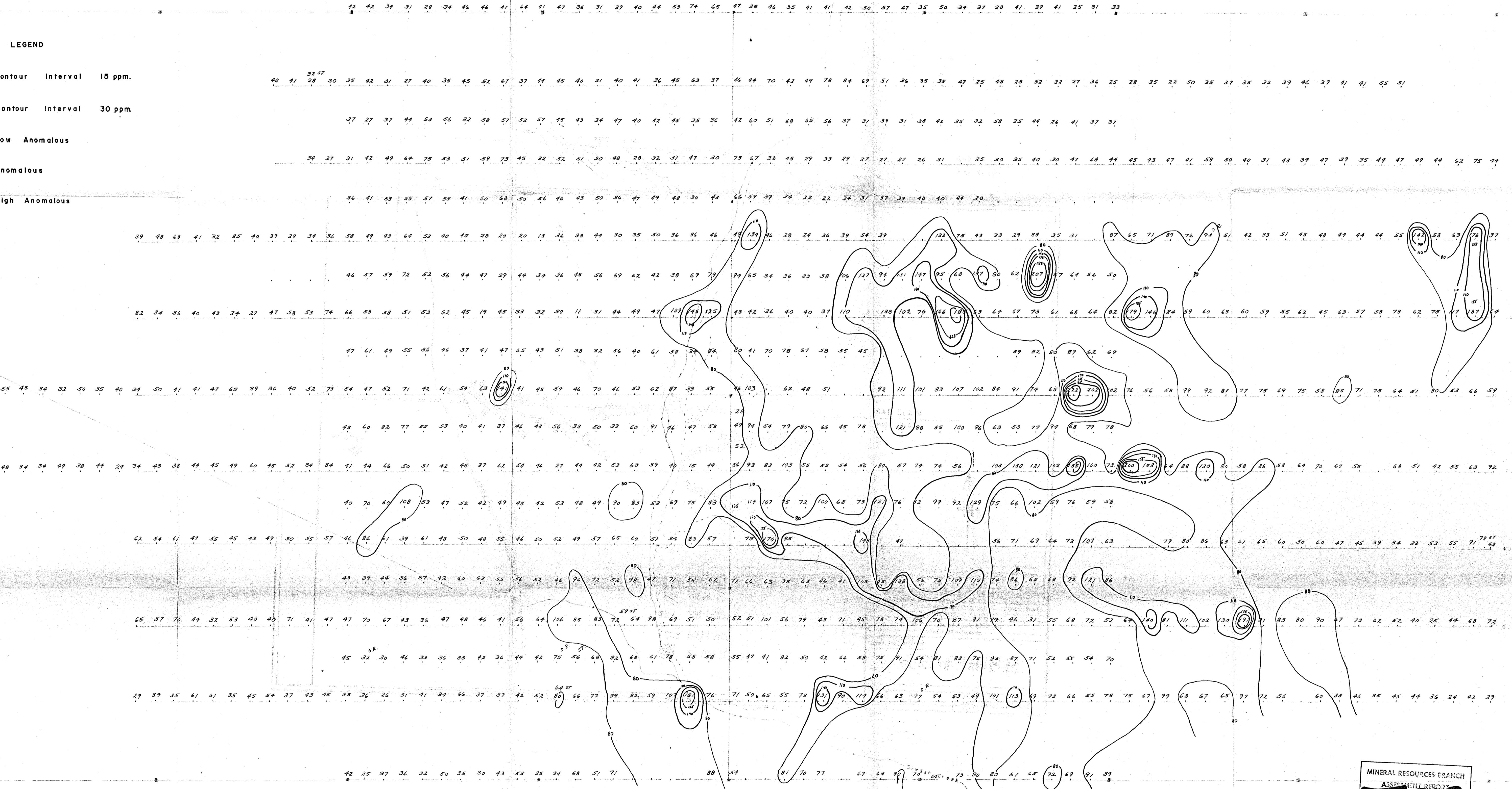
MINERAL RESOURCES BRANCH
ASSESSMENT WORKS
NO. 7981

BRENDA MINES LTD. EXPLORATION GROUP		SIWASH CREEK COPPER GEOLOGY (MAP A)
Drawn P.C. BANKES	Check.....	SCALE: 1:2,000
	Approv.....	FILE NO. Figure 14



MINERAL RESOURCES BRANCH
ASSESSMENT UNIT NO.
7987

BRENDA MINES LTD.	
Design Drawn Check Approved	SIWASH CK. COPPER PROPERTY Pb - Geochem
Rev. No.	SCALE 1:5000 DWG. NO. Figure 17



MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
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NO.

BRENDA MINES LTD.	
Design	SIWASH CK. COPPER PROPERTY
Drawn	Zn - Geochem
Check	
Approv.	SCALE: 1:5000 DWG. No. Figure 18
Rev. No.	Revision