Province of
British Columbia

Ministry of
Energy, Mines and
Petroleum Resources

Parliament Buildings
Victoria
British Columbia
V8V 1X4

EXPO

→ DVL

November 22, 1985

827748
Mt. Sicker Area
Tyee Lenora
mine
092B/13

Mr. Alex J. Davidson,
Senior Exploration Geologist,
Corporation Falconbridge Copper,
6415 - 64th Street,
DELTA, British Columbia V4K 4E2

Dear Alex:

Enclosed is a plot of the analyses, done by our own analytical laboratory, on soil samples collected by the prospecting class at Mt. Sicker. The grid used was your grid in the vicinity of the Tyee and Lenora mine workings. The samples were collected under the direct supervision of Stan Hoffman and the other geochemical instructors so it would be a safe assumption that the sampling is of good quality. The major gaps in the data are areas of obvious contamination. As per your request, Stan Hoffman has not seen these data, nor has anyone else outside of the Geological Branch.

We are presently storing the pulps from these samples but do not anticipate anything further with them. If you would like to have the pulps for possible follow-up work we will be happy to turn them over to you.

I am also enclosing a copy for you of a sample assessment report written by Stan Hoffman as an example for the students of how an assessment report should be done (I'm not insinuating that we have any problem with CFC reports!). The data he is reporting on are the results of Holman and Bloom field tests performed on site by the students at the same time that the main soil samples were being collected. The report is a mock-up, but the data and interpretation are real. I think you'll find some of his comments interesting.

Best wishes and good luck with your current work at Mt. Sicker and Indian River.

Yours truly,

H. Paul Wilton, P.Eng.,
District Geologist.

HPW:gd
CC: V.A. Preto
Encls:

GEOCHEMICAL ASSESSMENT REPORT ON THE

TYEE-LENORA GRID

MOUNT SICKER PROPERTY

Located Approximately 11 km Northwest of
Duncan, British Columbia

NTS 92B/13

Longitude 123°46.9', Latitude 48°51.9'

Dr. S.J. Hoffman
Geochemist

October, 1985

SUMMARY

Approximately 350 soil sites were tested using the Bloom "Total Heavy Metals" and Holman Copper methods on the Mount Sicker property (Tyee-Lenora). The BF soil horizon was sampled where available at 25 metre intervals along lines 50 metres to 100 metres apart; the BM horizon was sampled where the BF horizon was absent. Areas of extensive contamination were avoided, or where sampled were clearly noted on the geochemical map.

One major anomaly some 800 metres long, open to the west, and averaging 100 metres wide was outlined where values commonly exceed 10+. Two subareas within this zone not obviously related to contamination merit a second ground inspection.

One zone north, and four zones south of the main trend represent geochemical features of interest. Each averages 100 metres across and is characterized by maximum values in the 3.5 to 10+ range, weaker in contrast to background than the zone where contamination is obvious. Overburden cover in all areas is thin and residual in nature. Detailed geological mapping and sampling is recommended to be the first followup procedure, followed by trenching to bedrock if earth moving equipment is readily available and inexpensive. Otherwise, geophysical methods searching for conductors, faults and alteration zones might be

considered to locate drill targets. Geochemically anomalous areas defined by this study should be followed up in view of their proximity to the known Tyee and Lenora massive sulphide occurrences.

RECOMMENDATIONS

1. Available soil samples should be tested for a minimum element suite of copper, lead, zinc, silver, gold and cadmium based on past production statistics in this area. Multielement analysis is to be recommended.

2. Confirmed of Bloom test anomalies by (1) above would be further investigated using mapping and bedrock chip sampling techniques and/or trenching to bedrock across anomalous zones. The objective of this work is to locate the "root zones" of the soil anomaly.

3. Concurrently or subsequently geophysical methods could be applied to assess potential bedrock sources. Conducting recommendation (2) before recommendations (3) would be based on low costs of mobilization of earth moving equipment and the need to know geological controls in advance of decisions relating to the type of geophysical method which would be most appropriate.

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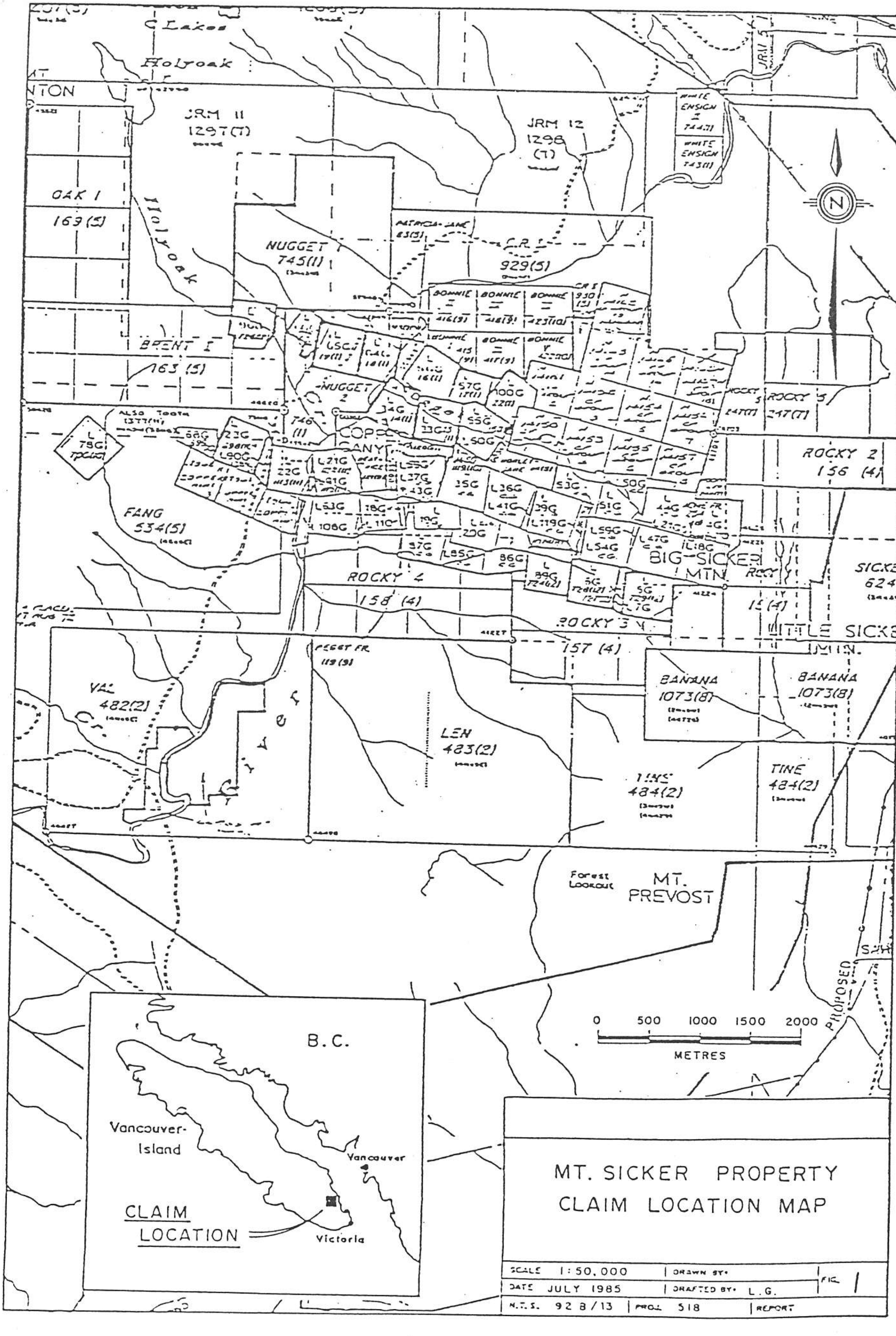
INTRODUCTION

The Mount Sicker property consists of the Tyee and Lenora Mines which produced copper, gold and silver between 1898 and 1907. The Tyee property returned to production between 1943 and 1947 and again in 1951 and 1964. In latter years lead, zinc and cadmium were also recovered.

Discovery and exploration history of the properties is recorded elsewhere (Muller et al, 1981). In recent years, interest in the areas has been generated by the topical nature of volcanogenic massive sulphide exploration and the belief that early feuding between owners of the Tyee and Lenora Mines proved counterproductive to efficient exploitation and exploration of the Mount Sicker deposits. This promotes the belief that a sufficient tonnage of ore may remain in known workings and/or in the immediate surroundings to be of economic interest.

The geochemical soil survey was undertaken to locate sub-outcropping exposures of massive sulphide occurrences near the two old mines. Contamination is a problem in the valley below mine workings, but sampling was conducted nevertheless in view of the possibility of additional virgin discoveries being made associated with favourable geology near the past producers. This report describes results of the geochemical survey.


MT. SICKER PROPERTY
CLAIM LOCATION MAP
SCALE 1:50,000
DATE JULY 1985
DRAFTED BY: L.G.
N.T.S. 92 B/13
PROJ. 318
FIG. 1
0 500 1000 1500 2000
METRES
B.C.
Vancouver-Island
Vancouver
Victoria
CLAIM LOCATION
Holyoak
JRM 11 1297(7)
JRM 12 1298 (7)
OAK 1 169(5)
NUGGET 1 745(1)
C.R. 1 929(5)
BRENT I 163 (5)
NUGGET 2
FANG 534(5)
ROCKY 4 158 (4)
ROCKY 3 157 (4)
ROCKY 2 156 (4)
ROCKY 5 247(7)
BIG SICKER MTN
LITTLE SICKER MTN.
BANANA 1073(8)
VAL 482(2)
LEN 483(2)
TINE 484(2)
MT. PREVOST
Forest Lookout
PROPOSED

LOCATION AND ACCESS

The Mount Sicker property lies at an elevation of 600 metres, 11 km northwest of Duncan, B.C. on Vancouver Island (see inset, Fig. 1). The property can be reached from the junction of the Youbou and Cowichan Lake roads by travelling 23.6 km eastward to Somenos Road, 0.4 km along Somenos Road before turning onto the Mount Prevost Road. Turnoff from the Mount Prevost Road is to the right after 5.1 km, and then to the left at Three Ribbons on a tree at 0.4 km. The Mines Road is labelled at 1.6 km.

The dumpsite at the Tyee Mine can be reached by high clearance two wheel drive vehicles. Travel on much of the property along the numerous road requires a four wheel drive vehicle.

CLIMATE

Mount Sicker lies in a temperate climate. Annual rainfall is about 150 cm per year. Precipitation is greatest in the winter and lowest in the summer.

GEOLOGY

Regional geology of the property is found in Clapp (1912). The following is a summary of detailed geology on the property.

Two parallel sulphide bodies (north and south) are believed to be massive to partial replacement of Sicker group folded tuffs and schists bounded by sodic rhyolite porphyry. Fine grained diorite forms sill-like bodies, and coarse grained diorite forms irregular masses and dykes which intrude the sediments. All rock types are older than the ore bodies which lie along two main dragfolds and were displaced by two main east-west faults. Two ore types occur. Barite ore is a fine grained mixture of pyrite, chalcopyrite, sphalerite and minor galena in a barite-calcite-quartz gangue, frequently banded with chalcopyrite-pyrite and sphalerite layers. Quartz ore is mainly quartz and chalcopyrite and occurs in long lenticular masses replacing barite ore and enclosing schists. Both north and south orebodies were mined on the Tyee and Lenora.

LAND STATUS

The status of claims around the Tyee and Lenora deposits are shown on Figure 1.

GEOCHEMICAL SURVEY

1. Landscape, Topography, Drainage

   The property is characterized by subdued mountainous topography, steep slopes of 20° being common. A series of creeks drains the central portion of the grid area, coallescing in the west into a single channelway.

2. Overburden, Soils and Vegetation

Overburden is generally thin, averaging 1 to 2 metres in thickness, ranging in the south up to perhaps 5 metres. Residual overburden and residual overburden mixed with glacial till predominate. Talus and overgrown talus are found over steeper slopes where outcrop is abundant. An ablation glacial till typifies the southern portion of the western half of the grid.

Soils are freely drained. Soils are commonly podzols, with a red brown BF horizon typical. Soil development has been less intense near talus deposits and soil formation has proceeded only to the stage of brunisol development typified by a medium olive brown BM horizon. Soil disturbance represents a serious problem near existing workings, tailings, roads, and leach piles.

The property is covered by a second generation growth of Douglas Fir, portions reaching marketable status. The mine workings area has been naturally reforested by poplar.

3. Sample Collection

Approximately 500 gm of sample was taken over a portion of the grid at 25 metre intervals along lines 50 metres to 100 metres apart. Soil pits were excavated with a shovel to a 30 cm or deeper depth, the soil horizons examined, and material taken from the BF horizon (or the BM where the BF was absent). Field notes were recorded on site and a plastic flag or picket marked the sample location. Soils were tested at 350 sites on location. Field notes and results are tabulated in Appendix 1.

4. Geochemical Analysis

A constant volume of soil was analyzed using the Bloom "total heavy metals" (THM) and Holman Copper tests. Soil samples returned from the field were air dried at ambient temperatures and are available for chemical analysis at the laboratories of the B.C. Department of Mines in Victoria. Analytical procedures are found in Appendix 2.

5. Method of Data Handling

Histograms were drawn of results for each field test. Obviously anomalous results representing contamination were not considered by the histogram analysis but have been contoured within the most anomalous contour level.

Remaining values define one population having characteristics of a normal distribution (see Appendix 3).

The upper 5% of the data were defined as being highly anomalous, and a second 5% of next highest values were contoured as being weakly anomalous. About 10% of the survey area is considered interesting for purposes of followup.

DESCRIPTION OF RESULTS

1. THM (Fig. 2)

The THM results are dominated by an east-west trending zone (No. 1) at least 800 metres long, open to the west, averaging 100 metres wide. Values often exceed 10. The anomaly is associated with known mine sites, dumps, tailings, roadbeds, adits, leach sites etc.; sources of obvious contamination along the valley bottom. The great age of the spoils has made identification of obvious contaminated sources difficult in some areas, such as along L5W/6+50S and L1E/6+50S, where additional work is needed to confirm or otherwise explain apparent virgin anomalies along the valley floor.

North of the main trend lies a two point, 100 metre long zone (No. 2), defined by values of 4 and 5. Possible contamination is evident near the western edge of the anomaly. The source of metal for the remainder of the

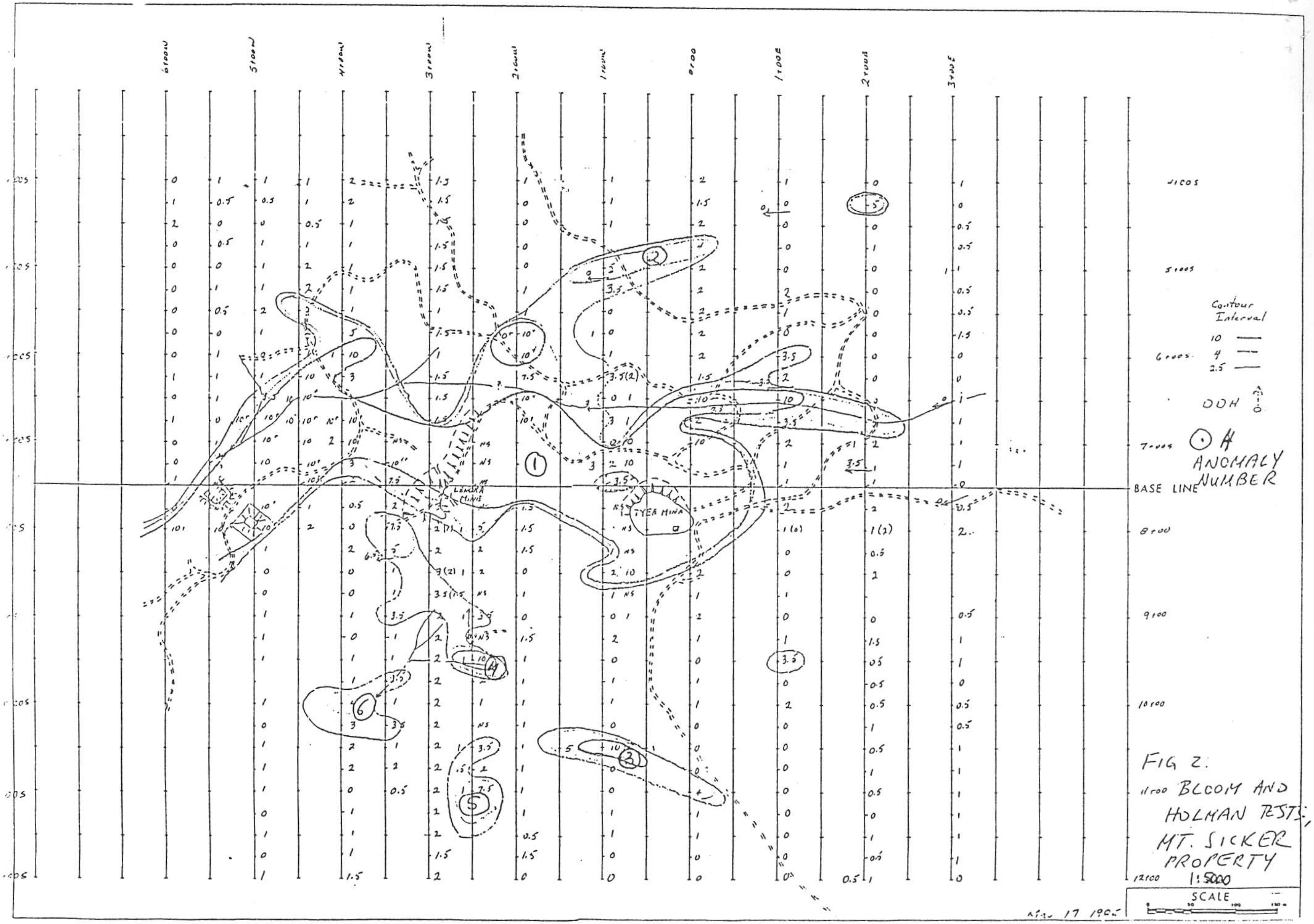


FIG 2.
BLOOM AND HOLMAN TESTS, MT. SICKER PROPERTY
1:5000

anomaly is not obviously contamination, and the area merits a second inspection.

More outstanding are a cluster of four zones (labelled No. 3, 4, 5, and 6) to the south of the main trend. These tend to be multisample anomalies having an approximate east-west or west-northwest trend and an average width of 25 to 50 metres. Potentially, a bedrock source may have an overall 400 metre lateral strike extent. Maximum values are generally in the 3.5 to 7.5 range with two values of 10+. At the location along L1W (No. 3), ground bedrock chips of local outcrop also indicated a positive THM result.

Lines 2W and 3W which initially gave anomalous results between 9S and 10S in 1984 could not be repeated, but adjacent lines 2+50W and 3+50W in 1985 give results similar to the 1984 work. Readings along the southern portion of L3W are consistently at 2, a level slightly higher than recorded elsewhere on the grid, suggesting analytical error and/or contaminated reagents in 1985 along L3W.

2. Holman (Fig. 2)

Holman values tend to be below the detection limit, and all measurable values are considered anomalous. The tailings area reports the highest values. Elsewhere L2+50W returns weakly anomalous results which are not matched by comparable features on either L2W or L3W. One anomalous value of 0.5 is found at the south end of L2E in an area of otherwise background values.

DISCUSSION OF RESULTS

The main anomaly is probably due to a variety of contaminated sources and is not of further interest. Zones north and particularly south of the main trend potentially represent new massive sulphide occurrences trending approximately parallel to the known ore zones. These should be investigated.

Overburden cover appears thin and locally derived (residual) and outcrop is abundant in many areas. Geochemical anomalies probably reflect local bedrock sources expected to lie within 50 to 100 metres upslope of a respective soil anomaly.

Soil anomalies can be followed up relatively inexpensively by geological inspection and trenching. Geophysical surveys might also assist by identifying potential bedrock zones of interest which could also be trenched. The most promising anomalies on followup could then be targets for a diamond drill program.

CONCLUSIONS

The soil geochemical survey has highlighted contamination related anomalies within which lie possibly two areas of interest seemingly unrelated to old workings. More outstanding are four metal-rich zones 250 metres south of the Tyee-Lenora. The 400 metre long anomalous zone merits priority followup.

REFERENCES

1. Clapp, C.H., 1912. Southern Vancouver Island, GSC Memoir 13, 206 pp.

2. Muller, J.E., Cameron B.E.B., and Northcote, K.E., 1981. Geological and Mineral Deposits of Nootka Sound Map Area, Vancouver Island, B.C., 53 pp.

APPENDIX 1

LIST OF FIELD NOTES AND RESULTS

Xerox copies of notes to
be included here
(not available for this report).

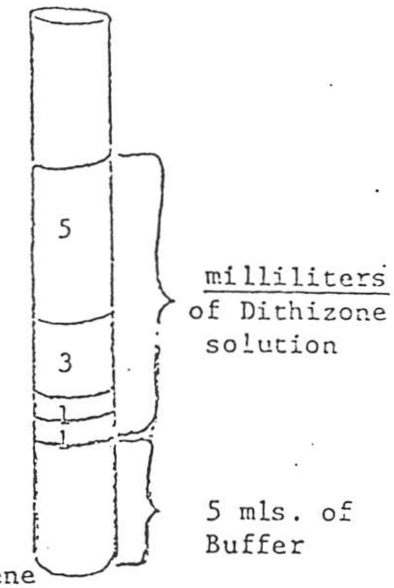
APPENDIX 2

ANALYTICAL PROCEDURES

212 Brooksbank
North Vancouver, B. C.

HEAVY METALS IN STREAM SEDIMENTS

BLOOM TEST FOR EXCHANGEABLE HEAVY METALS



Field equipment and apparatus (1 Kit)

- 1 - field kit
- 1 - 100 ml. graduate cylinder
- 6 - pyrex test tubes - calibrated
- 1 - 250 ml. brown plastic bottles
- 2 - 250 ml. plastic wash bottles
- 6 - polyethylene stoppers
- 1 - volumetric scoop - approx. 0.25 gm.

Field Chemicals

- 2.5 liters prepared Bloom buffer
- 2 liters Benzene
- 5 - 10 mg. capsules Dithizone.

Preparation of dithizone stock solution - 0.01%

Dissolve 10 mg. (1 capsule) of Dithizone in 100 mls. of Benzene Shake for about 3 minutes to dissolve.

Preparation of working dithizone solution - 0.002%

Dilute 1 part 0.01% dithizone stock solution with 4 parts clean Benzene.

Note 1: Both 0.01% and 0.002% Dithizone solutions should be kept in dark containers. (e.g. Plastic bottles wrapped in aluminum foil.)

PROCEDURE:

1. Measure one scoopful of sample, leveled with spatula, and tap into marked test tube.
2. Add Bloom Buffer solution to 5 ml. mark.
3. Add 1 ml. of 0.002% Dithizone in Benzene, bringing level to 6 ml. mark.
4. Insert stopper and shake 50 times.
5. Allow Dithizone solution to collect at surface of liquid and observe color. If green, record 0; if blue, record 1; if red, proceed with step 6.
6. Add 1 ml. more of 0.002% Dithizone solution, bringing the level to 7 ml. mark and shake 15 times. If color is blue, record 2; if purple or red, repeat the shakeout adding Dithizone solution in increments of 3 mls, 5 mls until blue-grey end point is reached. Record total volume of Dithizone solution needed to reach blue-grey end point.

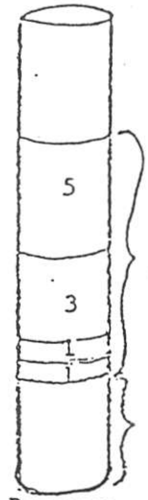
Note 2: One ml. of the 0.002% Dithizone solution at the blue-grey end point is roughly equivalent to 2 parts per million exchangeable heavy metals (as Zinc). Total heavy metal content in samples may be as much as 20 times greater.

Note 3: As the Bloom buffer contains ammonium hydroxide, this solution should be kept well capped.

CHEMEX LABS LTD.
212 Brooksbank Ave.,
North Vancouver, B. C.

COPPER IN STREAM SEDIMENTS

HOLMAN TEST FOR EXCHANGEABLE COPPER



Field equipment and apparatus (1 Kit)

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6 - pyrex test tubes - calibrated
1 - 250 ml. brown plastic bottles
2 - 250 ml. plastic wash bottles
6 - polyethylene stoppers
1 - volumetric scoop - approx 0.25 gm.

Field Chemicals

2.5 liters prepared Holman buffer
2 liters Benzene
5 - 10 mg. capsules Dithizone

Preparation of dithizone stock solution - 0.01%

Dissolve 10 mg. (1 capsule) of Dithizone in 100 mls. of Benzene Shake for about 3 minutes to dissolve.

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Note 1: Both 0.01% and 0.002% Dithizone solutions should be kept in dark containers. (e.g. Plastic bottles wrapped in aluminum foil.)

PROCEDURE:

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2. Add Holman Buffer solution to 5 ml. mark.
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4. Insert stopper and shake 50 times.
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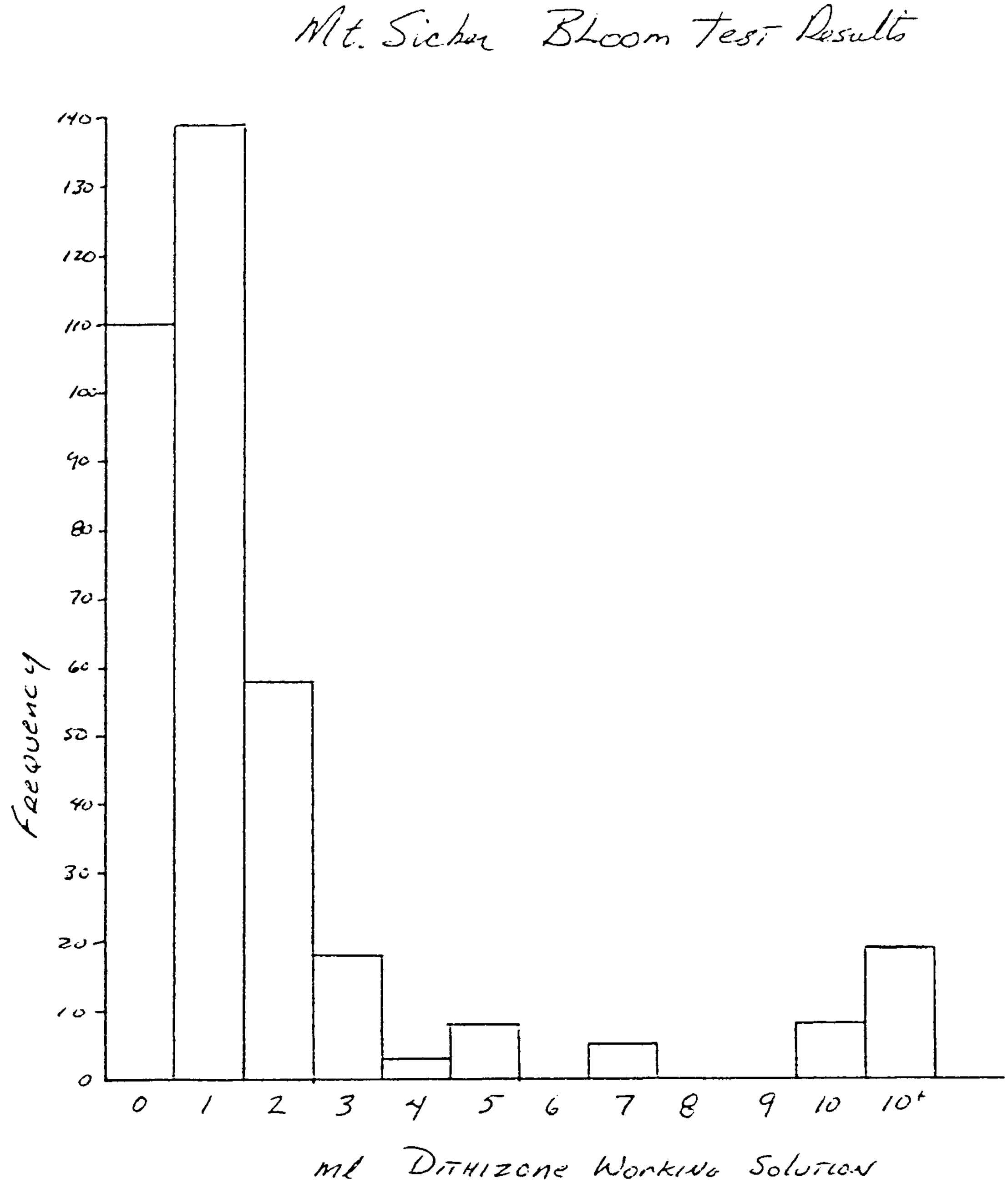
Note 2: One ml. of the 0.002% Dithizone solution at the blue-grey end point is roughly equivalent to 2 parts per million exchangeable COPPER. COPPER metal content in samples may be as much as 20 times greater.

Note 3: As the Holman buffer contains hydrochloric acid, this solution should be kept well capped.

APPENDIX 3

HISTOGRAMS - THM AND COPPER TESTS


Mt. Sicker Bloom Test Results
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
Frequency
0
1
2
3
4
5
6
7
8
9
10
10+
ml Dithizone Working Solution

APPENDIX 4

STATEMENT OF COSTS

Claimable costs for assessment reports are listed here.

APPENDIX 5

STATEMENT OF QUALIFICATIONS

Abbreviated List of Qualifications - S. J. Hoffman

BSc 1969 - McGill University (Hons., Geology and Chemistry)

MSc 1972 - The University of British Columbia (Geochemistry)

PhD 1976 - The University of British Columbia (Geochemistry)

Publication History (to September, 1985)

9. Papers published in referred journals (2 in the last 3 years).

2. Unpublished theses.

1. Paper published in a referred symposium special volume (0 in the last 3 years).

5. Papers submitted for publication, awaiting print.

2. Manuals awaiting publication decision.

List of Memberships

1. Geological Association of Canada, since 1967.
2. Canadian Institute of Mining and Metallurgy, since 1973.
3. Association of Exploration Geochemists, since 1973.
4. American Society of Agronomy, since 1973.
5. Geochemical Society, since 1983.

Other Qualifications

1. Instructor - B.C. Department of Mines, Northwest Mining Association, University of British Columbia, McGill University, B.C. and Yukon Chamber of Mines.
2. Speaker, CIM (Prince George), Geoscience Council (Yellowknife), Quebec Department of Natural Resources (Quebec City).
3. External Examiner, University of Calgary.
4. Chairman, GOLD-81 symposium (1981 - Vancouver), GEOEXPO/86 symposium (1986 - Vancouver.)
5. Council Member, AEG, 1980 - 1984.
6. Vice president, AEG, 1985 - 1986.
7. Business editor, GOLD-81 proceedings.
8. Member, committee to determine P. Geol. qualifications.

insert map

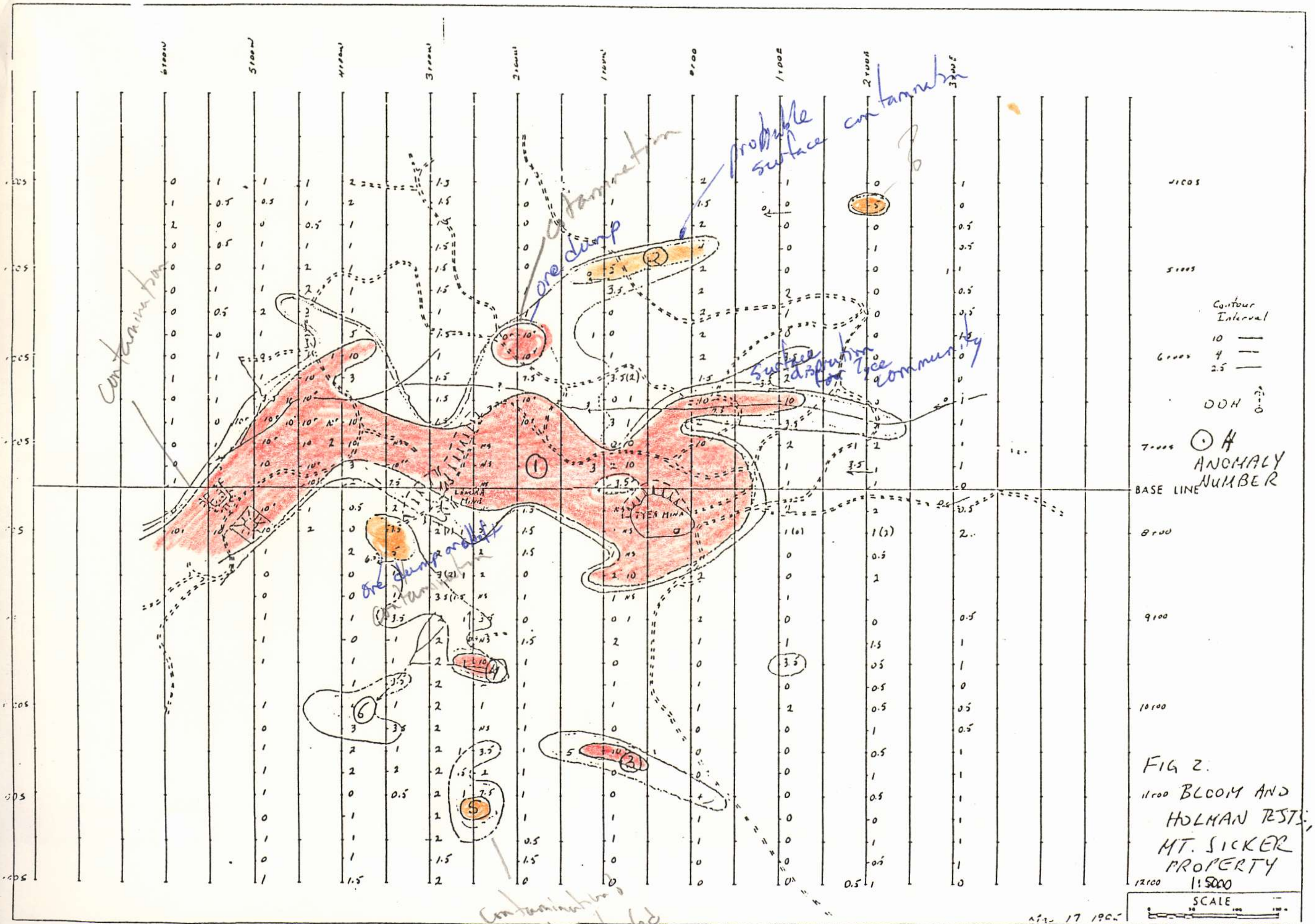
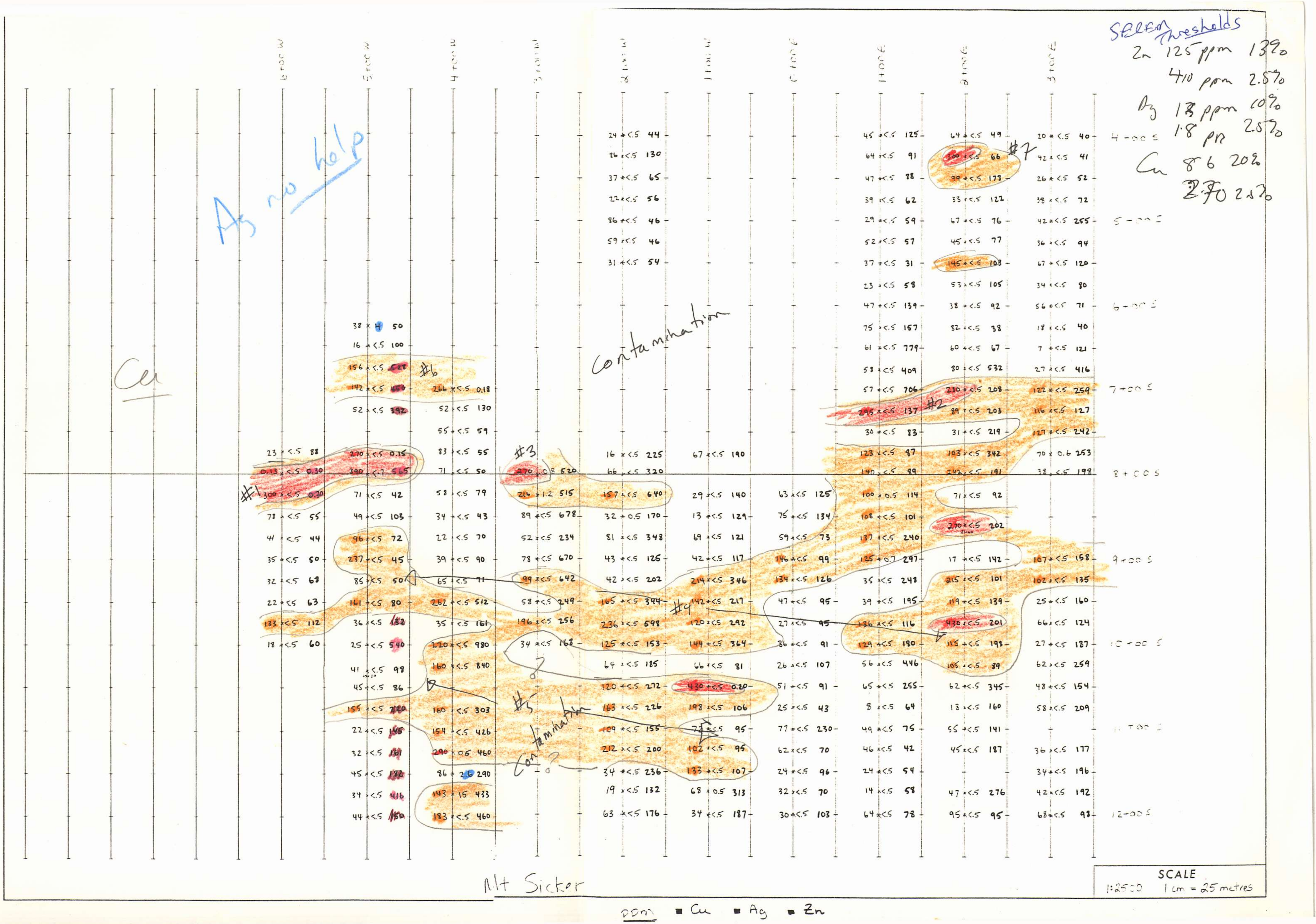
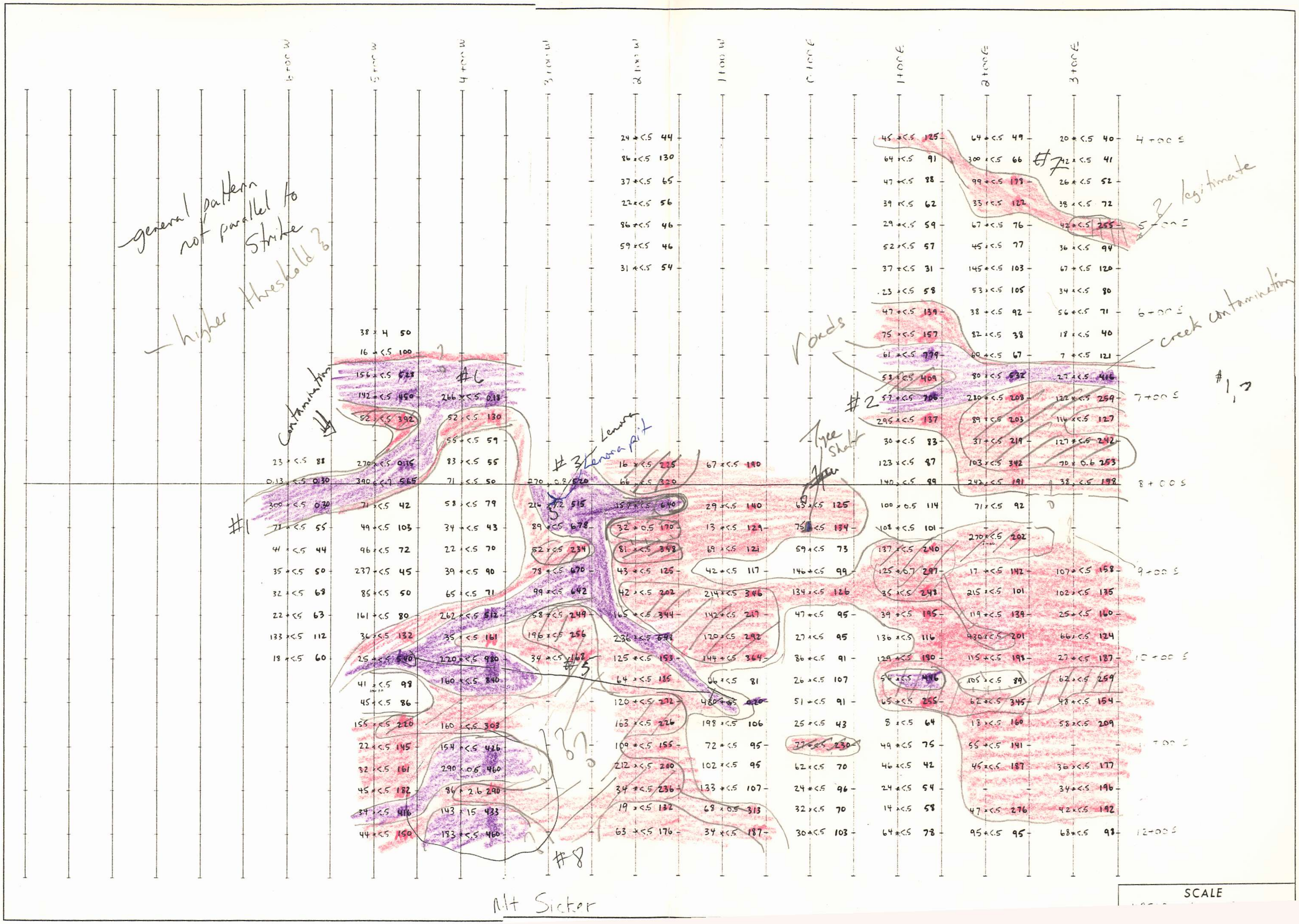


FIG 2.
BLOOM AND HOLMAN TESTS, MT. SICKER PROPERTY
1:5000



SEEM Thresholds
Zn 125 ppm 13%
410 ppm 2.5%
Ag 1.8 ppm 10%
1.8 pp 2.5%
Cu 86 20%
270 2.5%
Ag no help
Cu
Contamination
#1
#2
#3
#4
#5
#6
#7
Contamination ?
4+00 S
5+00 S
6+00 S
7+00 S
8+00 S
9+00 S
10+00 S
12+00 S
Mt Sicker
SCALE
1:2500 1 cm = 25 metres
ppm ■ Cu ■ Ag ■ Zn


6+00 W
5+00 W
4+00 W
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2+00 W
1+00 W
0+00 E
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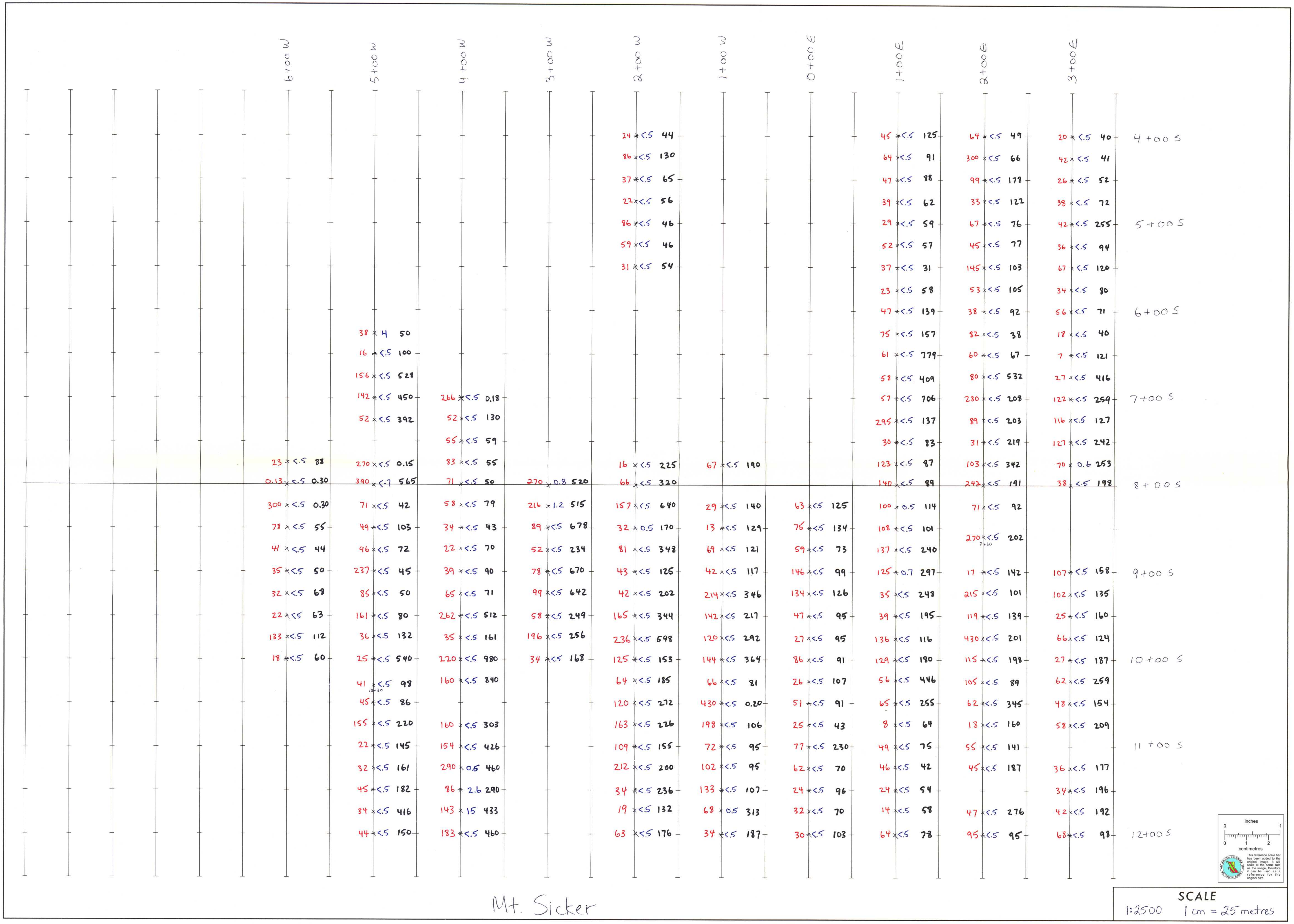
6+00 S
7+00 S
8+00 S
9+00 S
10+00 S
12+00 S
general pattern not parallel to Strike
– higher threshold?
contamination
#1
#6
#3
Lenora
Lenora pit
#5
#8
roads
Tyee Shaft
#2
#7
? legitimate
creek contamination
#1, 2
Mt Sicker
SCALE



ppm ■ Cu ■ Ag ■ Zn

(< 1.0 in Cu or Zn is %)

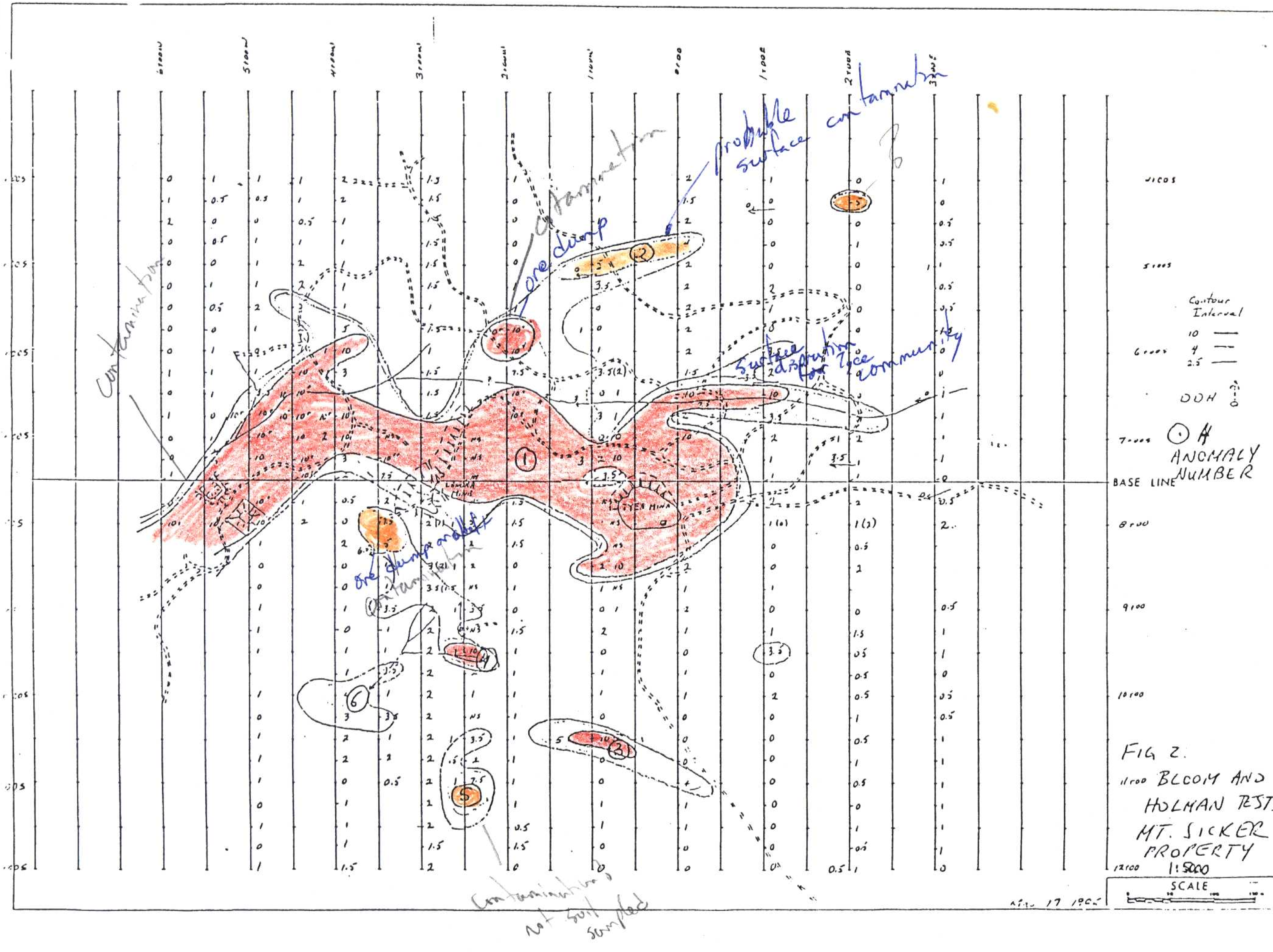


FIG 2. BLOOM AND HOLMAN TESTS, MT. SICKER PROPERTY 1:5000

inches 0 1

centimetres 0 1 2

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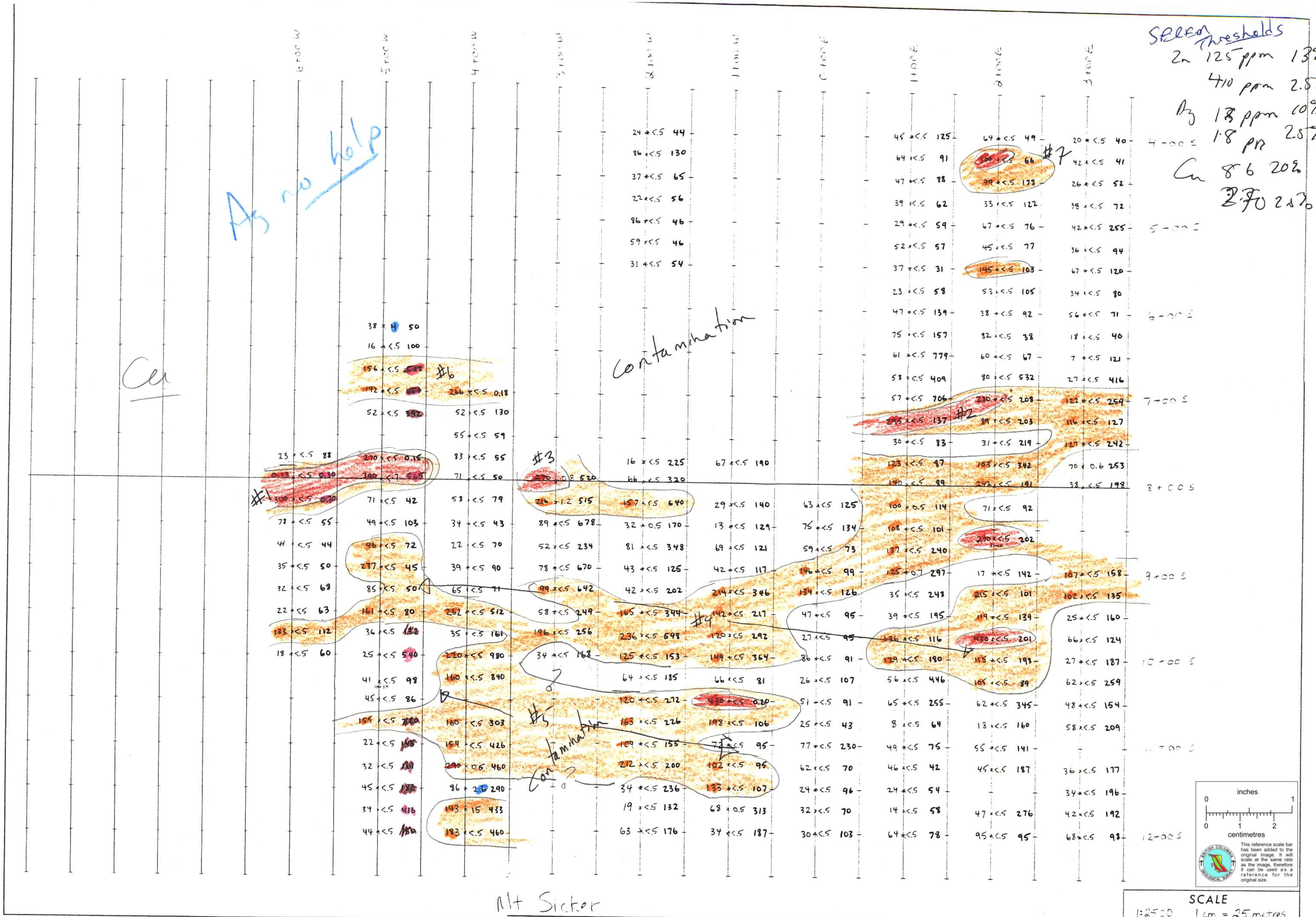
Soil Thresholds
Zn 125 ppm 13%
410 ppm 2.5%
Ag 1.8 ppm 10%
1.8 ppm 2.5%
Cu 86 20%
270 2.5%
As no help
Cu
contamination
contamination ?
#1
#2
#3
#4
#5
#6
#7
4+00 S
5+00 S
6+00 S
7+00 S
8+00 S
9+00 S
10+00 S
11+00 S
12+00 S
Mt Sicker
SCALE
1:2500
1 cm = 25 metres
inches
centimetres
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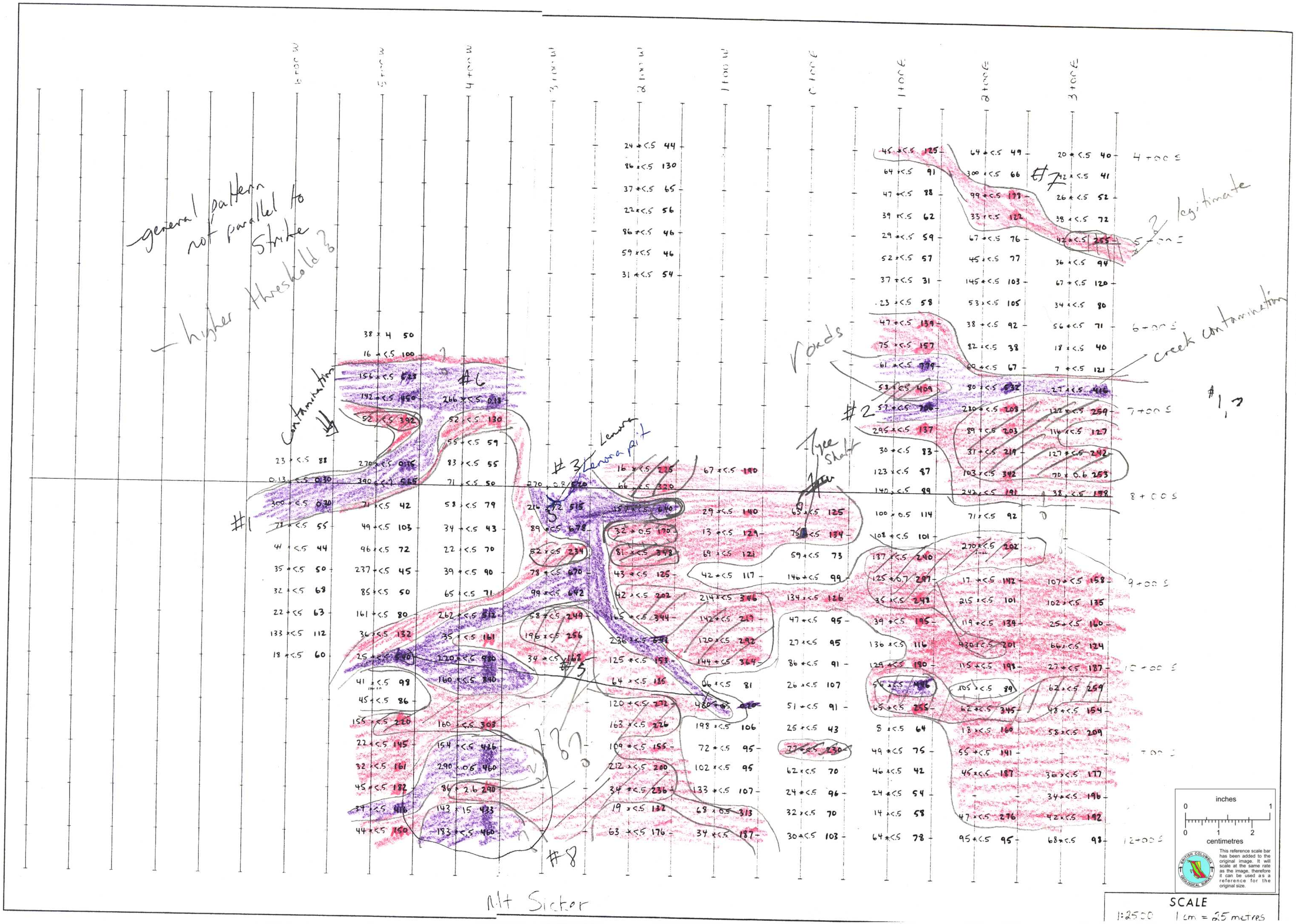
ppm ■ Cu ■ Ag ■ Zn



general pattern not parallel to strike
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contamination
roads
Lenora
Lenora pit
Tyee Shaft
creek contamination
? legitimate
#1
#2
#3
#5
#6
#7
#8
#1, 2
4+00 S
5+00 S
6+00 S
7+00 S
8+00 S
9+00 S
10+00 S
12+00 S
Mt Sicker
inches
centimetres
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SCALE
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