

COMINCO LTD.

EXPLORATION
NTS 92I/16

WESTERN DISTRICT
June 17, 1980

ASSESSMENT REPORT OF LINECUTTING
AND GEOLOGICAL, SOIL GEOCHEMICAL
AND MAGNETOMETER SURVEYS
ON THE HEFF LAKE PROPERTY

(Heff Lake and Heff Lake 2,3 & 4 Claims)

HEFFLEY LAKE AREA, KAMLOOPS M.D., B.C.

(Work performed May 20-30, June 2-7,
June 9-14 and June 16-19, 1980)

LATITUDE: 50⁰⁰'

LONGITUDE: 124⁰⁰'

REPORT BY:

M.J. CASSELMAN

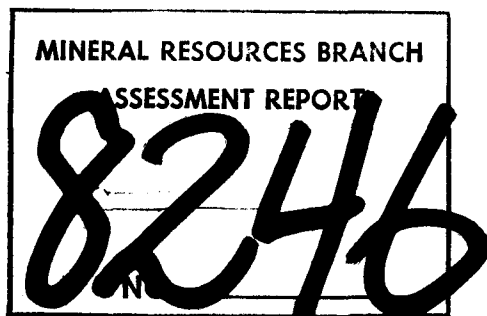


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ON THE HEFF LAKE PROPERTY

(Heff Lake and Heff Lake 2,3 & 4 claims)

SUMMARY

The Heff Lake property is situated in Upper Paleozoic, Cache Creek Group rocks, 26 km NE of Kamloops. The property comprises four Heff Lake claims; one was staked in June, 1979 and three were staked in April, 1980. The property has been mapped on a scale of 1:5000 and covered by soil sampling and magnetometer surveys. The soil samples were analyzed for Cu.

The property covers Paleozoic, Cache Creek Group metavolcanics and meta-sediments. The metavolcanics comprise primarily andesite pyroclastics with minor andesite tuffites and rhyolite pyroclastic horizons. The metasediments, which conformably overlie the metavolcanics, comprise limestone, argillite, calcareous argillite, and calc-silicate horizons. The metavolcanic and metasedimentary rocks have been intruded by a mafic stock and related andesite porphyry and diorite dykes. The Cache Creek Group rocks occur as a NW-SE striking, SW dipping, monoclinical sequence that has been metamorphosed primarily to the upper greenschist facies, although locally lower amphibolite assemblages occur.

The property is being investigated for stratiform cupriferous massive magnetite (pyrite, pyrrhotite) deposits. The mineralization is hosted by an intercalated package of limestone and calc-silicate horizons, with variable proportions of intercalated argillite, calcareous argillite and andesite tuff and tuffite. The stratigraphy which hosts the mineralization is indicated to extend fairly continuously NW across the property by both the mapping and by the magnetometer survey. The southern extension of the favourable stratigraphy is under Heffley Lake. The most significant mineralization located to date occurs in old trenches and diamond drill holes situated near the center of the property. The best mineralization observed in this zone during the mapping was a 10 meter thick calc-silicate horizon containing clots and disseminations of pyrite>pyrrhotite, minor chalcopyrite (locally 1.0% Cu) and magnetite. However, significant concentrations of magnetite and chalcopyrite are reported from diamond drilling in 1965 in similiar stratigraphy along strike to the south of the trenching. The best reported drill result intersected 36 feet of massive magnetite, followed by 15 feet of 1.67% Cu in semi-massive to massive magnetite.

The magnetometer survey defined two separate anomalous magnetic areas, designated the western and eastern anomalies. The western anomaly is thought to be related to an underlying mafic stock. The eastern anomaly, which comprises several separate magnetic anomalies aligned in a NW direction, is coincident with the projection of the mineralized stratigraphic package. Some of the anomalies coincide with known areas of magnetite-(pyrite, pyrrhotite)-chalcopyrite mineralization. All magnetic anomalies in the eastern anomaly are interpreted to be related to magnetite-(pyrite, pyrrhotite)-chalcopyrite mineralization.

The soil sampling survey collected 1052 samples which were analyzed for Cu. Several various sized Cu soil anomalies were defined which roughly coincide with the projected strike direction of the mineralized stratigraphic package and are partially coincident with the magnetic anomalies located along this stratigraphy.

The Heff Lake property appears to have good potential for hosting stratiform cupriferous magnetite(pyrite, pyrrhotite) deposits, and areas with coincident favorable geology and geophysical and geochemical anomalies should be drilled.

INTRODUCTION

This report describes the results of geological mapping and geochemical soil sampling and magnetometer surveys on the Heff Lake property. The work was conducted during the periods of May 20-30, June 2-7 and June 9-14, 1980, by M. Morrison and B. Ames, and supervised by M.J. Casselman. Data is presented on a scale of 1:5000 and 1:2500.

LOCATION AND ACCESS

The Heff Lake property comprises the Heff Lake and Heff Lake 2,3 and 4 claims. It is situated 26 km NE of Kamloops, surrounding Heffley Lake. Access to the property is north from Kamloops on Highway 5 and then east on the Heffley Creek Highway to Heffley Lake. The property is readily accessible by the Heffley Creek Highway and by a series of gravel roads extending from this highway.

TOPOGRAPHY AND VEGETATION

The property lies between 900-1400 meters above sea level with the majority of the property lying on a steep south facing slope. The greatest elevation occurs on the north side of the property. Most of the property is covered by pine and fir trees. There is about 5% outcrop on the property.

PREVIOUS WORK

The property has undergone several previous episodes of exploration. The earliest work consisted of trenching a chalcopyrite-magnetite showing in the 1950's. During the 1960's and 1970's various magnetometer surveys and some diamond drilling (6 holes of which 4 intersected bedrock) have been conducted on the property. All programs were designed to define and extend the known chalcopyrite-magnetite mineralization. The results of these programs are described in assessment reports 820, 821, 4418 and 4624.

CLAIMS

The Heff Lake property comprises the Heff Lake claim (20 units), the Heff Lake 2 claim (5 units), the Heff Lake 3 claim (10 units) and the Heff Lake 4 claim (2 units). These claims are contiguous and owned 100% by Cominco Ltd.

GEOLOGY

The Heff Lake property is located in Paleozoic, Cache Creek Group rocks. The property was mapped at a scale of 1:5000. Mapping control was provided by a north-south oriented baseline and about 35 km of cross lines spaced at 100 meter intervals.

The Paleozoic, Cache Creek Group rocks on the property occur as a northwest striking, southwest dipping, monoclinical sequence, and consist of intercalated metavolcanic and metasedimentary rocks. These units are cut by a mafic stock and by swarms of andesite porphyry and diorite dykes, all of which are thought to be subvolcanic equivalents to the andesite volcanics. The Cache Creek Group metavolcanics include primarily andesite pyroclastics and flows with minor intercalated andesite tuffite and rhyolite pyroclastic horizons. The Cache Creek Group metasediments consist of intercalated limestone, calcareous argillite and calc-silicate horizons. The rock types on the property were defined primarily on the basis of field observations with colour indices, phenocrysts and textures being the most useful compositional determinants.

Most of the mineralization is located near the center of the property and is exposed in old trenches and diamond drill holes. This mineralization is hosted by an intercalated package of limestone and calc-silicate horizons with variable proportions of intercalated argillite, calcareous argillite and andesite tuff and tuffite horizons. The majority of the mineralization is associated with only one of two types of calc-silicate horizons found in this package of rocks. The mineralization observed during the mapping comprised disseminated to massive magnetite with trace chalcopyrite and clots to disseminations of pyrite, pyrrhotite with minor chalcopyrite. The most significant thickness of mineralization located to date was reported from the 1965 diamond drilling programs.

The property is currently being investigated as a possible host for stratiform cupriferous magnetite (pyrite, pyrrhotite) deposits.

STRATIGRAPHY

CACHE CREEK GROUP

Unit 1 - Andesite Pyroclastics

This unit comprises primarily andesite lapilli tuffs, tuffs and tuffites with minor argillaceous tuffite and argillite horizons noted toward the west side of the unit. The andesite pyroclastics, although variable in composition, are generally mid to dark green, massive to weakly foliated, fine to medium grained and contain 10-30% pyroxene grains and 0-20% (average 5-10%) feldspar phenocrysts. The andesite tuffites are similar, but distinguished by the presence of 5-15% biotite. The andesite pyroclastics near the diorite and andesite dykes are locally altered (bleached) and contain clots and veins (1-5%) of pyrite-pyrrhotite.

The argillites are buff-brown to gray-black, weakly-moderately foliated, fine grained and locally carbonaceous. The argillaceous tuffites are similar to the argillites except that they are green-black and locally contain feldspar and/or pyroxene grains.

Unit 2 - Limestone

This unit comprises primarily limestone, although thin argillaceous limestone, calc-silicate, argillite, argillaceous andesite tuffite and rhyolite tuff(?) interbeds are common. These rocks have been extensively cut by feldspar, pyroxene porphyry andesite dykes, hornblende porphyry andesite dykes and diorite dykes. Calc-silicates are locally developed on the margins of the dykes when they intrude the limestone horizons.

The limestones are grey-brown to gray-black or black, massive, and vary from thin to thickly bedded to breccias comprising mixtures of argillite and limestone fragments. The limestones are locally fossiliferous and arenaceous.

The argillites and argillaceous tuffites are similar to those discussed in Unit 1.

The rhyolite tuffs are white to gray, massive to weakly foliated, medium grained and contain 10-35% feldspar grains. They are commonly calcareous and contain fragments of argillite, limestone and rhyolite porphyry (0.5-2cm).

The calc-silicates are usually thin, light to mid green, hard, massive to thin bedded, fine grained and unmineralized.

Unit 3 - Mineral Horizon

This unit comprises an intercalated package of limestone and calc-silicate horizons, with variable proportions of intercalated argillite, calcareous argillite and andesite tuff and tuffite horizons. The proportion of andesite tuff and tuffite seems to increase southeastward towards the base of this unit and the proportion of limestone increases northward towards the base of the unit. These rocks have been extensively cut by feldspar, pyroxene porphyry andesite dykes, hornblende porphyry andesite dykes and diorite dykes. Calc-silicates are locally developed on the margins of the dykes when they intrude the limestone horizons.

The limestones, argillites and calcareous argillites are similar to those discussed in Unit 2 and the andesite tuffs and tuffites are similar to those discussed in Unit 1.

There are two types of calc-silicate horizons. The most common is light to mid green, hard, massive to thinly bedded and fine grained (probably composed of hedenbergite). This horizon is usually unmineralized. The second type of calc-silicate horizon is commonly mineralized. It is reddish-brown to greenish brown, massive, medium to coarse grained and composed of variable proportions of garnet, actinolite, epidote, diopside, hedenbergite and hornblende(?). It usually contains disseminations, pods or massive lenses of magnetite with minor to significant chalcopryite, and/or clots or disseminations of pyrite, pyrrhotite with variable concentrations of chalcopryite. The calc-silicate horizons vary from pods or lenses in areas highly dissected by dykes to laterally fairly extensive beds, and range from less than one half a meter thick up to 50 meters thick.

INTRUSIVE ROCKS

Unit 4 - Mafic Stock

This stock is poorly exposed in outcrop, but is widely expressed on the west side of the property in boulders. The area of the outcrop and boulders is coincident with a large, moderate intensity magnetic anomaly defined by the ground magnetic survey. The area occupied by this stock on the geology map was defined by the 1000 gamma magnetic contour. The stock is dark green, massive and coarse grained and contains 30-60% pyroxene grains. Locally areas with 5-10% biotite grains were also noted. Clots of disseminated magnetite grains occur throughout the stock.

Unit 5 - Diorite Dykes

The diorite dykes are green to greenish black, massive, medium to coarse grained and comprise 15-25% pyroxene grains. Locally clots or veins of pyrite, pyrrhotite, minor chalcopyrite, occur in the dykes. These dykes are similar to the feldspar, pyroxene porphyry andesite dykes and are distinguished only by their coarser grain size. The diorite dykes, although not magnetic, are felt to be genetically related to, and derived by differentiation from, the mafic stock.

Unit 6 and 7 Andesite Dykes

Two types of andesite dykes were observed; feldspar, pyroxene porphyry andesite dykes and hornblende porphyry andesite dykes. The feldspar, pyroxene porphyry andesite dykes are mid green, massive and contain 10-20% feldspar phenocrysts and 15-25% pyroxene phenocrysts in a fine grained gray-green to gray matrix. Locally these dykes contain 2-5% blebs and/or veins of pyrite, pyrrhotite. These dykes are fine grained equivalents to the diorite dykes. The hornblende porphyry andesite dykes are mid green, massive and contain 10-20% hornblende phenocrysts in a fine grained greenish gray matrix. These dykes locally contain 1-2% blebs and/or veins of pyrite. The age of these dykes is unknown. It should be emphasized that because of the narrow width of many of the dykes, only a small proportion of the observed dykes (larger dykes) have been plotted on the geologic map.

STRUCTURE

The Cache Creek Group rocks on the Heff Lake property comprise part of a conformable monoclinial sequence which generally strikes NW-SE and dips 50-90° SW. Stratigraphic tops are to the SW. Considerable folding and boudinaging was observed in many of the sedimentary outcrops, especially in the limestone and calc-silicate horizons, but on the property there was no indication of major fold repetition of whole units. A major fault is thought to extend NW-SE across the property and to have been responsible for developing the prominent cliff and escarpments occurring in the north half of the property. The offset on this fault is not known. Primary textures, although locally disrupted by deformation, are generally well preserved and recognizable in most outcrops. Primary textures most commonly observed include lithic fragments, porphyry textures, and bedding. Bedding was most commonly observed in the limestone, calc-silicate, argillite and tuff and tuffite horizons. Foliation was best developed in the andesite pyroclastics and argillaceous units and is indicated by rare stretched fragments and occasionally by aligned chlorite, biotite and/or sericite grains. In all cases the foliation paralleled bedding. Although all the rocks have been subjected to varying degrees of deformation, the metamorphic grade does not generally exceed the upper greenschist facies except for local areas where it reached the lower amphibolite facies.

MINERALIZATION

The Heff Lake property is being evaluated for stratiform cupriferous magnetite (pyrite, pyrrhotite) deposits. The most significant mineralization located to date occurs in Unit 3, which although poorly exposed, is inferred from the geology and magnetometer surveys to extend fairly continuously in a NW direction across the property. The south extension of Unit 3 is under Heffley Lake. The rocks in Unit 3 include intercalated limestone and calc-silicate horizons with variable proportions of calcareous argillite, argillite and andesite tuff and andesite tuffite horizons. Within this package of rocks there occurs two types of calc-silicate horizons (see description of calc-silicate horizons under Unit 3 in the Stratigraphy Section). The most important calc-silicate horizons economically, are the garnet bearing type which contains variable concentrations of magnetite, pyrite, pyrrhotite and chalcopyrite. The second calc-silicate horizon type, the fine grained greenish ones, are usually unmineralized. The garnet bearing calc-silicate horizons nearly always occur intercalated within the fine grained greenish type, but the reverse is not true. The fine grained greenish calc-silicate type is the most abundant, and occurs throughout Unit 3, while the garnet bearing type commonly occurs toward the central part of Unit 3. Both types of calc-silicate horizons are commonly highly folded and boudinaged.

The majority of mineralization observed during the mapping was located in the garnet bearing calc-silicate horizons and included magnetite and pyrite, pyrrhotite with trace to significant disseminated chalcopyrite. The magnetite varied from disseminations to massive lenses (1 meter thick) and contained only trace chalcopyrite. The pyrite and pyrrhotite varied from disseminations to clots (up to 20% of the rock). The majority of the chalcopyrite observed was associated with the pyrite and pyrrhotite and varied in grade from 0.1 to 1.0% Cu (visual estimates). The thickest observed calc-silicate horizon was about 50 meters thick. It comprised primarily fine grained greenish calc-silicate horizons, but several 1-2 meter thick garnet bearing calc-silicate horizons occurred intercalated within it. These latter horizons contained 0.5-1 meter thick magnetite lenses (no chalcopyrite) and/or clots or disseminations of pyrite and pyrrhotite with minor chalcopyrite. The thickest garnet bearing calc-silicate horizon observed on the property was about 10 meters and contained primarily clots to disseminations of pyrite and pyrrhotite with minor chalcopyrite (locally about 1.0% Cu) and magnetite. The sulphides in this zone commonly occur either surrounding or interstitial to the garnet grains and appear to have been in the rock prior to the garnet growth. The thinnest calc-silicate horizon noted was 12.0 cm thick (fine grained greenish type) and was highly folded and boudinaged in a similarly highly folded limestone horizon. This calc-silicate horizon was almost assuredly present in the limestone prior to deformation. Locally within the calc-silicate horizons there occur intercalated horizons of andesite tuffs (1-3 meters thick) which contain 5-20% disseminated pyrite and pyrrhotite and trace chalcopyrite.

Clots and veins of pyrite and pyrrhotite (1-5%) and trace chalcopyrite were locally observed in and marginal to the diorite and andesite porphyry dykes. When marginal to the dykes, these minerals are often hosted by a calc-silicate assemblage. It is interpreted that the mineralization in the dykes was picked up from the calc-silicate horizons they intruded.

The best reported mineralization on the property was intersected by four diamond drill holes put down in 1965 by Madison Oils Ltd. Only two holes were assayed. One hole intersected contiguously, 36 feet of massive magnetite, 15 feet of 1.67% Cu, 45 feet of 13% Fe and 0.11% Cu and 15% of 0.04% Cu (no Fe assays). Another hole intersected five noncontiguous 5 foot sections of semi-massive to massive magnetite(21-48.5% Fe) with trace to 0.16% Cu. The magnetite horizons were separated by barren calc-silicate, argillite and argillaceous andesite tuffite horizons. The other two drill holes were not assayed, but were reported to have intersected similar grade material to the second hole. Two other holes were drilled, but did not reach bedrock. Of note, all the holes were interpreted by Madison Oils Ltd. to have been drilled toward the footwall of the favourable zone. Only one of the diamond drill sites has been located to date. The general location of the other holes is speculated from surface debris and from discussions with "locals" to lie just south of the located drill hole and south of the Heffley Lake highway. All the drilling appears to have been concentrated in Unit 3.

The magnetite-pyrite-pyrrhotite-chalcopyrite mineralization observed in Unit 3 is interpreted to have developed syngenetically, probably in conjunction with submarine hot-spring-fumarolic activity associated with the waning stages of the andesite(rhyolite?) volcanism, and to be genetically related to that activity. The calc-silicate assemblages are interpreted to have originally been calcareous, cherty, argillite horizons(locally contained beds of magnetite-pyrite-pyrrhotite-chalcopyrite) in a limestone. Later superimposed contact metamorphism which resulted from regional metamorphism and from the emplacement of the mafic stock and its related diorite and andesite porphyry dykes transformed the calcareous cherty mud into the presently observed calc-silicate mineral assemblages. The calc-silicate horizons are, therefore, not thought to represent a contact metasomatic "skarn" as has been often proposed for this rock-type, but rather a contact metamorphosed carbonate-sulphide-oxide-silica iron formation. The originally conformable magnetite-pyrite-pyrrhotite-chalcoprite mineralization has been folded, disrupted and locally remobilized by later regional deformation and/or by the emplacement of the mafic stock and dykes. It should be emphasized that the above hypothesis for a syngenetic origin of the mineralization on the Heff Lake property is not shared by M. Morrison, who believes that the mineralization was emplaced metasomatically.

MAGNETOMETER SURVEY

The Heff Lake property was covered by a magnetometer survey utilizing a MP-2 Proton Procession magnetometer. The survey was conducted, by B. Ames, variously between May 20 and June 16. A baseline and crosslines were established and traverse lines were run at 25 meter intervals. Stations were read at 25 meter intervals along the traverse lines. The 3 strongest eastern-most magnetic anomalies, which coincide with Unit 3, were subsequently detailed at 5 meter intervals. A total of 2300 stations were surveyed. Two main base stations were established from which the base line was surveyed with the 100 meter baseline stations read and checked for diurnal drift. Check readings were taken during the entire survey within every 120 minutes in order to correct for diurnal drift. There was no correcting necessary because of the small amount of drift which was considered well within the reading accuracy. The magnetometer results have been contoured by hand.


The object of the survey was to locate magnetic highs which might be related to stratiform magnetite-(pyrite,pyrrhotite)-chalcopyrite mineralization. Two areas of magnetic highs, designated the western and eastern anomalies, were defined. The western anomaly is centered just north of the west end of Heffley Lake. This anomaly was only partially defined, but its extensive size and the presence of outcrop and boulders belonging to Unit 4 locally throughout the anomaly, suggest that the anomaly probably relates to the underlying mafic stock. The eastern anomaly comprises a band of roughly lenticular NW trending anomalies which coincide with the projection of Unit 3. Minor outcrop exposed in, or peripheral to these anomalies comprises calc-silicate horizons with varying proportions of magnetite, pyrite, pyrrhotite and chalcopyrite. Also, the large southern anomaly in the eastern anomaly covers the area where all the previous diamond drilling was done and in which significant concentrations of magnetite-chalcopyrite mineralization were intersected. The eastern anomalies are interpreted to be related to magnetite-(pyrite,pyrrhotite)-chalcopyrite mineralization.

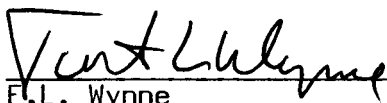
GEOCHEMISTRY

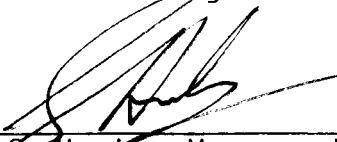
The property was covered by a soil sampling survey. The soil samples were collected from the B horizon at 25 or 50 meter intervals, along lines spaced 100 meters apart. The areas underlain by the mafic stock and by the andesite pyroclastics, were sampled at 50 meter intervals. The other areas were sampled at 25 meter intervals. 1052 samples were collected and analyzed for Cu. Cumulative frequency diagrams suggest that the threshold for Cu is 75 ppm. The soil geochemical sampling defined several N-NW trending Cu anomalies which roughly coincide with the strike projection of Unit 3 and closely overlie most of the magnetic anomalies which comprise the eastern magnetic anomaly. The values within the soil anomalies range from 75 to 1400 ppm Cu.

CONCLUSIONS

The Heff Lake property appears to have potential for hosting stratiform cupriferous magnetite-(pyrite,pyrrhotite) deposits. The best potential for finding deposits of this type exists in Unit 3 either down dip or along strike from the area of the previous diamond drilling. This area, and other areas underlain by Unit 3 and containing coincident magnetic and/or Cu soil anomalies are recommended for drilling.

Report by: 
M.J. Casselman
Project Geologist

Endorsed by: 
F.L. Wynne
Senior Geologist

Approved for
Release by: 
G. Harden, Manager, Western
District, Exploration

MJC/sf
Distribution:
Mining Recorder (2)
Western District File
Vernon File

COMINCO LTD.

EXPLORATION

WESTERN DISTRICT

APPENDIX "A"

Statement of Expenditures for Heff Lake Property

Geological, Geophysical and Geochemical Surveys -		
M Morrison - May 20-30, June 2-6, June 9-14 and June 17,18, 1980 (24 days @ \$150/day)		3,600.00
B. Ames - May 20-30, June 2-7, June 10-13, June 16-19, 1980 (25 days @ \$111/day)		2,775.00
Supervision - M.J. Casselman - May 20, May 30, June 12, June 18,19, 1980 (5 days @ \$179/day)		895.00
Report Writing and Drafting - M.J. Casselman (4 days @ 179/day)		716.00
Transportation - Truck for 24 days plus gas		350.00
Linecutting - 35.0 km of crosslines @ \$125/km		4,375.00
Assays - 1052 soil samples assayed for Cu at 1.95/sample		2,051.00
		<hr/>
		\$ 14,762.00

APPENDIX "B"

COMINCO LTD.

EXPLORATION


WESTERN DISTRICT

I, MICHAEL J. CASSELMAN, OF THE CITY OF VERNON, BRITISH COLUMBIA, HEREBY CERTIFY:

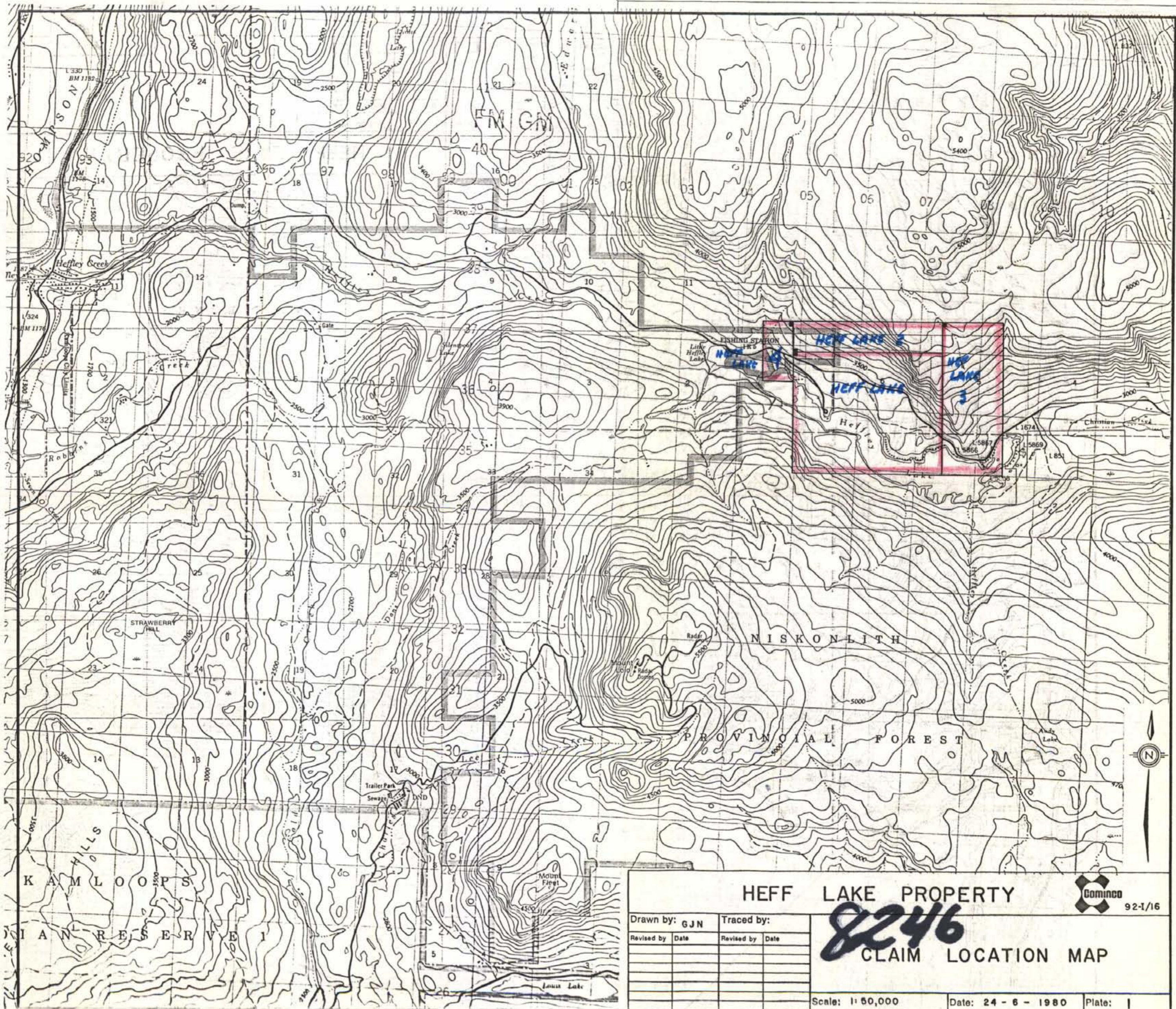
1. THAT I AM A GEOLOGIST, RESIDING AT 8901 CHERRY LANE, VERNON, BRITISH COLUMBIA, WITH A BUSINESS ADDRESS AT 4405 - 28 STREET, VERNON, BRITISH COLUMBIA.
2. THAT I GRADUATED WITH B.Sc. AND M.Sc. DEGREES IN GEOLOGY FROM THE UNIVERSITY OF BRITISH COLUMBIA IN 1969 AND CARLETON UNIVERSITY IN 1977.
3. THAT I HAVE PRACTISED GEOLOGY WITH COMINCO LTD. FROM 1969 TO PRESENT.

DATED THIS 17th day of June, 1980 at Vernon, British Columbia.

SIGNED BY:



Michael J. Casselman, M.Sc.



HEFF LAKE PROPERTY



Drawn by: GJN Traced by:

Revised by Date Revised by Date

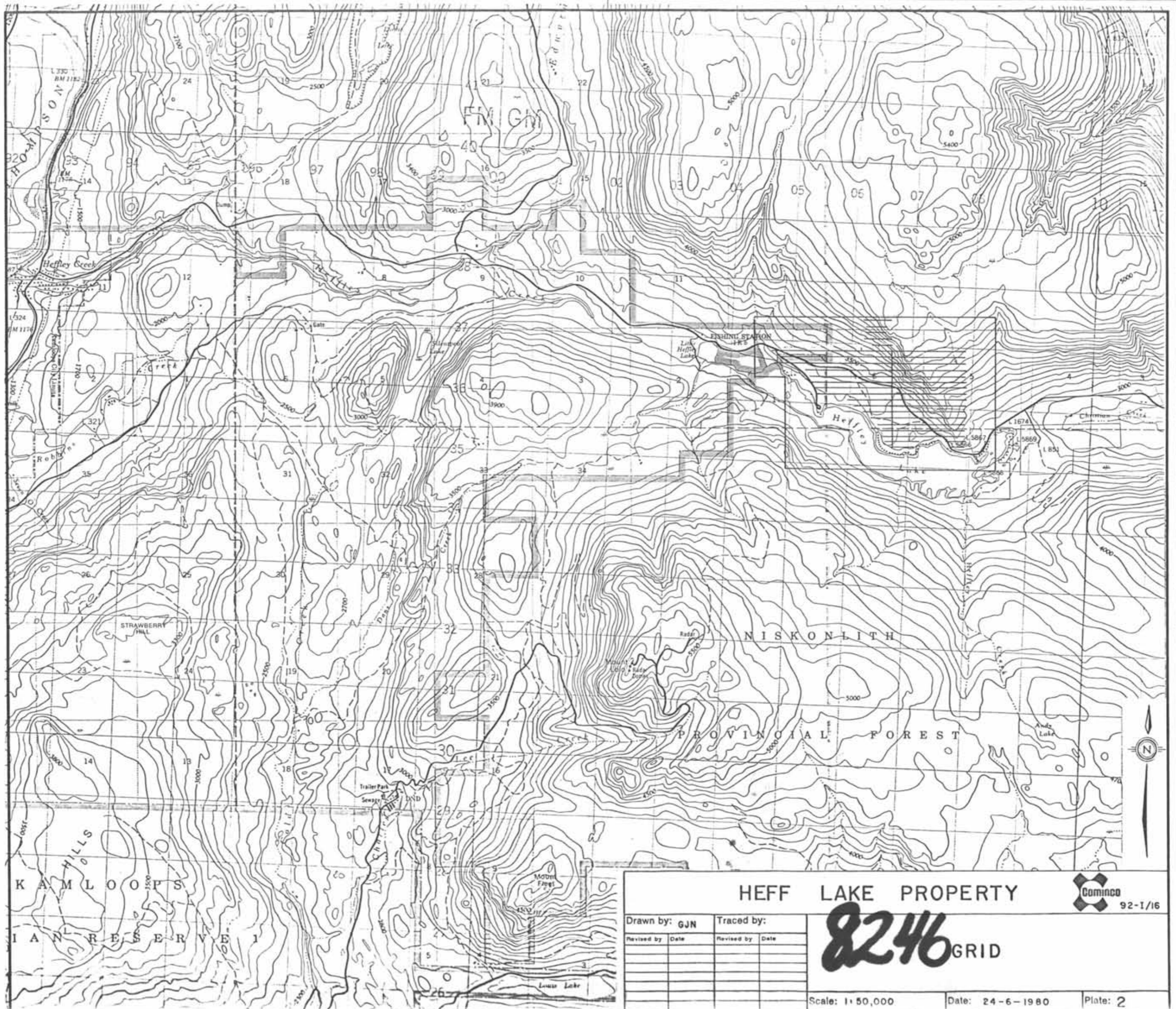
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CLAIM LOCATION MAP

Scale: 1:50,000

Date: 24 - 6 - 1980

Plate: 1



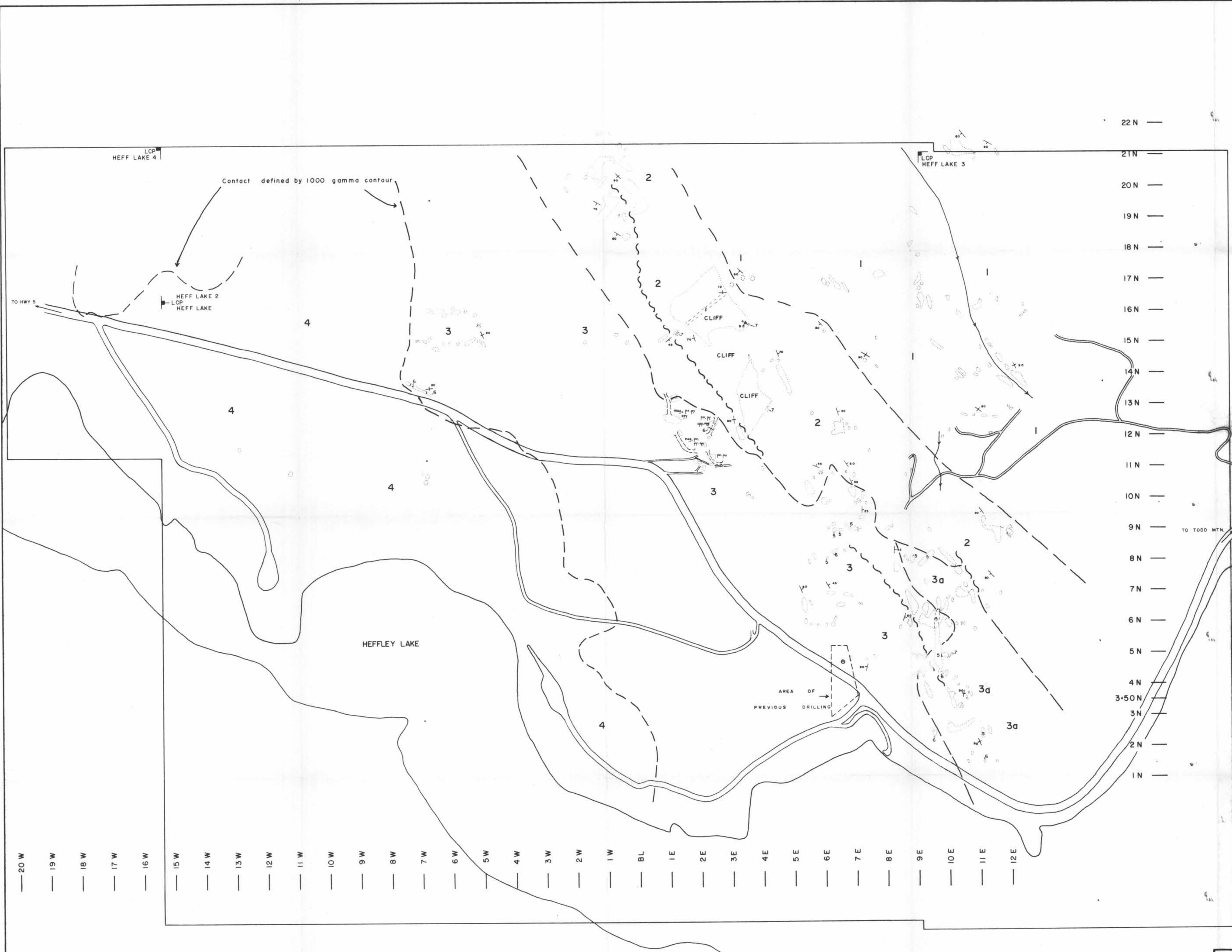
HEFF LAKE PROPERTY



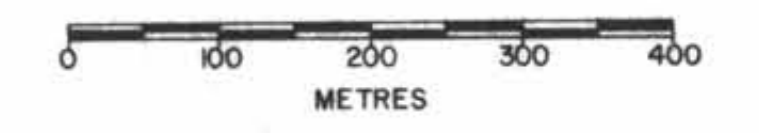
8246 GRID

Drawn by: GJN	Traced by:
Revised by:	Revised by:

9428
MINERAL RESOURCES BRANCH
ASSESSMENT REPORT



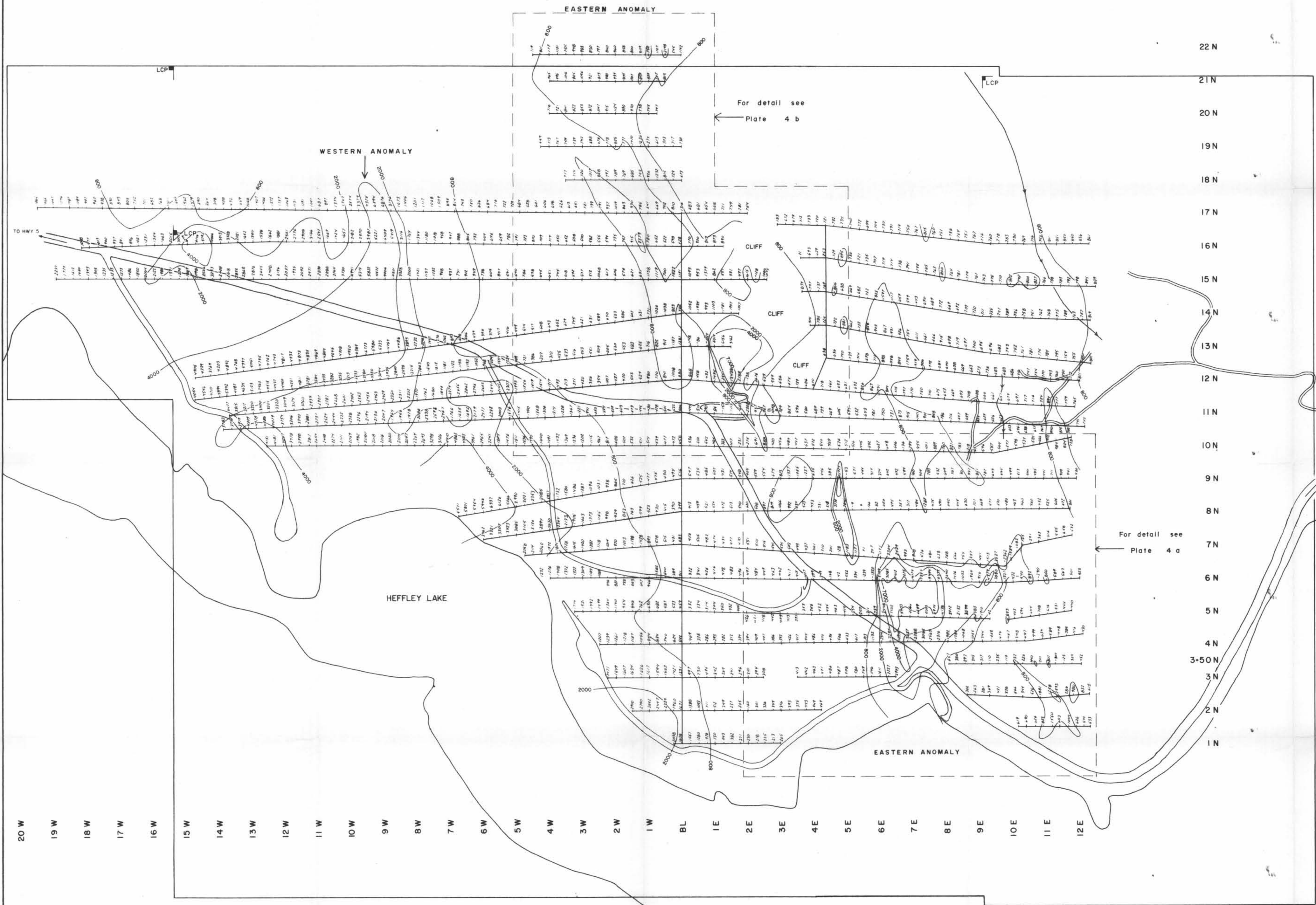
- LEGEND**
- 7 Hornblende Porphyry Andesite Dykes
 - CACHE CREEK GROUP
 - 6 Feldspar, Pyroxene Porphyry Andesite Dykes
 - 5 Diorite Dykes
 - 4 Mafic Stock
 - 3 Mineral Horizon - intercalated calc-silicate and limestone horizons with variable proportions of argillite, calcareous argillite and andesite tuff and tuffite horizons; calc-silicate horizons of two types (i) garnet, actinolite, epidote, diopside, hedenbergite with variable concentrations of magnetite, pyrite, pyrrhotite, chalcopyrite and (ii) pale-mid green, hard, fine grained (hedenbergite) with no mineralization (most common calc-silicate type); a) mainly intercalated andesite tuff and tuffite and calc-silicate type ii horizons; all horizons extensively cut by andesite porphyry and diorite dykes.
 - 2 Limestone - variable proportions of argillaceous limestone, argillite, and andesite tuff and tuffite horizons; minor calc-silicate and rhyolite tuff horizons; all horizons extensively cut by andesite porphyry and diorite dykes.
 - 1 Andesite Pyroclastics - minor andesite tuffite and argillite horizons; all horizons extensively cut by andesite porphyry and diorite dykes.
- SYMBOLS**
- outcrop
 - geologic contact, inferred
 - - - bedding; strike, dip
 - - - fault
 - └┐ LCP legal corner post
 - ▬ paved highway; gravel road
 - diamond drill hole
 - - - trench
 - ~ stream
 - mag. py magnetite, pyrite, pyrrhotite, chalcopyrite
 - pr. cpy





20 W — 19 W — 18 W — 17 W — 16 W — 15 W — 14 W — 13 W — 12 W — 11 W — 10 W — 9 W — 8 W — 7 W — 6 W — 5 W — 4 W — 3 W — 2 W — 1 W — BL — 1 E — 2 E — 3 E — 4 E — 5 E — 6 E — 7 E — 8 E — 9 E — 10 E — 11 E — 12 E

22 N —
21 N —
20 N —
19 N —
18 N —
17 N —
16 N —
15 N —
14 N —
13 N —
12 N —
11 N —
10 N —
9 N —
8 N —
7 N —
6 N —
5 N —
4 N —
3.50 N —
3 N —
2 N —
1 N —

HEFFLEY LAKE PROPERTY				92-1/16
Drawn by: BGA	Traced by:			
Revised by: Date	Revised by: Date			
RJE	07.80			
GEOLOGY			Scale: 1:5,000	Date: JULY 1980
			Sheet: 3	



- SYMBOLS
-  2 000 2 000 gammas (all values plus 57 000 gammas)
 -  outline of areas covered by detailed survey (see Plates 4 a & 4 b)

MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
8246
NO.

0 100 200 300 400
METRES

HEFF LAKE PROPERTY		92-1/16	
Drawn by: BGA	Traced by:		
Checked by: CJA	Reviewed by: JJA		
		MAGNETICS	
Scale: 1:5,000		Date: JULY 1980	Plate: 4

20 W
19 W
18 W
17 W
16 W
15 W
14 W
13 W
12 W
11 W
10 W
9 W
8 W
7 W
6 W
5 W
4 W
3 W
2 W
1 W
BL
1 E
2 E
3 E
4 E
5 E
6 E
7 E
8 E
9 E
10 E
11 E
12 E

22 N
21 N
20 N
19 N
18 N
17 N
16 N
15 N
14 N
13 N
12 N
11 N
10 N
9 N
8 N
7 N
6 N
5 N
4 N
3-50 N
3 N
2 N
1 N

MINERAL RESOURCES BRANCH
 ALBERTA
8246



10 N
 9 N
 8 N
 7 N
 6 N
 5 N
 4 N
 3+50 N
 3 N
 2 N
 1 N

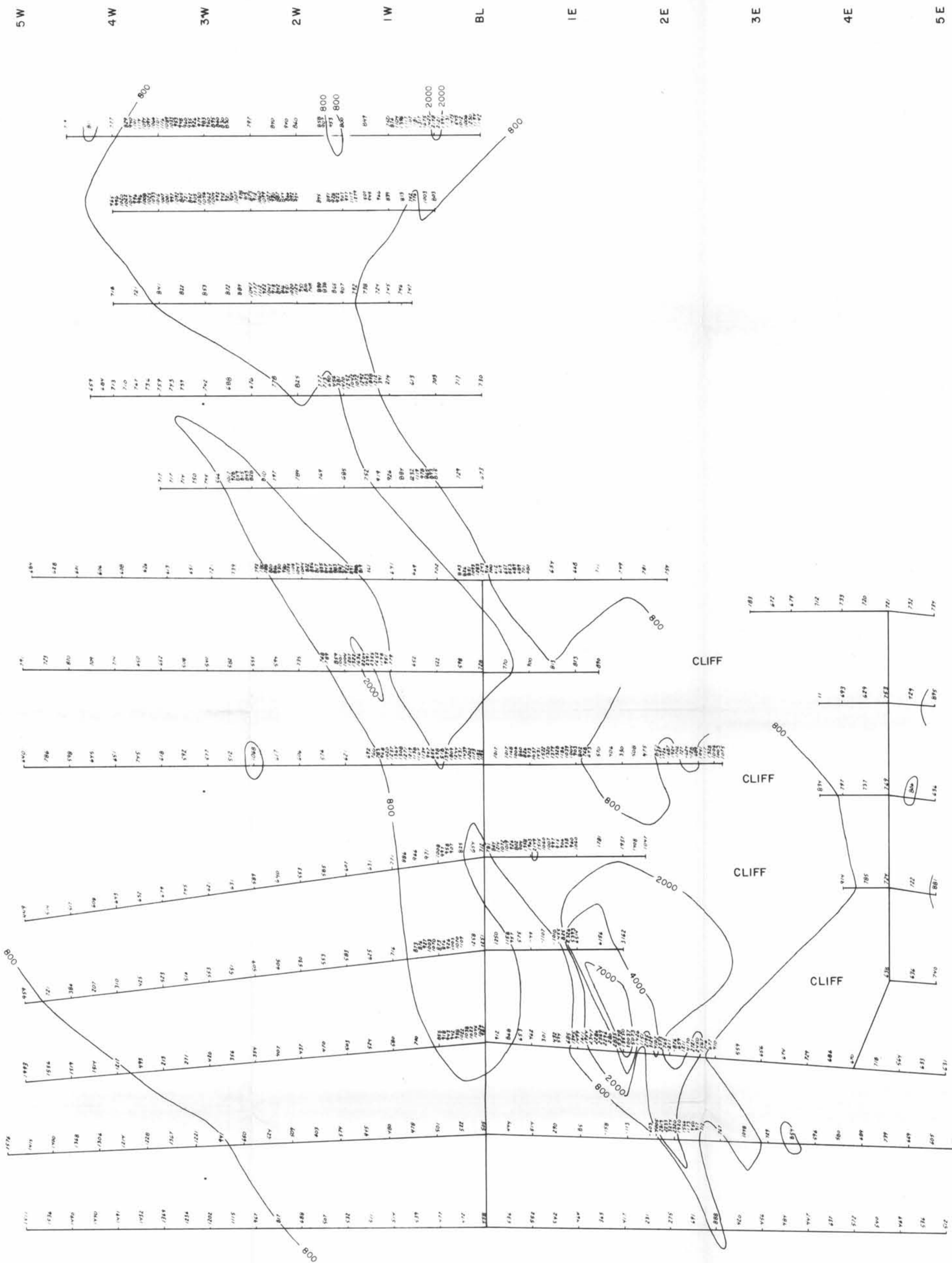


SYMBOLS

2000 2000 gammas (all values plus 57,000 gammas)



HEFF LAKE PROPERTY				
Drawn by: BGA	Traced by:		DETAIL MAGNETICS	
Revised by: _____	Date: _____	Revised by: _____		Date: _____
Scale: 1:2,500			Date: JULY 1980	Plate: 4a



22 N
21 N
20 N
19 N
18 N
17 N
16 N
15 N
14 N
13 N
12 N
11 N
10 N



SYMBOLS

2000 2000 gammas (all values plus 57000 gammas)

0 100 200 300 METRES

MINERAL RESOURCES GEMMETER
ASSESSMENT REPORT
8246

HEFF LAKE PROPERTY

92-1/16

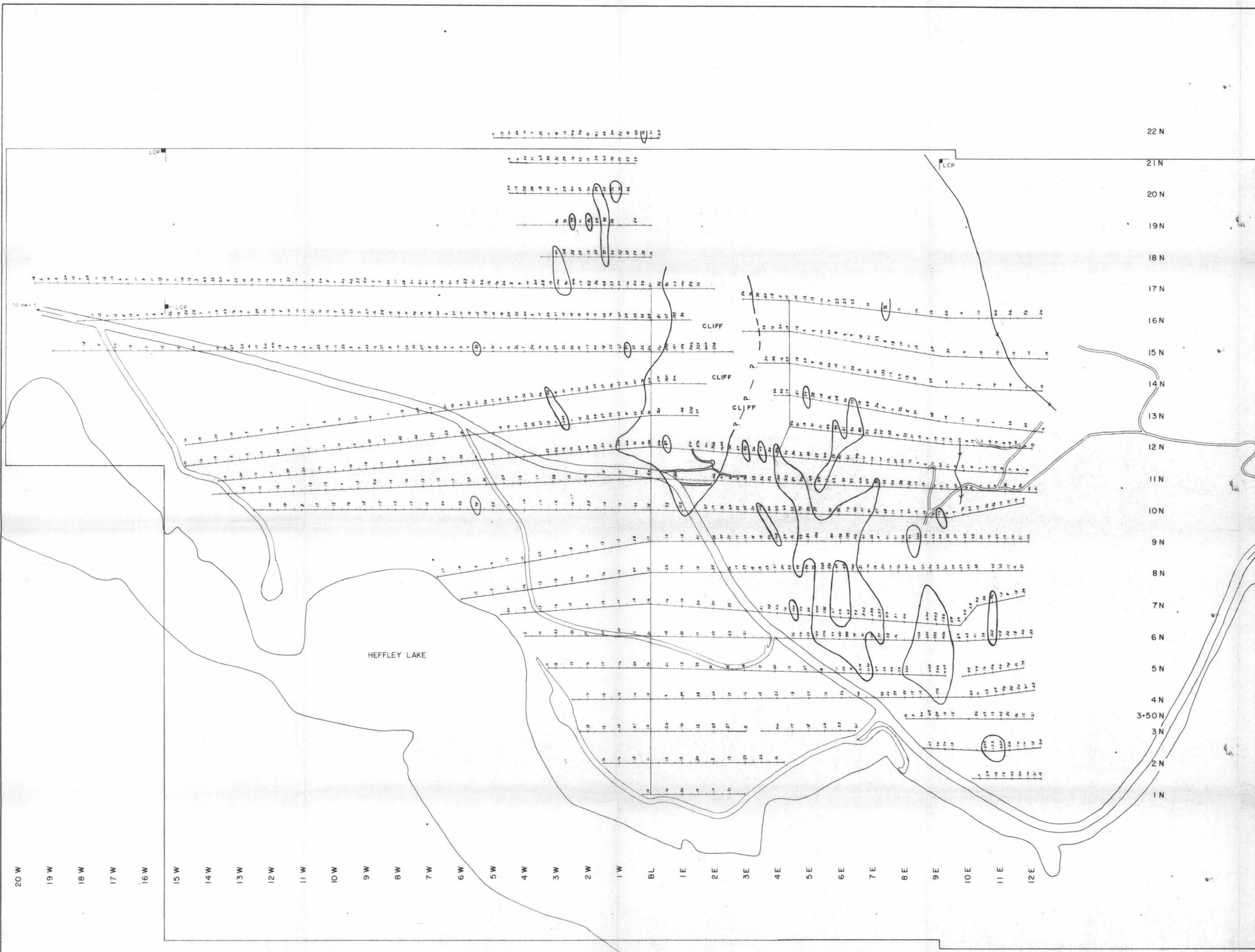
Drawn by: BGA	Traced by:
Revised by: []	Revised by: []

DETAIL MAGNETICS

Scale: 1:2,500

Date: JULY 1980

Plate: 4 b



SYMBOLS

- soil sample location
- Cu in ppm; contoured at 75 ppm



MINERAL RESOURCES BRANCH
ASSESSMENT REPORT
8246

HEFF LAKE PROPERTY		92-1/16	
Drawn by:	Traced by:		
Reviewed by:	Reviewed by:		
GEOCHEMISTRY Cu			
Scale: 1:5,000	Date: JULY 1980	Plate: 5	