# EXPLORATION FOR LEAD VEINS

## BANNOCKBURN AREA - SOUTHEASTERN ONTARIO

### INTRODUCTION

As a result of a lead property submission by the writer an agreement covering exploration for lead veins in the Bannockburn area of Southeastern Ontario was entered into on March 17, 1966, with Peñarroya Canada Limitée. In particular, it was decided to explore by geophysical and geochemical means, supplemented by a general structural study using air photos and aeromagnetic data, a six claim group adjoining the old Hollandia Lead Mine property to the south. Peñarroya obtained a six month option to purchase this group.

The presence of a number of calcite-barite-galena veins occurring in the Precambrian limestone sediments of Southeastern Ontario has been known for over 100 years. A large part of the work on these veins was done 50 to 100 years ago. There has been very little exploration in recent years. The writer believes that there is a good chance of success in looking for an economic lead deposit in the Bannockburn area if an adequate systematic exploration program is carried out. There are a number of reasons for believing this-- (1) the prevalence of lead occurrences in the area; (2) the opportunity to use modern techniques and equipment; (3) the economic possibilities suggested by the presence of associated silver. An analogous situation exists in the Northern part of Portugal. After many years lying dormant mining has recently commenced on the Terramonte vein. This vein consists of a vertical quartz-filled fissure containing 4% lead, 3% zinc, and 6.0 ounces of silver per ton in a series of lenses. Stoping width is held to 3 feet. The Terramonte vein has been known for over a century. It was partially mined to a maximum depth of 150 feet before 1890. Placer Development and Noranda Mines are two of the operating partners.

The present work in Southeastern Ontario, as described in this report, was carried out at intervals over the past season. Some additional work is necessary to provide adequate information for evaluation of results.

## PROPERTY DETAILS

The property covered by the present detailed surveys is about 140 miles by highway north-east of Toronto and almost an equal distance south-west of Ottawa. It is in the Southeastern Ontario region. It is readily accessible by Highway No. 62 a distance of 11 miles north of Madoc plus 2 miles of gravel road transects the property.

The group consists of 6 contigious mining claims numbered EO-32372 to 32377 recorded Feb. 14, 1966. This group is located in the north central part of Madoc Township, Hastings County.

For clarification concerning property details and location refer to accompanying sketches -- "Property Sketch" and "Key Map".

## HISTORY

In Southeastern Ontario the principal producer of lead was the Kingdon Mine which, before ceasing operations in 1931, produced over 60,000,000 pounds of lead from a 5' wide vein with an average grade of about 8.5% lead. Other producers of lesser extent were the Frontenac, Hollandia and Long Lake Mines. All of which are the fissure vein type of deposits with the possible exception of Long Lake Mines. The Frontenac Lead Mine produced 39,000 pounds of lead in 1916-17 from a 12' wide vein averaging somewhat in excess of 4% lead. The Hollandia produced 2,700,000 pounds of lead from a 4' wide vein averaging 6% lead, in 1905 to 1906 and 1916. The production from Long Lake Mines was principally zinc.

The present work is mostly in the vicinity of the Hollandia Lead Mine but takes in a general area about 6 miles in diameter which includes a number of lead occurrences. The most recent work in the area consisted of a limited diamond drilling program by Teck Exploration on the Hollandia property, in the shaft vicinity only, in 1956. The Hollandia vein was traced for a long distance on the surface and was developed for a length of over 400 feet by four shafts ranging in depth from 50 to 132 feet, very shallow by present day standards.

GENERAL GEOLOGY IN RELATION TO LEAD VEINS

Precambrian sediments, primarily of limestone composition, underlie the south-west quarter of Tudor Township and part of the south-east quarter of Lake Township, also immediately to the north of the village of Bannockburn near the north boundary of Madoc Township, in Southeastern Ontario. According to recent geological compilation* these sediments form a basin-like structure roughly eight miles in diameter, folded in the form of a syncline, the synclinal axis extends in a sinuous manner from north to south and plunges to the south. It appears that a number of lead-barite-calcite veins formed in tension (primarily) fractures at right angles to the axis of synclinal folding. This is similar to structural conditions indicated at the Violamac Mine in the Slocan district of British Columbia. Here "---orebodies formed in the axial regions of folds, in tension fractures that cut the fold axes almost at right angles".** The Violamac lead vein was located in calcareous sediments and had an average width of 2½ feet. There are no figures on grade of ore.

Genetically, there is a strongly suggestive relationship of the lead-barite-calcite veins of the Bannockburn area to granitic cupolas in the immediate area surrounding the sedimentary basin structure. Essentially, all metals are zoned about summit cupolas. Some veins change in composition as they are followed downward or toward the cupola, in the order from lead to zinc to copper.*** The relatively small size of these granitic masses or cupolas indicates the most favourable stage of erosion of the batholith for exploration. Refer to sketch "Bannockburn District Lead Occurrences". It should be noted that in the general region to the west erosion has reached a stage where the barren core is exposed and very little sulphide mineralization is found.

A study of stereoscopic air photos indicates a strong fault or fracture system connecting the Gawley Creek granite cupola, near Bannockburn, to the Hollandia lead veins. Refer to sketch "Geological Structure from Air Photos". Preliminary work shows this to be the case in regard to the Katherine Lead Mine also. These structures are partly indicated on Ontario Department of Mines geological maps of the area. They could have provided channelways for the mineralizing solutions which formed the lead veins.

The principal features indicated from a study of air photos (see sketch) are: (1) prominent north-south trending linears

*Lumbers, S.B., Fig. No. 7 Bancroft-Madoc Area, Ont., Dept of Mines, 1964.

**Ambrose, J.W., Violamac Mine, Slocan District, B.C., Structural Geology of Canadian Ore Deposits - Pp.88-95 - Vol. II, 1957.

***Emmons, W.H., On the Mechanism of the Deposition of Certain Metalliferous Lode Systems Associated with Granite Batholeths: Ore Deposits of the Western States Pp. 327-349 - A.I.M.E. 1933.

representing bedding in the limestone; (2) weaker linears at right-angles to the bedding representing structures thought to be associated with lead-bearing veins; (3) a prominent linear representing the limestone-andesite contact; (4) some transverse linears of unknown origin.

A study of aeromagnetic contours (Refer to sketch - "Aeromagnetic Contours") indicates the greatest thickness of predominately limestone sediments to occur in an area just to the south of a line connecting the Hollandia and Katherine lead veins. A point to note is that the most prominent known lead veins occur in the vicinity of the 800 to 900 gamma contours, along with a number of lesser occurrences.

A number of lead occurrences of various degrees of interest were located and examined in the field and are shown on the various sketches accompanying this report.

## GENERAL GUIDES TO EXPLORATION FOR LEAD - BANNOCKBURN AREA

The present work consisted primarily of a detailed geochemical soil survey supplemented by a ground magnetometer survey over a six claim group covering the strike of the Hollandia Lead Mine to the south. Other methods used in the present work are itemized as follows:

(1) Compilation and analysis of available geological data

(2) Study of structures from air photos

(3) Study of the distribution of lead occurrences in the Bannockburn sedimentary basin

(4) Correlation of lead occurrences and structure with aeromagnetics

PRELIMINARY DETAILED EXPLORATION - "HOLLANDIA" GROUP

Grid: A grid system was established to cover the property with picket lines at 400 foot intervals at right-angles to the strike of the Hollandia lead vein along its projected extension to the south-east. Pickets were set at 100 foot spacings along all lines.

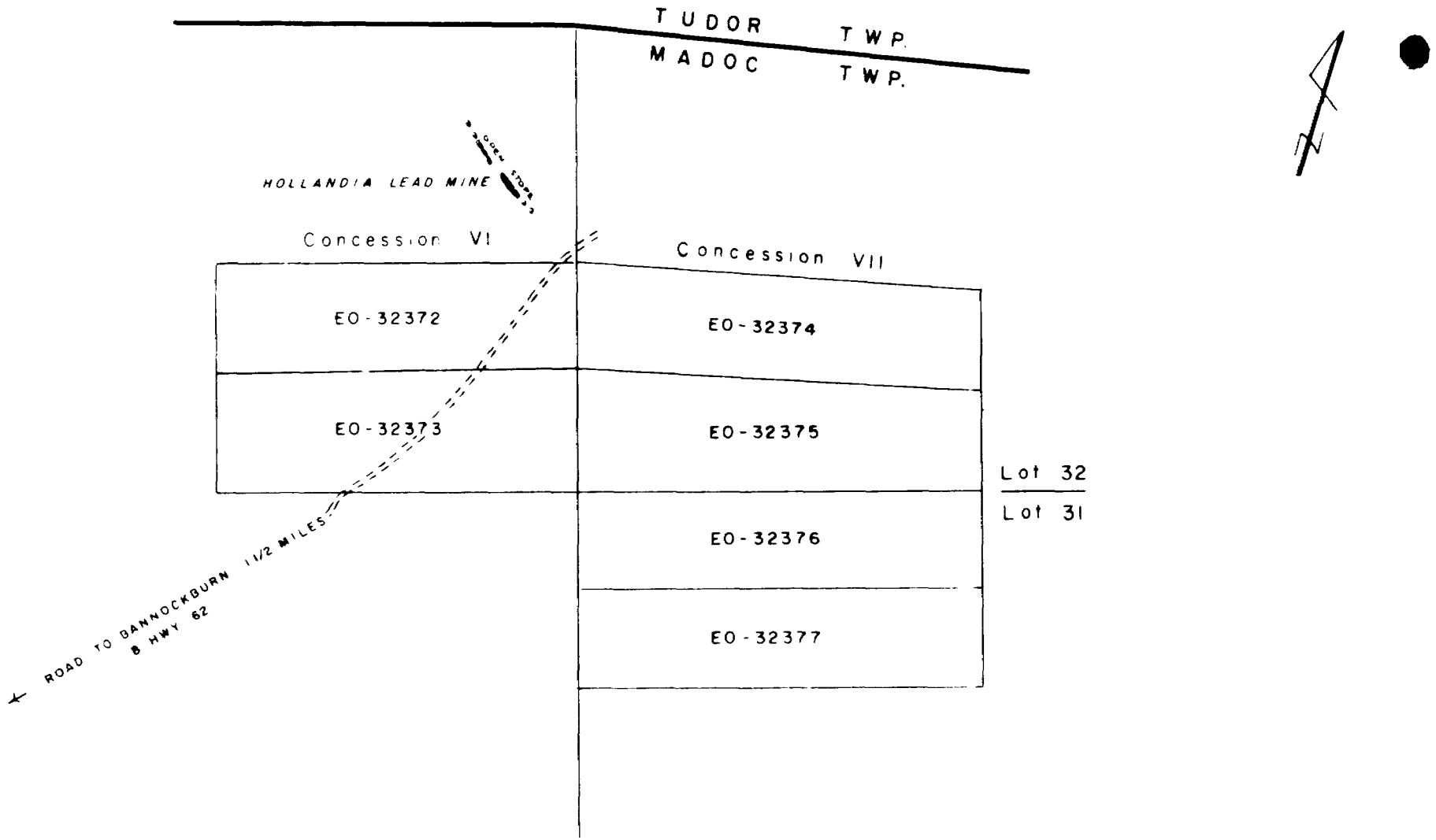
Geochemical Survey: Soil samples were taken at a depth of 1 foot where possible and at a maximum spacing of 100 feet along all lines. Sampling covered the entire property except in a few marshy areas. Additional samples were taken in anomalous areas throughout. Tests were made of each sample for cold-extractable total heavy metals (zinc, copper, lead) by a modified "Bloom" method using ammonium citrate buffer and dithizone. Colorimetric estimates were made of the total heavy metals. This method is more sensitive to zinc than copper or lead. Zinc is also more mobile but its mobility is reduced in a calcareous environment such as this.

The veins sought are known to contain predominantly lead with sometimes associated zinc and possibly very minor amounts of copper, in the form of galena, sphalerite, and chalcopyrite respectively.

The results of the geochemical survey outlines irregular cold-extractable heavy metal anomalies along the projected strike of the Hollandia lead vein to the south-east. As the lead in the veins occurs in irregular "pockets" and lenses there will be no anomaly if lead is not present where a vein suboutcrops. Thus it is quite possible that an anomalous zone will be far from continuous as in the present case.

In order to obtain more conclusive data some additional work involving analysis for "total" lead following a hot 25% nitric acid digestion should be carried out on a number of samples in the anomalous zones.

Magnetometer Survey: A magnetometer survey was carried out with a Sharp Model MF-1, fluxgate magnetometer over all lines at 50 foot intervals, and the results contoured. There was some correlation between high magnetic trends and total heavy metal geochemical anomalies.



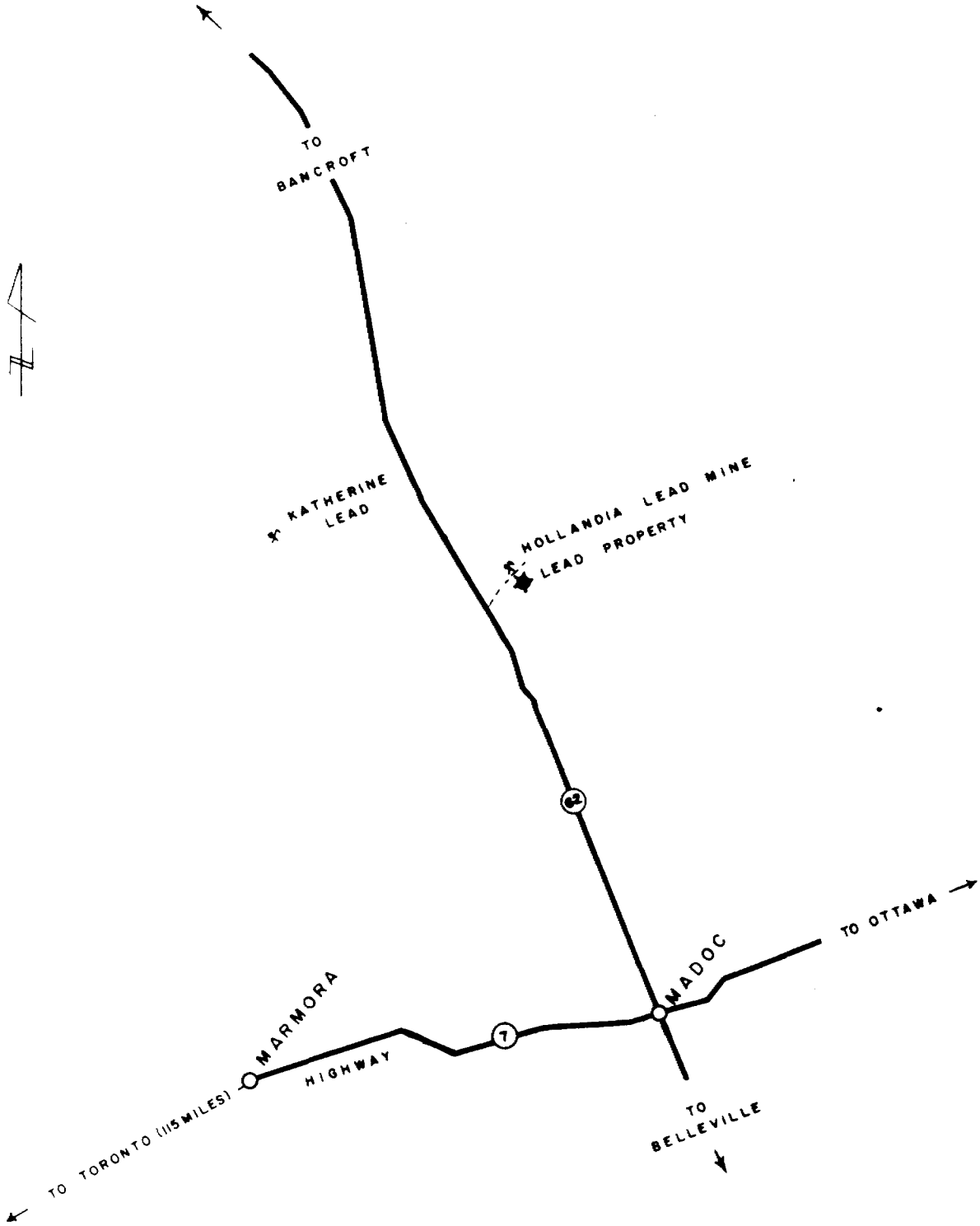

# PROPERTY SKETCH

MADOC TWP. - ONTARIO

SCALE

0 1000'

SEPT. 1966




# Key Map

SCALE: 1" = 4 MILES

## PRESENTATION OF RESULTS OF GEOCHEMICAL & GEOPHYSICAL SURVEYS

The contoured results of the Geochemical Soil Survey and Magnetometer Survey are shown on Maps 637-A & 637-B respectively, in the pocket of this report at a scale of 1" = 200'.

## CONCLUSIONS & RECOMMENDATIONS

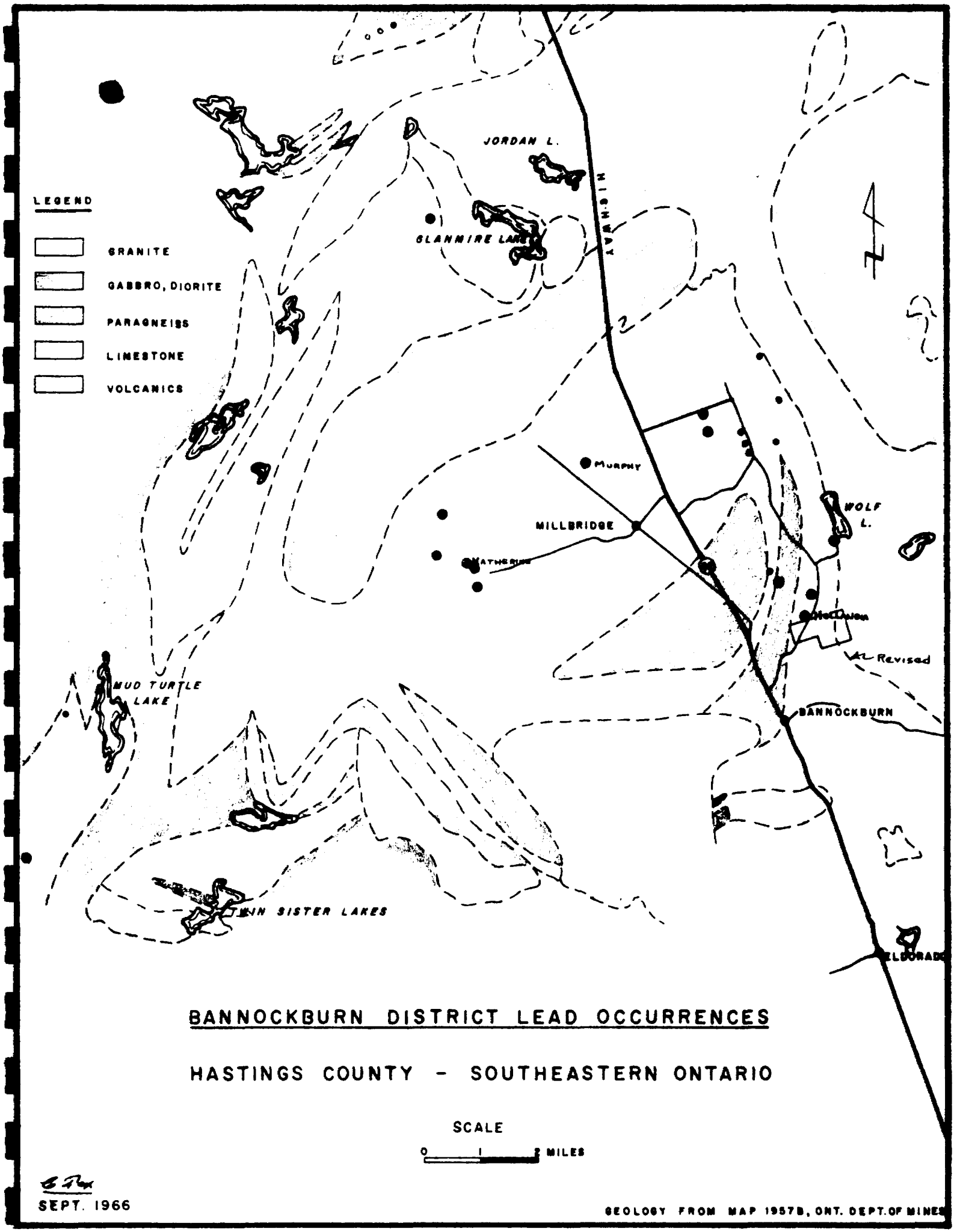
The results of the present work are promising but inconclusive. A limited amount of additional work will be necessary in order to form definite conclusions. Specifically, analyses for "total" lead in anomalous heavy metal areas should be carried out and the results interpreted and correlated with the present work. Also, the silver content of the lead veins should be investigated by assaying samples from the Hollandia for comparison. Appreciable silver could have a substantial effect on oconomic possibilities of lead veins. The Katherine lead vein, in this area, was said to average 10 oz./ton silver.

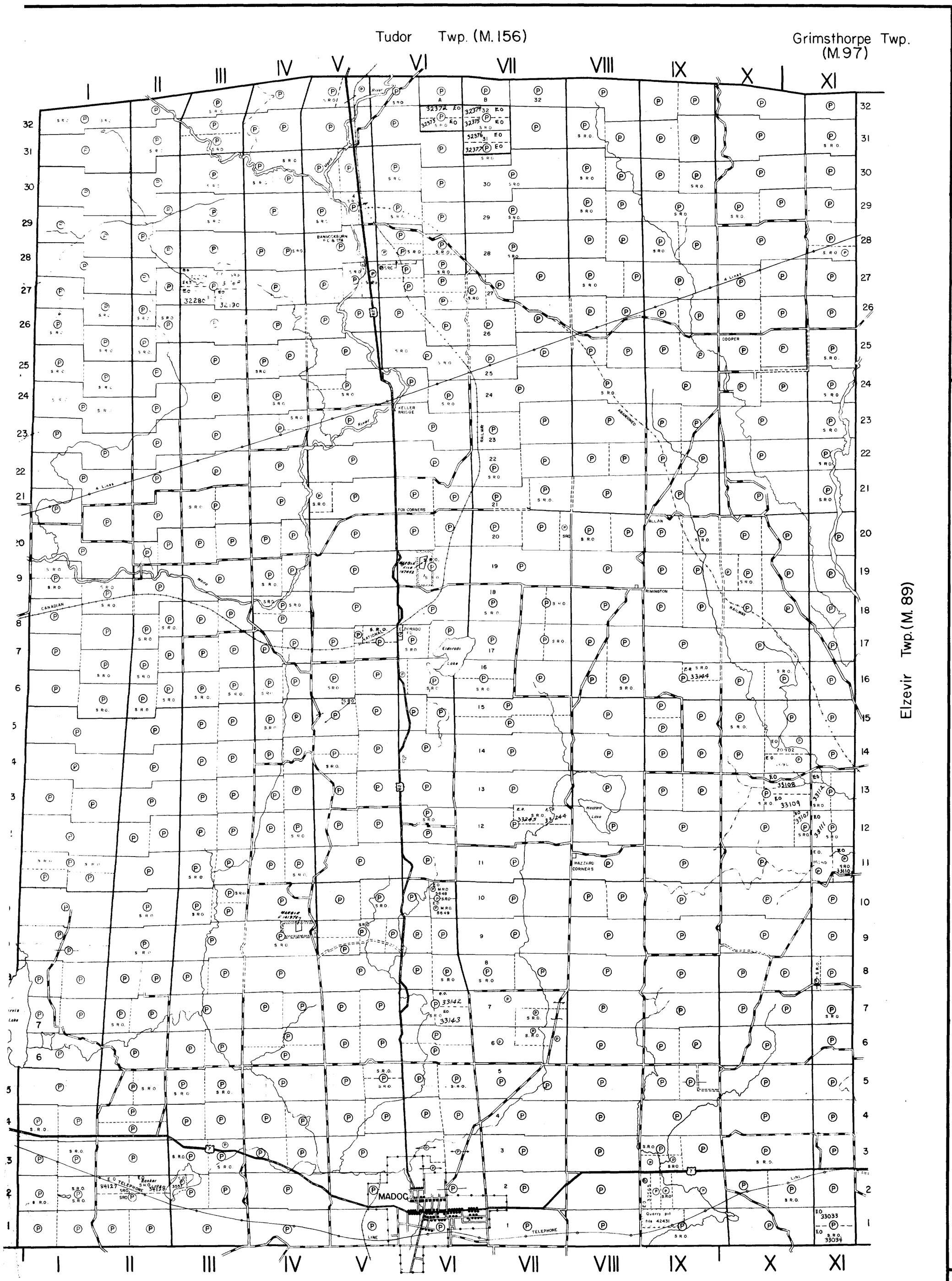
The above work including sample analyses, assays for silver on lead ore, and report with interpretation, would cost $500.

Campbell Fox

Campbell Fox, P. Eng.

Brighton, Ontario
September 24, 1966


LEGEND
GRANITE
GABBRO, DIORITE
PARAGNEISS
LIMESTONE
VOLCANICS
JORDAN L.
GLANMIRE LAKE
HIGHWAY
MURPHY
MILLBRIDGE
WOLF L.
MUD TURTLE LAKE
BANNOCKBURN
Revised
TWIN SISTER LAKES
BANNOCKBURN DISTRICT LEAD OCCURRENCES
HASTINGS COUNTY - SOUTHEASTERN ONTARIO
SCALE
0 1 2 MILES
SEPT. 1966
GEOLOGY FROM MAP 1957B, ONT. DEPT. OF MINES




THE TOWNSHIP OF

# MADOC

COUNTY OF HASTINGS

EASTERN ONTARIO MINING DIVISION

SCALE: 1-INCH = 40 CHAINS

## LEGEND

| | |
|---|---|
| PATENTED LAND | Ⓟ |
| CROWN LAND SALE | C.S. |
| LEASES | Ⓛ |
| LOCATED LAND | Loc. |
| LICENSE OF OCCUPATION | L.O. |
| MINING RIGHTS ONLY | M.R.O. |
| SURFACE RIGHTS ONLY | S.R.O. |
| ROADS | |
| IMPROVED ROADS | |
| KINGS HIGHWAYS | |
| RAILWAYS | |
| POWER LINES | |
| MARSH OR MUSKEG | |
| MINES | |

## NOTES

This Map Is Not To Be Used —FOR SURVEY PURPOSES—

400' SURFACE RIGHTS RESERVATION AROUND ALL LAKES AND RIVERS.

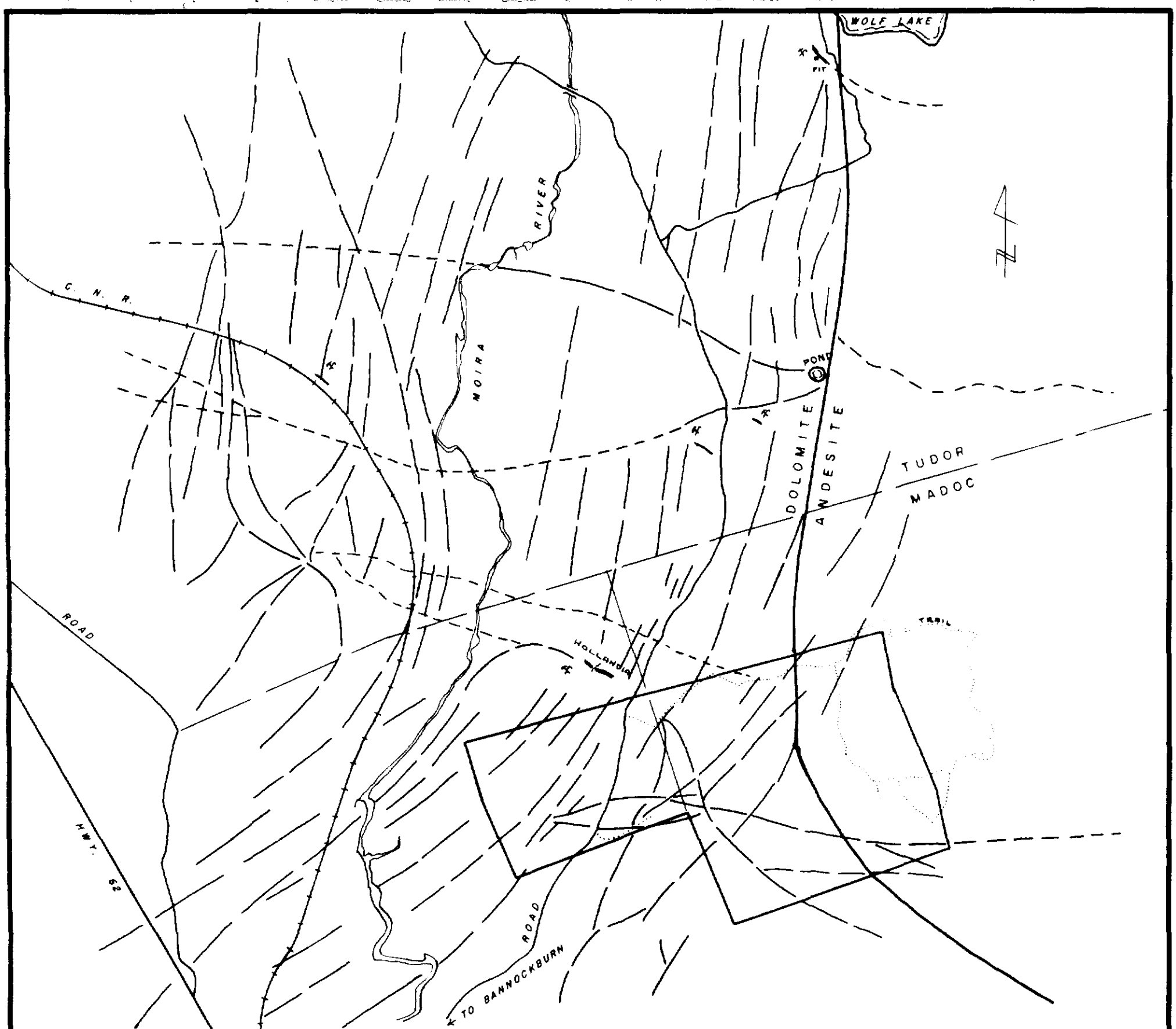
Marble Reserved under section 42 of Mining Act for areas marked thus :



DATE OF ISSUE
FEB 24 1967
ONTARIO DEPT. OF MINES

PLAN NO.-M.120

DEPARTMENT OF MINES
— ONTARIO —




FAULT, FOLIATION, OR STRIKE OF BEDDING - LINEATION

SAME - BUT LESS DISTINCT

NOTE: DOLOMITE-ANDESITE CONTACT FROM P.R. 1964-4 BY S.B. LUMBERS, ONT. DEPT. OF MINES MODIFIED BY PRESENT WORK.

LEAD VEIN

# GEOLOGICAL STRUCTURES FROM STEREOSCOPIC AIR PHOTOS

# VICINITY OF HOLLANDIA LEAD MINE, SOUTHEASTERN ONTARIO

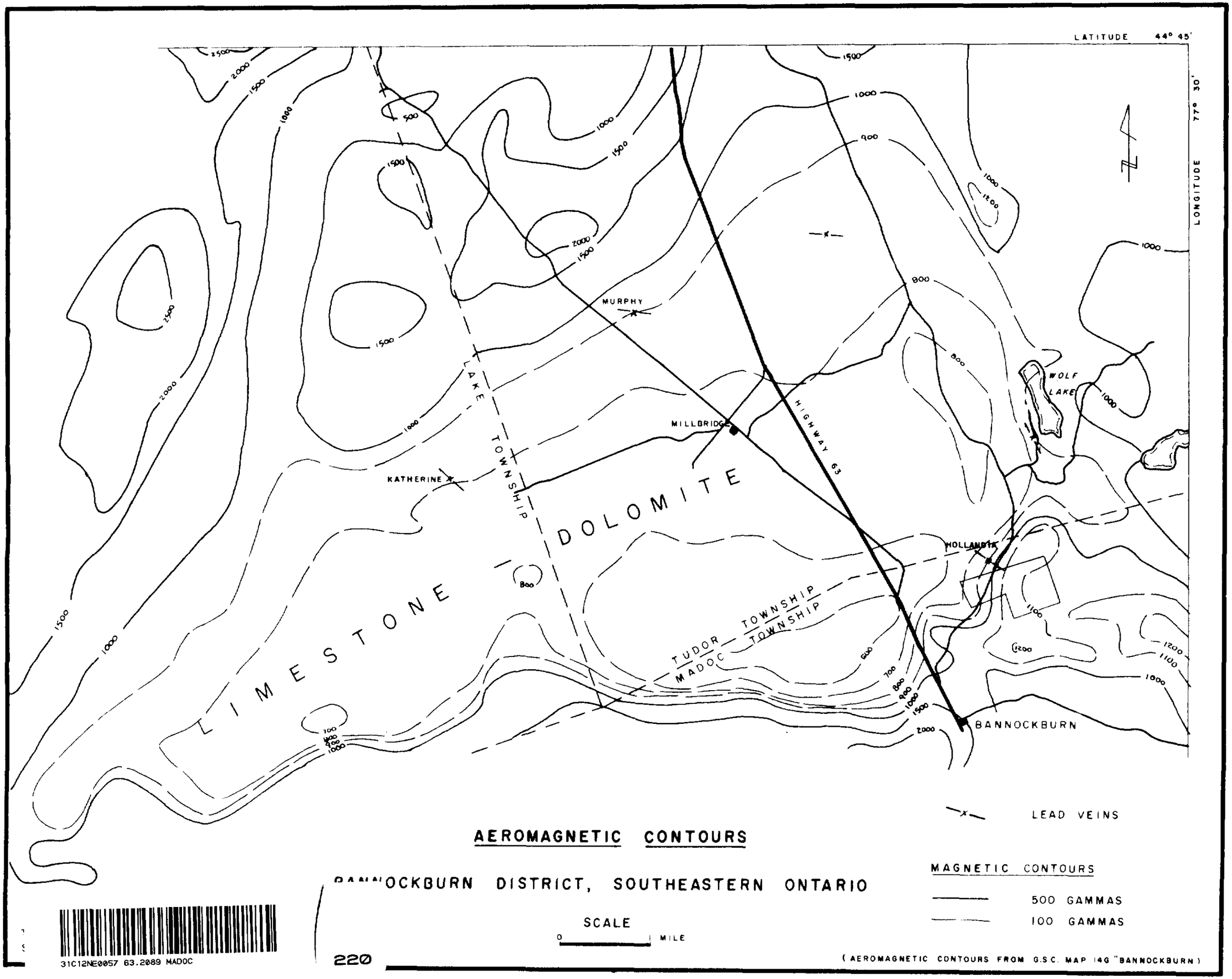
SCALE

0 1/4 MILE

31C12NE0057 63.2089 MADOC

210

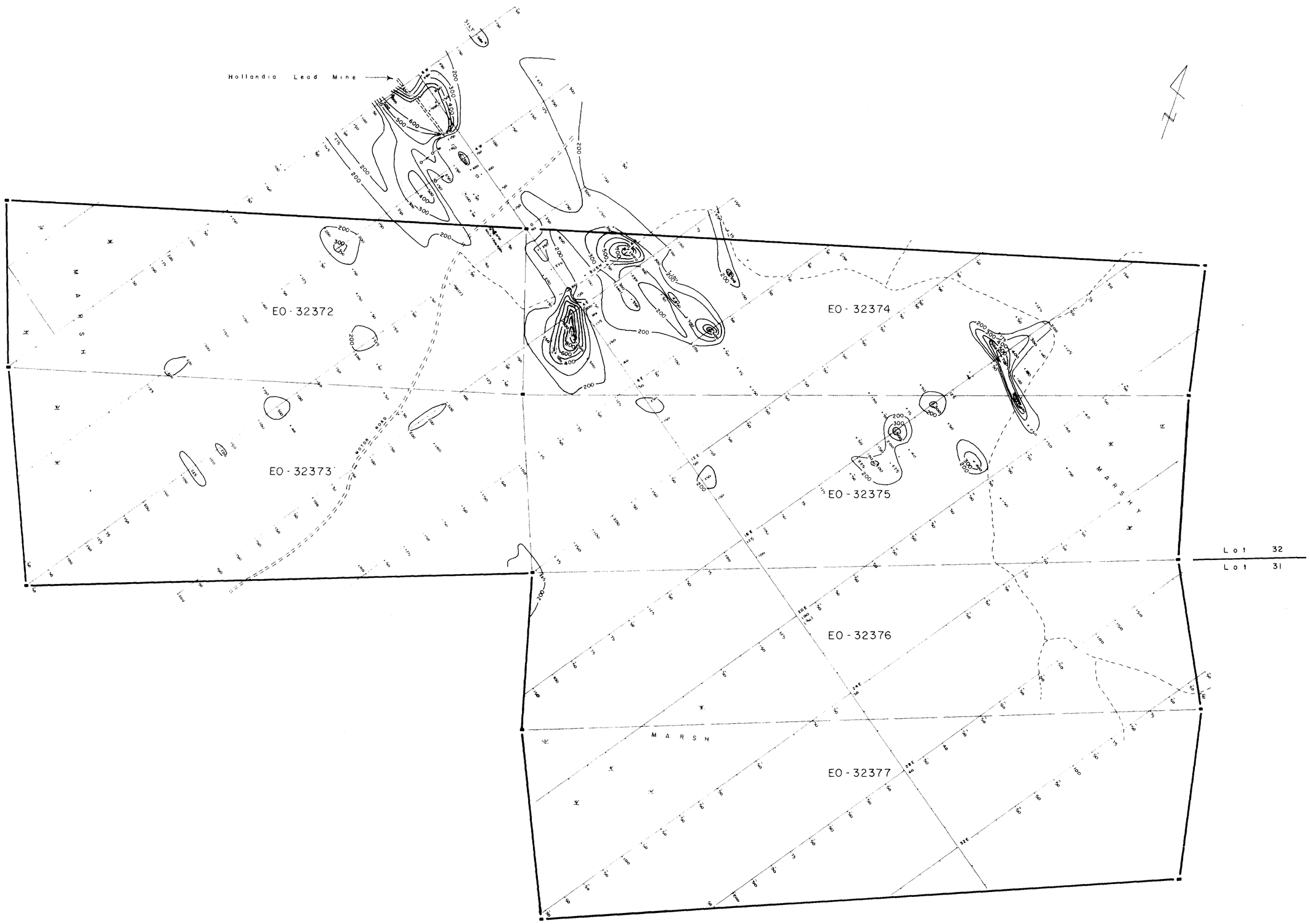
B. Rock SEPT. 1966




AEROMAGNETIC CONTOURS

BANNOCKBURN DISTRICT, SOUTHEASTERN ONTARIO

(AEROMAGNETIC CONTOURS FROM G.S.C. MAP 14G "BANNOCKBURN)




**DATA**

PICKET LINE SHOWING SOIL SAMPLE VALUES OF COLD-EXTRACTABLE TOTAL HEAVY METALS IN PARTS PER MILLION

GEOCHEMICAL CONTOUR (CxHM IN PPM)

UNCORRELATED ANOMALOUS GEOCHEMICAL VALUE

COLD-EXTRACTABLE HEAVY METALS (ppm)

100 200 300 400 500 600

# PEÑARROYA OPTION

MADOC TOWNSHIP - SOUTHEASTERN ONTARIO

## GEOCHEMICAL SOIL SURVEY

SCALE: 1" = 200'

SEPTEMBER 1966

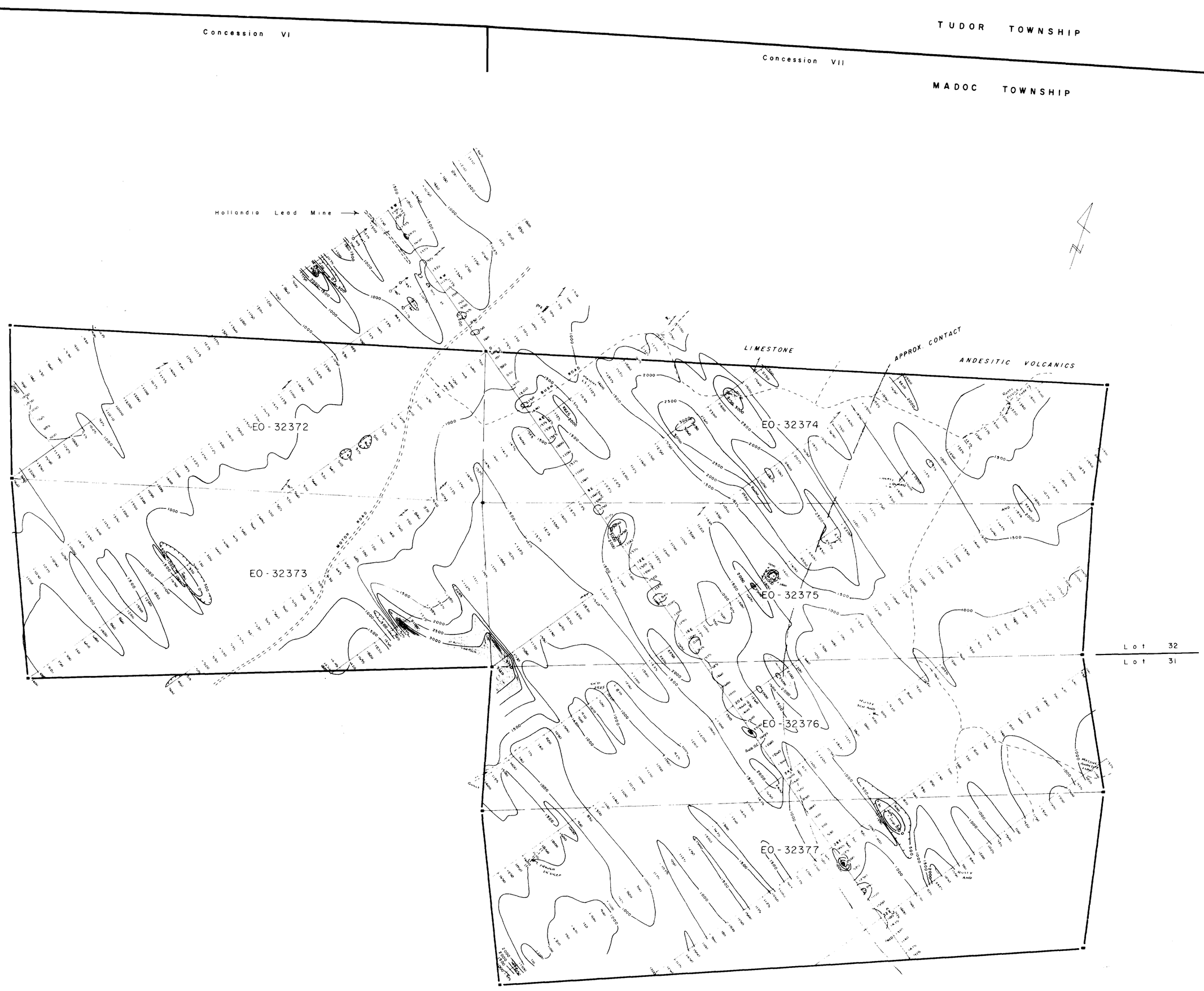
Campbell Fox, P.Eng.

**MAP NO. 637-A**

31C12NE0057 63.2089 MADOC

230

63.2089




MAGNETIC DATA

PICKET LINE WITH MAGNETIC READINGS IN GAMMAS

MAGNETIC CONTOUR LINES (VERTICAL COMPONENT)

DEPRESSION CONTOUR

500 GAMMA INTERVAL

LEGEND

| GAMMAS | |
|---|---|
| 3000 - PLUS | |
| 2500 - 3000 | |
| 2000 - 2500 | |
| 1500 - 2000 | |
| 500 1500 | |
| 500 MINUS | |

PEÑARROYA OPTION

MADOC TOWNSHIP - SOUTHEASTERN ONTARIO

# MAGNETOMETER SURVEY

SCALE: 1" = 200'

SEPTEMBER 1966

Campbell Fox, P.Eng.

SHARPE MODEL MF-1 FLUXGATE MAGNETOMETER

31C12NE0057 63.2089 MADOC

240

MAP NO. 637-B