



42A03NE0028 2.11387 BARTLETT

010

A-773

REPORT ON AN

**AIRBORNE MAGNETIC
AND VLF-EM SURVEY**

McARTHUR AND BARTLETT TOWNSHIPS

PORCUPINE MINING DIVISION, ONTARIO

for

NORWIN RESOURCES LIMITED

RECEIVED

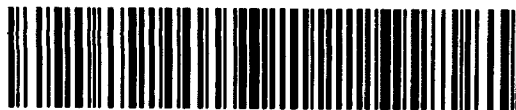
JUL 12 1988

by: **TERRAQUEST LTD.**

Toronto, Canada

June 22, 1988

MINING LANDS SECTION



42A03NE0028 2.11367 BARTLETT

010C

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No. A-773-3 ~ VLF-EM Survey

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● Introduction

This report describes the specifications and results of a geophysical survey carried out for Norwin Resources Limited of 208-430 Notre Dame Ave., Sudbury, Ontario, P3C 2K7 by Terraquest Ltd., 240 Adelaide Street West, Toronto, Canada. The field work was completed on April 10, 1988 and the data processing, interpretation and reporting from April 11 to June 22, 1988.

The purpose of a survey of this type is two-fold. First to prospect directly for anomalously conductive and magnetic areas in the earth's crust which may be caused by, or at least related to, mineral deposits. A second is to use the magnetic and conductivity patterns derived from the survey results to assist in mapping geology, and to indicate the presence of faults, shear zones, folding, alteration zones and other structures potentially favourable to the presence of gold and base-metal concentration. To achieve this purpose the survey area was systematically traversed by an aircraft carrying geophysical instruments along parallel flight lines spaced at even intervals, 100 metres above the terrain surface, and aligned so as to intersect the regional geology in a way to provide the optimum contour patterns of geophysical data.

2. The Property

The property is located in the southeast corner of McArthur township and the northeast corner of Bartlett township in the Porcupine Mining Division of Ontario about 30 kilometres south of the town of Timmins. The property can be accessed by bush roads to the north and west.

The latitude and longitude are 48 degrees 12 minutes, and 81 degrees 13 minutes respectively, and the N.T.S. reference is 42A/3.

The claim numbers are shown in figure 2 and listed below:

P 968398-968416 (19)
943709-943712 (4)
969603-969614 (12) ~ Total 35 claims

3. Geology

Map References

1. Map 2345: Peterlong Lake.
Scale 1:50,000.
O.G.S. 1977.
2. Map 2363: McArthur and Douglas Townships.
scale 1:31,680.
O.D.M. 1976.
3. Map 2364: Bartlett and Geikie Townships.
Scale 1:31,680.
O.D.M. 1976.

The survey area is underlain predominantly by a suite of metavolcanic rocks that have been compressed between the Adams Pluton to the north, the Geikie Pluton to the east and the Peterlong Lake Complex to the west. The metavolcanics trend to the north and northwest and are composed of massive to spinifex textured flows of ultramafics to the northeast, a narrow band of massive to pillowed mafic metavolcanics across the centre, and tuff and lapilli tuff intermediate to felsic metavolcanics across the southwestern half of the survey area. Narrow iron formations are associated with the mafic, intermediate and felsic metavolcanics. Small semi-conformable plutons of trondhjemitic quartz feldspar porphyry and fine to medium grained equigranular trondhjemite intrude all the metavolcanics. The intermediate to felsic metavolcanics have been intruded by narrow sills and minor dykes of gabbro and quartz-gabbro. The entire lithological package has been cut by late stage olivine diabase dykes trending to the northwest.

The dominant structures are parallel and slightly oblique to the major stratigraphic trends. Several cross faults trending to the northeast are indicated in the area.

There are numerous prospects, trenches and shafts within the general area indicating gold, iron, copper, nickel and asbestos mineralization. Seven gold occurrences have been discovered within this 35 claim group property.

4. Survey Specifications

4.1 Instruments

The survey was carried out using a Cessna 182 aircraft, registration C-FAKK, which carries a magnetometer and a VLF electromagnetic detector.

The magnetometer is a proton precession type based on the Overhauser effect. The Overhauser effect allows for polarization of a proton rich liquid of the sensor by adding a "free radical" to it and irradiating it by RF magnetic field. Strong precession signals are generated with modest RF power.

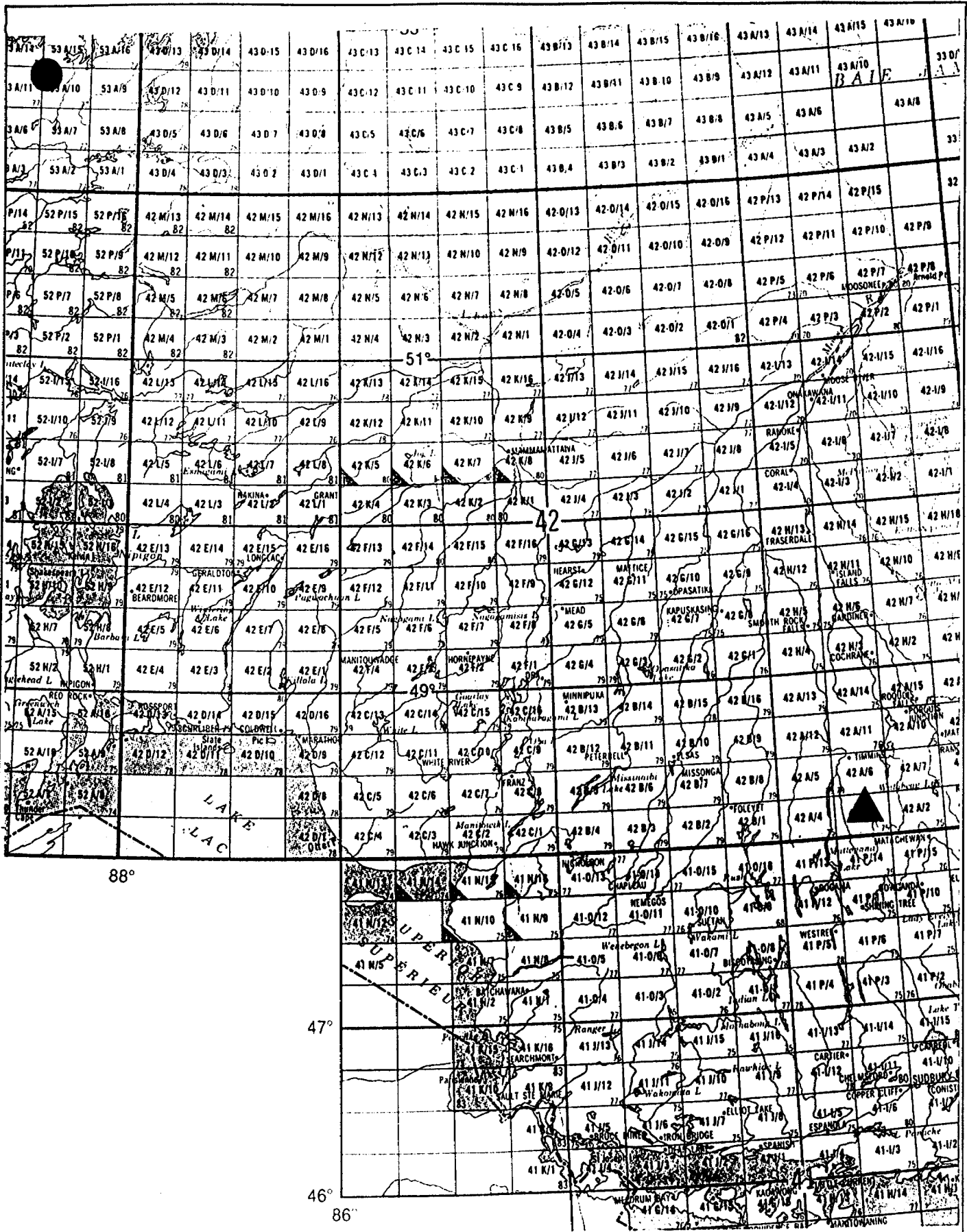
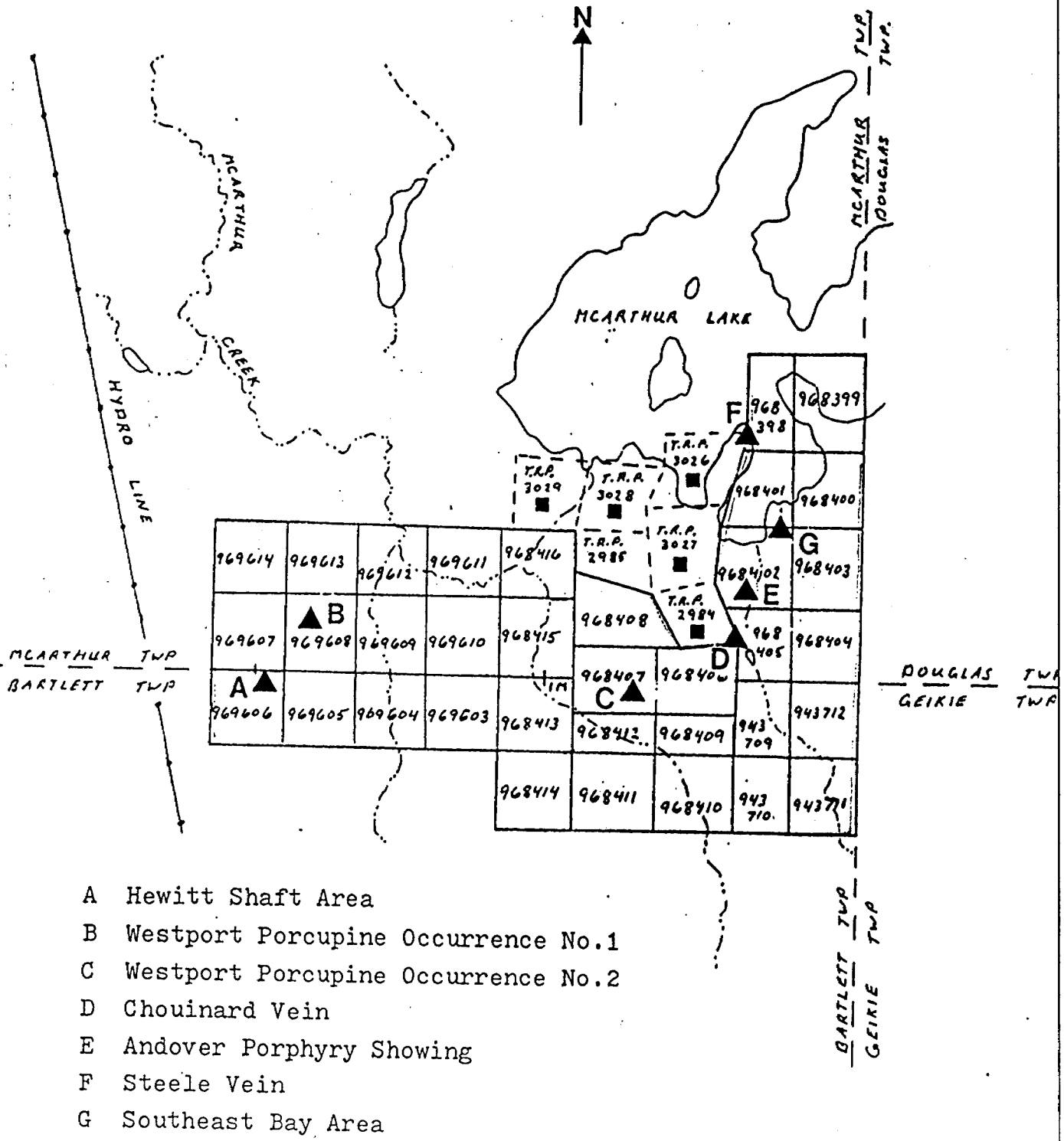


FIGURE 1. General Location





- A Hewitt Shaft Area
- B Westport Porcupine Occurrence No.1
- C Westport Porcupine Occurrence No.2
- D Chouinard Vein
- E Andover Porphyry Showing
- F Steele Vein
- G Southeast Bay Area

FIGURE 2. Claim Location Map
(exact locations not certified)



The sensor element is mounted in an extension of the right wing tip. Its specifications are as follows:

Model: GSM-9BA
Manufacturer: GEM Systems Inc.
105 Scarsdale Road
Don Mills, Ontario
Resolution: 0.5 gamma
Accuracy: 0.5 gamma
Cycle time: 0.5 second
Range: 20,000-100,000 gammas in 23 overlapping steps
Gradient tolerance: Up to 5,000 gammas/m

The VLF-EM unit uses three orthogonal detector coils to measure (a) the total field strength of the time-varying EM field and (b) the phase between the vertical coil and both the "along line" coil (LINE) and the "cross-line" coil (ORTHO). The LINE coil is tuned to a transmitter station (Channel 1) that is ideally positioned at right angles to the flight lines, while the ORTHO coil transmitter (Channel 2) should be in line with the flight lines. Its specifications are:

Model: TOTEM 2A
Manufacturer: Herz Industries,
Toronto, Canada
Accuracy: 1%
Reading interval: 0.5 second

The VLF sensor is mounted in the left wing tip extension.

Other instruments are:

- King KRA-10A radar altimeter
- PDAS-1100 data acquisition system with two 3.5" floppy disk drives manufactured by Picodas Group Inc., Richmond Hill, Ontario
- Geocam video camera and recorder for flight path recovery, manufactured by Geotech Ltd., Markham, Ontario.
- PBAS-9000 portable field base station with a 3.5" floppy disk drive and an analog print out manufactured by Picodas Group Inc., Richmond Hill, Ontario, coupled with a GSM-8 proton magnetometer manufactured by Gem Systems Inc., Toronto, Ontario.

4.2 Lines and Data

Line spacing: 100 metres
Line direction: 040 degrees

Terrain clearance: 100 m
Average ground speed: 156 km/hr

Data point interval:

Magnetic: 27 metres
VLF-EM: 27 metres
Tie Line interval: 2 km
Channel 1 (LINE): NAA Cutler, 24.0 kHz
Channel 2 (ORTHO): NSS Annapolis, 21.4 kHz
Line km over total survey area including overrun: 102 line km
Line km over claim groups:
Magnetic survey totals: 70 line km
VLF-EM survey totals: 70 line km

4.3 Tolerances

Line spacing: Any gaps wider than twice the line spacing and longer than 10 times the line spacing were filled in by a new line.

Terrain clearance: Portions of line which were flown above 125 metres for more than one km were reflight if safety considerations were acceptable.

Diurnal magnetic variation: Less than twenty gammas deviation from a smooth background over a period of two minutes or less as seen on the base station analogue record.

Manoeuvre noise: Approximately +/- 5 gammas.

4.4 Photomosaics

For navigating the aircraft and recovering the flight path, mosaics of aerial photographs were made from existing air photos.

5. Data Processing

Flight path recovery was carried out in the field using a video tape viewer to observe the flight path as recorded by the Geocam video camera system. The flight path recovery was completed daily to enable reflights to be selected where needed for the following day.

The magnetic data was levelled in the standard manner by tying survey lines to the tie lines. The IGRF has not been removed. The total field was

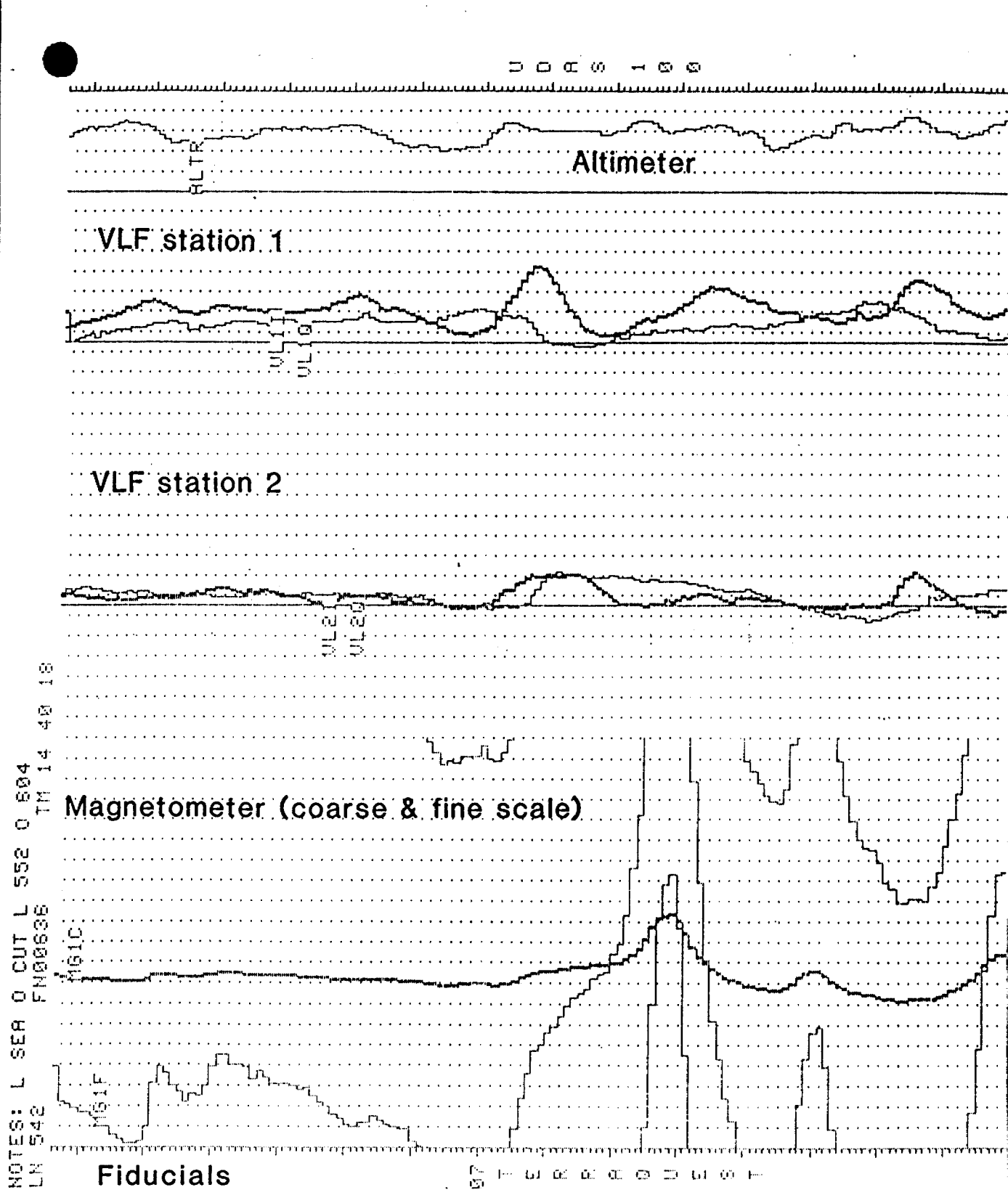


FIGURE 3. Sample of analogue data



contoured by computer using a program provided by Dataplotting Services Inc. To do this the final levelled data set is gridded at a grid cell spacing of 1/10th of an inch at map scale.

The vertical magnetic gradient is computed from the total field data using a method of transforming the data set into the frequency domain, applying a transfer function to calculate the gradient, and then transforming back into the spatial domain. The method is described by a number of authors including Grant, 1972 and Spector, 1968. The computer program for this purpose is provided by Paterson, Grant and Watson Ltd. of Toronto.

The VLF data was treated automatically so as to normalize the non conductive background areas to 100 (total field strength) and zero (quadrature). The algorithms to do this were developed by Terraquest and will be provided to anyone interested by application to the company.

All of these dataprocessing calculations and map contouring were carried out by Dataplotting Services Inc. of Toronto.

Grant, F.S. and Spector A., 1970: Statistical Models for Interpreting Aeromagnetic Data; Geophysics, Vol 35

Grant, F.S., 1972: Review of Data Processing and Interpretation Methods in Gravity and Magnetism; Geophysics Vol 37-4

Spector, A., 1968: Spectral Analysis of Aeromagnetic maps; unpublished thesis; University of Toronto.

6. Interpretation

6.1 General Approach

To satisfy the purpose of the survey as stated in the introduction, the interpretation procedure was carried out on both the magnetic and VLF data. On a local scale the magnetic gradient contour patterns were used to outline geological units which have different magnetic intensity and patterns or "signatures". Where possible these are related to existing geology to provide a geological identity to the units. On a regional scale the total field contour patterns were used in the same way.

Faults and shear zones are interpreted mainly from lateral displacements of otherwise linear magnetic anomalies but also from long narrow "lows". The

direction of regional faulting in the general area is taken into account when selecting faults. Folding is usually seen as curved regional patterns. Alteration zones can show up as anomalously quiet areas, often adjacent to strong, circular anomalies that represent intrusives. Magnetic anomalies that are caused by iron deposits of ore quality are usually obvious owing to their high amplitude, often in tens of thousands of gammas.

VLF anomalies are categorized according to whether the phase response is normal, reverse, or no phase at all. The significance of the differing phase responses is not completely understood although in general reverse phase indicates either overburden as the source or a conductor with considerable depth extent, or both. Normal phase response is theoretically caused by surface conductors with limited depth extent. In some cases, a change in the orientation of the conductor appears to affect the sense of the phase response.

Areas showing a smooth VLF-EM response somewhat above background (ie. 110 or so) are likely caused by overburden which is thick enough and conductive enough to saturate at these frequencies. In this case no response from bedrock is seen.

The VLF-EM conductor axes have been identified and evaluated according to the Terraquest classification system (Figure 4). This system correlates the nature and orientation of the conductor axes with stratigraphic, structural and topographic features to obtain an association from which one or more origins may be selected. Alternate associations are indicated in parentheses.

6.2 Interpretation

The magnetic and VLF-EM data are shown in contoured format on maps at a scale of 1:10,000 in the back pocket. An interpretation map is also provided. The following notes are intended to supplement these maps.

The total magnetic field has a relief of over 2,000 gammas across the survey area and shows the general trend of the lithologies. The vertical magnetic gradient slightly improves the resolution of these anomalies, particularly the weaker magnetic units.

The strong responses to the northeast correlate with the ultramafic metavolcanics (Unit 1). The slightly weaker magnetic responses southeast of McArthur Lake within this unit may be related to

FIGURE 4

TERRAQUEST CLASSIFICATION OF VLF-EM CONDUCTOR AXES

<u>SYMBOL</u>	<u>CORRELATION</u>	<u>ASSOCIATION: Possible Origins</u>
a , A	Coincident with magnetic stratigraphy	Bedrock magnetic horizons: stratabound mineralogic origin or shear zone
b , B	Parallel to magnetic stratigraphy	Bedrock non-magnetic horizons: stratabound mineralogic origin or shear zone
c , C	No correlation with magnetic stratigraphy	Association not known: possible small scale stratabound mineralogic origin, fault or shear zone, overburden
d , D	Coincident with magnetic dyke	Dyke or possible fault: mineralogic or electrolytic
f , F	Coincident with topographic lineament or parallel to fault system	Fault zone: mineralogic or electrolytic
ob , OB	Contours of total field response conform to topographic depression	Most likely overburden: clayey sediments, swampy mud
cul , CUL	Coincident with cultural sources	Electrical, pipe or railway lines

NOTES

- 1 - Upper case symbols denote a relatively strong total field strength
- 2 - Underlined symbols denote a relatively strong quadrature response
- 3 - Mineralogic origins include sulphides, graphite, and in fault zones, gouge
- 4 - Electrolytic origins imply conductivity related to porosity or high moisture content

anges in the original composition of the ultramafic suite. Alternatively some of the stronger responses (Unit 1m) may be related to an alteration halo around the Geikie Pluton.

The narrow northwest trending magnetic units correlate with iron formation (Unit 4a), gabbroic intrusives (Unit 5m) and olivine diabase dykes (Unit 12). It is difficult to determine at this scale whether the magnetic responses across the centre of the property are related to the iron formation, the adjacent gabbroic dyke, or some combination of both. The small gabbroic pod to the southeast of the claim group correlates with weak magnetic responses.

The mafic metavolcanics (Unit 2) correlate with moderate magnetic responses. In places these responses are overwhelmed by those from the ultramafic metavolcanic sources.

The magnetic background correlates with the metasediments (Unit 4) and the trondhjemitic intrusives (Unit 6). It is difficult to discriminate between these two units by magnetic mapping because a) they are of similar magnetic character and b) they are overwhelmed by the responses from the adjacent lithologies. The trondhjemitic intrusives appear to correlate with weaker responses than the felsic intermediate to metavolcanics, but this could be a function of total mass not susceptibility. The Geikie Pluton to the northeast correlates with uniform and weak magnetic responses.

The regional structures are not readily apparent on the interpretation map, primarily because they are parallel to the magnetic stratigraphy. Several northeast crosscutting faults or shear zones have been interpreted.

The VLF-EM survey shows weak to moderate strength total field strength and generally flat quadrature responses. Most of the conductor axes are associated with structural sources, either faults or shear zones, probably related to the regional northwest set of structures. This type of conductivity may be related to a) minerals such as graphite,

sulphides or gouge along the structure, or b) an ionic effect created by porosity or water along the structure or to conductive overburden in an overlying topographic depression. In the latter case it is difficult to identify whether the source is related to conductive overburden, the structure itself, or some combination of both. Faults or shear zones identified by either VLF-EM or magnetic mapping should be investigated for potential epithermal mineralization.

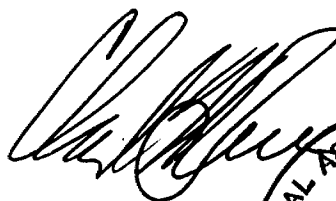
One moderately strong conductor axis correlates with the combined gabbroic iron formation magnetic responses in the southeast corner of the survey area. This may be related to sulphides or graphite and should be followed up on the ground using EM or IP techniques.

7. Summary

An airborne combined magnetic and VLF-EM survey has been done on the property at line intervals of 100 metres. The total field and vertical gradient magnetic data, VLF-EM data and interpretation maps are produced at a scale of 1:10,000.

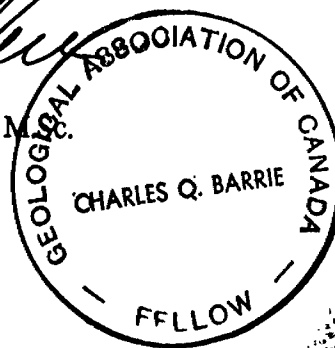
The magnetic data has been used to modify and update the existing geology and has shown a number of new contacts and faults. A number of VLF-EM conductor axes were found of which most are associated with structural sources and one has potential sulphide origin and has been recommended for additional investigation.

TERRAQUEST LTD.



Charles Q. Barrie, M.Sc.
Geologist

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Mit

Type of Survey(s) Airborne Geophysical Surveys		Township or Area McArthur & Bartlett Townships	
Claim Holder(s) Norwin Resources Ltd.		Prospector's Licence No. T5046	
Address 560 Notre Dame Avenue, Sudbury, Ontario P3C 5L2			
Survey Company Terraquest Ltd.		Date of Survey (from & to) 17 04 88 to 17 04 88	Total Miles of line Cut
Name and Address of Author (of Geo-Technical report) Charles Barrie 240 Adelaide Street West Toronto Ontario M5H 1W7			

Credits Requested per Each Claim in Columns at right

Mining Claims Traversed (List in numerical sequence)

Special Provisions	Geophysical	Days per Claim
For first survey: Enter 40 days. (This includes line cutting)	- Electromagnetic	
	- Magnetometer	
For each additional survey: using the same grid: Enter 20 days (for each)	- Radiometric	
	- Other	
	Geological	
	Geochemical	
Man Days Complete review of site and enter total(s) here JUN 7 1988	Geophysical	Days per Claim
	- Electromagnetic	
	- Magnetometer	
	- Radiometric	
	Geological	
	Geochemical	
Airborne Credits		Days per Claim
Note: Special provisions credits do not apply to Airborne Surveys.	Electromagnetic	40
	Magnetometer	40
	Radiometric	

Mining Claim		Expend. Days Cr.	Mining Claim		Expend. Days Cr.
Prefix	Number		Prefix	Number	
	P968398			P969603	
	P968399			P969604	
	P968400			P969605	
	P968401			P969606	
	P968402			P969607	
	P968403			P969608	
	P968404			P969609	
	P968405			P969610	
	P968406			P969611	
	P968407			P969612	
	P968408			P969613	
	P968409			P969614	
	P968410				
	P968411				
	P968412				
	P968413				
	P968414				
	P968415				
	P968416				
	P943709				
	P943710				
	P943711				
	P943712				

Expenditures (excludes power stripping)

Type of Work Performed

Performed on Claim

APR 19 1988

Calculation of Expenditure Days Credits:

Total Expenditures \$ ÷ 15 = Total Days Credits

Instructions
Total Days Credits may be apportioned at the claim holder's choice. Enter number of days credits per claim selected in columns at right.

Date April 18, 1988
Recorded Holder or Agent (Signature)

Certification Verifying Report of Work
I hereby certify that I have a personal and intimate knowledge of the facts set forth in the Report of Work annexed hereto, having performed the same and/or after its completion and the annexed report is true.

Name and Postal Address of Person Certifying
Stewart Winter, 1849 Oriole Drive, Sudbury, Ontario P3E 2W5

For Office Use Only

Total Days Cr. Date Recorded
2500 April 19/88

Date Approved as Recorded
20 July 88

Mining Recorder
Branch Director

RECORDED
APR 19 1988
ONTARIO GEOLOGICAL SURVEY
ASSESSMENT FILES
OFFICE
JUL 22 1988
RECEIVED 35

Date Certified April 18 1988
Certified by (Signature)

McArthur Tp. - M. 298

THE TOWNSHIP OF

BARTLETT

DISTRICT OF
TIMISKAMING

FORCUPINE
MINING DIVISION

SCALE: 1-INCH=40 CHAINS

LEGEND

PATENTED LAND	⊙ or ⊕
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	—
KING'S HIGHWAYS	—
RAILWAYS	—
POWER LINES	—
MARSH OR MUSKOG	—
MINES	—
CANCELLED	—
PATENTED S.R.O.	—

NOTES

400' Surface Rights Reservation along the shores of all lakes and rivers.

Areas withdrawn from staking under Section 43 of the Mining Act (R.S.O. 1970)

Order No.	File	Date	Disposition
⊙ 1719/77	17408	11/17/77	S.R.O.
⊕ 1719/77	186543	10/4/78	S.R.O.

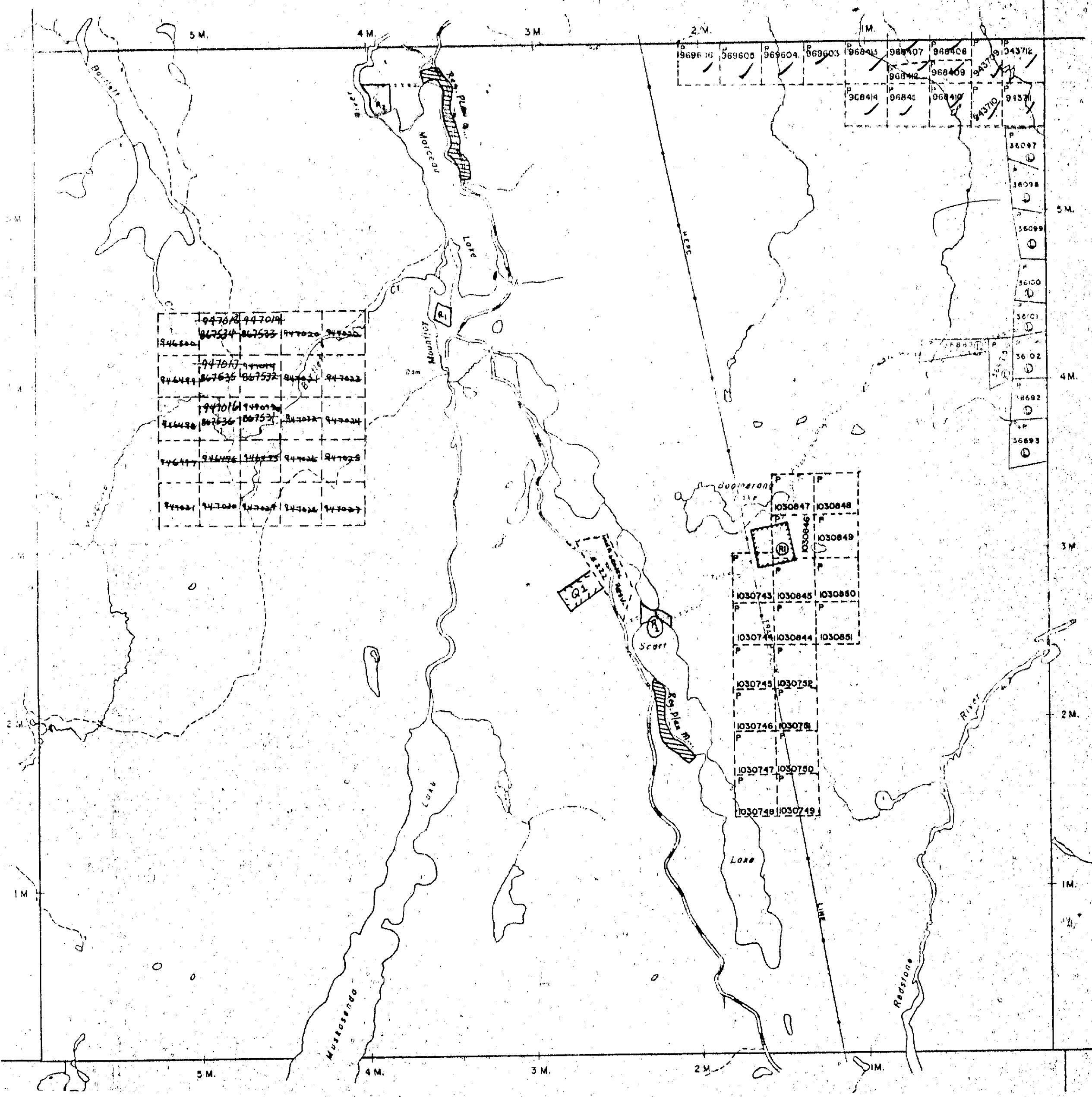
Q1 - Proposed Gravel Pit

RECEIVED
MAR 7 1988

Received July 21/86
Checked July 21/86 EP HA

PLAN NO. - M-262

ONTARIO
MINISTRY OF NATURAL RESOURCES
SURVEYS AND MAPPING BRANCH



Musgrove Tp. - M. 297

Geikie Tp. - M. 320

English Tp. - M. 787

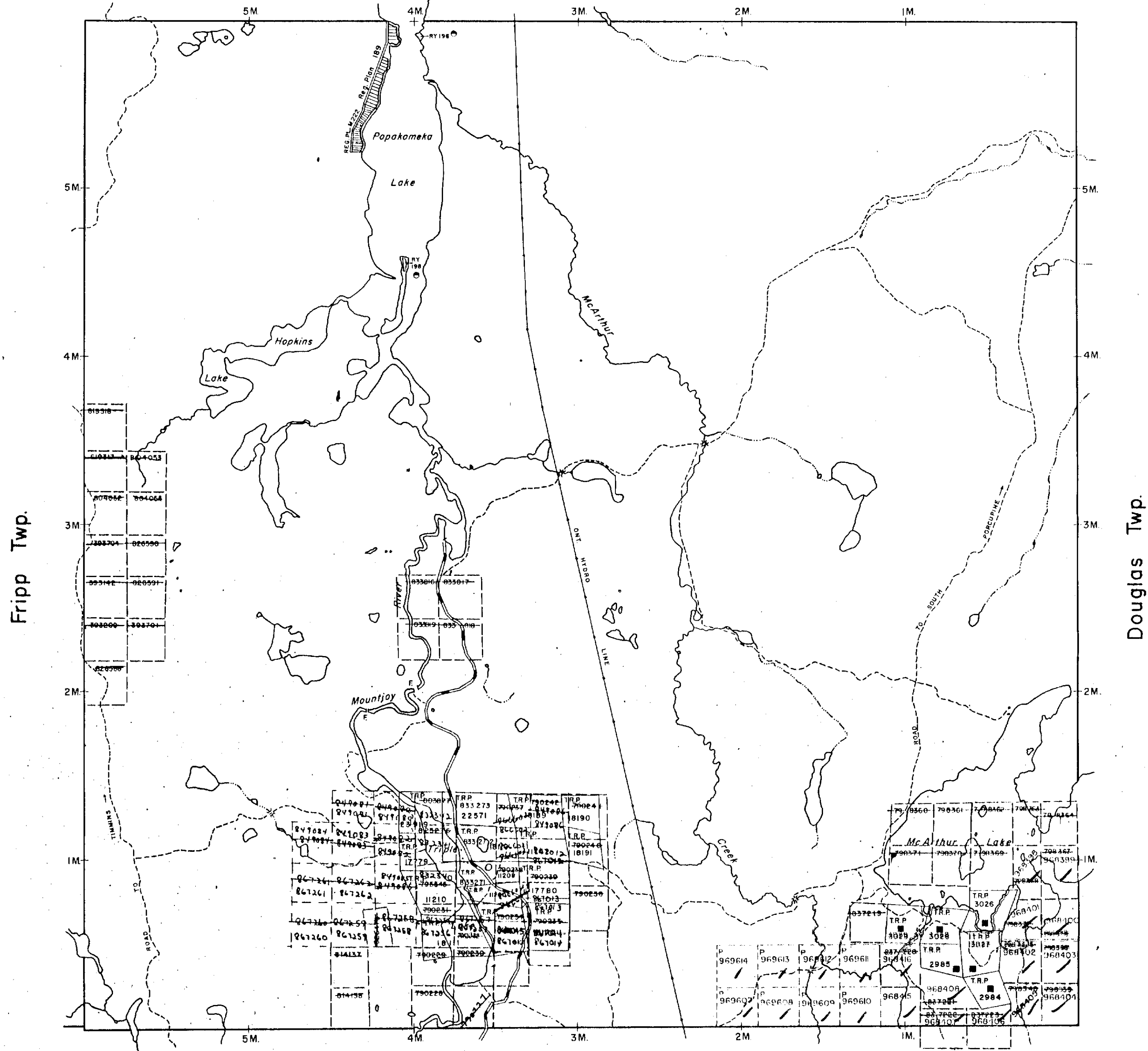


ICES

FROM DISPOSITION
 RIGHTS ONLY
 RIGHTS ONLY
 AND SURFACE RIGHTS

Date	Disposition	File

Adams Twp.



Frripp Twp.

Douglas Twp.

Bartlett Twp.

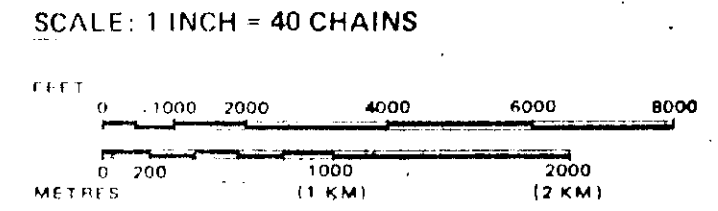
LEGEND

- HIGHWAY AND ROUTE No.
- OTHER ROADS
- TRAILS
- SURVEYED LINES:
 - TOWNSHIPS, BASE LINES, ETC.
 - LOTS, MINING CLAIMS, PARCELS, ETC.
- UNSURVEYED LINES:
 - LOT LINES
 - PARCEL BOUNDARY
 - MINING CLAIMS ETC.
- RAILWAY AND RIGHT OF WAY
- UTILITY LINES
- NON PERENNIAL STREAM
- FLOODING OR FLOODING RIGHTS
- SUBDIVISION OR COMPOSITE PLAN
- RESERVATIONS
- ORIGINAL SHORELINE
- MARSH OR MUSKEG
- MINES
- TRAVERSE MONUMENT

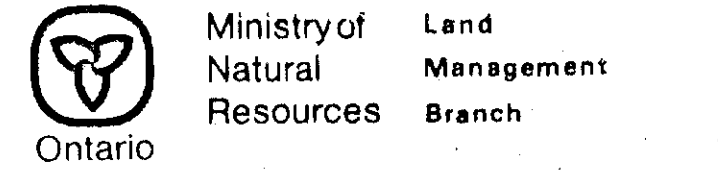
DISPOSITION OF CROWN LANDS

TYPE OF DOCUMENT	SYMBOL
PATENT, SURFACE & MINING RIGHTS	
" SURFACE RIGHTS ONLY	
" MINING RIGHTS ONLY	
LEASE, SURFACE & MINING RIGHTS	
" SURFACE RIGHTS ONLY	
" MINING RIGHTS ONLY	
LICENCE OF OCCUPATION	
ORDER-IN-COUNCIL	
RESERVATION	
CANCELLED	
SAND & GRAVEL	

NOTE: MINING RIGHTS IN PARCELS PATENTED PRIOR TO MAY 6, 1913, VESTED IN ORIGINAL PATENTEE BY THE PUBLIC LANDS ACT, R.S.O. 1970, CHAP. 380, SEC. 63, SUBSEC. 1.



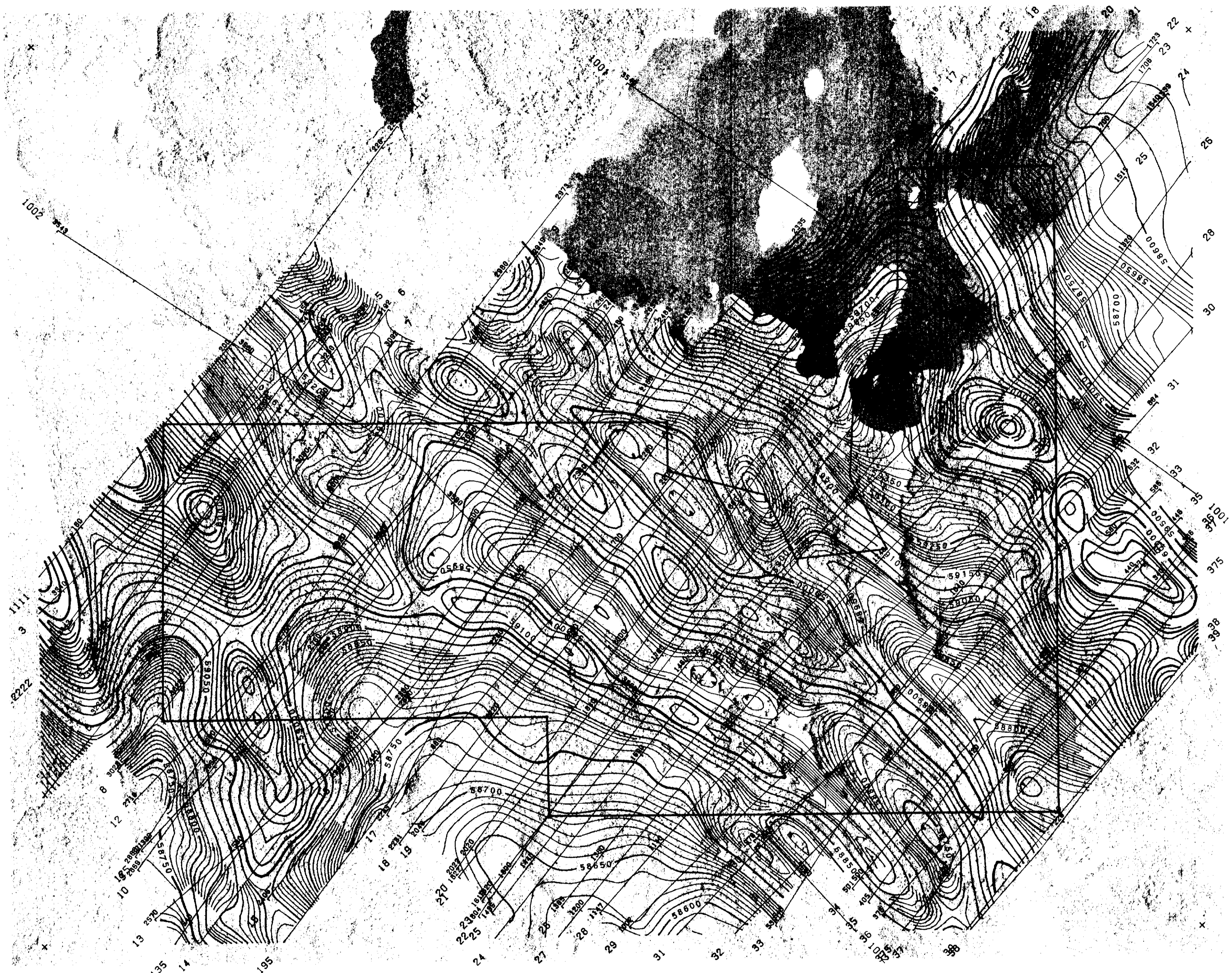
TOWNSHIP
McARTHUR
 M.N.R. ADMINISTRATIVE DISTRICT
 TIMMINS
 MINING DIVISION
 PORCUPINE
 LAND TITLES / REGISTRY DIVISION
 TIMISKAMING



Date FEBRUARY 1985
 Number **G-3227**

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 SEP 28 1987



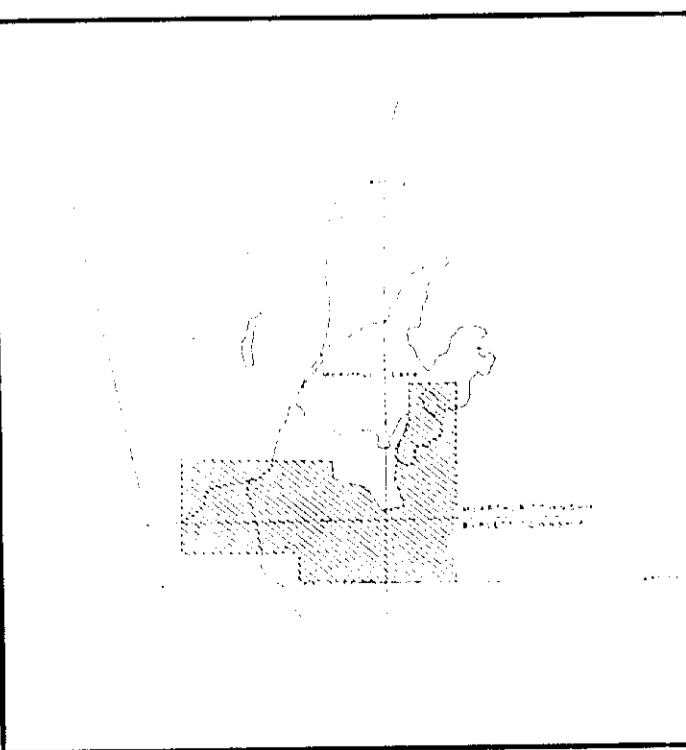



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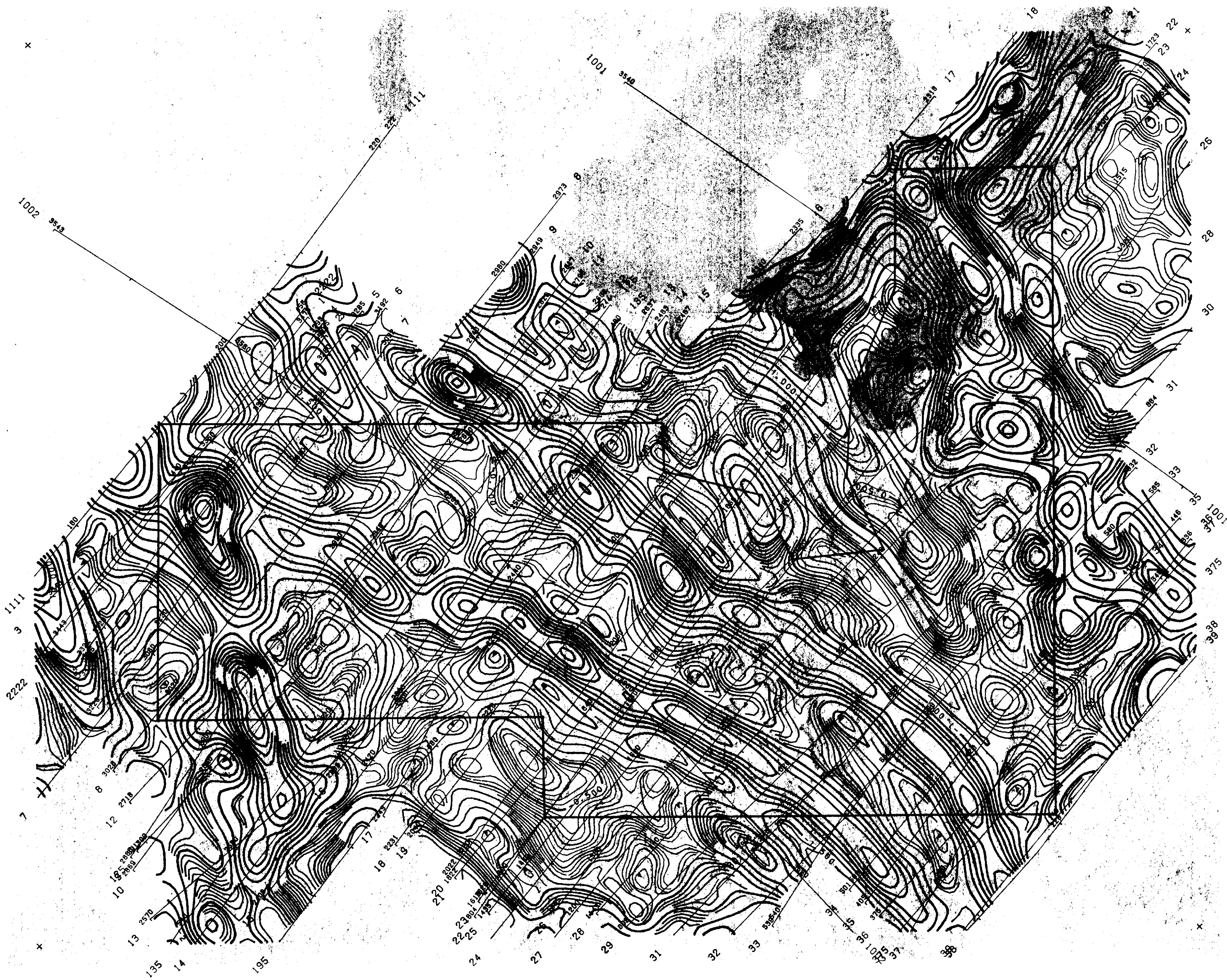
LEGEND

Terrain Clearance	100 meters
Line Spacing	100 meters
TOTAL MAGNETIC FIELD	
1000 gammas	=====
250 gammas	=====
50 gammas	=====
10 gammas	=====



NORWIN RESOURCES LTD.	
AIRBORNE MAGNETIC SURVEY TOTAL MAGNETIC FIELD	
McARTHUR & BARTLETT TWP. ONTARIO	
N.T.S. NO. 42A/3	DRAWING NO. A-773-1
SCALE: 1:10,000	DATE: June 1988
TERRAQUEST LTD.  TORONTO, CANADA	



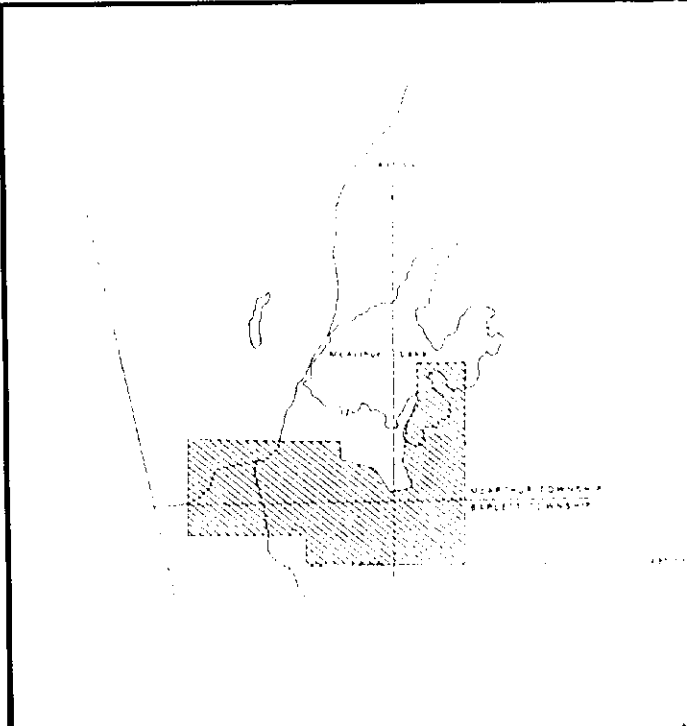


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LEGEND

- Terrain Clearance 100 meters
 - Line Spacing 100 meters
- VERTICAL MAGNETIC GRADIENT**
- 10,000 gammas/meter
 - 2,500 gammas/meter
 - 500 gammas/meter
 - 100 gammas/meter



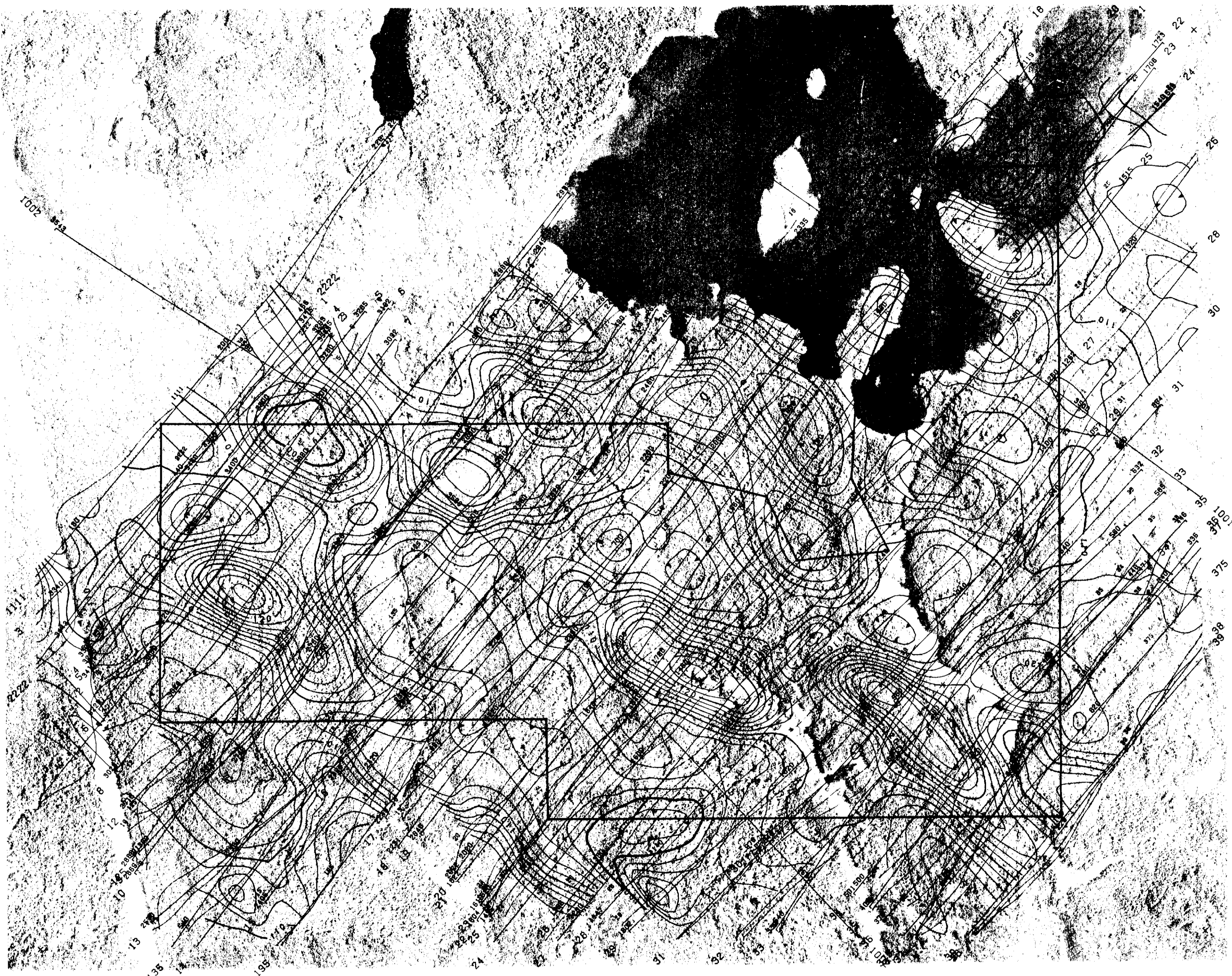
NORWIN RESOURCES LTD.
AIRBORNE MAGNETIC SURVEY
 VERTICAL MAGNETIC GRADIENT
 Calculated From Total Field

McARTHUR & BARTLETT TWP.
 ONTARIO

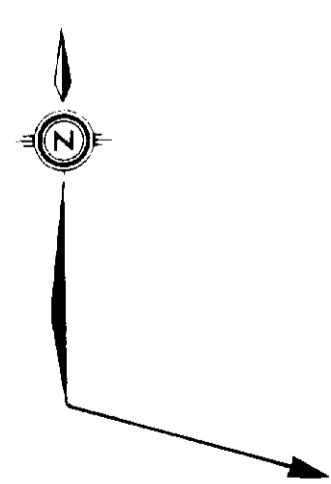
N.T.S. NO. 42A/3 DRAWING NO. A-773-2
 SCALE: 1:10,000 DATE: June 1988

TERRAQUEST LTD. 
 TORONTO, CANADA





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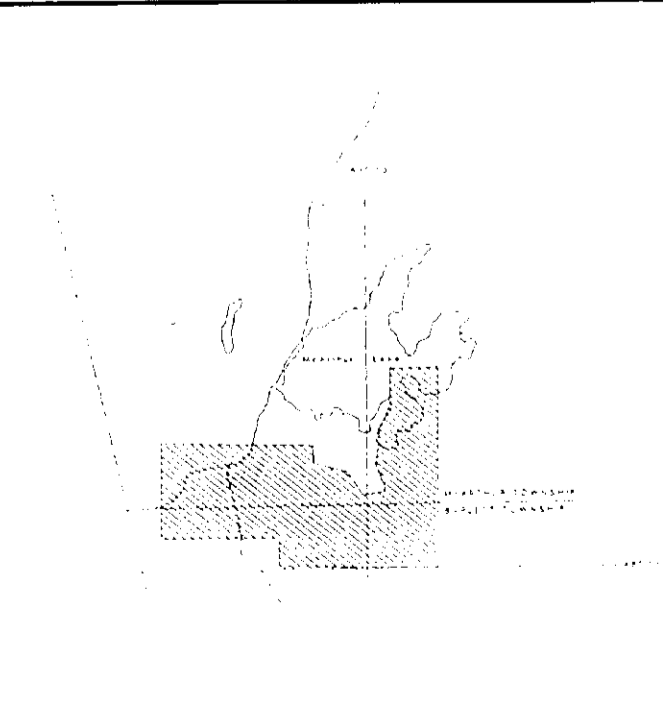
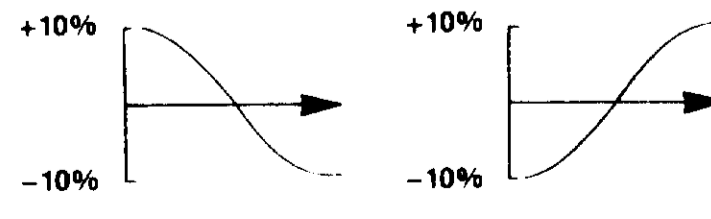
VLF Transmitter
NAA Cutler, 24.0 kHz
Azimuth 105

LEGEND

Terrain Clearance 100 meters
Line Spacing 100 meters

TOTAL FIELD STRENGTH (Contours)
50%
10%
2%

QUADRATURE (Profiles)
Normal Slope Reverse Slope



NORWIN RESOURCES LTD.

AIRBORNE VLF-EM SURVEY
CONTOURS OF TOTAL FIELD STRENGTH
PROFILES OF QUADRATURE

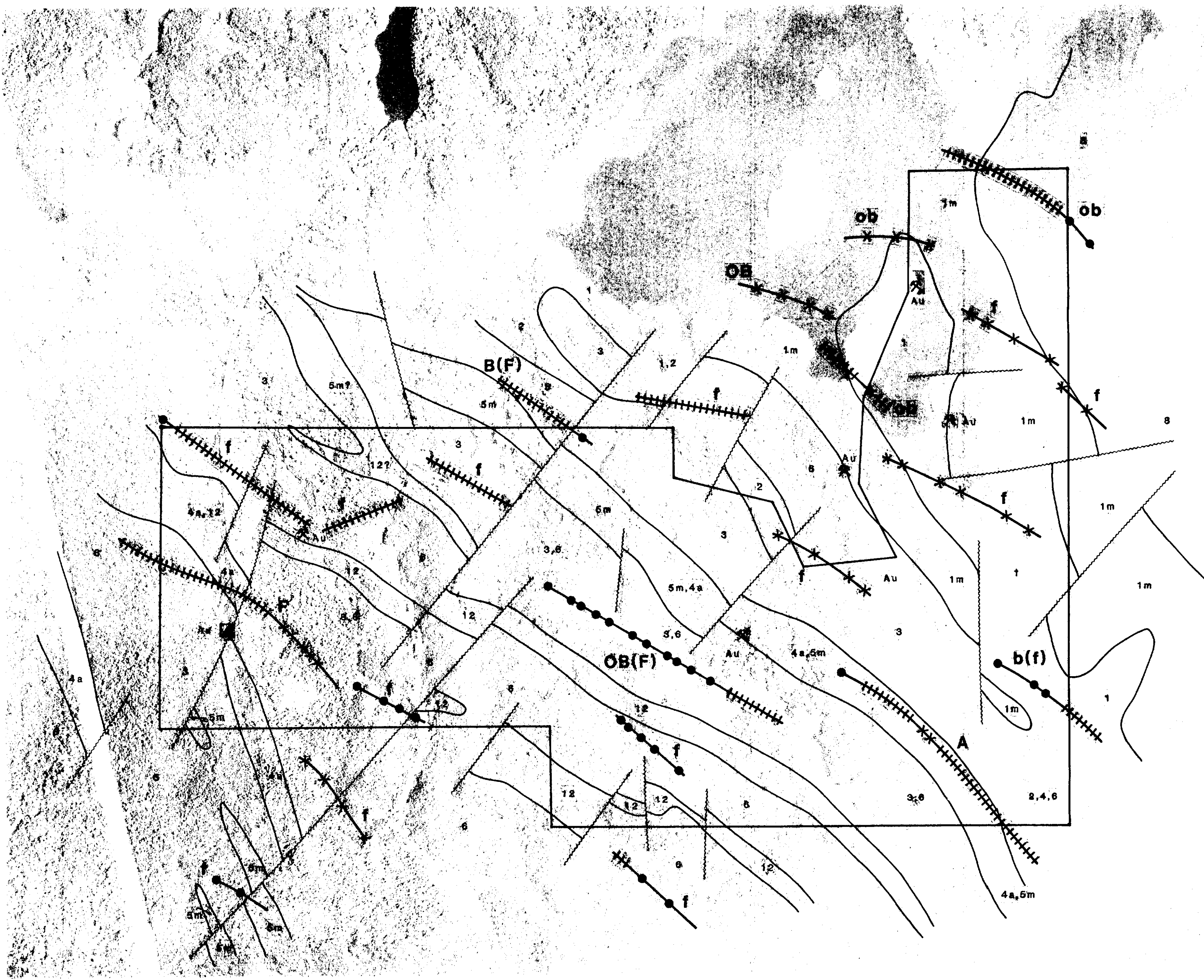
McARTHUR & BARTLETT TWP.
ONTARIO

N.T.S. NO. 42A/3 DRAWING NO. A-773-3
SCALE: 1:10,000 DATE: June 1988

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42A03NE0028 2.11387 BARTLETT



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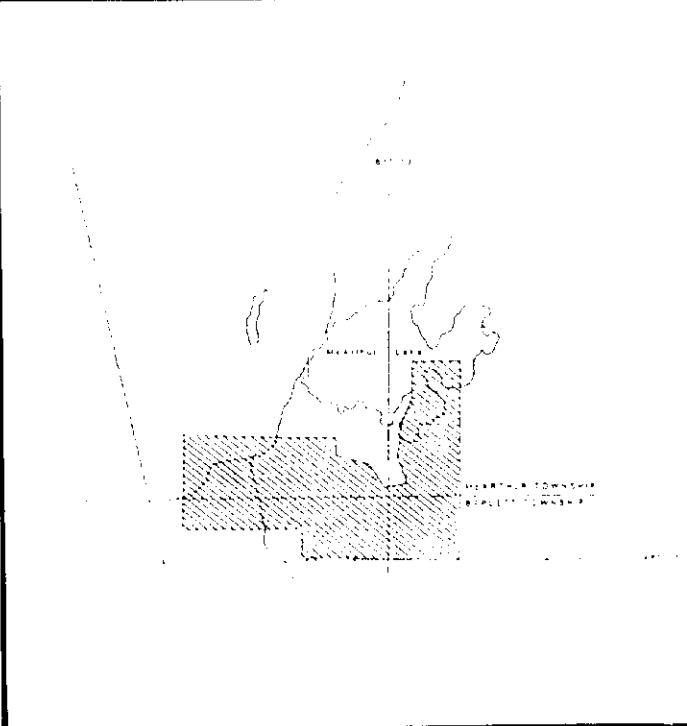
VLF Transmitter
NAA Cutler, 24.0 kHz
Azimuth 105

LITHOLOGY

- | | |
|----------------------------|--|
| 12 Olivine Diabase | 3 Felsic to Intermediate Metavolcanics |
| 8 Geikie Pluton | 2 Mafic Metavolcanics |
| 6 Trondhjemitic Intrusives | 1m Magnetic Unit Within 1 |
| 5m Magnetic Unit Within 5 | 1 Ultramafic Metavolcanics |
| 5 Gabbroic Intrusives | |
| 4a Iron Formation | |
| 4 Metasediments | |

LEGEND

- Terrain Clearance 100 meters
Line Spacing 100 meters
- INTERPRETATION**
- Contact
- - - Fault
— Property Boundary
- VLF-EM Conductor Axes**
- normal quadrature
-x-x- reverse quadrature
++++ total field only
- See text for classification of VLF-EM conductor axes



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INTERPRETATION

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