REPORT ON

GROUND MAGNETOMETER SURVEY

LITTLE GROUP 1

LITTLE TOWNSHIP, ONTARIO

Amax Potash Limited
255 Algonquin Blvd. West
Timmins, Ontario

R.J. Roussain
April 9, 1973

I. INTRODUCTION

This report discusses the results of ground geophysical survey (magnetometer) executed on property held by Amax Potash Limited in Little Township, Ontario. The property comprises 18 claims located in northeast Little Township; however, geophysical surveys were carried out only on 16 of the above (Fig. 1). The claim numbers and amount of assessment credit requested for each claim are listed in Appendix A. The surveys were carried out to confirm and define anomalies detected by an AEM survey carried out with the Geoterrex Otter system.

II. LOCATION AND ACCESS

The claim group lies in the northeast corner of Little Township approximately 20 miles east of Timmins. Access to the group is best reached via the Hydro road to the control dam on the Frederick House River. A series of old drill and lumbering roads lead eastward from this point through our claim group.

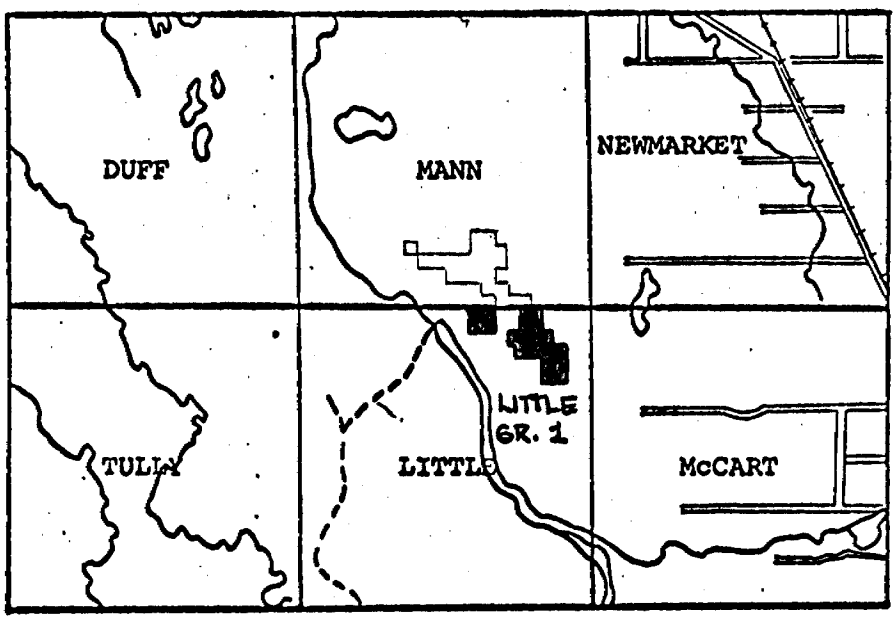
III. GENERAL GEOLOGY

In general the bedrock geology of Little Township is largely obscured by Pleistocene overburden, which reaches thickness of up to 150 feet in this area. Exploration work by other companies, limited outcrop exposures and aeromagnetic data indicate that the northeastern third of the township is underlain by NW trending volcanics, with a high proportion of felsic pyroclastic and flow units. NW faulting is suggested from the aeromagnetic data and from the alignment of the Frederickhouse River. Some distance to the NW an interesting base metal prospect occurs on property held by Jonsmith Mines.

IV. PREVIOUS WORK

Previous exploration work in and around the Little Group 1 claims is quite limited. To the NW, 3 DDHs were drilled by O'Brien Gold Mines in 1965 to test a long conductor; graphite without economic base metal values was intersected. Further to the east, Van Gulf Exploration drilled two holes in 1971, again encountering graphite. Amax in 1972, drilled one hole on claim P308110 to test a conductor; a 15 foot wide section of graphite and pyrite was intersected.

LOCATION MAP



Scale: 1" = 4 Miles

V. SURVEY DESCRIPTION

A cut-line grid was established on the above property by Ingamar Explorations Ltd. under the supervision of Maurice Hibbard, 362 7th Avenue, Timmins, Ontario, during the period June 5 through June 22, 1971. The base line orientation is approximately 320° azimuth. Picket lines were cut at an interval of 400 feet, with a nominal orientation of 90° to the baseline, and picketed at 100 foot intervals. Inclusive of base lines and tie lines, a total of 17 miles of line was cut.

The magnetometer survey was carried out with an Askania model GF-Z, serial # 600457, by R. Shirley and R. Wank of Amax, in June-July, 1971. This instrument measures the vertical component of the earth's magnetic field, and has a calibration 225 gammas per scale division, with a repeatability of ± 5 gammas.

Magnetometer base stations were established along each base line. The readings were then taken along the picket lines at 100 foot intervals. The departures of the cross line values from the base stations were graphically plotted with time and appropriate corrections were then computed to tie the cross lines to the base stations. A total of 850 magnetometer readings were taken during the survey.

VI. PRESENTATION OF DATA

The magnetometer data is presented in appropriately contoured form, with the corrected readings plotted (Fig. 2).

VII. DISCUSSION OF RESULTS

Magnetometer Survey: The magnetic relief over the above claims is quite subdued. In the extreme NE corner of the survey area, the edge of a strong anomaly is seen, most likely reflecting the edge of the ultramafic complex in adjoining Mann Township. Elsewhere, local magnetic anomalies with under 1000 gammas relief are present on claims P308108 and P308112; but however, no confident interferences can be made as to the local geological structure from these isolated features.

VIII. SUMMARY AND RECOMMENDATIONS

Ground geophysical surveys (CEM and magnetometer) were carried out in Little Group 1 to confirm and delineate AEM anomalies. Two separate probably bedrock conductors were detected under a substantial thickness of overburden.

One conductor has already been tested with one diamond drill hole; the remaining conductor requires evaluation by drilling to establish any base metal potential. This conductor does not appear to have any coincident magnetic expression.

RJR:ms

R.J. Roussain

APPENDIX A CLAIM NUMBERS AND ASSESSMENT CREDIT REQUESTED

Claim Number	Days Credit Requested Magnetometer & Linecutting
P.301369	40
P.301370	40
P.308103	40
P.308104	40
P.308105	40
P.308106	40
P.308107	40
P.308108	40
P.308109	40
P.308110	40
P.308111	40
P.308112	40
P.308114	40
P.308115	40

REPORT ON AN

AIRBORNE GEOPHYSICAL SURVEY

IN LITTLE TOWNSHIP, ONTARIO

Amax Potash Limited
7 King Street East,
Toronto 1, Ontario

February 19, 1973

J. Roth

REPORT ON AN

AIRBORNE GEOPHYSICAL SURVEY

IN LITTLE TOWNSHIP, ONTARIO

I. INTRODUCTION

Between March 6 and March 18, 1971, Geoterrex Limited carried out an airborne geophysical survey for Amax Potash Limited over a portion of Mann and Little Townships, Ontario (Fig. 1).

The purpose of the survey was to detect bedrock electromagnetic conductors which might reflect the presence of base metal sulphides, and to evaluate prospective conductor zones from a geophysical point of view, in order to suggest recommendations for a further exploration program.

II. PERSONNEL

The following personnel were involved with this survey:

A. Field Operation:

Pilot	J. Whiteduck, Maniwaki, Ont.
Navigator	R. Bolivar, Ottawa, Ont.
Operator	R. Stone, Ottawa, Ont. R. Youngberg, Ottawa, Ont.
Data Compilers	G. McKnight, Ottawa, Ont. W. Couwenberghs, Ottawa, Ont.
Geophysicist	B. Anderson, Ottawa, Ont.
Aircraft Engineer	W. McFadden, New Brunswick

B. Office Compilation:

Data	D. Sarazin, Ottawa, Ont.
Drafting	M. Dostaler, Ottawa, Ont.
Geophysics	E. Waddington, Ottawa, Ont. R. Dowse, Ottawa, Ont. D. M. Wagg, Manotick, Ont.

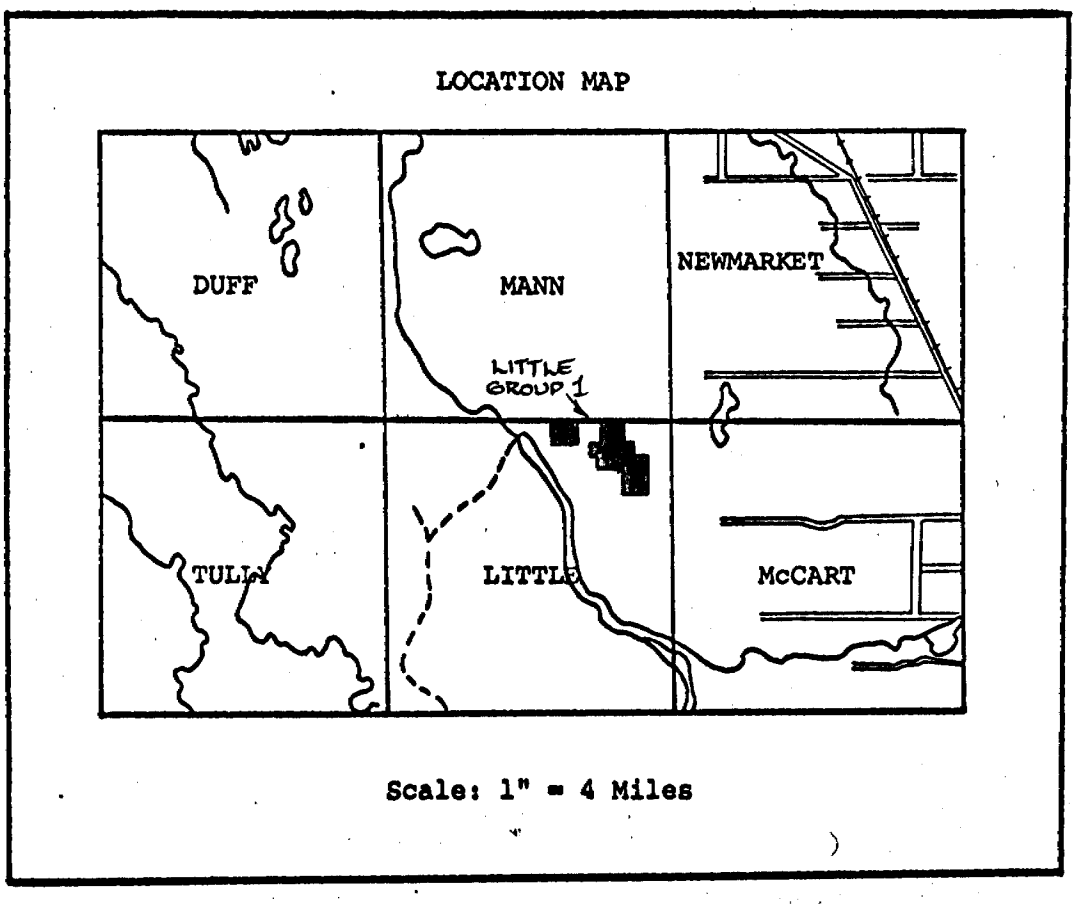

LOCATION MAP
DUFF
MANN
NEWMARKET
LITTLE GROUP 1
TULLY
LITTLE
McCART
Scale: 1" = 4 Miles

Figure 1

C. General Supervision:

Geophysicist — J. Roth, Amax Exploration, Inc., Toronto, Ontario.

III. SURVEY EQUIPMENT AND COVERAGE

The data were obtained with an Otter CF-AYR aircraft equipped with an In-Phase/Out-of-Phase electromagnetic system operating at 320 Hz, a Geometrics G-803 High Performance proton resonance magnetometer and associated survey equipment which is described in more detail in Appendix B to this report.

A total of 201 line miles were flown in this area at 1/8 mile spacing in a N-S direction; of this mileage a total of 7.5 miles were flown over the 15 claims listed in Appendix A. Assessment credit of 20 days per claim is requested in conformity with the provisions of the Ontario Mining Act.

IV. GEOLOGY

From the limited outcrops and exploration DDHs, the bedrock geology of Little Township in inferred to consist of a complex assemblage of felsic to intermediate volcanics and associated volcaniclastic sediments, all of Archaean age. This assemblage is succeeded to the north in Mann Township by a zone of abundant ultramafics intercalated with volcanics. The general trend of the volcanics would appear to be WNW. To the north, in Mann Township, an interesting base metal prospect occurs on ground held by Jonsmith Mines.

V. PREVIOUS WORK

Previous exploration work in and on the Little Group I claims is quite limited. To the NW, 3 DDHs were drilled by O'Brien Gold Mines in 1965 to test a long conductor; graphite without economic base metal values was intersected. Further to the east, Van Gulf Exploration drilled one hole in 1971, again encountering graphite.

VI. PRESENTATION OF AEM RESULTS

All detected electromagnetic responses are individually listed according to line number and letter designation in Appendix C, and also plotted along with the flight lines on a photomosaic base at a scale of 1 inch equals 1320 feet, (Fig. 2). The in-phase and out-of-phase anomaly amplitudes are shown, as well as any magnetic association and the flying altitude at that location. Inferred conductor zones are outlined and numbered.

VII. DISCUSSION OF AEM RESULTS

Within the claims comprising Little Group 1, four separate zones of anomalous AEM responses were detected.

The first anomalous zone, designated #9, is a modest but definite bedrock conductor and extends in a WNW direction into Mann Township. This conductor is without any associated magnetic anomaly, and is covered by at least 100 ft. of overburden.

The second anomalous zone, designated #10, is a short, definite bedrock conductor. It also is without any associated magnetic anomaly, and is covered by at least 100 ft. of overburden.

The third anomalous AEM feature is a one-line response on Line 28. The poor in-phase to quadrature ratio and correlation with a low swampy area suggest conductive overburden.

The fourth anomalous AEM feature is also a one-line response on Line 39. Again the poor in-phase to quadrature ratio suggests conductive overburden.

VIII. SUMMARY & CONCLUSIONS

AEM coverage of a portion of NE Little Township with the Geoterrex Otter disclosed two definite bedrock conductors and two additional anomalies probably reflecting conductive overburden, in an area of felsic to intermediate volcanics.

The northern conductor has been drilled previously by O'Brien Gold Mines; graphite and non-economic sulphides were intersected. Anomaly Zone 10 was drilled by Amax in 1971; the conductor was found to be a narrow graphitic horizon.

Because of the proximity of the Jonsmith prospect to the NW, an additional DDH may be warranted on the northern conductor.

Jeremy Roth

J. Roth,
Amax Potash Limited.

APPENDIX A

LIST OF CLAIMS

LITTLE GROUP 1
(15 claims)

P301369
301370
308103
308104
308105
308106
P308107
308108
308109
308110
308111
308112
308113
308114
308115

40 x 7.5 = 300 ÷ 15 = 20 days per claim

gj

Following is a description of equipment and procedures used during this airborne geophysical survey.

A. EQUIPMENT

1) Aircraft:

The aircraft is a deHavilland Otter DHC-3 with Canadian registration CF-AYR. This aircraft is a single engine, slow speed, high performance type with a gross weight of 8,000 lbs. The aircraft may be equipped with wheels, skis, or floats, as required. Normal survey speed is 100 miles per hour.

2) Electromagnetometer:

The electromagnetic unit is a Rio Tinto type, measuring In-Phase and Out-of-Phase components of the secondary field at a frequency of 320 cycles per second. The unit was designed and built by Geoterrex, and carries Serial #1.

A transmitter generates a closely controlled sine wave of 320 cps which is amplified and fed to a transmitting coil mounted on the starboard wing-tip. This coil is iron cored and has vertical windings, with coil axis in the direction of flight. The circulating coil power is some 5000 volt amperes.

A receiving coil is mounted on the port wing, co-planar with, and 62 feet from, the transmitting coil. The voltage developed in the receiver coil due to the transmitted field is some 300 millivolts. In the absence of external conductors, this voltage is cancelled by a reference voltage derived directly from the transmitter voltage.

When the aircraft comes within range of a conductor, the normal (or primary) field is changed by a secondary field and the resultant voltage at the receiver coil is amplified and passed on to the EM receiver in the aircraft. This signal is filtered and split into one component in-phase and one component out-of-phase with reference to the transmitter voltage. The signals are then passed through phase-sensitive detectors where their amplitudes may be read on meters, or

recorded on a chart. A system of calibration is included so that amplitude of responses (anomalies) may be determined in "parts per million" of the primary receiver coil voltage prior to cancellation. Noise level of the system due to movement of the metal aircraft within the EM field is normally 50 parts per million or less. Significant conductors depending on distance and size, will produce anomalies of more than 50 parts per million.

The system is also equipped with a receiver noise channel operation at a frequency of 268 cps. This channel is not susceptible to the electromagnetic response, and is affected only by radiated noise such as power and telephone lines, and atmospheric discharges. It is frequently useful in determining the validity of electromagnetic anomalies.

An accelerometer is also installed and the output recorded on the 8-channel recorder. This indicates flexure on the aircraft and enables discarding of false anomalies which could result from the aircraft motion.

Calibration marks are displayed on the eight-channel chart, and are approximately 15 millimeters for 200 parts per million.

Any anomalies noted are listed in Appendix A of this report, indicating position, (fiducial number on the path recovery camera), amplitudes, aircraft altitude, magnetic relationship if any, relative anomaly rating, and comments which may be of significance.

The anomalies are then plotted on the base map in coded form, according to the legend accompanying this Appendix. Anomaly groups which reflect probable ground conductors are circled and numbered. These are described and discussed in the report in the context of geophysical and where possible, geological significance.

3) Magnetometer:

The magnetometer used is a Geometrics Model G-803 Proton Resonance type incorporating a High Performance option. Recording times are variable, from three times per second to once per 2 seconds, with respective sensitivities of 2 gammas to 0.5 gamma. In normal use readings are obtained

once per second with a sensitivity of 1 gamma.

The sensing head is a torvidal coil immersed in a special hydrocarbon fluid and mounted beneath the port wing.

The magnetometer is a digital readout unit and output is used to drive a paper recorder (Hewlett Packard Model 5050-B). In addition analogue outputs are fed to the 8-channel recorder for direct comparison with the electro-magnetic results, and to a Hewlett-Packard Model 680 - six inch rectalinear strip recorder.

Full scale deflection usually used in mineral surveys is 1000 gammas although other sensitivities are available. Automatic stepping of the full scale analogue deflection is incorporated. Recordings made on the paper tape are the values of the total field intensity.

Contouring of results is accomplished as desired.

4) Spectrometer:

An Exploranium DGRS-1000 spectrometer is normally carried on the Otter, along with a sensing head containing three 6" x 4" Sodium Iodide crystals.

This is a four channel differential gamma-ray unit measuring energy levels of potassium 40, bismuth 214 thallium 208 plus total count.

Time constants and full scale ranges are variable and are selected to suit the conditions and background of the survey area.

Depending on requirements of the survey, one or more channels may be recorded on the eight channel recorder.

Data presentation, if required, is usually in the form of plotted anomalies showing channel intensities and aircraft altitude. Contour maps of one or more channels may be produced in special circumstances.

5) Altimeter:

The altimeter is a GAR Model 10 wide band radar type.

One unit is carried on each wing. The output from the altimeter recorded on the eight channel recorder. The recording is linear and normally covers from 50 feet to 300 feet, or 25 feet per major division.

6) Camera:

The camera used for path recovery is a Hulcher continuous strip 35 millimeter type. It can accommodate 400 ft. lengths of film, good for some 250 line miles of survey. It is fitted with a special wide angle lens for low level work.

Fiducial numbers and markers are impressed on the film and controlled by the intervalometer.

7) Intervalometer:

This is a Geoterrex Model X-1 solid state unit which derives triggering from the magnetometer. Basic fiducial pulses are provided once for each two magnetometer readings, so that in usual operation one fiducial is recorded every two seconds. A long pulse is produced once for every ten normal fiducials.

These fiducial marks are impressed on the path recovery film, the eight channel recorder, the Hewlett Packard Model 680 recorder and the digital printer in order to identify and locate geophysical records with ground positions.

8) Eight Channel Recorder:

This recorder is a Gulton Industries Model TR-888. Records are made on heat sensitive paper of 16 inch width. Each channel has a width of 1.6 inches. Individual signal processors are included for each channel, selected according to requirements for each channel to be recorded.

Normal chart speed is 5.0 inches per minute giving a horizontal scale of approximately 1000 feet per inch.

A typical chart record is included with this appendix.

B. PROCEDURES

1) Photo Laydowns:

Prior to undertaking of the survey, air photos of the area are obtained from which a photo laydown is produced, to an appropriate scale, usually 1" = 1320 feet. Proposed lines are drawn on the laydown, in the appropriate direction and line spacing. These "flight-strips" are then used by the air crew for navigating the airplane visually along the proposed lines. This photo laydown is also used to produce the subsequent base maps.

2) Aircraft Operation:

The air crew consists of pilot, co-pilot (or navigator) and equipment operator. The aircraft is flown along the proposed lines at an altitude of some 200 feet, using the flight strips for navigation. Altitudes in excess of 300 feet are generally considered too high for effective penetration.

The operator records lines, direction of flight and starting and finishing fiducial numbers on a flight log. Equipment is normally left on during the whole of the survey flight, while the intervalometer is turned on only for the actual survey line. Thus, the appearance of fiducial marks on the charts indicates the extent of the survey line.

3) Field Reduction:

Upon completion of the flight, the film is developed and the actual path of the aircraft is plotted on the photo laydown. This is accomplished by comparing film points with the photo. For any given point, the appropriate fiducial number is placed on the photo laydown and the points joined to produce the actual flight path.

When field results are desired, anomalies are chosen and assigned appropriate fiducial numbers. The anomalies are then transferred to their correct position on the photo laydown.

4) Office Reduction:

On completion of the survey, base maps are drawn using the photo laydown as a base. Flight lines and fiducial numbers are shown on this base map.

In the case of EM or radiometric results the anomalies are then plotted on the base map as boxes with symbols representing anomaly grade or amplitude (as noted on the legend accompanying each map). Anomaly "systems" are then outlined as conductive zones at which stage geological comparison and interpretation may be made.

In the case of magnetic results, the values noted on the Moseley chart are transcribed to a work sheet (overlay of the base map) after levelling or correcting for heading error, diurnal, etc. The values are then contoured on the work sheet and then drafted on a copy of the base map.

Since base maps use the photo laydown as a base, all geophysical results portrayed may be compared as overlays, and all features of interest may be identified on the appropriate photo for subsequent ground location.

"APPENDIX C"

GEOTERREX LIMITED

Anomaly Sheet No.____

PROJECT 84-77

AREA: MANN & LITTLE

ANOMALY	FIDUCIALS	IN-PHASE. QUAD.	ALTI-TUDE	MAGNETICS	RATE	COMMENTS
27-A	490.95/1.3	60/60	160'	S.side 1000	3B	
28-A	505.3/.8	40/160	140'	Nil	X	
B	507.2/.8	40/120	160'	Narrower 160	3B	
29-A	523.8/4.25	-/80	165'	Narrower 240	X	Poss. 3A
30-AA	540.1/.6	-/70	145'	N. flank 260	X	
31-A	565.05/.65	110/160	145'	N. flank 60	3B	Good
32-A	579.95/0.35	60/80	140'	Nil	3B	
32A-A	583.6/4.3	110/100	145'	Nil	3B	
33-A	601.05/.65	-/140	125'	Nil	X	Weak I.P.
34-B	612.4/3.1	60/120	135'	Nil	3B	
35-A	633.85/4.3	70/50	140'	Nil	3B	Poor
39-A	697.8/3.15	20/80	135'	Nil	X	Weak I.P.

900

GEOPHYSICAL – GEOLOGICAL TECHNICAL DATA STATEMENT

PROJECTS SECTION

TO BE ATTACHED AS AN APPENDIX TO TECHNICAL REPORT
FACTS SHOWN HERE NEED NOT BE REPEATED IN REPORT
TECHNICAL REPORT MUST CONTAIN INTERPRETATION, CONCLUSIONS ETC.

Type of Survey: Magnetometer

Township or Area: ~~Mann~~ LITLE

Claim holder(s): Amax Potash Limited

Author of Report: R. J. Roussain

Address: 255 Algonquin Blvd. W., Timmins, Ont

Covering Dates of Survey: June 5 - July 22, 1971 (linecutting to office)

Total Miles of Line cut: 17

SPECIAL PROVISIONS CREDITS REQUESTED

ENTER 40 days (includes line cutting) for first survey.

ENTER 20 days for each additional survey using same grid.

DAYS per claim

Geophysical
--Electromagnetic
—Magnetometer 40
—Radiometric
—Other
Geological
Geochemical

AIRBORNE CREDITS (Special provision credits do not apply to airborne surveys)

Magnetometer ____ Electromagnetic ____ Radiometric ____ (enter days per claim)

DATE: ____ SIGNATURE: R. J. Roussain
Author of Report or Agent

PROJECTS SECTION

Res. Geol. ____ Qualifications 63.2531 2.279

Previous Surveys 2.839 Air (mag) Ne line cutting
Credits received. L.D.

Checked by ____ date ____

GEOLOGICAL BRANCH

Approved by ____ date ____

GEOLOGICAL BRANCH

Approved by ____ date ____

OFFICE USE ONLY

MINING CLAIMS TRAVERSED
List numerically

293097-98-99

(prefix)	(number)
P	301369
P	301370
P	308103 1/2
P	308104 1/3 not covered
P	308105
P	308106
P	308107
P	308108
P	308109
P	308110
P	308111 3/4
P	308112 1/3
P	308114 1/2
P	308115

If space insufficient, attach list

Area of claims not covered = 2 1/3

40 × 17 = 680 ÷ (17+2) = 35.8 days per claim

TOTAL CLAIMS 14

Show instrument technical data in each space for type of survey submitted or indicate "not applicable"

GEOPHYSICAL TECHNICAL DATA

GROUND SURVEYS

Number of Stations 788 Number of Readings 788

Station interval 100'

Line spacing 400'

Profile scale or Contour intervals -1000γ, -100γ, -50γ
(specify for each type of survey)

MAGNETIC

Instrument Askania GF-Z Serial #

Accuracy - Scale constant 225 γ per scale division

Diurnal correction method Time check method

Base station location Base line - cross line intersections (indicated on plans)

ELECTROMAGNETIC

Instrument

Coil configuration

Coil separation

Accuracy

Method: ☐ Fixed transmitter ☐ Shoot back ☐ In line ☐ Parallel line

Frequency
(specify V.L.F. station)

Parameters measured

GRAVITY

Instrument

Scale constant

Corrections made

Base station value and location

Elevation accuracy

INDUCED POLARIZATION – RESISTIVITY

Instrument

Time domain Frequency domain

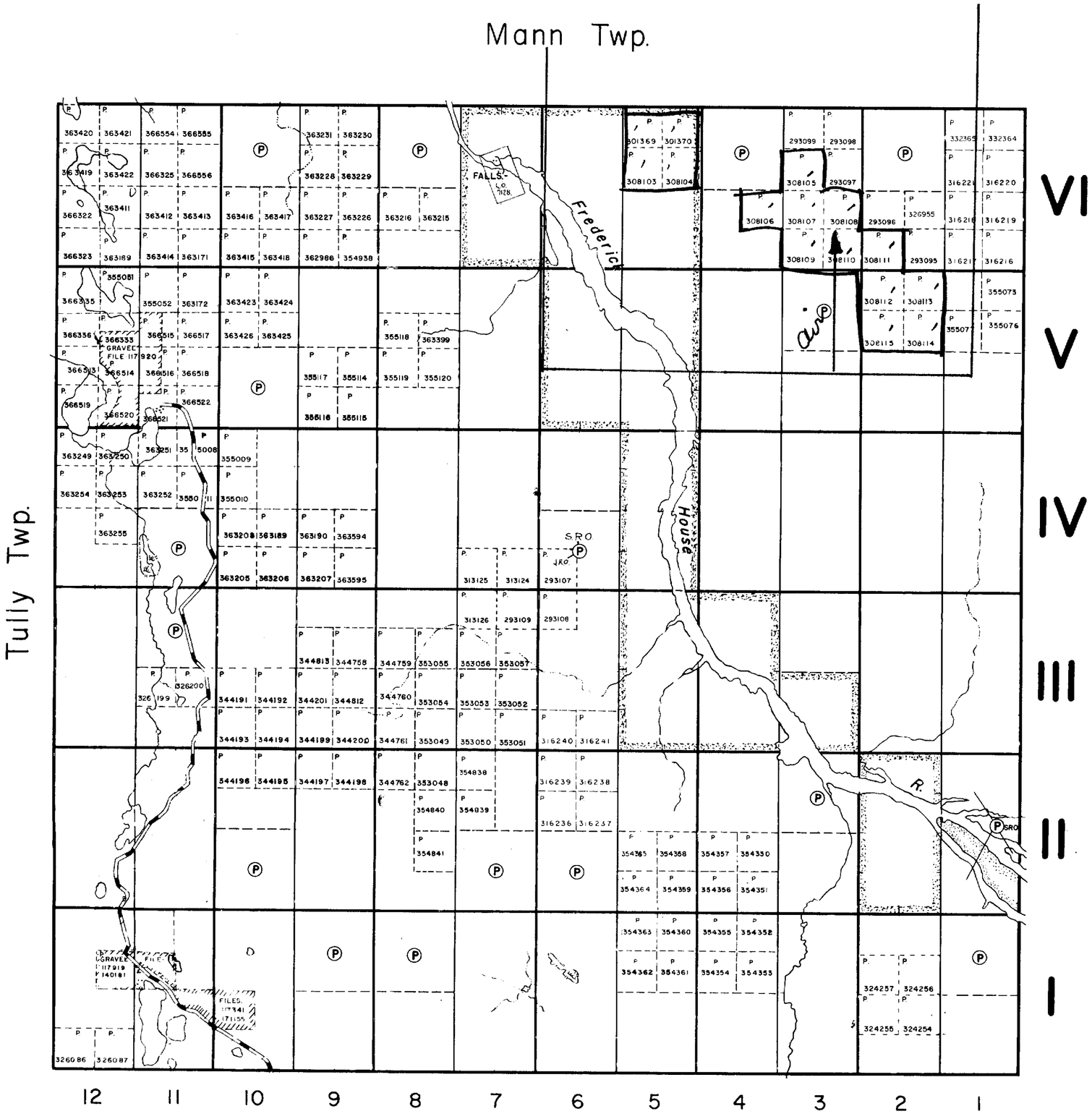
Frequency Range

Power

Electrode array

Electrode spacing

Type of electrode



THE TOWNSHIP OF LITTLE

DISTRICT OF COCHRANE

PORCUPINE MINING DIVISION

SCALE: 1-INCH = 40 CHAINS

LEGEND

PATENTED LAND	(P)
CROWN LAND SALE	C.S.
LEASES	(L)
LOCATED LAND	Loc.
LICENSE OF OCCUPATION	L.O.
ROADS	
IMPROVED ROADS	
RAILWAYS	
POWER LINES	
MARSH OR MUSKEG	

NOTES

Area reserved to H.E.P.C. for water power purposes shown thus:

Flooding rights lands bordering the Frederick House River.

400' Surface Rights Reservation around all Lakes and Rivers.

- MINING LANDS -
DATE OF ISSUE
FEB 27 1973
MINISTRY OF NATURAL RESOURCES

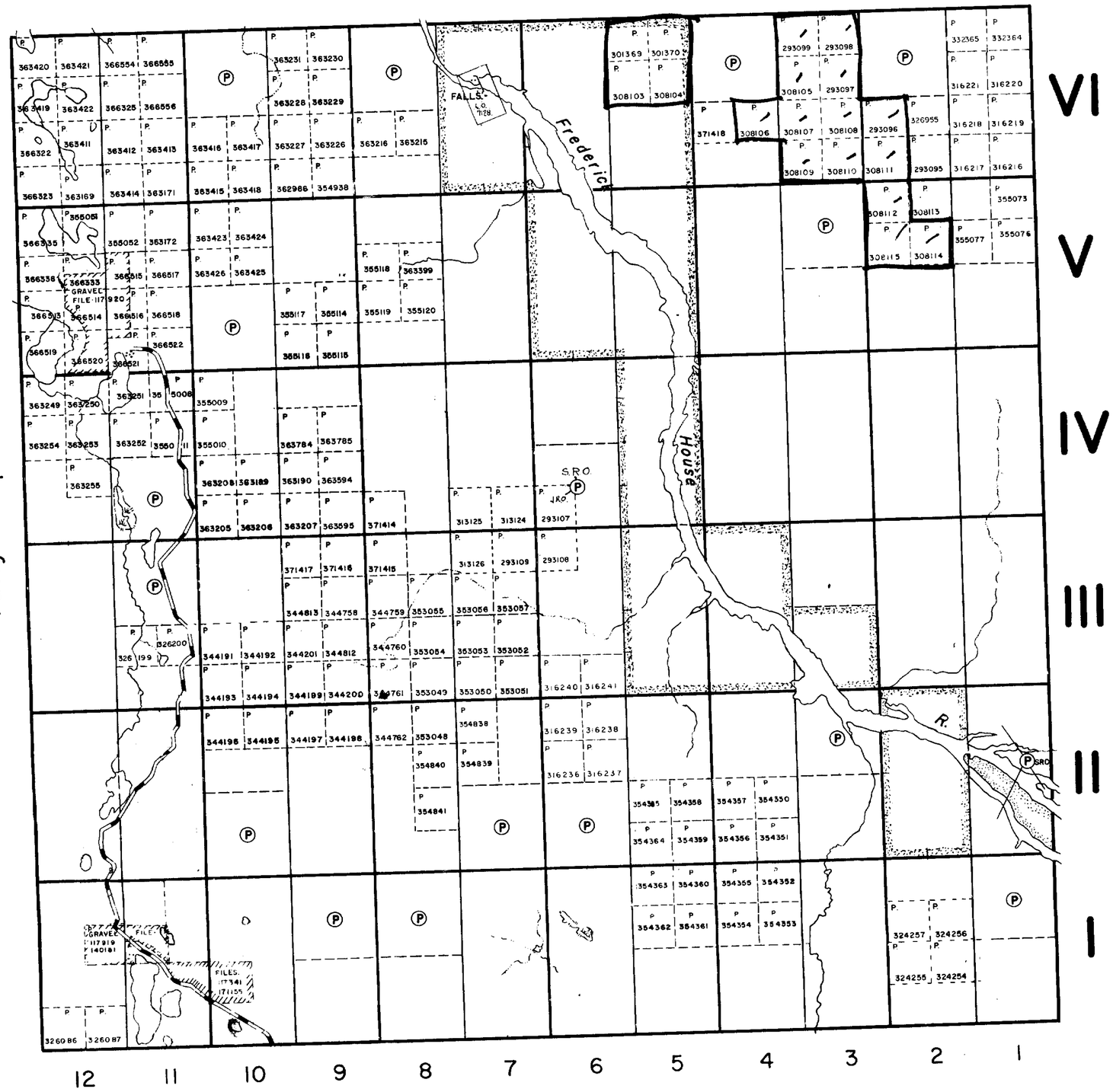
EM
Airborne
2.1156

PLAN NO. — M. 535

ONTARIO
MINISTRY OF NATURAL RESOURCES
SURVEYS AND MAPPING BRANCH

JK:

Mann Twp.



Tully Twp.

McCart Twp.

Evelyn Twp.

THE TOWNSHIP OF LITTLE

DISTRICT OF COCHRANE

PORCUPINE MINING DIVISION

SCALE: 1-INCH = 40 CHAINS

LEGEND

PATENTED LAND	(P)
CROWN LAND SALE	C.S.
LEASES	(L)
LOCATED LAND	Loc.
LICENSE OF OCCUPATION	L.O.
ROADS	
IMPROVED ROADS	
RAILWAYS	
POWER LINES	
MARSH OR MUSKEG	

NOTES

Area reserved to H.E.P.C. for water power purposes shown thus: ▨

Flooding rights lands bordering the Frederick House River.

400' Surface Rights Reservation around all Lakes and Rivers.

- MINING LANDS -
DATE OF ISSUE
APR 17 1973
MINISTRY OF NATURAL RESOURCES

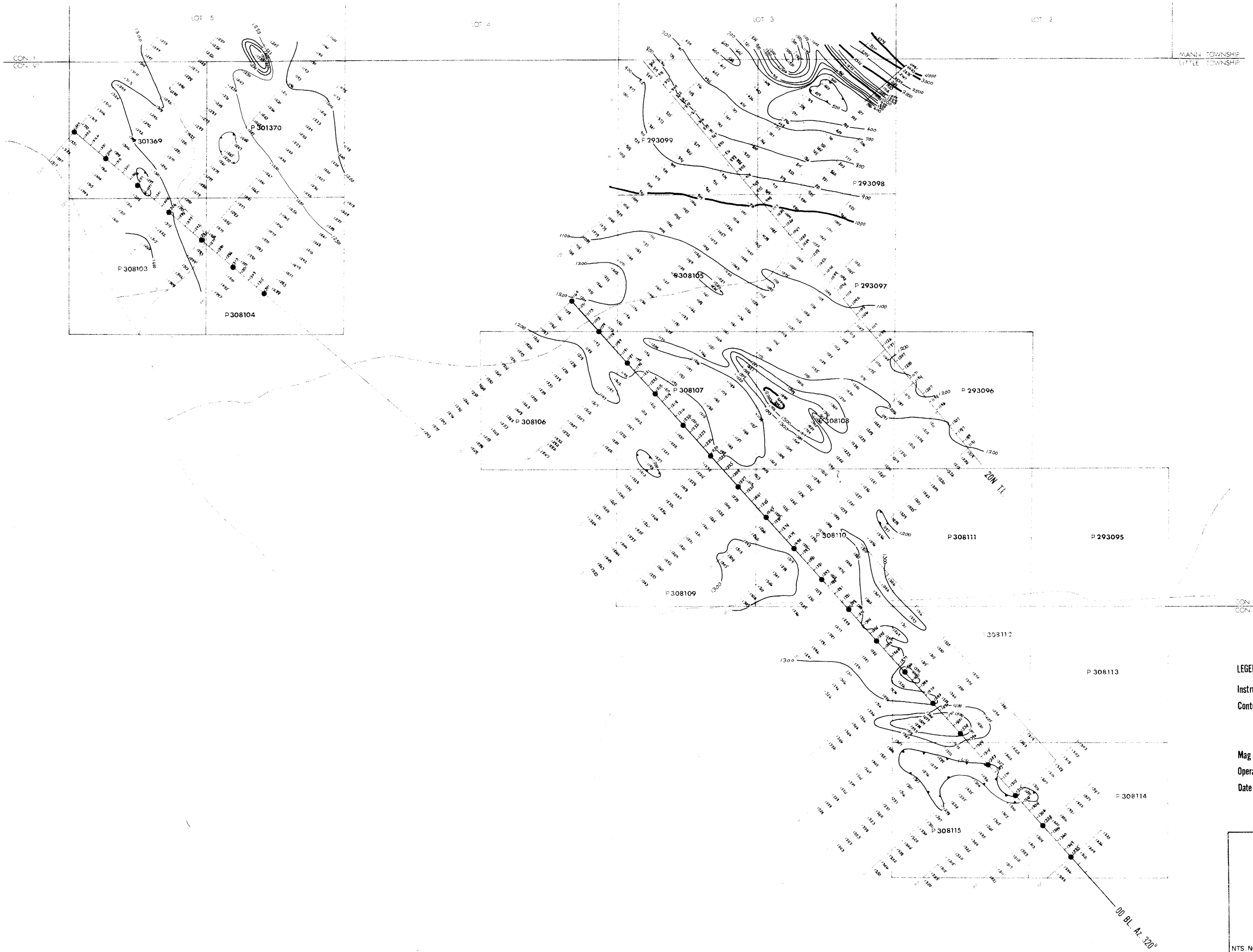
2.1156

May ground

PLAN NO. — M. 535

ONTARIO
MINISTRY OF NATURAL RESOURCES
SURVEYS AND MAPPING BRANCH

JK:



LEGEND:

Instrument: McPhar Fluxgate, Ser. No. 6494

Contour Interval: 1000 Gammas
100 "
50 "

Mag. Base Station: ●

Operators: R. Shirley, R. Wank

Date: September, 1971

R. G. Roussan

AMAX EXPLORATION INC.

MAGNETOMETER SURVEY

LITTLE-I

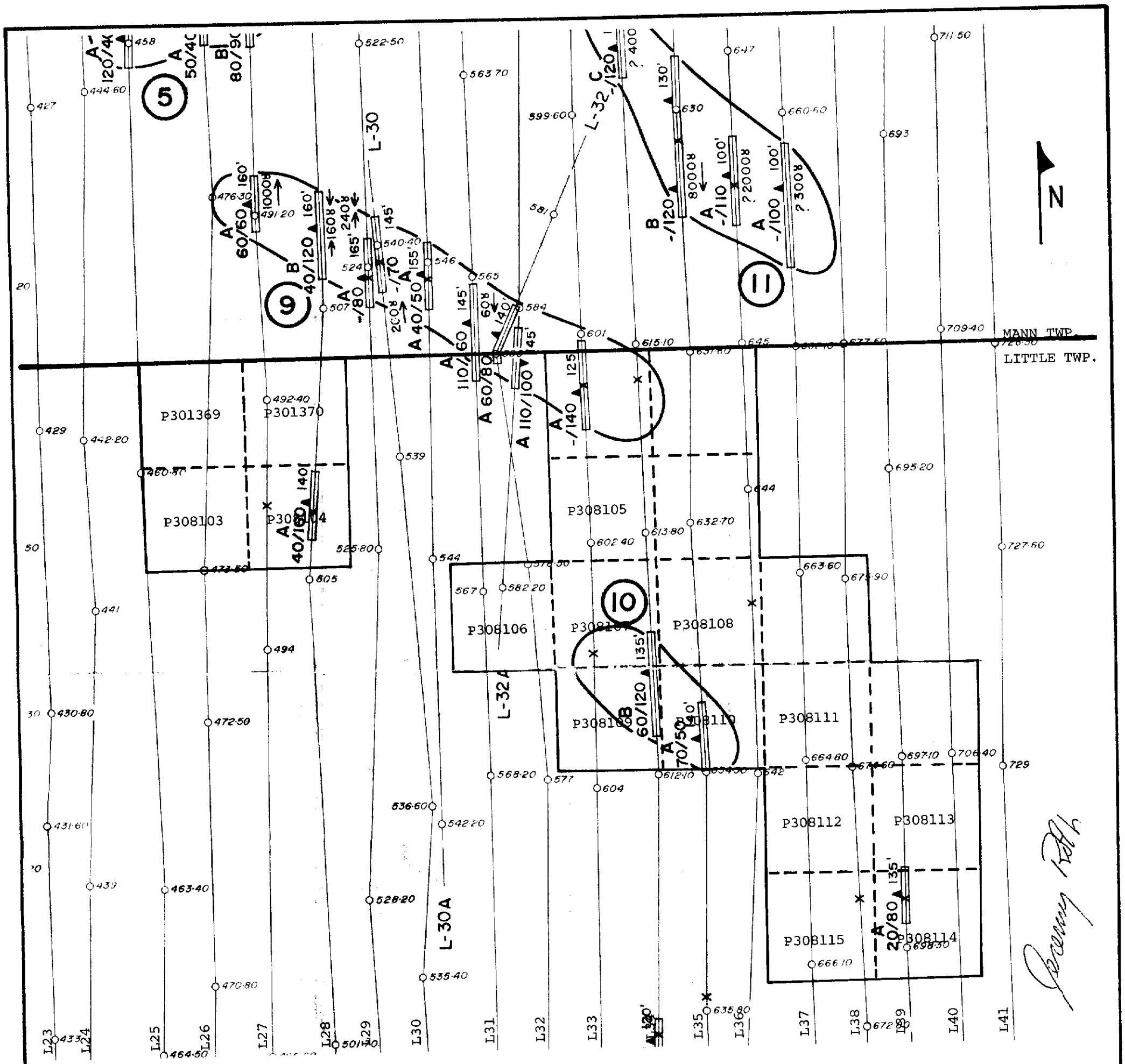
Little Township, Ontario

NTS. NO. 42A/14,15 PROJECT 414

SCALE: 1" = 400'

TO ACCOMPANY Assessment Report

BY DATE PLATE



AMAX POTASH LTD.

ELECTROMAGNETIC SURVEY

LITTLE TOWNSHIP - GROUP 1

Scale: 1" = ¼ Mi.

Surveyed & Compiled by Geoterrex
Flown in March 1971