



411055E0005 0037A1 BALDWIN

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REPORT ON

AIRBORNE GEOPHYSICAL SURVEY

OF THE

BALDWIN TOWNSHIP AREA OF ONTARIO

FOR

DENISON MINES LIMITED

BY

CANADIAN AERO MINERAL SURVEYS LIMITED

PROJECT NO. 7067.

OTTAWA, Ontario  
July 12, 1967.

Robert W. Stemp, F. Eng.  
Geophysicist.



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Accompanying this Report:

- One EM Plan Map at a scale of

1" =  $\frac{1}{4}$  mile.

REPORT ON  
AIRBORNE GEOPHYSICAL SURVEY  
OF THE  
BALDWIN TOWNSHIP AREA OF ONTARIO  
FOR  
DENISON MINES LIMITED

I. INTRODUCTION

This report pertains to the combined airborne E.M. and magnetometer survey flown on behalf of Denison Mines Limited in the Spanish River-Agnew Lake Area, Baldwin Township, Ontario. The flying was accomplished on June 30, 1967 by the Canadian Aero Mineral Surveys Limited geophysically equipped Otter aircraft (registration CF-1GM) based at Elliott Lake, Ontario.

The survey was flown at a mean altitude of 150' with flight lines spaced at 1/16 mile intervals. All of the lines were oriented North-South. The geophysical data acquired totalled 82 line miles.

Canadian Aero Mineral Surveys Limited personnel associated with the project were as follows:

- |             |   |                             |
|-------------|---|-----------------------------|
| G. P. Smith | - | Project Manager & Navigator |
| R. Veale    | - | Pilot                       |
| D. Graham   | - | Data Compiler               |
| R. Skinner  | - | Operator                    |
| A. Martin   | - | Draftsman                   |
| J. Irvine   | - | Geophysicist                |
| R. W. Stemp | - | Geophysicist                |

The E.M. data and all magnetic anomalies coincident with conductors are plotted on a plan map at the scale of 1" = 1/4 mile.

An airphoto laydown provided the base for this map.

## II. GEOLOGY

The following map has been used as a reference:

Geological Survey of Canada - Map #291A - 1938

Scale: 1" = 1 mile.

The geology is rather complex with the uranium bearing sediments of the Bruce Series being the most important rock type present. Pre-Huronian volcanics appear in the southern part of the survey area. In addition, a number of younger diabase intrusives appear throughout the area.

## III. DISCUSSION OF RESULTS

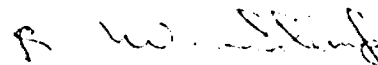
Two conductive zones have been outlined on the plan map although conductor 2 is an "x-type" or questionable conductor.

There is good magnetic correlation up to 500 gammas in amplitude with the EM anomalies in zone 1. However, the conductivity (ratio of in-phase to out-of-phase response) is rather low for massive sulphides. If sulphides are the source, they are probably somewhat disseminated or fractured. Graphite is the other alternative although the magnetics do favour a sulphide source. This conductor should definitely be investigated on the ground.

Zone 2 lies on strike with conductor 1, and if real, is probably a weak conductor that is related to zone 1. If conductor 1 proves interesting, it should also be checked out on the ground.

The scintillometer trace on the brush chart is anomalous over a portion of the area mapped as conglomerates which should be a guide in the search for uranium.

Respectfully submitted,



OTTAWA, Ontario.  
July 12, 1967.

Robert W. Steamp, P.Eng.  
Geophysicist.

PROJECT NO. 7067 - BALDWIN TOWNSHIP AREA

<u>Anomaly</u>	<u>Fiducials</u>	<u>In-Phase Quad</u>	<u>Altitude</u>	<u>Magnetics</u>	<u>Rate</u>	<u>Comments</u>
12 A	5016/18	30/0	165	S.Edge 120g	X	
13 A	4951/54	0/30	150	s.Flank 120g	X	Possible Turbulence
19 A	4418/23	20/20	145	S.Flank 1100g	3	Weak
20 A	4289/94	40/30	155	Dir? 430g	3	
21 A	4242/47	107/70	135	Dir. 130g	3	
22 A	4119/24	100/140	160	Dir. 380g	3	Multiple?
23 A	4070/73	?/140	145	Dir. 500g	3	In-Phase Distorted by Mag. Permea- bility effect.

APPENDIX IIA. EQUIPMENT

The electromagnetic unit and the magnetometer are the key instruments in the Canadian Aero Mineral Surveys Limited Otter survey system. The remainder of the equipment consists of a radio-altimeter, a scintillation counter, an accelerometer, a continuous-strip camera, two recorders and a fiducial numbering system.

The EM unit is the low frequency (320 c.p.s.) in-phase/out-of-phase system designed by Mullard Ltd. of England and operated formerly by Riocanex. The transmitting and receiving coils are mounted on the wingtips of the Otter, with a vertical coplanar orientation and a separation of 61 feet. An electronic null device is adjusted so that in the absence of a conductor within the range of the system no signal is recorded. The anomalous signal is divided into two components, the "in-phase" component having the same phase as the transmitted field and the "quadrature" or "out-of-phase" component being at right angles to it. These two measurements are recorded on two channels of the six-channel recorder.

Variations in the total magnetic field of the earth are measured by a Gulf Fluxgate magnetometer mounted in the aircraft. Anomalies as small as 10 gammas can normally be distinguished. The output of the magnetometer is presented as one channel on the six-channel recorder to facilitate correlation with the EM traces. It is also presented at a larger scale and in rectilinear form on a separate recorder, these recordings being used in the preparation of isomagnetic contour maps whenever they are required.

An APN-1 radio altimeter provides a terrain clearance profile on one channel of the six-channel recorder. Because EM response decays rapidly with increasing altitude this altitude information is important in the analysis of the EM data.

A vertical accelerometer mounted in the aircraft provides a record of the air turbulence and of any drastic manoeuvres of the aircraft. The accelerometer trace on the six-channel recorder is often helpful in recognizing spurious blips on the EM traces caused by air turbulence on drastic manoeuvres.

A Nuclear Enterprises Mark VI-A scintillation counter in the aircraft records gamma radiation from the land surface. This record can be used as auxiliary location information since outcrop, overburden-covered areas and swamps are readily distinguishable by their radiation levels.

APPENDIX II - cont'd  
Page 2

The entire flight path is photographed by a vertically-mounted Aeropath 35 mm. continuous-strip camera.

Synchronization of the film strip with the two recorders is accomplished by means of an automatic fiducial numbering system which prints simultaneous time markers on all three records at regular time intervals, normally every ten seconds.

B. DESCRIPTION OF RECORDS

Rectilinear Magnetic Record

With the chart oriented so that fiducial numbers increase from right to left, upward deflections on the chart indicate increases in the total magnetic field of the earth. On the 600 scale the smallest division on the chart is approximately equivalent to 5 gammas. When the record "steps" a change of approximately 500 gammas is indicated. On the "1200" scale the smallest division is 10 gammas and a step 1000 gammas.

The fiducial marks are normally spaced at 10-second intervals, a spacing which is equivalent to approximately 1500 feet on the ground. The exact horizontal scale of the tape can be established by measuring the fiducial spacing on the map.

Brush Six-Channel Record

With the chart oriented so that fiducial numbers increase from right to left the tracings from the bottom to the top of the chart are as follows:

- (1) Fiducial markers - same comments as above
- (2) Magnetometer - positive upward. On the 600 scale 1 mm. is approximately equivalent to 7.5 gammas and a step is approximately 500 gammas.
- (3) EM In-Phase - positive upward. 1 mm. represents approximately 20 parts per million, referred to the primary field at the receiving coil. The scale is linear until approximately 600 p.p.m. is reached, after which compression occurs to a level of 1200 p.p.m., beyond which the value is "off-scale".
- (4) EM Quadrature - positive upward. Same scale as In-Phase.



APPENDIX II - cont'd  
Page 3

- (5) Altimeter - increasing altitude upward. Centre line position approximately 150 feet. Scale below 150 feet approximately 5 feet per mm. Scale above 150 feet approximately 7 feet per mm.
- (6) Accelerometer - an acceleration of  $1/3$ "G" is equivalent to a 5 mm. deflection from the central point.
- (7) Scintillation - positive upward. 5 mm. represents a change of approximately 0.06 mr./hr.

C. SURVEY AND MAP COMPILATION PROCEDURES

Uncontrolled airphoto mosaics usually serve as base maps for flying the survey and for compilation of the geophysical data. The most common scale is  $1/4$  mile per inch.

The flight lines are oriented perpendicular to the assumed longest dimension of massive sulphide occurrences anticipated in the survey area. Occasionally two or more line directions have to be used to accommodate changes of geological strike within the area. Line spacings normally range between  $1/8$  mile and  $1/4$  mile.

The navigator is provided with "flight strips" of the area to be surveyed. These flight strips are a copy of the airphoto mosaic, with the intended flight lines inked and numbered. Navigation along the parallel flight lines is accomplished by visual means based on the physical detail observed on the photos. The aircraft is flown at a terrain clearance of 150 feet or, in rough terrain, at the lowest safe altitude.

Flight path is recovered in the field by comparison of the 35 mm. strip film with the airphoto mosaics. Identifiable points are marked on the mosaics and esignated by numbers determined from the fiducial numbering system on the film. These recovered flight lines provide the positional basis for plotting the geophysical data. The EM anomalies are listed and graded in the field and are often plotted on the field mosaics to permit immediate acquisition of ground.

In our Ottawa office transparent overlays of the mosaics are prepared, upon which are drafted the recovered fiducial points, the interpolated flight lines positions, the key planimetric features as traced from the mosaics, and the significant geophysical data. The geophysical data are subjected to a careful analysis by a geophysicist who prepares an interpretation report including recommendations for further work.

D. DATA PRESENTATION

The data presentation procedure which we employ for the Otter geophysical system is a combination of an anomaly listing and a plan map plot of graded EM anomalies. The anomaly listing provides the significant details concerning each anomaly and the map gives a "bird's eye view" of the conductors detected.

For purposes of listing and to facilitate reference in the report each EM anomaly is assigned a "name", which is made up of the number of the line upon which the anomaly occurs plus a letter. For example, on line 257 anomalies would be named 257A, 257B, 257C, etc., from south to north or from west to east. The letter which appears beside each EM anomaly on the map is therefore part of its name. These names also appear on the Brush records and in the anomaly list.

The anomaly list contains the fiducial numbers at the edges of the EM anomaly, the in-phase and quadrature amplitudes in p.p.m., the altitude at which the anomaly was detected, the positional relationship of the EM anomaly to magnetic anomalies (if any), a rating, and comments concerning any other pertinent characteristics of the anomaly.

The nomenclature used in the "magnetics" column of the anomaly list requires some explanation. The main terms used are side, flank, edge and direct. These refer to the position of the EM peak relative to the axis of the magnetic feature. "Direct" depicts coincident peaks and similar widths; "edge" is slightly offset; "flank" is somewhere along the flank of the magnetic anomaly; "side" is down near the base. "N. Flank 800g" means that the EM anomaly occurs along the northern flank of a magnetic feature of 800 gammas total amplitude. When one peak of a multiple EM anomaly coincides with a magnetic high the specific peak may be designated. For example, if the southern peak of a double EM anomaly coincided with a 250 gamma magnetic anomaly the nomenclature would be "Dir. S. 250g".

The rating assigned to each EM anomaly in the listing determines the symbol which represents the anomaly on the map. Six categories of anomalies are defined: 1A, 1B, 2A, 2B, 3, and X. The numbers "1", "2" and "3" are primarily a measure of in-phase amplitude corrected for altitude variation: "1" is for very large anomalies, "2" for intermediate, and "3" for relatively weak response. This rating is sometimes affected by the shape, by

APPENDIX II - cont'd  
Page 5

the in-phase to quadrature ratio, or by the location of the anomaly. The letters "A" and "B" merely refer to the magnetics: "A" indicates a directly coincident magnetic anomaly, and "B" indicates the lack thereof. The "X" rating is reserved for questionable anomalies. The legend on the map shows the symbol used for each of these ratings. In general, the more the rectangle is filled in, the stronger the anomaly.

In the case of directly coincident magnetic anomalies, the amplitude of the magnetic feature is shown on the EM map. It is stencilled beneath the symbol which portrays the EM anomaly.

During the final interpretation stage, EM anomalies are correlated from line to line wherever possible and the conductive zones are outlined. All definite conductors are numbered on the map and discussed in the report.



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REPORT ON

AIRBORNE MAGNETOMETER SURVEY

IN THE

BALDWIN TOWNSHIP AREA OF ONTARIO

FOR

DENISON MINES LIMITED

BY

CANADIAN AERO-MINERAL SURVEYS LIMITED

PROJECT NO. 7067

OTTAWA, Ontario.  
July 12, 1967

R.W. Steep, P. Eng.  
Geophysicist.



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Accompanying this Report:

One Isomagnetic Contour Map at the  
scale of 1" =  $\frac{1}{4}$  Mile.

REPORT ON  
AIRBORNE MAGNETOMETER SURVEY  
IN THE  
BALDWIN TOWNSHIP AREA OF ONTARIO  
FOR  
DENISON MINES LIMITED

I. INTRODUCTION

On June 30, 1967, Canadian Aero Mineral Surveys Limited conducted an airborne survey over a group of claims in the Baldwin Township area of Ontario for Denison Mines Limited.

This report pertains to the magnetometer phase of the programme.

II. SURVEY AND COMPILATION DATA

The survey was flown by the Canadian Aero Mineral Surveys Limited geophysically equipped Otter aircraft, registration CF-IGM, based at Elliott Lake. Flight lines were oriented North - South and spaced at 1/16 mile intervals. A mean terrain clearance of 150' was maintained throughout the survey. The geophysical data acquired totalled approximately 82 line miles.

The following Canadian Aero Mineral Surveys Limited personnel were associated with the project:-

- |            |   |                               |
|------------|---|-------------------------------|
| G.P. Smith | - | Project Manager and Navigator |
| R. Veale   | - | Pilot                         |
| D. Graham  | - | Data Compiler                 |
| R. Skinner | - | Operator                      |
| A. Martin  | - | Draftsman                     |
| R.W. Stemp | - | Geophysicist                  |

The magnetometer used in this survey was the total magnetic intensity "Flux Gate" saturable core instrument, developed by Gulf Research and Development Company. For the present survey, a sensitivity setting of 1200 gammas for full scale deflection was used. A "step" on this setting is equivalent to 1000 gammas.

The magnetic profile is displayed on a Gulf Research and Development rectilinear recorder with a 10 inch chart width.

The flight path of the aircraft is recorded by an Aeropath AS-5 continuous strip, 35 mm. camera. The camera is synchronized with the magnetometer record by means of a fiducial numbering system. Path recovery is accomplished by relating this strip film to an airphoto composite of the area. Identified points are designated by their fiducial numbers.

An overlay of the airphoto mosaic showing the fiducial points provides the base for the isomagnetic contour map. After a line-to-line comparison of the levels of the magnetic records, to reduce the profiles to the same level, the profiles are transcribed from the tapes to the plan map. This data is then contoured at 50 gamma intervals and drafted. The isomagnetic contours of this area are presented on one plan map at the scale of 1" = 1/4 mile.

### III. GEOLOGY AND RESULTS

The following map has been used as a reference:

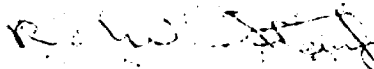
Geological Survey of Canada - Map #291A - 1938

Scale: 1" = 1 mile

The geology is rather complex with the uranium bearing sediments of the Bruce Series being the most important rock type present. Pre-Huronian volcanics appear in the southern part of the survey area. In addition, a number of younger diabase intrusives appear throughout the area.

The isomagnetic contours are very flat throughout the central part of the area which would correspond with the Huronian sediments. The stronger magnetic features across the northern and southern sections of the property probably relate to the basic intrusives, primarily diabase.

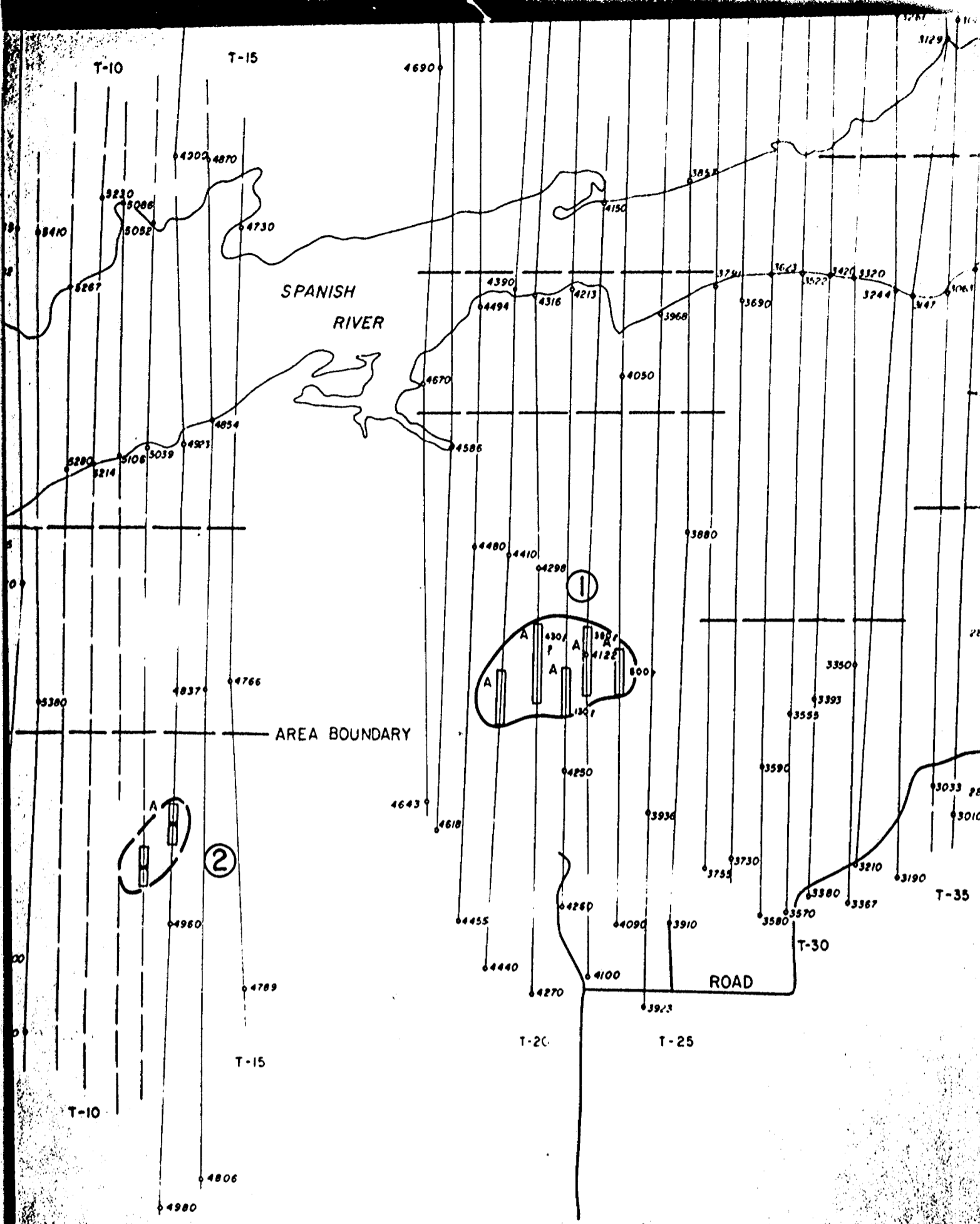
Respectfully submitted,



OTTAWA, Ontario.  
July 12, 1967

R.W. Stemp, P. Eng.,  
Geophysicist.





BALDWIN TOWNSHIP

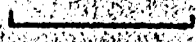
AIRBORNE ELECTROMAGNETIC SURVEY  
BALDWIN TOWNSHIP AREA

ONTARIO

DENISON MINES LIMITED

SCALE 1 INCH TO 1320 FEET (APPROX.)

MEAN TERRAIN CLEARANCE  
FLIGHT LINE SPACING  
HORIZONTAL CONTROL  
PHOTO LAYDOWN



1" = 1320'





900

File: 63.2170

THE MINING ACT  
Assessment Work Credits

Name: DENISON MINES LTD.

Township or Area: BALDWIN TOWNSHIP

Number of Assessment work days per claim:

Geophysical 80 Airborne

Geological N11

Geochemical N11

Mining Claims:

S 136650 to 136653 inclusive

S 136628

S 136629

EASTERN ONTARIO  
MINING DIVISION



ONTARIO

63 2170

PARLIAMENT BUILDINGS  
TORONTO 2, ONTARIO  
TEL. 365-1322

DEPARTMENT OF MINES  
OFFICE OF MINING RECORDER

November 14th, 1967.

Dear Sir:

Subject: Geophysical and Geological Surveys

The assessment work credits as shown on the attached list have been approved as of the above date. Please inform the recorded holder and so indicate on your records.

Yours truly,

A handwritten signature in cursive script, appearing to read "Fred W. Matthews".

Fred W. Matthews,  
Mining Recorder.

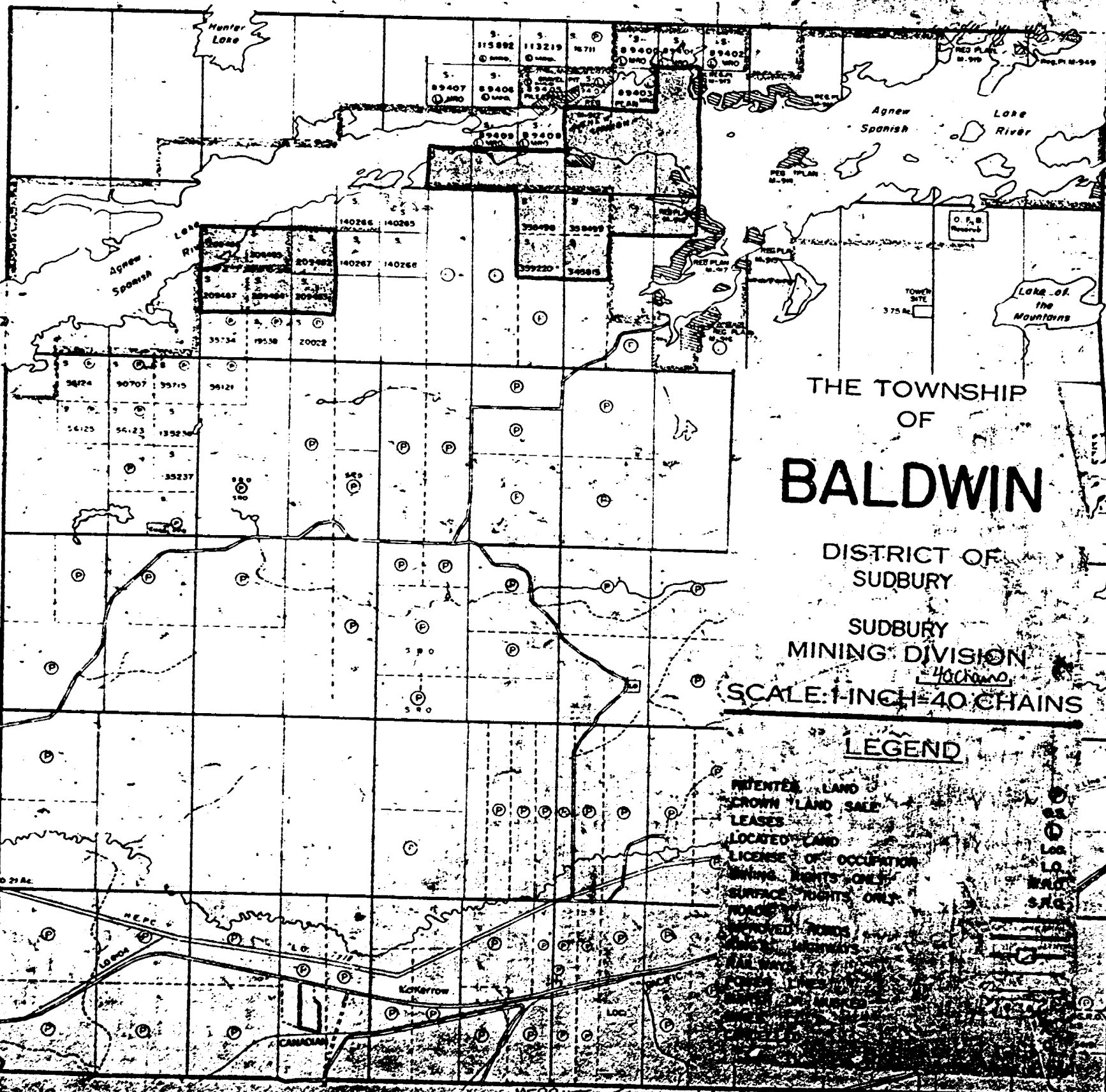
FWM:smm

cc. Dr. J. F. Donovan  
Denison Mines Ltd

Mr. K. M. Hallock,  
Mining Recorder,  
Sudbury, Ontario.

Porter Twp. (M.-106f)

Shakespeare Twp. (M.-1104)



THE TOWNSHIP  
OF  
**BALDWIN**

DISTRICT OF  
SUDBURY  
SUDBURY  
MINING DIVISION  
*Yochano*  
SCALE: 1 INCH = 40 CHAINS

**LEGEND**

- PATENTED LAND
- CROWN LAND SALE
- LEASES
- LOCATED LAND
- LICENSE OF OCCUPATION
- MINING RIGHTS ONLY
- SURFACE RIGHTS ONLY
- ROADS
- APPROVED ROADS
- RAILWAYS
- CANALS
- L.O.
- L.O.
- L.O.
- S.F.C.

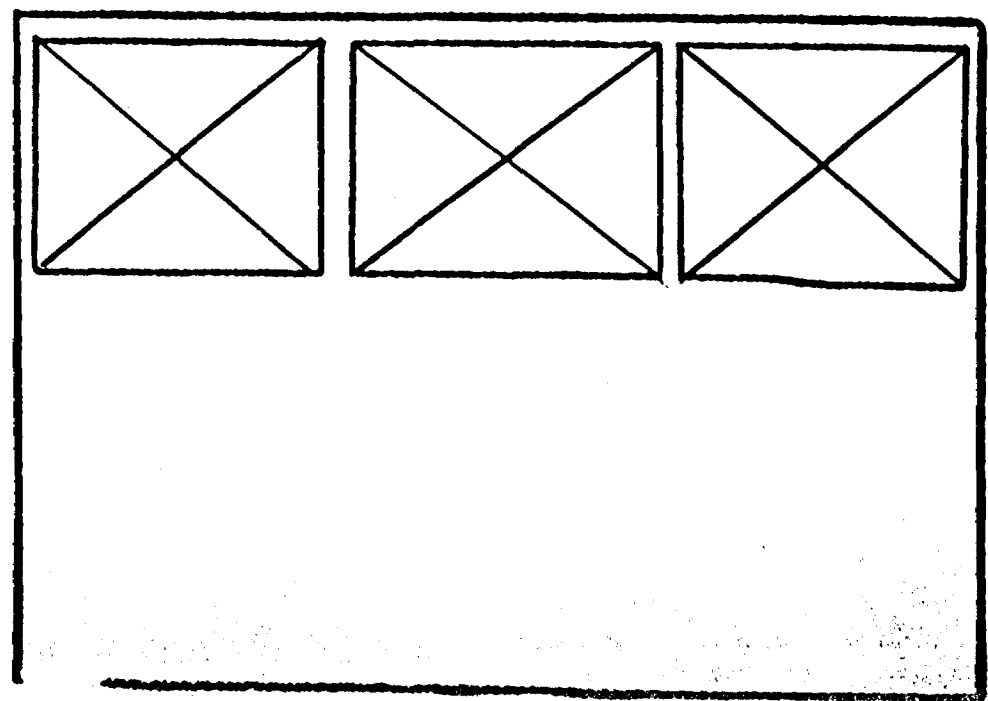
VI  
V  
IV  
III  
II  
I

Narr Twp  
M. 883

12 11 10 9 8 7 6 5 4 3 2 1  
MERRITT Twp. (M.-108)

SEE ACCOMPANYING  
MAP(S) IDENTIFIED AS  
BALDWIN-0037-A1, #1-3

LOCATED IN THE MAP  
CHANNEL IN THE FOLLOWING  
SEQUENCE (X)





LEGEND

- CONTOUR INTERVAL... 50 GAMMAS
- 500 GAMMA CONTOUR...
- 100 GAMMA CONTOUR...
- 50 GAMMA CONTOUR...
- MAGNETIC LOW...

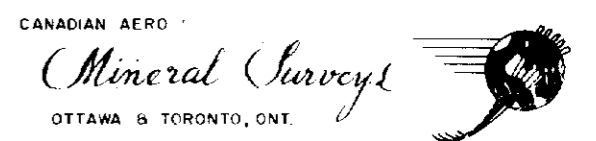


(APPROX)

AIRBORNE MAGNETOMETER SURVEY  
BALDWIN TOWNSHIP AREA

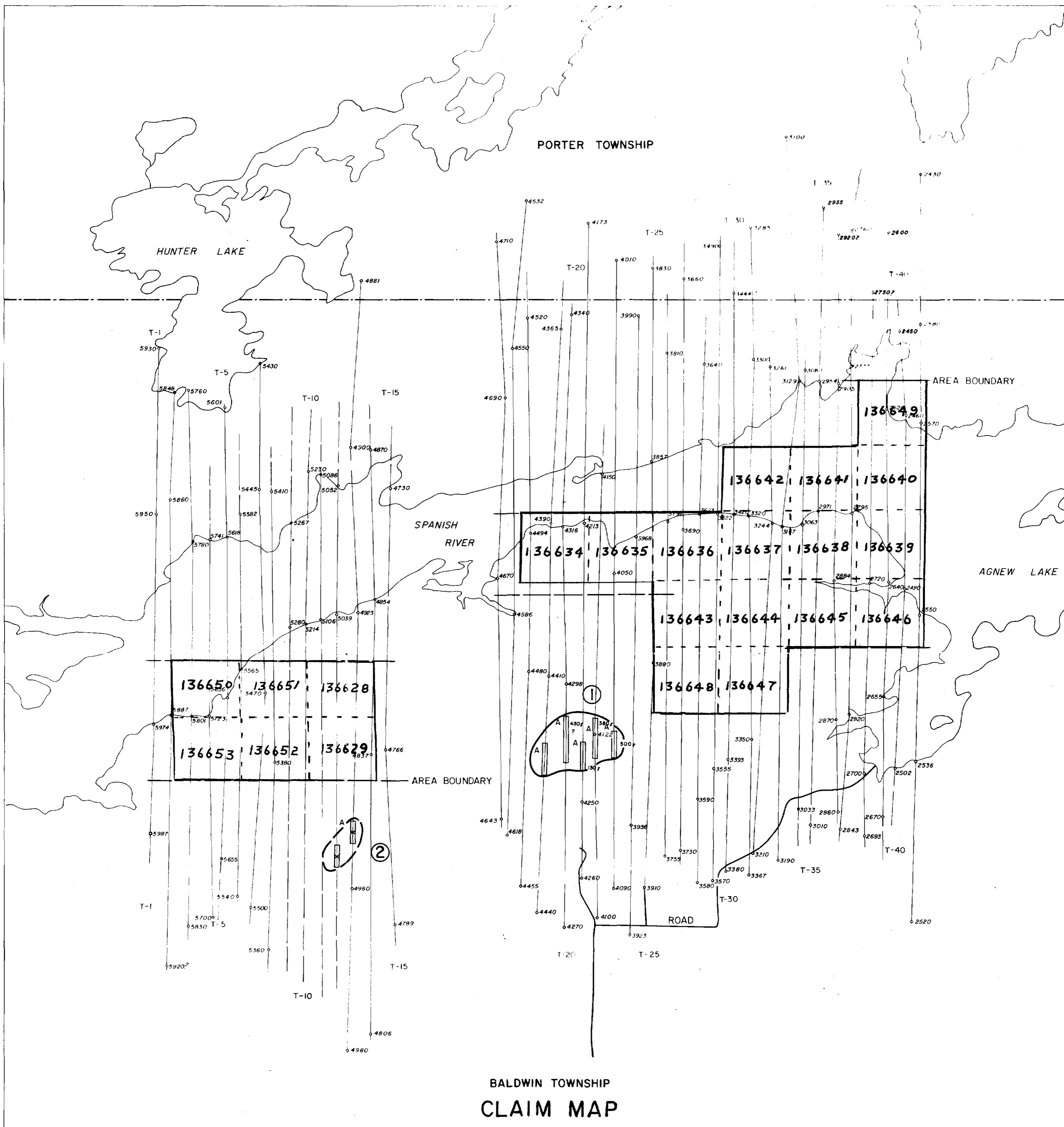
ONTARIO  
DENISON MINES LIMITED  
SCALE 1 INCH TO 1320 FEET (APPROX)

MEAN TERRAIN CLEARANCE... 150 FEET  
FLIGHT LINE SPACING... 1/16 MILE  
HORIZONTAL CONTROL... BASED ON  
PHOTO LAYDOWN



41105SE0005 0037A1 BALDWIN

BALDWIN-0037-A1, #1 *W. Staff*



LEGEND

- 1 A ANOMALY.....
- 1 B ANOMALY.....
- 2 A ANOMALY.....
- 2 B ANOMALY.....
- 3 B ANOMALY.....
- X type ANOMALY.....



(APPROX)

AIRBORNE ELECTROMAGNETIC SURVEY.

BALDWIN TOWNSHIP AREA

ONTARIO

DENISON MINES LIMITED

SCALE 1 INCH TO 1320 FEET (APPROX.)

MEAN TERRAIN CLEARANCE... 150 FEET  
 FLIGHT LINE SPACING... 1/16 MILE  
 HORIZONTAL CONTROL... BASED ON  
 PHOTO LAYDOWN

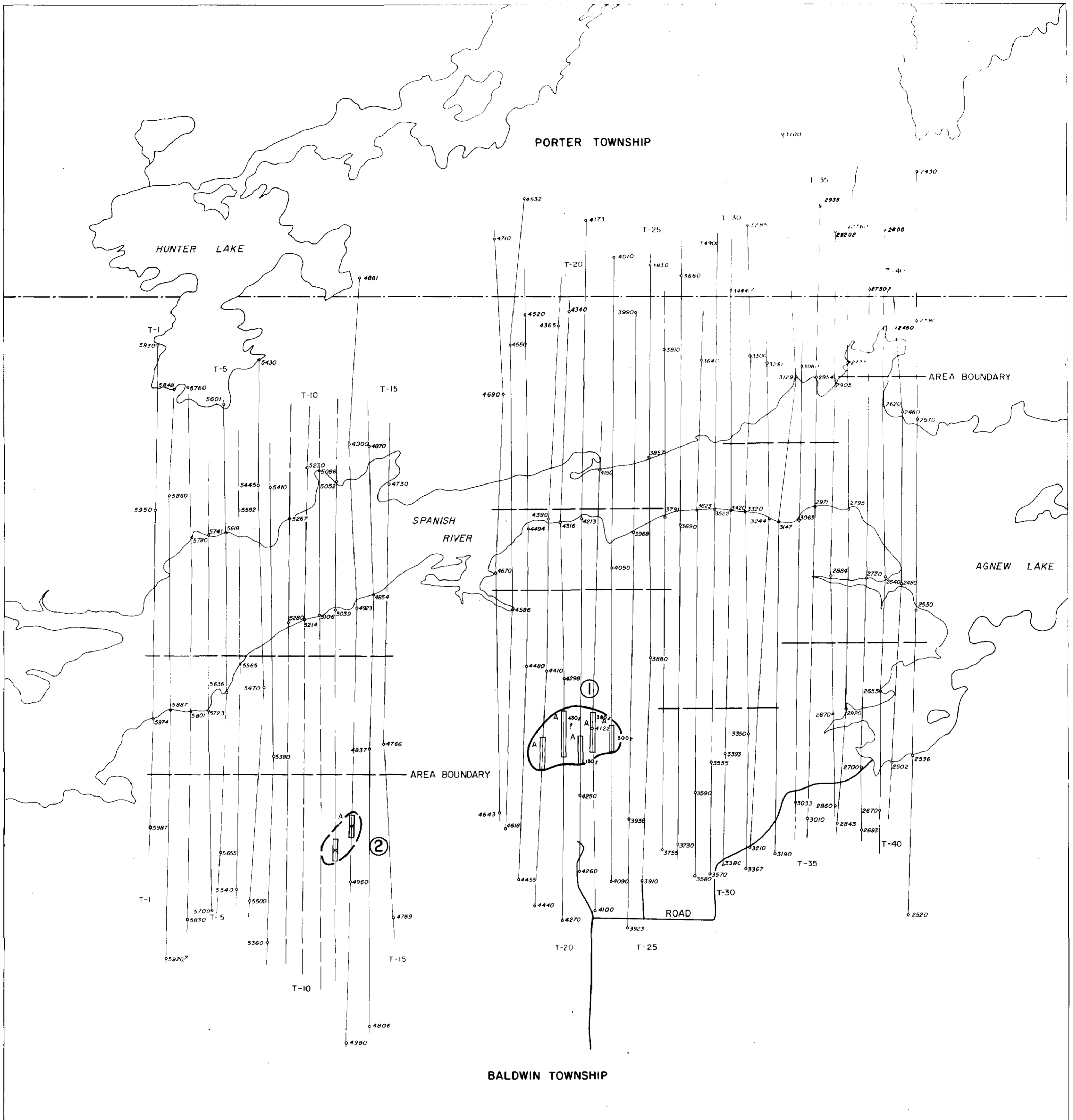
CANADIAN AERO

Mineral Surveys  
 OTTAWA & TORONTO, ONT.



41105E0005 0037A1 BALDWIN

BALDWIN-0037-A1, #2



LEGEND

- 1 A ANOMALY..... [Symbol]
- 1 B ANOMALY..... [Symbol]
- 2 A ANOMALY..... [Symbol]
- 2 B ANOMALY..... [Symbol]
- 3 B ANOMALY..... [Symbol]
- X type ANOMALY..... [Symbol]



(APPROX.)

AIRBORNE ELECTROMAGNETIC SURVEY  
BALDWIN TOWNSHIP AREA

ONTARIO  
DENISON MINES LIMITED  
SCALE 1 INCH TO 1320 FEET (APPROX.)

MEAN TERRAIN CLEARANCE... 150 FEET  
FLIGHT LINE SPACING... 1/16 MILE  
HORIZONTAL CONTROL... BASED ON  
PHOTO LAYDOWN

CANADIAN AERO

Mineral Surveys

OTTAWA & TORONTO, ONT.



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BALDWIN-0037-A1 #3 R. W. [Signature]