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MINING LANDS SECTION

NORCEN ENERGY RESOURCES LIMITED ASSESSMENT REPORT

AIRBORNE MAGNETOMETER SURVEY

LARDER LAKE MINING DIVISION

ONTARIO

CLAIMS: Halliday Township (129) Hutt Township (1) Midlothian Township (13)

LOCATION: 65 km south of Timmins, Ontario

NTS: 41 pl4+15; 42A 2+3

Adet Land

R.J. Laird

April, 1981

INTRDUCTION

This report contains my interpretation of the results of an airborne magnetometer survey flown in the Timmins area of Ontario. The field portion of the work, including installation, was begun on January 16, 1981 and completed on February 3.

The survey area is centered approximately 65 kilometers (40 miles) south of Timmins, Ontario (see Figure 1). The survey covered an area in and around Halliday Township (Figure 2). Total coverage including two magnetic tie lines was 1545 line kilometers (or 1451 line kilometers when measuring from survey boundary to survey boundary only). The operations base was the United Asbestos mine site located on Lloyd Lake, approximately 30 kilometers west, by road, from Matachewan. The survey aircraft was a Bell 206B helicopter.

The survey crew consisted of:

Pilot Operator 1 Operator 2 Dataman Geophysicists John Hall/John Ahlstrom John Glover Evan Veroni Paul Conroy Ian Johnston/Vince Tanzini

Mike Lewis, Operations Manager of Scintrex, maintained overall supervision from the Scintrex office, Toronto.

The core of this report is Scintrex's "Airborne Geophysical Survey Report" which is included here as Appendix I.

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LOCATION MAP

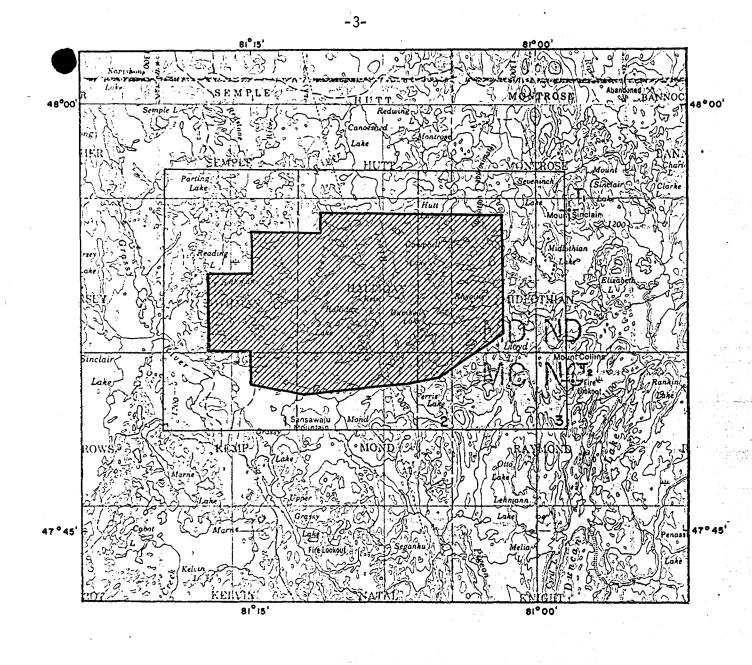
NORCEN ENERGY RESOURCES LIMITED HALLIDAY TOWNSHIP AREA **ONTARIO**

AIRBORNE GEOPHYSICAL SURVEY

SCALE : 1:2,000,000

50





SURVEY AREA MAP

NORCEN ENERGY RESOURCES LIMITED

HALLIDAY TOWNSHIP AREA ONTARIO

AIRBORNE GEOPHYSICAL SURVEY

--- TRANSPANDERS T. & T2

KILOMETERS 2 5 10 15 KILOMETERS Scale : 1 : 250,000

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MAP COMPILATION

The flight path was machine plotted on the base maps at a scale of 1: 10 000. The flight path film was used to outline all significant topographic features on the photomosaic base (photo - enlarged to a scale of 1: 10 000). Such topographic features were then transferred in outline to the flight path map by comparing fiducials.

SURVEY PROCEDURE

Sensor terrain clearance was kept at 100 to 150 feet; aircraft speed was 70 mph. Lines 1 to 123 inclusive were flown with a 125m (410 feet) line spacing. Lines 123 to 155 inclusive were flown with a 250 m (820 feet) line spacing.

A Del Norte Flying Flagman electronic navigational system was used to provide a position fix of the aircraft. This system operates on the principal of pulse radar. Actual location accuracy is probably \pm 5 meters.

INTERPRETATION

BLOCK A

The higher intensity magnetic features in central Halliday Township (north-west of Annie Lake) appear to be related to interbedded felsic and intermediate metavolcanics. The strike in this area is generally east-west.

The three isolated magnetic highs north of Annie Lake appear to be related to rhyolite outcrops.

The remaining part of the block is magnetically uniform and featureless. No apparent dikes or faults are indicated by the magnetic features. The magnetic intensity in Block A ranges from 59 040 to 59 300 gammas.

BLOCK B

Block B covers the northwest part of Midlothian Township.

The dominant magnetic feature in this block is the moderate magnetic high (60 gammas) just east of Bluebottle Lake. This anomaly appears to be related to the contact between metasediments (conglomerates and arkose) and felsic metavolcanics. The strike is generally east-west in this area.

No apparent dikes or faults are indicated by the magnetic features in this block. The magnetic intensity in Block B ranges from 59020 to 59150 gammas.

Report On A Helicopter Borne Geophysical Survey Halliday Township Area Timmins, Ontario

On Behalf Of NORCEN ENERGY RESOURCES LIMITED

1. Introduction

A helicopter-borne geophysical survey was carried out by Scintrex Limited on behalf of Norcen Energy Resources Limited in the Timmins area of Ontario. The field portion of the work, including installation, was begun on January 16, 1981 and completed by February 3.

The survey covered an area in and around Halliday Township, Ontario (see Figures 1 and 2). Total coverage, including two magnetic tie lines was 1545 line kilometers (or 1451 line kilometers when measuring from survey boundary to survey boundary only). Principal geophysical sensors were an electromagnetic system (HEM-802) measuring in-phase and quadrature secondary field components at 735 and 3220 Hz and a proton precession magnetometer (Scintrex MAP-4). Navigation was controlled by a 'Flying Flagman' radar ranging navigational system.

Results were compiled in Toronto with contoured magnetics and drafted EM anomaly centers at a scale of 1:10,000 being the principal presentation styles.

This report describes the survey procedures, instrumentation and production, in-field compilation and final compilation. Maps showing the results of

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This report was prepared by Scintrex Limited, Concord, Ontario, Canada.

2. Survey Area

The survey area is centered approximately 60 miles south of Timmins (or 25 miles west of Matachewan) (see Figures 1 and 2). The operations base for the survey was the United Asbestos mine site located on Lloyd Lake, approximately 20 miles west, by road, from Matachewan.

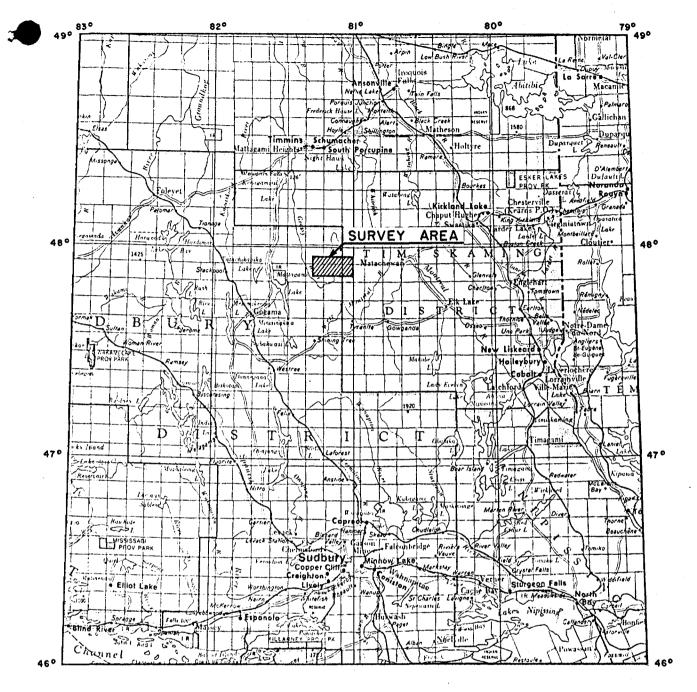
3. Survey Equipment

The survey equipment consisted of the following:

- A Scintrex HEM-802 electromagnetic system measuring in-phase and a) quadrature (out-of-phase) secondary field components at frequencies of 735 and 3220 Hz. (See Appendix I for details). The analog output of the EM system was prefiltered with a low-pass filter. The rise time on said filter (Rise time = the time required for an impulse response to go from 10% to 90% of the impulse value) was 0.50 seconds. The digital recording rate of all HEM data was 0.5 seconds.
- A Scintrex MAP-4 Proton Precession Magnetometer with the sensor b) mounted in the HEM bird. (See Appendix II for details).
- A Scintrex RCM-8 eight channel analog recorder (hot-pen type). c)
- A Sonotek SDS-1200 digital data acquisition system. d)

e) A Bonzer MK-10 radar altimeter. 2





LOCATION MAP

NORCEN ENERGY RESOURCES LIMITED HALLIDAY TOWNSHIP AREA ONTARIO

AIRBORNE GEOPHYSICAL SURVEY

SCALE : 1:2,000,000

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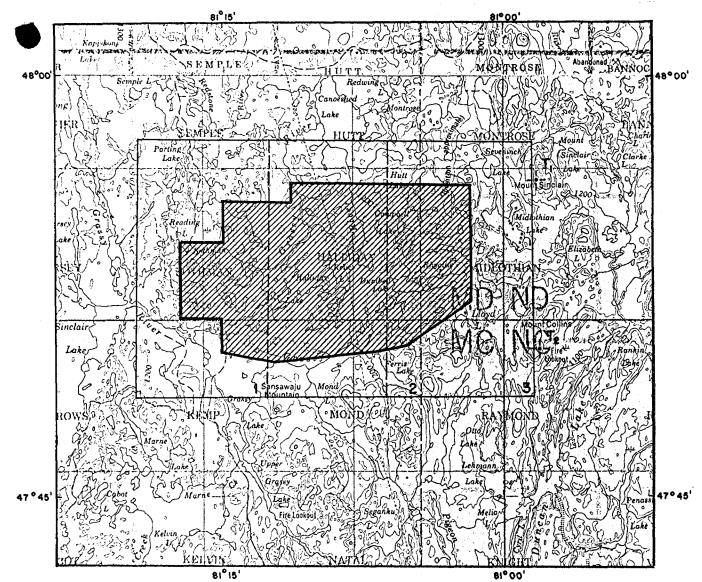
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FIGURE I



SURVEY AREA MAP

NORCEN ENERGY RESOURCES LIMITED

HALLIDAY TOWNSHIP AREA ONTARIO

AIRBORNE GEOPHYSICAL SURVEY

--- TRANSPANDERS T, & T2

KILOMETERS 2 5 19 15 KILOMETERS Scale : 1 : 250,000



FIGURE 2

Charles and the second second

- f) A 60 Hz monitor.
- g) A Scintrex IITC-2 intervalometer.
- h) A Vinten 16 mm camera.
- A Del Norle Flying Flagman transponder-based navigational system.
 (See Appendix III for details).
- j) Instrument mounting rack, base station magnetometer, test equipment, tools and spare parts.
- 4. Survey Specifications and Survey Crew

The survey specifications were as follows:

Line Spacing - 125 meters (410 feet) and 250 meters (820 feet)

Sensor terrain clearance - 100 to 150 feet

Aircraft speed - 70 mph

The survey crew consisted of:

Geophysicists - Ian Johnson/Vince Tanzini

Operator 1 - John Glover

Operator 2 - Evan Veroni

Dataman - Paul Conroy

Pilot - John Hall/John Ahlstrom

Mike Lewis, Operations Manager of Scintrex, maintained overall supervision from the Scintrex office, Concord (Toronto).

John Gillan of Norcen Energy was on site at the start and end of the project.

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The helicopter, C-GGUB, a Bell 206B, was owned and operated by Huisson Aviation Ltd., Timmins, Ontario.

5. Field Procedures and Production Summary

If all were to proceed without failures or interruptions, the field work would advance according to:

- a) Install equipment in helicopter, assemble HEM 'bird', set-up base station magnetometer. Install the two fixed transponders.
- b) Ground-test and HEM warm-up.
- c) Fly survey.
- d) Check and edit all analog traces, develop flight-path film and plot back the flight-path (as a check against the Flying Flagman operation).

The acceptable data was produced on eighteen survey flights. (See Table I for details).

Any given flight would normally proceed as follows:

- a) Ground system and magnetometer check.
- b) Take off
- c) Airborne systems check (including Flying Flagman) and pre-flight analog/digital calibration sequence.

d) Fly Lines

e) Post-flight analog/digital calibration sequence.

f) Land

4

TABLE I

Survey Production Summary

Flight	Date	Lines Survey & Accepted
1	January 23	
2	January 24	1 - 6
3	January 25	7 - 11
4	January 27	12 - 17
5	January 28	18 - 29
6	January 28	32 - 42
7	January 28	42 - 55
8	January 29	56 - 67
9	January 29	68 - 70
10	January 30	•••
11	January 31	
12	January 31	71 - 82
13	January 31	83 - 91
14	January 31	94 - 105
15	February 1	108 - 115
16	February 3	116 - 127
17	February 3	129 - 155, MTL 1
18	February 3	30, 31, 92, 93, 106, 107, MTL 2

N.B. Lines 1 to 123 inclusive were flown with a 125 m line spacing. Lines 123 to 155 inclusive were flown for odd numbered lines only (giving an effective line spacing of 250 m).

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SAMOTEN X

The one technical procedure requiring special attention was the installation and operation of the Flying Flagman navigational system. This system operates with two ground (remote or slave) transponders and one airborne (master) transponder. The master communicates with both remotes in order to establish the distances from master to both slaves. (The communication signal is transmitted at approximately 9 Gigahertz and then only during short 'on' periods separated by approximately 1 millisecond).

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The two distances, master to remote (T_1) and master to remote (T_2) are internally compared with the base line distance $(T_1 \text{ to } T_2)$ which was entered earlier by flying across the base line, the Flying Flagman system automatically recognizing the minimum distance point. Triangulation gives the x-y co-ordinate at a given point in time. The pre-programmed grid is compared with actual position to provide direction to the pilot. X and Y co-ordinates are recorded on the digital data acquisition system with updates every 0.5 seconds. Positional information is recorded to the nearest 0.1 meter: actual accuracy is probably ±5 meters.

The two fixed transponders were set up A) in the fire tower on Mount Collins and B) on Mount Sinclair (See Figure 2). These locations permitted line-of-site coverage for the entire survey area. Having fixed these ground stations, the system was initialized by setting the start and end points of line zero (just outside, to the East of and parallel to the North-South boundary line of the survey area (Eastern Edge)). As the system programs the flight plan as a rectangular grid, all line stop-starts, except those in the North-East corner, were controlled manually using the photomosaic.

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page

The survey work proceeded in most part without incident. A few points should

however be mentioned.

- A) Flight number two was aborted due to dropping the HEM bird. The sensor was repaired and used to complete the survey. A noticeable and yet acceptable increase in EM noise levels ensued.
- B) A power line running approximately North-South through the center of the area rendered the EM data useless for at lease one line spacing (125m) on either side.

6. Data Recording

6.1 Analog Records

The analog records display the following:

Channel	Content	Approximate Full Scale Gain
1	60 Hz Monitor	
2	735 Hz In-Phase	130 ppm
3	735 Hz Quadrature	130 ppm
4	3220 Hz In-Phase	130 ppm
5	3220 Hz Quadrature	130 ppm
6	Magnetometer	100 gammas
7	Magnetometer	1000 gammas
8	Altimeter	500 feet

6

Fiducial (one per second) counters are shown above channel one and below channel 8. Chart speed is 2 mm per second. Lines and fiducial numbers are manually labelled. Where the fiducial trace is seen the system is on line and all recording systems on.

The analog records for the survey have been fan folded and stored in envelopes: one per flight.

At the start and end of each flight are calibration sequences. The four EM channels are calibrated by activating pre-set 100 ppm (parts per million) calibration pulses. The magnetometer channels are calibrated on analog only as the digital records read directly in gamma. The same holds true of the radar altimeter record.

The base station magnetometer recorder was run with 100 gamma full scale and at a chart speed of 10 cm per hour. Throughout the production survey work, the base station magnetometer showed no anomalous external field magnetic activity.

Flight logs, maintained by the operator, show all lines surveyed, start and end fiducial points, initializing information and any non-standard events.

6.2 Digital Records

All airborne survey data were recorded on the digital data acquisition system. Fiducials and magnetometer readings were updated every one second. All time EM, altimeter and positioned X-Y data were sampled every 0.5 seconds. All EM data was digitally sampled after electronic filters of rise times 0.5, 1.1 and 2.2 seconds.

page

Recording was on 9 track magnetic tape, 800 bpi format.

7. In-Field Compilation

The analog records were studied for quality and consistency. All lines were labelled and fiducials marked. The flight path film was developed and edited. The flight path was recovered on photomosaics (scale $1'' = \frac{1}{2}$ mile) to ensure area coverage at agreed line spacings. Prominent electromagnetic anomalies were identified and plotted on an overlay ("red-ball" map) at the scale of the photomosaics. These maps were presented to Norcen at the end of the field work.

8. Presentation

8.1 Base Map

The flight path was machine plotted at a scale of 1:10,000. The flight path film was used to outline all significant topographic features on the photomosaic base (Photo-enlarged to a scale of approximately 1:10,000). Such topographic features were then transferred in outline to the flight path map by comparing fiducials. Such a scheme was adopted as the photomosaics was of uncertain quality; a gross scaling error of approximately 2%, and possibly more severe local offsets were apparent.

8.2 Electromagnetic Anomaly Selection and Plotting

The analog records were studied for anomalous responses, all of which were analysed and plotted. Those responses which were considered as due to "Lake bottom" sediments (typified by a broad, low amplitude response primarily in the 3220 Hz quadrature channel) are identified by a 'bar' indicated bredth of the anomalous response.

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All selected anomaly amplitudes were analysed by computer and the interpreted conductance and depth to source estimates listed. The results are shown in Appendix IV.

All selected anomalies have been plotted on the flight path map at the scale of 1:10,000. Appearing with the anomaly center are the anomaly label, conductance estimate and depth of burial estimate (both for the Vertical Half Plane Model).

8.3 Magnetic Contour Map

All magnetic data was machine contoured at the scale of 1:10,000. The minimum contour interval is 10 gamms. Magnetic contouring was done by Dataplotting Services Limited, Toronto.

Lines one to twenty-nine inclusive showed a digital magnetic record of uncertain quality. As a result, magnetic data for these lines was manually digitized from the analog records before entering the machine contouring process.

In the North-West corner of the survey area, magnetic anomalies were encountered which caused, for certain line segments, the magnetometer to go 'off-lock' with a consequent loss of data. Magnetic contours appearing in this area are shown as dashed lines as the contouring has been done manually by "sticking" together available data. A measured confidence in the contoured magnetics is recommended in this area.

9. Conclusions

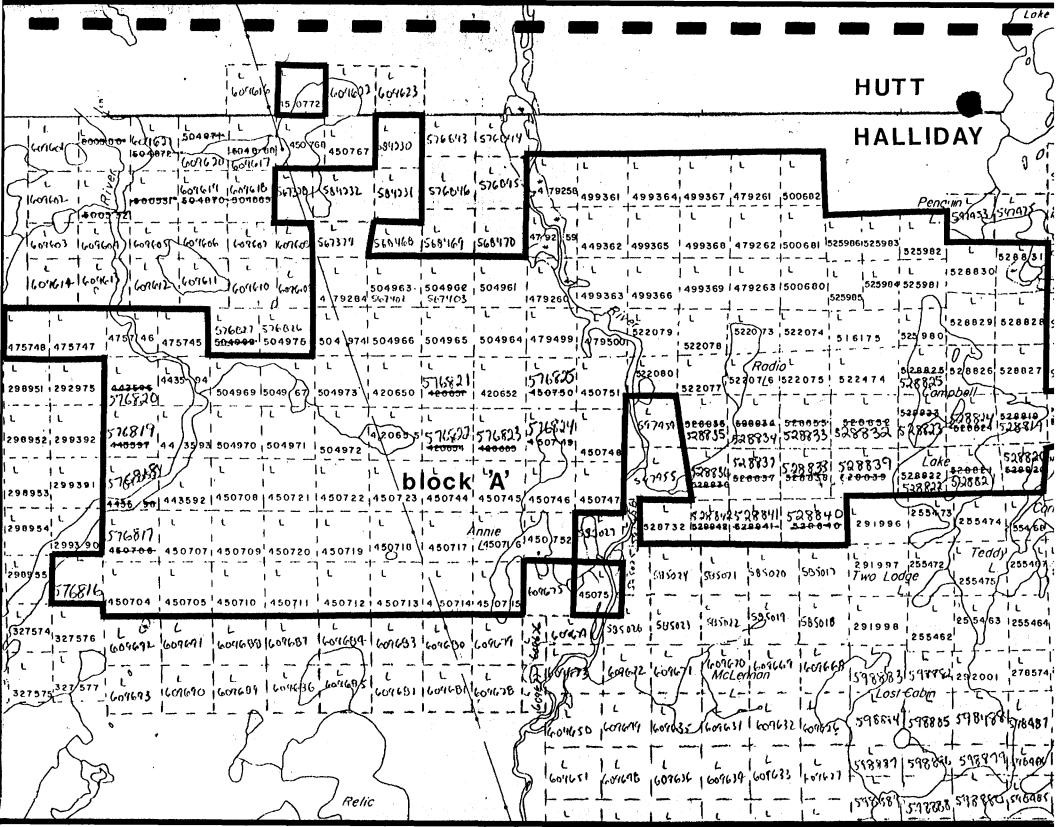
A helicopter borne electromagnetic and magnetic survey of approximately 1500 line kilometers has been completed on behalf of Norcen Energy Resources Limited in the Halliday Township area of Ontario. Results, including the radar ranging flight path have been plotted at a scale of 1:10,000. Numerous high conductance EM targets are indicated. Comparison with the contoured magnetics would guide the assignment of conductor axes and priorities thereof. The interpreted results should be of high quality, as the survey flown was of the "high-resolution" type.

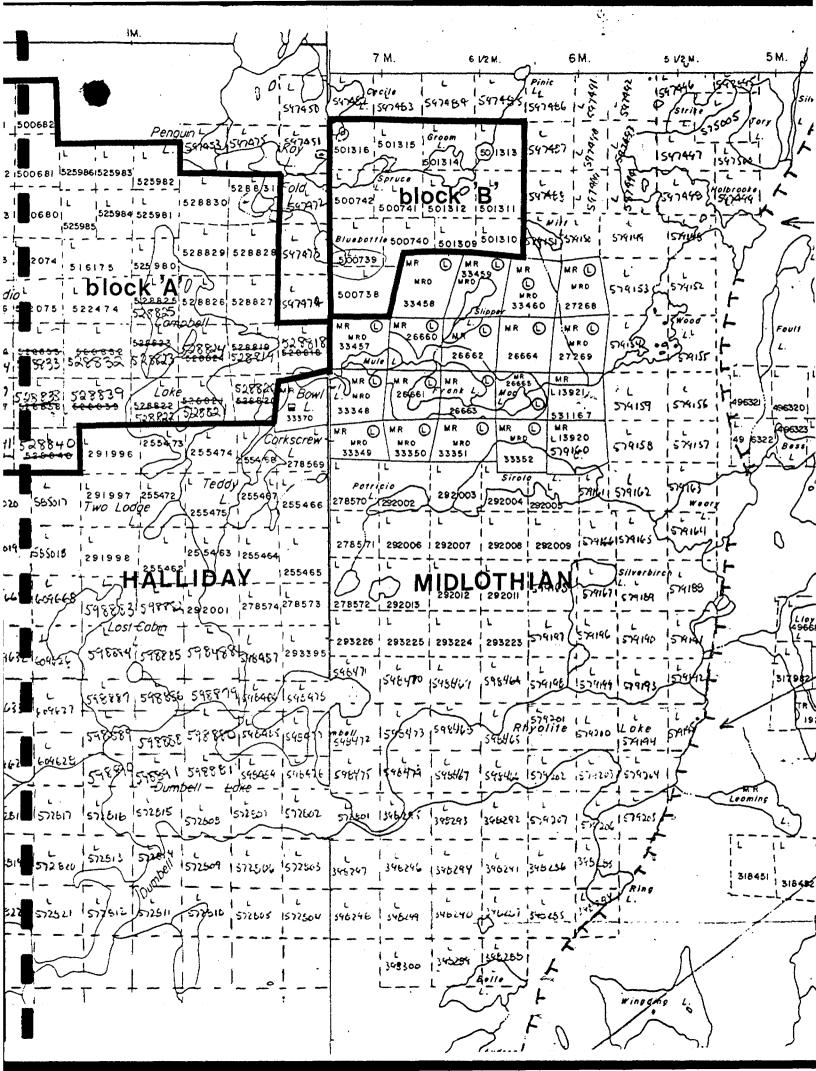
Respectfully submitted,

Uan M. Johnso

Ian Johnson, Ph.D., P.Eng.

Mike Lewis, M.Sc., P.Eng. Manager - Geophysical Surveys Divison





CLAIM SCHEDULE

BLOCK "A"

Halliday Township

Claim No.	Days	Claim No.	Days	Claim No.	Days	Claim No.	Days
L 475748	40	L 450719	40	L 499361	40	L 500681	40
L 475747	40	L 450712	40	L 499362	40	L 500680	40
L 576816	40	L 584230	40	L 499363	40	L 522074	40
L 475746	40	L 584231	40	L 479500	40	L 522075	40
L 576820	40	L 567402	40	L 450751	40	L 528833	40
L 576819	40	L 504966	40	L 450748	40	L 528838	40
L 576818	40	L 420650	40	L 450747	40	L 528840	40
L 576817	40	L 420655	40	L 450755	40	L 525986	40
L 450704	40	L 450723	40	L 499364	40	L 525985	40
l 475745	40	L 450718	40	L 499365	40	L 525983	40
L 443594	40	L 450713	40	L 499366	40	L 525984	40
l 443593	40	L 567403	40	L 522079	40	L 516175	40
L 443592	40	L 504965	40	L 522080	40	L 522474	40
L 450707	40	L 576821	40	L 528732	40	L 528832	40
L 450705	40	L 576822	40	L 499367	40	L 528839	40
L 504969	40	L 450744	40	L 499368	40	L 525982	40
L 504970	40	L 450717	40	L 499369	40	L 525981	40
L 450708	40	L 450714	40	L 522078	40	L 525980	40
L 450709	40	L 504961	40	L 522077	40	L 528825	40
ь 450710	40	L 504964	40	L 528835	40	L 528823	40
L 567378	40	L 420652	40	L 528836	40	L 528822	40
L 504967	40	ь 576823	40	L 528842	40	L 528830	40
L 504971	40	L 450745	40	L 479261	40	L 528829	40
L 450721	40	L 450716	40	L 479262	40	L 528826	40
L 450720	40	L 450715	40	L 479263	40	L 528824	40
L 450711	40	L 479258	40	L 522073	40	L 528821	40
L 584232	40	L 479259	40	L 522076	40	L 528831	40
L 567379	40	L 479260	40	L 528834	40	L 528828	40
L 479284	40	L 479499	40	L 528837	40	L 528827	40
L 504974	40	L 576825	40	L 528841	40	L 528819	40
L 504973	40	L 576824	40	L 500682 [,]	40	L 528820	40
L 504972	40	L 450746	40			L 528818	40
L 450722	40	L 450752 64	40				

Hutt Township

Claim No.	Days
L 450772	40

CLAIM SCHEUDLE

BLOCK "B"

Midlothian Township

Claim No.	Days	Claim No.	Days
L 501316	40	L 501314	40
L 500742	40	L 501312	40
L 500739	40	L 501309	40
L 500738	40	L 501313	40
L 501315	40	L 501311	40
L 500741	40	L 501310	40
L 500740	40		

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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 SurveyAIRBORNE_!	MAGNETICS		
Township or Area_HALLIDAY	TOWNSHIP	·····	
-	NERGY RESOURCES LIMITED	MINING CLAIMS TRAVERSED List numerically	
Author of Report ROBERT LA Address C/O NORCEN ENE			
-		(prefix) (number)	
Covering Dates of SurveyJA1	(linecutting to office)		•••••
Total Miles of Line cutN	Τ <u>ι</u>	as attached	
SPECIAL PROVISIONS	DAYS		
CREDITS REQUESTED	Gcophysical per claim		•••••
ENTER 40 days (includes	Electromagnetic		•••••
line cutting) for first survey.	Magnetometer Radiometric		•••••
ENTER 20 days for each	Other		•••••
additional survey using	Geological		•••••
same grid.	Geochemical		
AIRBORNE CREDITS (Special pro	vision credits do not apply to airborne surveys)		
Magnetometer 40 Electroma	gnetic Radiometric		•••••
DATE: APRIL]4/8] SIGN	O(1,1)		•••••
PROJECTS SECTION			•••••
Res. Geol.	Qualifications		•••••
Previous Surveys			•••••
Checked by	date		
GEOLOGICAL BRANCH			
Approved by	date		,
GEOLOGICAL BRANCH	-		
Approved by	date	TOTAL CLAIMS 143	

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GEOPHYSICAL TECHNICAL DATA

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Number of Stations	Nur	nber of Readings_	
Station interval			
Line spacing			
Profile scale or Contour intervals			
(specify	for each type of survey)		
<u>MAGNETIC</u>			
Instrument			
Accuracy - Scale constant			
Diurnal correction method			
Base station location			
ELECTROMAGNETIC		***********	77 Mar - 167 Mar - 167 Mar - 167 Mar - 177 Mar - 167 Mar
Instrument			
Coil configuration			
Coil separation			
Accuracy			·····
Method: 🗌 Fixed transmitter	Shoot back	🔲 In line	Parallel line
Frequency		····	
Parameters measured	(specify V.L.F. station)		
GRAVITY			
Instrument			
Scale constant			
Corrections made			
Base station value and location			
Elevation accuracy			
INDUCED POLARIZATION RESISTIVITY			
Instrument		· · · · · · · · · · · · · · · · · · ·	
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Frequency	Range		
Power		·····	
Electrode array			
Electrode spacing			
Type of electrode			

SELF POTENTIAL

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Instrument	Range
Survey Method	

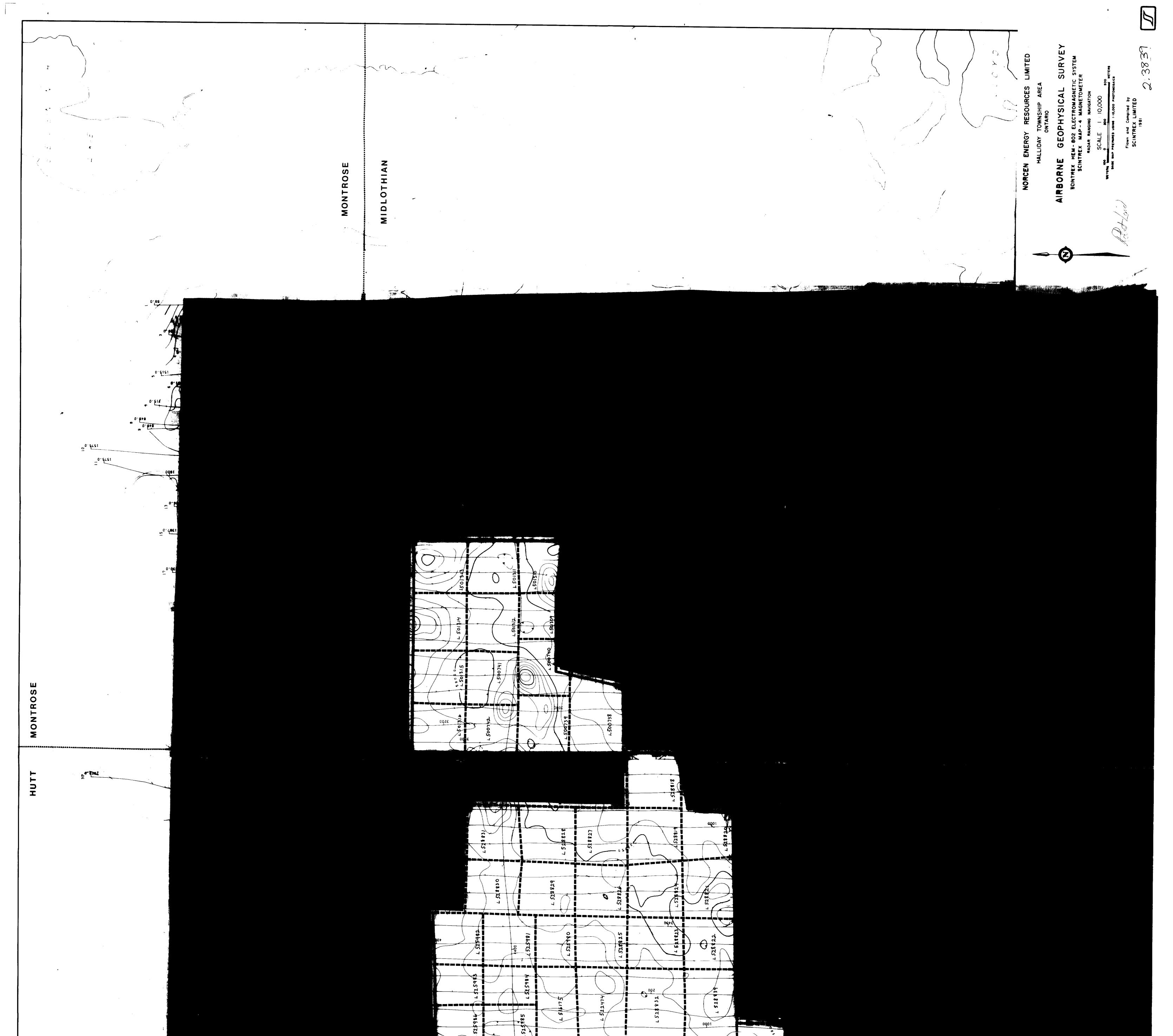
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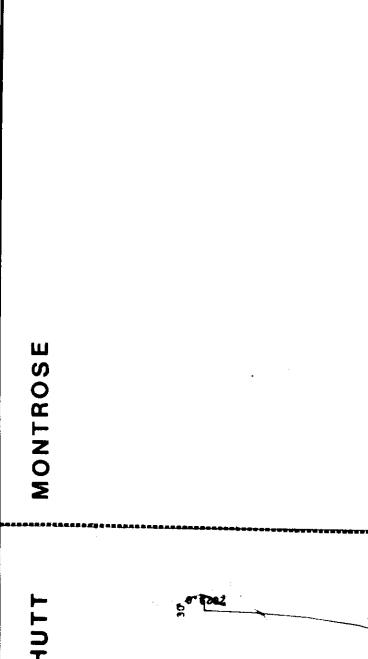
RADIOMETRIC

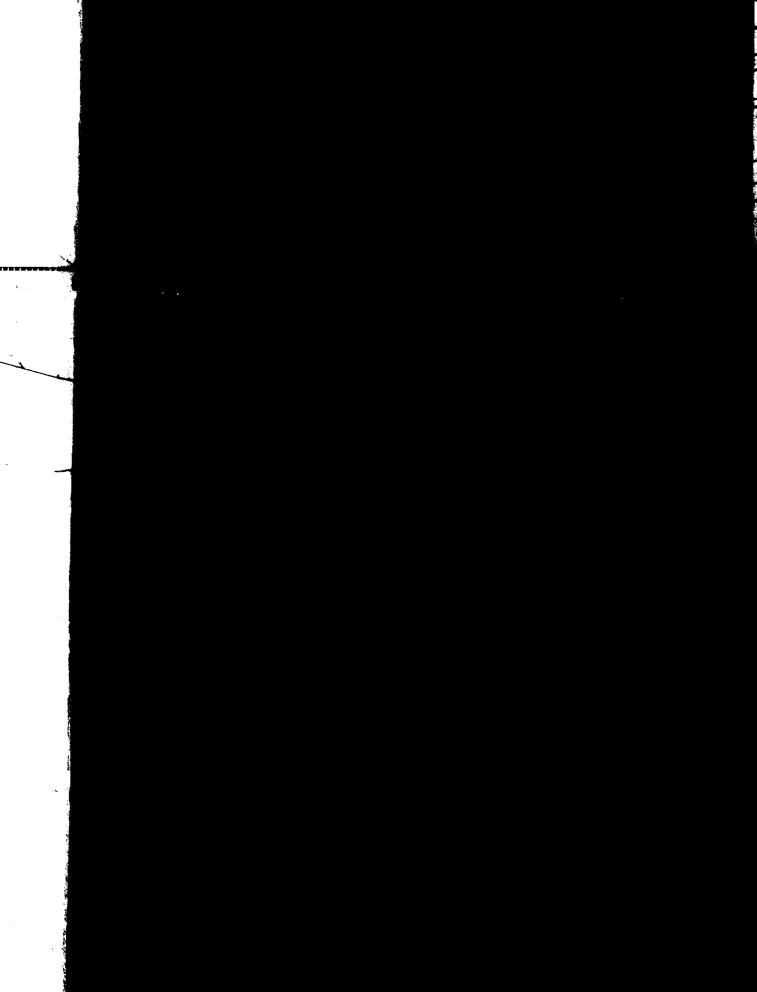
MINIONATING		
Instrument		
Values measured	······································	
Energy windows (levels)		
Height of instrument	_Background Count	
Size of detector		
Overburden		<u> </u>
(type, depth – include outcrop n	nap)	
OTHERS (SEISMIC, DRILL WELL LOGGING ETC.)		
Type of survey		
Instrument		
Accuracy	<u></u>	
Parameters measured		
Additional information (for understanding results)		
	· · · · · · · · · · · · · · · · · · ·	
<u>AIRBORNE SURVEYS</u>		
Type of survey(s) AIRBORNE MAGNETICS		······································
Instrument(s)	MAGNETOMETER	
(specify for each type of survey) Accuracy I GAMMA		
(specify for each type of survey)		
Aircraft used BELL 206B HELICOPTER		
Sensor altitude100 ft		
Navigation and flight path recovery method FLYING FLAGMAN SYSTEM; 16 mm FILM STRIPS	I RADAR NAVIGA	TIONAL
Aircraft altitude200 feet	_Line Spacing	125 m and 250m
Miles flown over total area 902 miles		

GEOCHEMICAL SURVEY – PROCEDURE RECORD

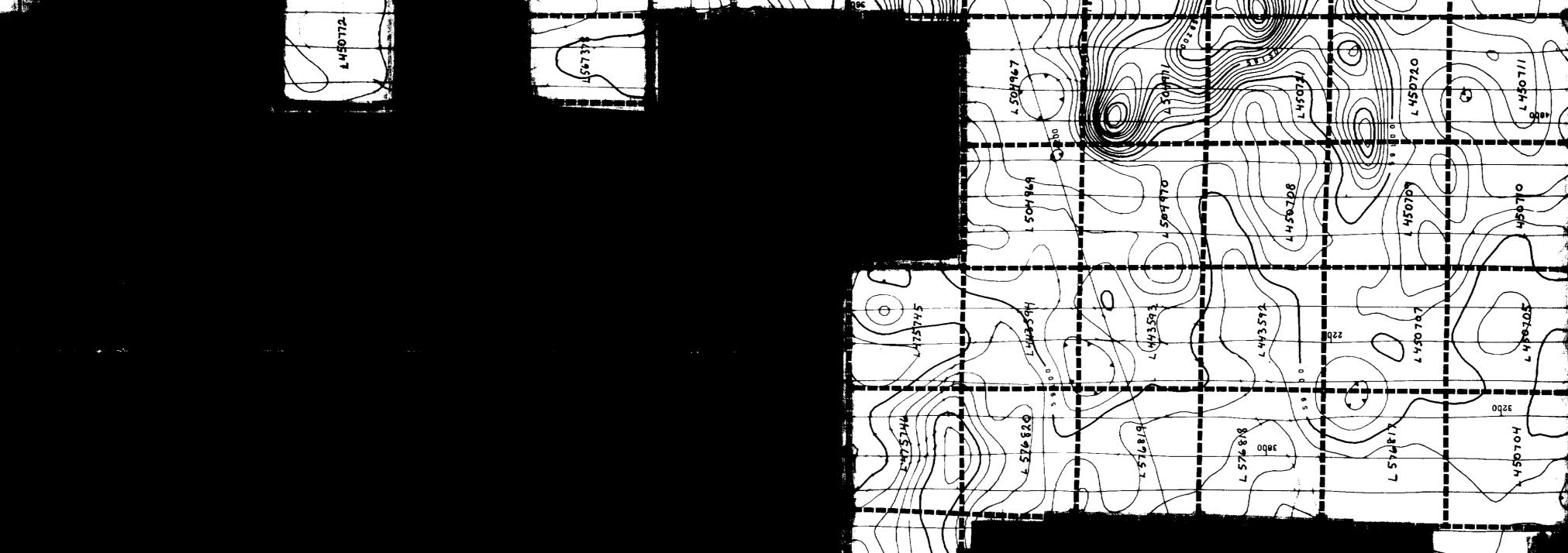
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** <u>***********************************</u>
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