INTERPRETATION REPORT

of an

AEROMAGNETIC SURVEY

in

CARGILL and CUMMINGS TWPS., N. ONT.

for

INTERNATIONAL MINERALS AND CHEMICALS CORP.

by

GEOTERREX LIMITED

Project #84-134

OTTAWA, CANADA

AUGUST, 1975

B. SCHACHT, Geophysicist

I. TYL, P. Eng.

geoterrex

TABLE OF CONTENTS

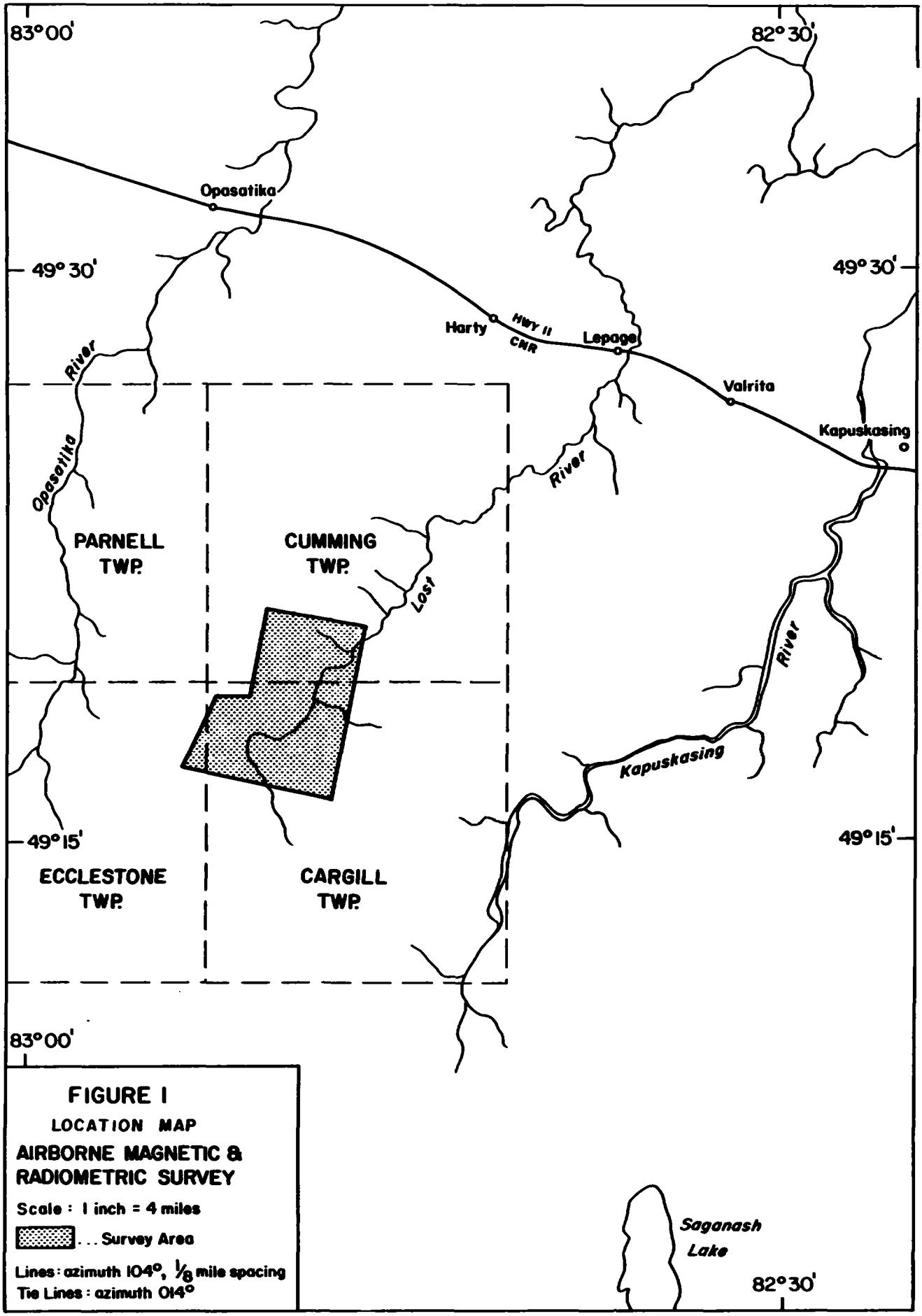

FIGURE 1

LOCATION MAP

AIRBORNE MAGNETIC & RADIOMETRIC SURVEY

Scale : 1 inch = 4 miles

... Survey Area

Lines : azimuth 104°, 1/8 mile spacing

Tie Lines : azimuth 014°

I. INTRODUCTION

On 22 June, 1975, Geoterrex Limited commenced flying an airborne magnetic and radiometric survey in Cargill and Cummings Twps. area for International Minerals and Chemicals Corporation. The survey plan of 244 statute line miles, was designed to produce an approximate geological map of the Cargill Carbonatite Complex.

The interpretation was based solely on the aeromagnetic data; no radiometric maps were prepared.

II. SPECIFICATIONS AND SURVEY OPERATIONS

II.1 Equipment

Aircraft	- De Havilland Otter, registration CF-AYR, air speed about 100 mph.
Magnetometer	- Geometrics G803 proton resonance, mounted on the wing strut, measuring total magnetic intensity, ± 1 gamma at 1 second intervals.
Spectrometer	- Exploranium DIGRS-3001 four channel spectrometer with 900 cubic inches of sodium iodide crystal measuring at one second intervals.
Analog Recorders	- Hewlett-Packard 7001 ten inch rectilinear, recording magnetics with full scale deflections of 1000 and 10,000 gammas; and a Gulton TR-888 eight channel, recording magnetics and spectrometer with full scales as follows: total count - 0 - 1000 c.p.s. potassium channel 0 - 500 c.p.s.

uranium channel 0 - 200 c.p.s.
thorium channel 0 - 200 c.p.s.

Altimeter	- GAR radar
Digital Recorder	- Geometrics 704 Data Aquisition Cypher 70
Tracking Camera	- Hulcher 35 mm. continuous strip

II.2 PERSONNEL

The field crew consisted of the following:

Pilot, Party Chief	D. Féminier
Navigator	A. Tolley
Electronics Operator	E. Nagy
Data Compiler	Y. Theintz
Engineer	W. Woodland

The interpretation was done by:

B. Schacht	Geophysicist
I. Tyl	P. Eng.

II.3 SURVEY OPERATIONS

The base of operations was Kapuskasing. The first production flight was on June 24, 1975 and the last was on June 28, 1975. Four survey flights were required to complete the 244 statute line mile program. The average ferry was about 18 miles.

The flying procedure entailed following a pre-determined flight path from 1:1320 uncontrolled photo mosaics and continuously photographing the aircraft's actual position. Upon completion of a flight, the 35 mm. tracking film was developed, from which the data compiler then checked the track flown by the aircraft using 1:1320 uncontrolled photo mosaics. A comparison was then made between the planned and actual flight line locations; reflights were made if the line spacings, or altitude, exceeded specification limits.

II.4 SURVEY SPECIFICATIONS

Flight Grid	lines 1/8 statute mile apart oriented along azimuth 104°
	tie lines oriented along azimuth 014°
Flight Navigation	visual
Mileage	244 statute miles
Flight Elevation	200 feet mean terrain clearance

III. DATA PROCESSING, COMPILATION AND PRESENTATION

III.1 Flight Path Processing

The flight path was recovered from the 35 mm. continuous strip film and plotted onto 1:1320 scale uncontrolled photo mosaics. The fiducial numbers of identifiable picked points were shown as frequently as possible, and ranged from a point every quarter mile to points one mile apart (10% of this was done in the field).

III.2 Magnetic Data Contouring

Control analysis is accomplished through an inspection of the magnetic differences between line and tie-line readings at intersections. These differences are analysed, and separated into compensations which will level the data together and provide a pattern of smoothly varying adjustments along each line and tie line. Erratic differences imply an error in the intersection location, and are most carefully checked and corrected.

III.3 Map Presentation

The final presentation consists of two maps on a base of uncontrolled photo mosaics at 1:1320 scale. One presents the flight lines and magnetic contours and the other adds the interpretation.

IV. GEOLOGICAL BACKGROUND

The Cargill Carbonatite Complex lies in a Precambrian plain covered by muskeg and clay. Less than 1% of the complex is exposed but it produces a group of intense aeromagnetic anomalies.

Four main rock types have tentatively been distinguished by Bennet et al 1967:

1. Medium to very coarse grained pyroxenite consisting of titaniferous augite, up to 10% olivine, up to 25% magnetite, and traces of pyrite, pyrrhotite and chalcopyrite.

2. Number one is cut by very course white calcite veins with up to 20% apatite.

3. A very fine grained, buff coloured dolomitic carbonate occurs on the shore of Cargill Lake.

4. Hybrid carbonate-biotite-pyroxene-hornblende rocks occur as an apparent transition zone between massive carbonatite and pyroxenite.

Ground surveys have revealed a magnetic contrast of up to 9,000 gammas between rock types one and three (private communication with Mr. George Erdosh).

Although quartz gabbro bodies are found in the immediate area they are not considered to be genetically related to the carbonatite intrusion. The host rocks are archean hybrid granitic gneisses of the Migmatite Complex. Gittins et al dated the complex at 1740 m.y. with K-Ar.

Bennet et al have mapped the Cargill Complex at the junction of two prominent faults, the Lost River to the north and the Cargill to the south. (fig. 13 pg. 67 of Operation Kapuskasing, 1967). They both trend N.N.E. and are offset about one mile at the north edge of the complex. Their map also shows a diabase dyke running N.N.E. through the south portion of the complex.

V. INTERPRETATION METHODS

V.1 General Theory

The earth's magnetic field, which changes from about 60,000 gammas in a vertical direction at the poles to about 30,000 gammas in a horizontal direction at the equator, induces a secondary magnetic field in rock bodies containing ferromagnetic minerals. It is this property to become magnetized by an external field which is described as the susceptibility of a rock.

Some rocks contain a natural or remanent magnetization which was acquired when the rock was last heated above the Curie point and subsequently cooled. The direction of this remanent magnetization is parallel to the magnetic field which prevailed during the cooling period. These fields, both the induced and remanent, disturb the otherwise smooth magnetic pattern of the earth's field, and it is these perturbations that are of prime interest in aeromagnetic interpretation.

The crystalline rocks of igneous or high grade metamorphic origin, such as granite, basalt, gneiss and schist, usually contain sufficient quantities of ferromagnetic minerals that their influence on the earth's field can be observed even when covered by sedimentary sections thousands of feet thick.

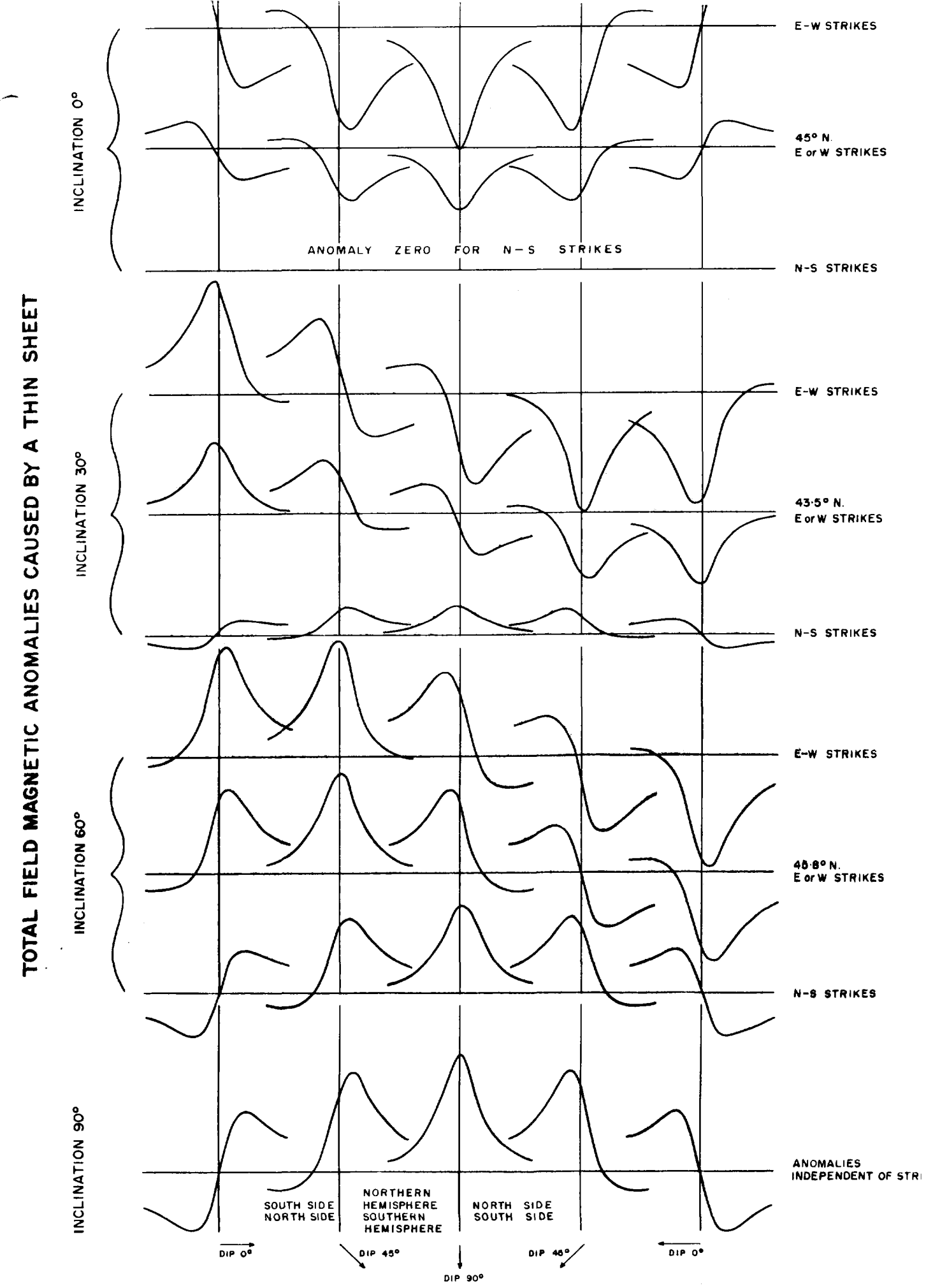

FIGURE 2

TOTAL FIELD MAGNETIC ANOMALIES CAUSED BY A THIN SHEET

The magnetic pattern over large areas of a single rock type is generally consistent throughout, and whenever the magnetic character changes, it usually implies a change in the rock composition. For example, the contact between a granitic mass and an ultra basic unit can often be approximately positioned where the magnetic pattern begins to change from the usual quiet character of a granite to the more disturbed pattern of an ultrabasic rock body.

The study of magnetic anomalies does, to some degree, depend upon the latitude. In high latitudes, attention is devoted to positive anomalies, while at the equator, negative anomalies are of prime interest. This is due to the inclination of the earth's magnetic field which is near vertical, 90^{o}, at the pole, horizontal, 0^{o}, at the equator, and aoubt 78^{o} in the survey area. The sets of curves on figure 2 show how the theoretical magnetic anomaly depends on the inclination of the earth's magnetic field. The curves are based on a thin sheet-type body uniformly magnetized by induction. It should be apparent from the curves that the shape of an anomaly is also a funtion of its strike. The interpretation of these anomalies can be done both qualitatively and quantitatively with certain assumptions.

V.3 Qualitative Interpretation Procedure

In the qualitative interpretation, magnetic features on the analog and contour map are studied with regard to intensities, shapes, sizes, gradients, strike directions (wherever possible) and density. Prominent highs and lows of the magnetic anomalies are transcribed from the analogs onto the line location map and then correlated as magnetic axes from line to line with the aid of the contour map.

The data is also studied for expressions of faulting and geological contacts. These structres are interpreted from gradients in the magnetic contours and profiles, and from abrupt terminations and/or displacements of magnetic trends.

as seen in ground surveys over the carbonatite-pyroxenite contact within this complex. Those areas interpreted as "possible" carbonatite should be viewed as extremely tentative as they are drawn on magnetic lows of far lower amplitude and frequency than those of C_1 and C_2, and may only reflect slight changes of magnetite content within the pyroxenite. Furthermore, C_3 may represent an area of host rock lying between intrusions I_1 and I_5.

The anomalies over the larger intrusions I_1, I_2, I_6 frequently rise in a series of steps. These flanking anomalies may arise from part of the complex or from neighbouring magnetic bodies which are genetically unrelated to the carbonatite. Whenever in doubt we have assumed the former, thus the actual dimensions for bodies I_1, I_2, I_6 may be slightly smaller than those indicated.

The Cargill Carbonatite is located at the junction of the Lost River and Cargill Faults (see Geological Background) which both trend N.N.E. and are offset by about one mile at the north edge of the complex. These faults are very evident on the government aeromagnetic maps and our own except that the Lost River Fault appears to extend to the south of the complex and the Cargill Fault has a tenuous magnetic expression within the complex itself. We have positioned the Cargill Fault primarily on the basis of fig. 13 pg. 67 of Operation Kapuskasing, 1967. A number of possible east-west faults were found, the most prominent of which runs through the intrusion I_1. This fault is based on the observed change in trend direction within

the intrusion plus the change in overall shape of the anomaly.

Of the numerous anomalies interpreted as dykes the longest are a pair striking north on the east side of the Complex. These dykes do not appear on the government aeromagnetic maps because of the near coincidence of flight and strike directions. A third prominent dyke, apparently associated with an extension of the Lost River Fault strikes north-northeast. All bodies we have interpreted as dykes produce narrow anomalies of over 100 gammas and/or correlate over a number of flight lines.

We hope this survey will prove useful to you and we remain at your disposal for any inquiries.

Respectfully submitted,

Brian Schacht

Brian Schacht,
Geophysicist.

Ivo Tyl,
P. Eng.

geoterrex

VII. REFERENCES

Bennet, G. Et al.

1967: Operation Kapuskasing; Ont. Dept. Mines, Misc. Paper 10

Gittins, J. et al.

1967: The ages of carbonatite complexes in Eastern Canada; Can. Jour. Earth Sci., v.3, p. 651 - 655.

Heinrich, E.W.

1966: The Geology of Carbonatites; Rand McNally and Co., Chicago.

Ontario Department of Mines

1963: Map 2252G, aeromagnetic map of the Lost River, Cochrane District, one inch to one mile

1966: Map 7100G, aeromagnetic map of Kapuskasing, Districts of Algoma and Cochrane, one inch to four miles.

1967: Map 2166, geological compilation series, Hearst-Kapuskasing sheet, one inch to four miles.

Tuttle, O.F. and Gittins, J. (Editors)

1966: Carbonatites, Wiley-Interscience, New-York, London, Sydney.

VI. INTERPRETATION

The presence of a highly magnetic intrusive complex (The Cargill Carbonatite) is immediately evident from the magnetic contour map. It consists primarily of two magnetic bodies I_1 and I_2 on the interpretation map, with secondary bodies I_3, I_4, I_5 and I_6. The two large bodies produced magnetic anomalies of up to 18,000γ. Although the magnetic anomalies over bodies I_3 to I_6 are considerably smaller, we have mapped them as part of the carbonatite intrusive complex as they are distinct in shape from the elongate dyke anomalies in the area and of substantially higher intensity. Furthermore, I_3, I_4 and I_5 appear to form a link between the two large intrusives. The body I_6 is mapped by geophysics on the Ont. Dept. of Mines map 2166 as gabbro. However, a second gabbro body, mapped by outcrop, lies about 3/4 of a mile S.S.E. of body I_2 and has no corresponding intense magnetic anomaly like that of I_6.

Geological contacts drawn within the intrusive bodies are based upon the fact that this carbonatite is observed to have a very low magnetic susceptibility while the pyroxenite has a high susceptibility (see Geological Background). No attempt was made to distinguish any other rock types within the intrusives as even this two-fold distinction is tentative. Areas C_1, C_2 within I_1 are the most certain sites of carbonatite implacement; we recorded changes here of up to 11,000 gammas within one second (approximately 150 feet). Even at our terrain clearance of 200 feet this is extremely unusual and implies a distinct and drastic change in magnetic susceptibility,

File 2.1907

Ontario

42G07SW0015 2.1907 ECCLESTONE

900

RECEIVED

SEP 8 1975

PROJECTS UNIT

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(s) Airborne Geophysics

Township or Area Cargill, Cumming, Ecclestone Twps.

Claim Holder(s) International Minerals & Chemical Corporation (Canada) Ltd.

Survey Company ~~Geoterrex Ltd., Ottawa, Ont.~~

Author of Report B. Schacht & T. Tyl

Address of Author 2060 Walkley Road, Ottawa, Ont.

Covering Dates of Survey June 25 - July 23, 1975
(linecutting to office)

Total Miles of Line Cut --

SPECIAL PROVISIONS CREDITS REQUESTED		DAYS per claim
ENTER 40 days (includes line cutting) for first survey.	Geophysical	
	–Electromagnetic	
	–Magnetometer	
	–Radiometric	
ENTER 20 days for each additional survey using same grid.	–Other	
	Geological	
	Geochemical	

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

Magnetometer 9792 Electromagnetic -- Radiometric 9792
(enter days per claim)

DATE: Sept. 2, 1975 SIGNATURE: G. Erdosh
Author of Report or Agent
G. Erdosh

L.D.

Res. Geol. _____ Qualifications on this file

Previous Surveys

File No.	Type	Date	Claim Holder

MINING CLAIMS TRAVERSED
List numerically

(prefix) (number)

150 x 40 = 6000 ÷
(269-23) : 24 =
24 claims

If space insufficient, attach list

TOTAL CLAIMS _____

SELF POTENTIAL

Instrument _____ Range _____

Survey Method _____

_____

Corrections made _____

_____

RADIOMETRIC

Instrument _____

Values measured _____

Energy windows (levels) _____

Height of instrument _____ Background Count _____

Size of detector _____

Overburden _____

(type, depth – include outcrop map)

OTHERS (SEISMIC, DRILL WELL LOGGING ETC.)

Type of survey _____

Instrument _____

Accuracy _____

Parameters measured _____

_____

Additional information (for understanding results) _____

_____

_____

AIRBORNE SURVEYS

Type of survey(s) Fixed-winged using single Otter aircraft.

Instrument(s) ~~Geometrics G-803 proton resonance magnetometer; Exploranium DiGRS~~ 3001 4-channel Spectrometer.
(specify for each type of survey)

Accuracy ~~Magnetometer: ±1 gamma; Spectrometer: varies with channels~~ - see encl. report.
(specify for each type of survey)

Aircraft used DeHavilland Otter

Sensor altitude 200 feet mean altitude

Navigation and flight path recovery method Visual and 35 mm tracking film

_____

Aircraft altitude 200 feet mean altitude Line Spacing 1/8 mile

Miles flown over total area 244 miles Over claims only appr. 150 mi.

I.M.C. CLAIM GROUP CARGILL PROJECT

Claim Numbers:

409088	413062	420259	424497	424542
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409090	413064		424499	424544
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409095	413069	424459	424504	443734
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409121	415878	424485	424530	443760
		424486	424531	443761
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413053	420250	424488	424533	443762
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I.M.C. CLAIM GROUP CARGILL PROJECT

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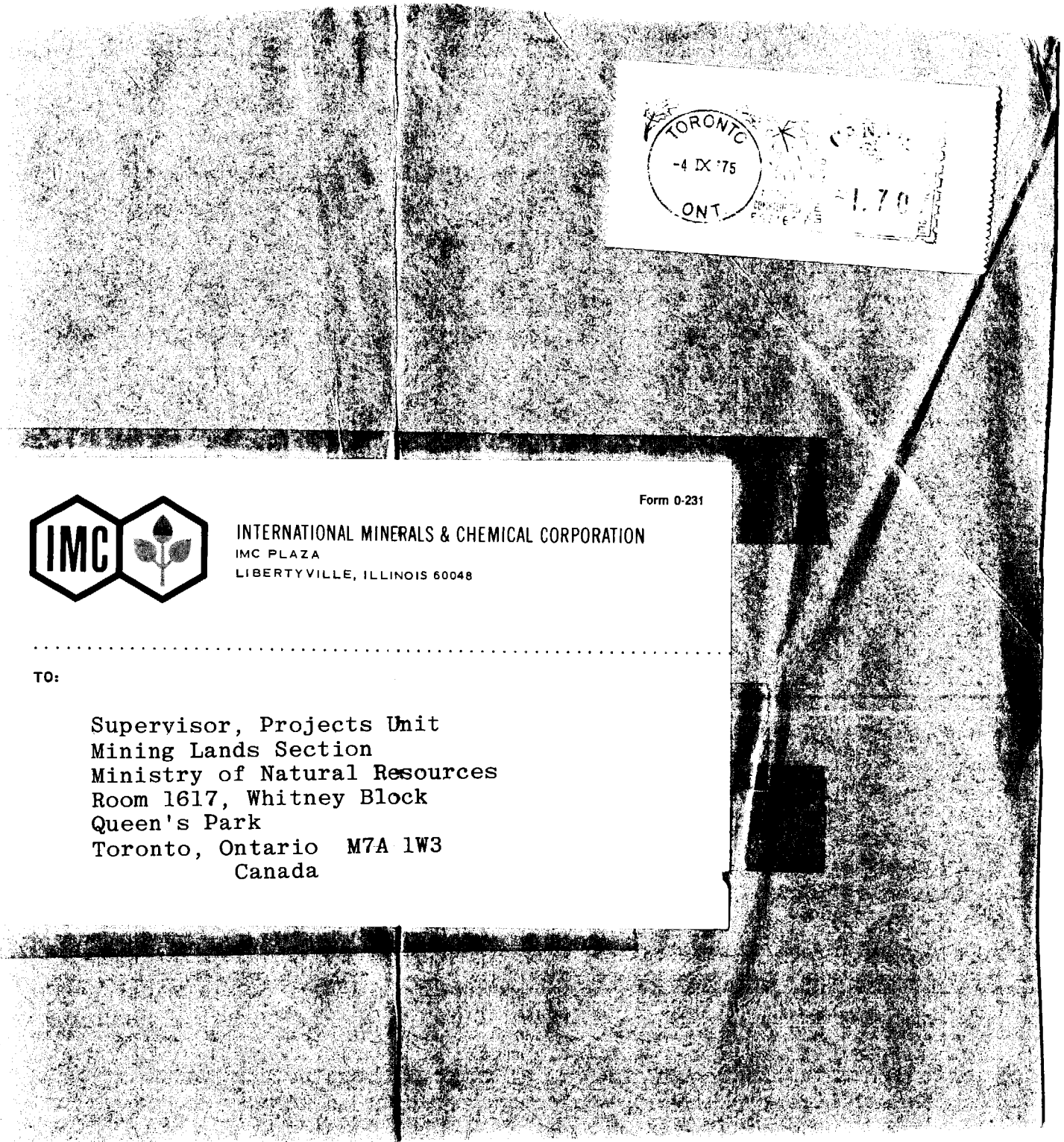


Form 0-231

INTERNATIONAL MINERALS & CHEMICAL CORPORATION
IMC PLAZA
LIBERTYVILLE, ILLINOIS 60048

TO:

Supervisor, Projects Unit
Mining Lands Section
Ministry of Natural Resources
Room 1617, Whitney Block
Queen's Park
Toronto, Ontario M7A 1W3
Canada

ECCLESTONE

DISTRICT OF COCHRANE

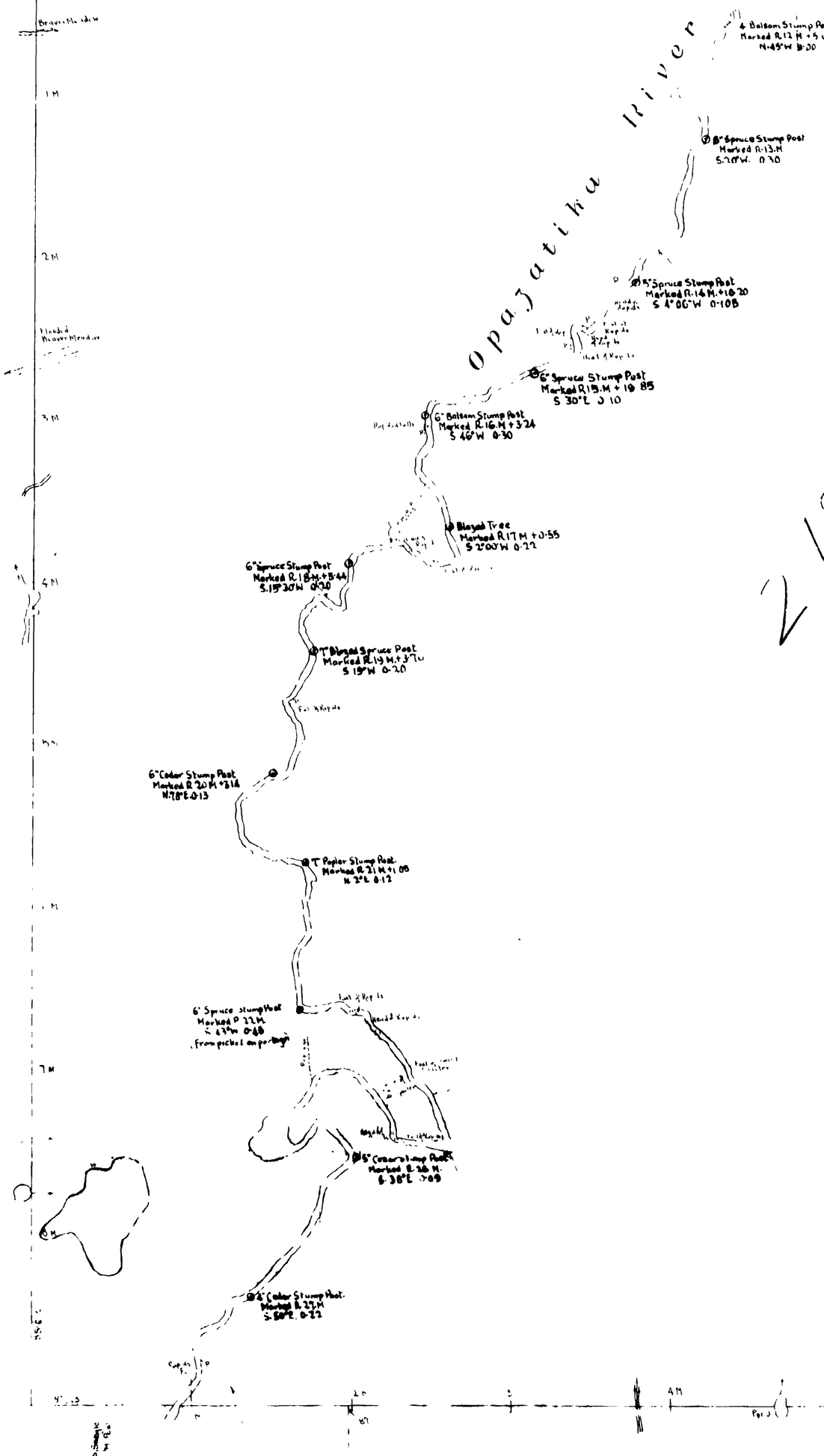
PORCUPINE MINING DIVISION

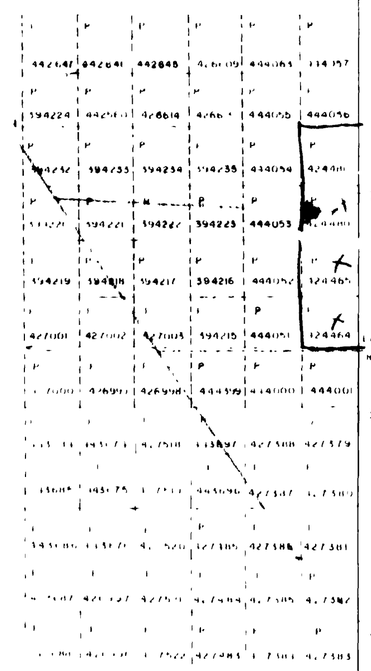
SCALE 40 CHAINS = 1 INCH

PARNELL

NOTE

400' Surface Rights Reservation around all Lakes and Rivers.





DATE OF ISSUE
APR 30 1976
SURVEYS AND MAPPING BRANCH

TOWNSHIP LINES RUN BY A.S. CODE 1913

TRAVERSE BY T.G. CODE. 1913

200

OPAZATIKA

BOURKNOT

THE TOWNSHIP
OF 2-1907

CARGILL

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.
MINING RIGHTS ONLY	M.R.O.
SURFACE RIGHTS ONLY	S.R.O.
ROADS	
IMPROVED ROADS	
KING'S HIGHWAYS	
RAILWAYS	
POWER LINES	
MARSH OR MUSKEG	
MINES	
CANCELLED	C.

NOTES

Water Power Reserve No 13 On White Otter Falls To Spruce Falls Power & Paper Co. Ltd File 35146 Vol. 2

400' Surface Rights Reservation around all Lakes and Rivers.

Cumming Twp.

Ecclestone Twp.

Sulman Twp.

Bourinot Twp.

Shanly Twp.

Gosselin Lake

White Otter Falls

Kapuskasing River

Post Mkd 1M+76.00

PLAN NO - M.701

ONTARIO
MINISTRY OF NATURAL RESOURCES
SURVEYS AND MAPPING BRANCH

210

J v K

GUMMING

PORCUPINE MINING DIVISION

SCALE 40 CHAINS = 1 INCH

M.743

ONTARIO

MINISTRY OF NATURAL RESOURCES

SURVEYS AND MAPPING BRANCH

NOTE

400' Surface Rights Reservation around all Lakes and Rivers.

IDINGTON 2.1907

HULL LAKE

SOLOMAN LAKE

QUARRY PERMIT

LOST RIVER

PARNELL

OWENS

CARGILL

XVIII XVII XVI XV XIV XIII XII XI X IX VIII VII VI V IV III II I

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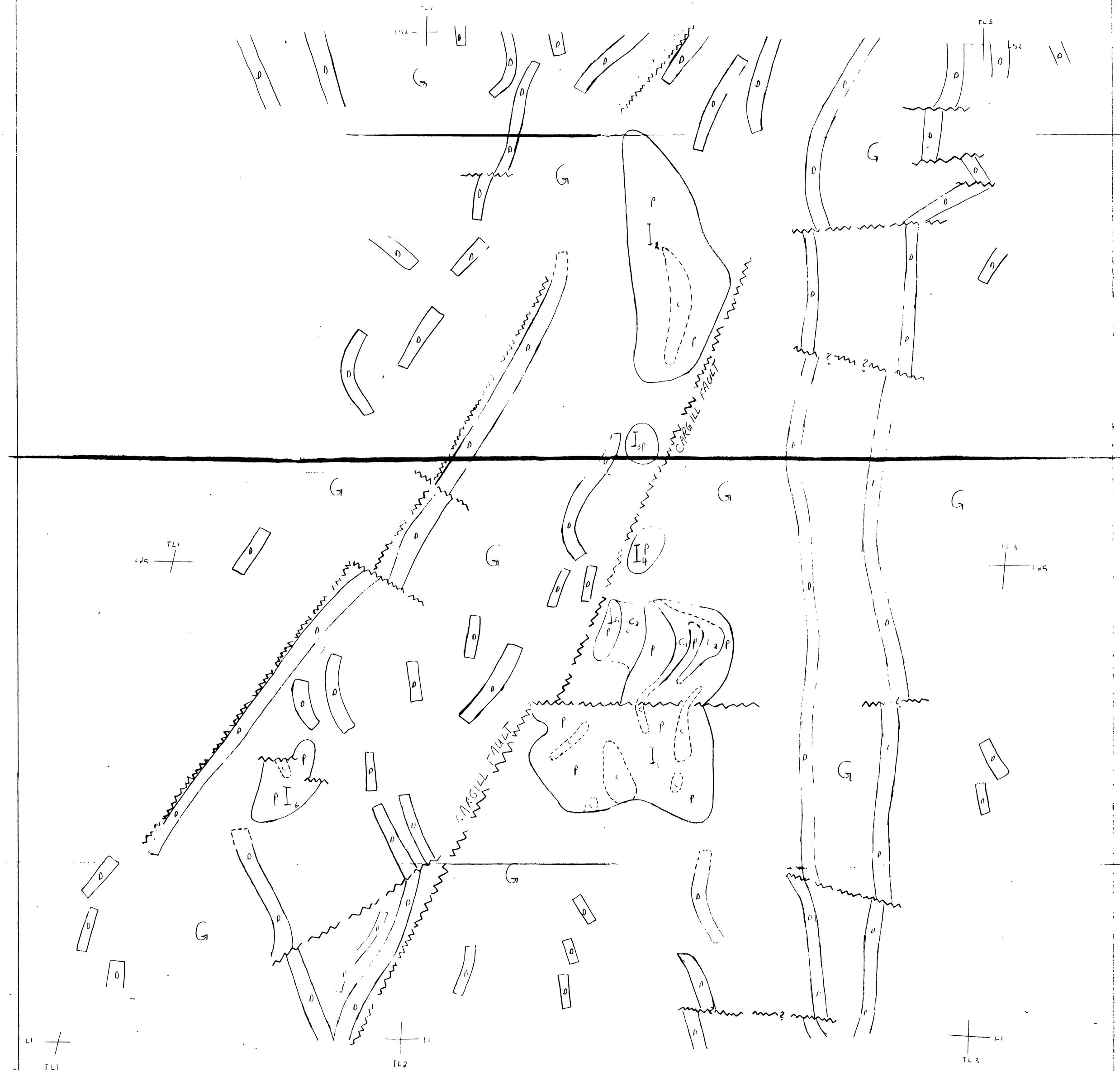


INTERPRETATION LEGEND

- ~~~ POSSIBLE FAULT
- ——— PROBABLE (POSSIBLE) GEOLOGICAL CONTACT
- P PYROXENITE ?
- D DIABASE DIKES ?
- C CARBONATITE ?
- G GRANITIC GNEISS (HOST ROCK)
- I INTRUSIVE, GENETICALLY PART OF CARBONATITE COMPLEX

AEROMAGNETIC INTERPRETATION

for

INTERNATIONAL MINERALS AND CHEMICAL CORP.

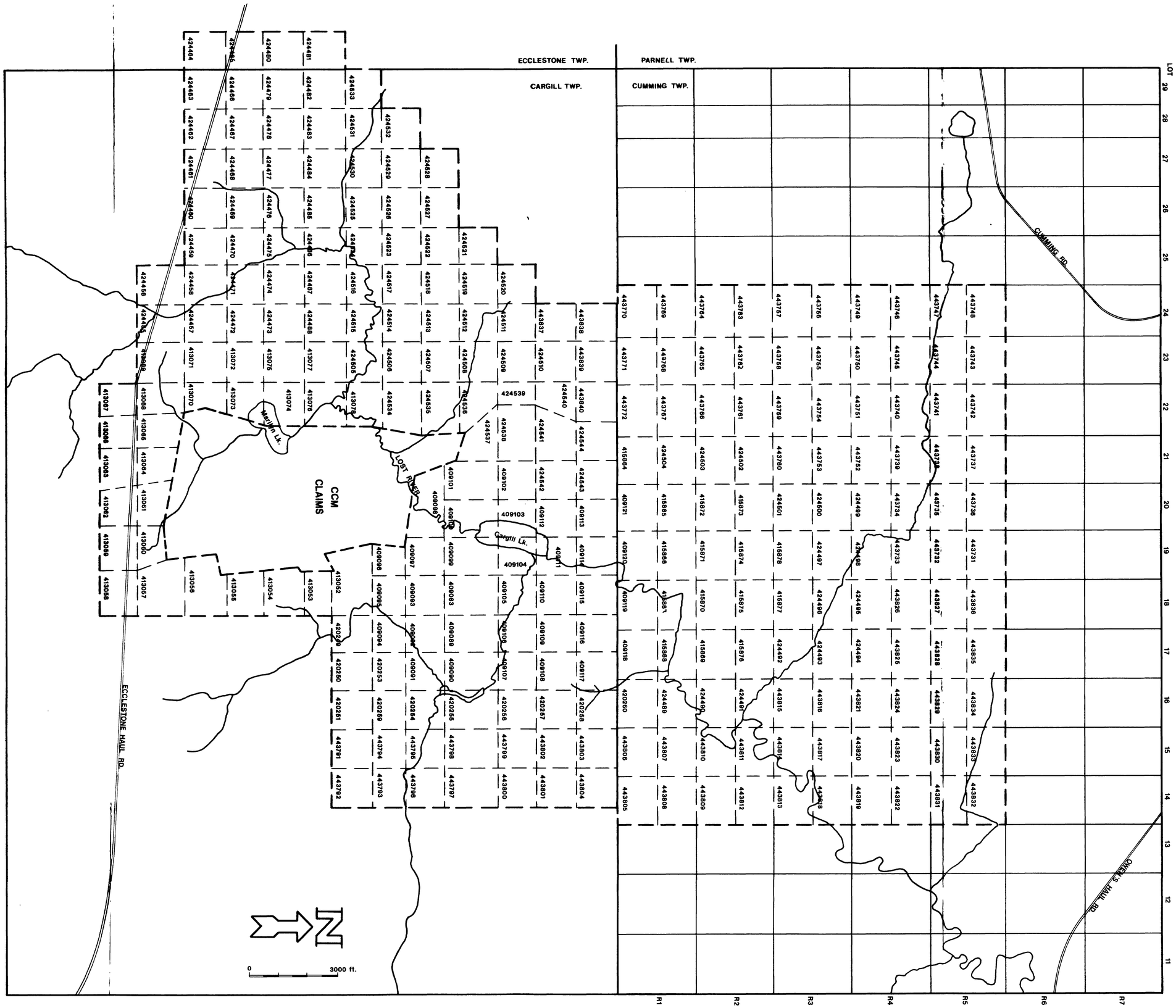
by

GEOTERREX LTD

of

THE CARGILL CARBONATITE COMPLEX

Brian Schacht



REFERENCE DRAWINGS	REFERENCE DRAWINGS	MARK	REVISION	BY	DATE	MARK	REVISION	BY	DATE	APPROVED BY	DATE	SCALE	DATE	LOCATION OF JOB
												DRAWN BY O. Hanner	Aug. 1975	Kapuskasing, Ontario
												CHECKED BY		
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IMC INTERNATIONAL MINERALS & CHEMICAL CORPORATION
ADDRESS LIBERTYVILLE, IL.
DIVISION GEOLOGY & EXPLORATION

TITLE
-IMC CLAIM GROUP-
CARGILL PROJECT

APPN. NO.
DRWG NO.
FILE NO.

PARNELL

CUMMING

CARGILL

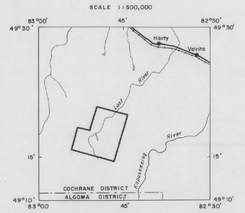
ECCLESTONE

LEGEND

1000 GAMMAS	
500 GAMMAS	
100 GAMMAS	
20 GAMMAS	
MAGNETIC LOW	
CONTOUR INTERVAL	20 GAMMAS

SCALE - 1 inch = 1320 feet
1/4 mile

LOCATION MAP
SCALE 1:500,000



SURVEYED & COMPILED BY
geoterrex ltd.

FOR
INT. MINERALS & CHEMICAL CORP.

AIRBORNE GEOPHYSICAL SURVEY

CARGILL & CUMMING TWPS AREA
KAPUSKASING, ONTARIO

ISOMAGNETIC CONTOUR MAP

SHEET 1 OF 1	HORIZONTAL CONTROL	BASED ON	CONTOUR INTERVAL: 20 GAMMAS	FLIGHT ALTITUDE	1000' M.T.C.
SCALE 1" = 1320'		PHOTOMOSAICS	FLOWN IN JULY 1975	GEOTERREX PROJECT No.	84-134

CLAIM BOUNDARY

CUMMING TP

CARGILL TP

PARDELL TP

ECCLESTONE TP

L-52 L-50 L-47 L-46A L-46 L-45A L-45 L-44A L-44 L-40 L-35 L-30 L-29 L-25 L-20 L-19 L-18 L-15 L-16 L-14 L-15A L-13 L-15A L-12 L-12A L-10 L-9 L-7 L-5 L-3 L-4 L-2 L-1

LEGEND

- Flight line with fiducial
- 299 Fiducial number
- Radiometric readings for Th U / K Total (e.g. 16 87 / 55 180)

Scale 1 cm = ½ km

COCHRANE DIST. ALBERTA 100K

SURVEYED BY GEOTERREX for IMC (CANADA)

AIRBORNE GEOPHYSICAL SURVEY

RADIOMETRIC READINGS

CARGILL COMPLEX