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ASSESSMENT REPORT, PROJECT 7185-05, LAC CARMEN AREA

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Énergie et Ressources naturelles
Québec

URANERZ EXPLORATION AND MINING LIMITED

ASSESSMENT REPORT

PROJECT 7185-05

LAC CARMEN AREA

(March 1983)

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ZM/ab

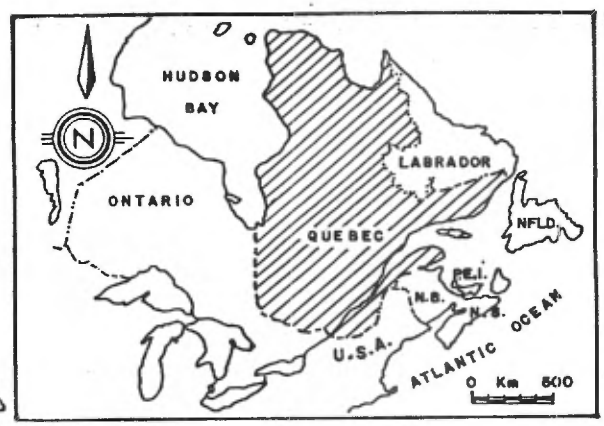
SUMMARY

The various regional surveys undertaken in the Lac Carmen area outlined two separate uranium occurrences along the same ENE trending gabbro dyke - the J. Robert Boulder Train and the Marc-André Showing. In both cases, the uranium mineralization occurs within highly altered gabbros and, to a lesser extent, quartzites. Grades of up to 0.5% U_3O_8 and 0.1% U_3O_8 were encountered in the gabbros and the quartzites respectively. Alterations include hematization, limonitization, tourmalinization, silicification and minor albitization.

The various He surveys within the Lorenz Gully and Lac Carmen grids failed to indicate any prospective areas of buried uranium mineralization other than the known Lorenz Gully structure.

Age dating of the basement rocks in the Lac Carmen area has confirmed an Archean age of formation with partial or total anatexis during the Kenoran orogeny (2500 m.y. ago).

A gold sampling survey on a conductive horizon within the Lac Carmen metavolcanic belt has returned essentially negative results.



HUDSON STRAIT

SUPERIOR PROVINCE

CHURCHILL PROVINCE

NAIN PROV.

LABRADOR SEA

HUDSON BAY

FORT-CHIMO

SCHEFFERVILLE

EAU CLAIRE LAKE

MILDRED LAKE

GRANDE BALEINE

CANIAPISCAU RIVER

CANIAPISCAU LAKE

CHURCHILL RIVER

LABRADOR CITY

PROVINCE

LA GRANDE RIVIERE

BEAVER - ZORAN / OTISH WEST

JOHAN BEETZ

EASTMAIN RIVER

SEPT-ILES

Témiscamie

GRENVILLE

CHIBOUGAMAU

ST. LAWRENCE RIVER

R. SAGUENAY

APPALACHIAN FOLD BELT

VAL D'OR

MONTREAL

52°

56°

60°

64°

72°

76°

48°

0 100 200 300 Km.

LEGEND

PLATFORM SEDIMENTARY ROCKS YOUNGER THAN CAMBRIAN

APPALACHIAN FOLD BELT

GEOSYNCLINAL SEDIMENT FOLDED AND PARTLY METAMORPHIC

GRENVILLE PROVINCE

PALEOZOIC & MESOZOIC ROCKS

B. JOHAN BEETZ METASEDIMENTS

BASEMENT (USUALLY GRANULITIC GNEISS)

CHURCHILL PROVINCE

SEAL LAKE GROUP (HELIKIAN)

LETITIA LAKE GROUP (HELIKIAN)

AILLIK GROUP (APHEBIAN)

LABRADOR TROUGH SEDIMENTS (APHEBIAN)

BASEMENT (GRANITIC GNEISS)

SUPERIOR PROVINCE

SEDIMENTARY ROCKS (APHEBIAN AND YOUNGER)

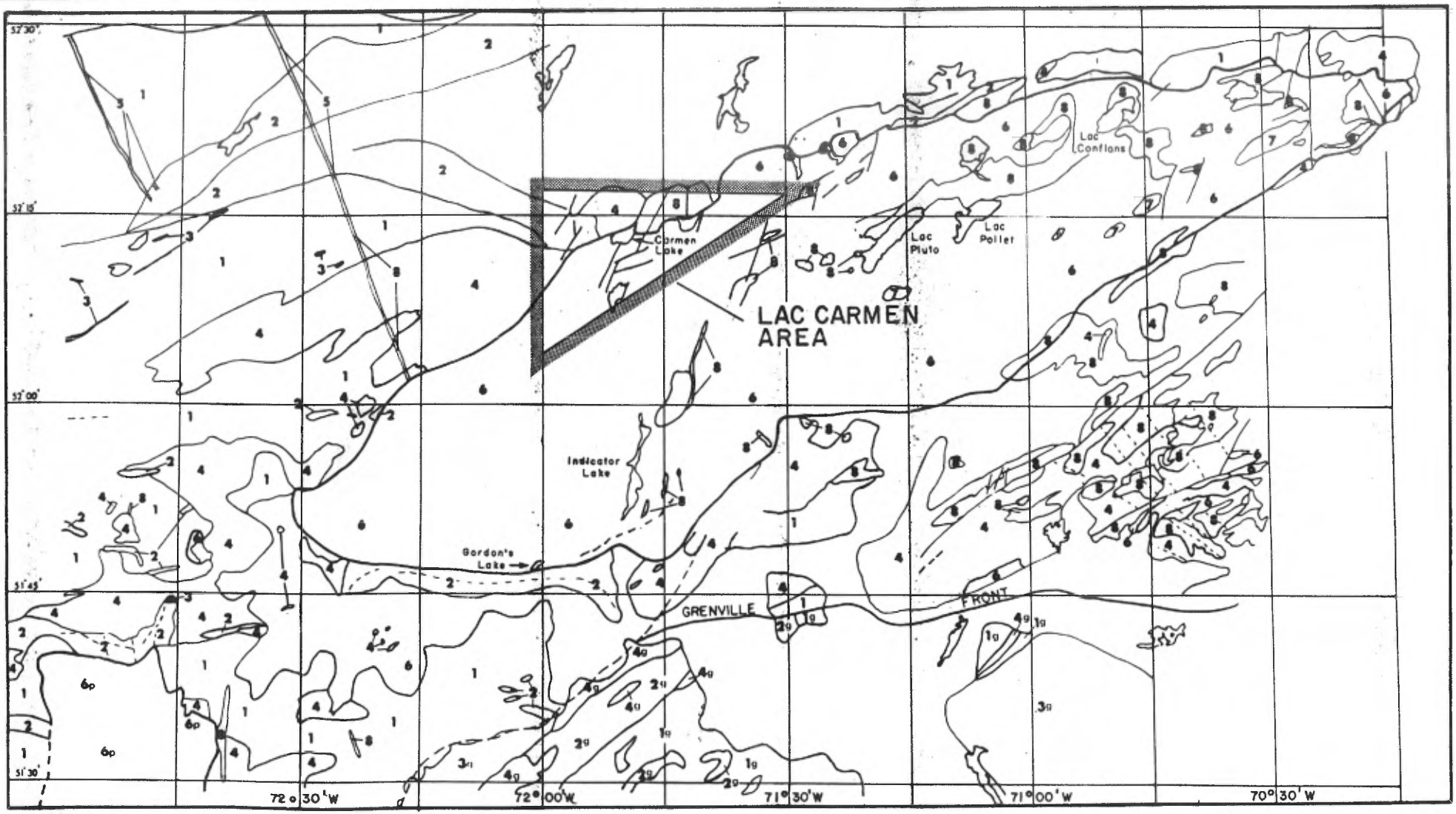
METAVOLCANICS

BASEMENT (GRANITIC GNEISS)

PROJECT BEAVER - ZORAN / OTISH WEST
71 - 85
GENERAL LOCATION MAP

Fig. -1-

File / Doss No. 1



LEGEND

QUATERNARY

GLACIAL DEPOSITS

PRECAMBRIAN

SUPERIOR PROVINCE

8 - OTISH MTS. GABBRO

OTISH GROUP

7 - PERIBONCA FM.

6 - INDICATOR FM.

MISTASSINI GROUP

6P - PAPASKWASATI FM.

UNCONFORMITY

5 - DIABASE DIKES

4 - GRANITE

3 - META-ULTRAMAFIC

2 - METAVOLCANIC - METASEDIMENTARY ROCKS

1 - GNEISS & MIGMATITE

GRENVILLE PROVINCE

4g - GRANITE

3g - ANORTHOSITE

2g - METAVOLCANICS

1g - GNEISS

FAULTS

STRUCTURAL TREND (Foliation, Fold Axis)

SCALE = 1:800,000

0 10 20 30 40 km

LAC CARMEN AREA
71-85
General Geology & Location Map

Fig. -2-

File IDocs. No. 685

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APPENDICES

MAPS

1. INTRODUCTION

1.1 AREA OF INVESTIGATION

The Lac Carmen area is situated approximately 310 km NE of Chibougamau and 800 km NNE of Montreal. It is accessible throughout most of the year with float or ski-equipped aircraft from Chibougamau and from the Témiscamie River airbase, 155 km to the southwest. Access during freeze-up (Nov.-Dec.) and break-up (April-May) is possible only with rotary-wing aircraft (Figs. 1 and 2).

1.2 PURPOSE OF INVESTIGATION

The main objective of the 1982 field program was to evaluate, on a regional scale, the uranium potential within the Otish Basin. Any significant surface mineralization outlined would be followed up in greater detail.

A second objective was to evaluate the uranium potential of the Lac Carmen conductor, using helium in soils and in drill hole waters as a geochemical tracer.

In addition, a bulk sampling survey of the various lithological units in the basement was undertaken in order to date these units and thereby establish a genetic relationship between them.

1.3 TIME OF INVESTIGATION

June 1 - August 31, 1982.

1.4 PERSONNEL

Permanent Staff

Dr. R. Lambert	Exploration Manager - Eastern Canada
Dr. W. Gehrisch	Chief Geologist
Dr. M. Leppin	Area Geophysicist
Z. Madon	Project Geologist
G. Lambert	Geophysicist
R. Cicci	Landman
G. Darcy	Buyer/Expediter
B. McKenzie	Field Foreman
P. Letourneau	Draftsman
Y. Boucher	Draftsman
A. Ferland	Draftsman

Temporary Staff

1 Geologist
1 Senior Assistant
2 Junior Assistants
2 Technicians
6 Prospectors
1 Dispatcher
1 Cook
1 Camp Manager

Contract Staff

Trans Québec Helicopters Ltd: 2 pilots, 2 engineers
-airborne spectrometer survey
-ground support surveys

Winterbourne Expl. Ltd: 1 consultant geologist

1.5 INSTRUMENTS, VEHICULES USED

Airborne Spectrometer System

1 Scintrex GAM-25 Gamma Ray Analyser
1 Scintrex RRC-2 Radiometric Ratio Computer
1 Scintrex GSA-64 Sensor
1 Scintrex GSA-42 Sensor (rental)
1 RCM-6 Recorder
12 SPP-2NF Scintillometers
1 URTEC (UG-135) Spectrometer
2 Marconi CH-100 Transceivers
1 Stereoscope
1 Binocular Microscope
1 3M Photocopier
1 Down-Hole Water Sampler (rental)

Transportation of supplies, equipment and personnel from Chibougamau to Temiscamie was with a rented crew cab pick-up truck.

2. GENERAL INFORMATION

2.1 TOPOGRAPHY

The Lac Carmen area straddles the height of land where the northern region drains into the Eastmain River, then onto James Bay and the southern portion drains into Lake Mistassini via the Témiscamie River and then onto James Bay via the Rupert River.

Local topography is dominated by numerous granitic and gneissic ridges as well as "hogback" structures formed by resistant gabbro sills overlying sedimentary and granitic rock. The area lies within the northeast trending ridge that forms the Otish Mountains range. Hummocky glacial moraine and elongated shallow glacial lakes dominate the topography in the southern half of the area. Narrow elongate ridges formed by gabbro dykes and shallow dipping sedimentary outcrops occur sporadically within the basin area of Lac Carmen.

2.2 CLIMATE

The area is classified as subartic. Average winter temperatures range around -10°C, summer temperatures are in the 15°C range. A relatively large amount of precipitation falls during both summer and winter seasons - approximately 80 cm, of which nearly half falls during the months of July and August. The lakes are relatively ice-free from about the beginning of June to the end of October.

2.3 VEGETATION

Boreal forest-type vegetation covers most of the area. Tops of ridges and other elevated areas display a tundra-like environment.

Black spruce (Picea Mariana) and Jack Pine (Pinus Banksiana) with a few groves of white Birch (Betula Papyrifera) are the main tree types.

Underbrush is dominated by moss, lichen and Labrador tea.

2.4 WATER RESOURCES

A few large structurally controlled fresh-water lakes dominate the northern half of the Lac Carmen area. Within the southern portion of this area, fresh-water lakes that are elongated in the glacial direction abound. Minor structural control is evident here as well. Several streams and rivers, usually parallel to ice direction, are found within the southern half of the area.

2.5 POPULATION AND LAND USE

There are no settlements or commercial sites in the immediate area.

2.6 MAGNETIC DEVIATION

The magnetic deviation is in the order of 23°30'W.

3. PREVIOUS SURVEYS AND ACTIVITIES

3.1 TOPOGRAPHIC MAPPING

The following NTS maps cover the area of investigation:

NTS Numbers	Title	Scale
23 SW	Nichicun	1:500,000
23 D	Lac Naococane	1:250,000
23 D/4	(not yet published)	

The following airphotos cover the area of investigation:

Photo Number		Scale
A12798	362-372, 8-16	1:35,000
A16602	80-89	1:40,000
A15475	31-34	1:55,000
A21578	79-86	1:45,000
A15654	26-29	1:55,000
A12649	106-113	1:35,000
A15678	32-35	1:55,000
A21579	43-46	1:45,000

3.2 GEOLOGICAL MAPPING

The Lac Carmen area has been mapped by the Ministère de l'Energie et des Ressources and the maps have proved to be reliable on a regional scale. The following report covers the area.

Report	Map Scale	Author
Régions des Lac Fromont, Laparre DP-165	1:31,680	E.H. Chown

3.3 GEOPHYSICAL SURVEYS AND ACTIVITIES

Aeromagnetic map 7114G (Lac Naococane) at a scale of 1:253,440 covers the area of interest.

In 1982, Uranerz, Eldorado and Seru were actively exploring for uranium in the Otish Basin.

4. MINERAL CLAIMS

The Lac Carmen claim group contains 295 claims covering an area of 4720 hectares (47.2 km^2). Map 1 outlines the claim block along with the location of the Lorenz Gully and Lac Carmen grids. Appendix 1 contains a complete list of these claims.

5. GENERAL GEOLOGY

The Proterozoic Otish and Papaskwasati sediments are situated within the Superior Structural Province near a poorly defined metamorphic front (Grenville Orogenic Front) (see Figure 2 and Table 1). The Superior basement consists of (i) gneisses and migmatites (ii) meta-volcanics and metasedimentary fold belts and (iii) granites. All these units are thought to be Archean although recent age datings appear to indicate an Aphebian age (1800-2400 m.y.). These dates, however, might reflect a metamorphic overprint on Archean rocks during the Kenoran and Hudsonian orogenies.

The gneiss and migmatite complex underlies most of the area. It is variable in appearance, ranging from a schistose, layered variety to a nearly massive type. Compositionally, the quartz-biotite feldspar gneiss predominates, although cordierite and garnet are found as well. Alternating light and dark bands are a distinctive feature resulting from variations in mafic content (chiefly biotite).

Metavolcanic and metasedimentary sequences outcrop as narrow east-west trending belts and as small inclusions in granite-gneiss complexes. The unit is composed of metamorphosed acid to basic tuffs, flows and fragmented volcanic rock, interlayered with sandstones, conglomerates, cherty iron formation and chloritic schists. Graphitic schists and narrow sulfide-rich (pyrite-pyrrhotite) horizons were outlined through drilling.

The granitic complex, typically coarse grained, equigranular, with quartz, feldspar and minor mafics is predominant over a large part of the basement. This unit intrudes all the above rock types, usually as concordant sills parallel to the gneissic foliation. Some of the granitic material appears to have been formed from the granitization of gneisses and migmatites. NW-SE trending diabase dykes, in turn, intrude all above units.

The basement complex is unconformably overlain by fluvioterrestrial to marginal marine sediments of the Otish Group (Otish Basin) and of the Mistassini Group (Papskwasati Basin). The Otish and lower Mistassini Groups, although separated by a 30 km wide erosional gap, are easily correlatable. The basal formations consist of a quartz pebble conglomerate or polymictic conglomerate grading up to a massive gritty arkose. This, in turn, grades into well laminated and crossbedded quartzites, arkoses and minor argillites (Indicator and Papaskwasati Formations). Conformably overlying the terrestrial sediments are dolomitic arkoses and sandstones, dolomites and argillaceous (partly graphitic) sandstones of marginal marine origin (Peribonca, Cheno, Upper and Lower Albanel Formations). True marine sediments (iron formation, chert, graphitic and pelitic shales) are found only south of the Papaskwasati Basin - around Lakes Mistassini and Albanel. Fresh and partly uralitized olivine gabbro dykes and sills intrude both the sedimentary and basement units.

The Grenville Orogeny (900 m.y.) folded both basins into broad gently plunging synclines. Thrust faulting and tight folding of the sediments is evident along the southeastern margins of both basins.

Unconsolidated glacial material was deposited during various ice advances in the Pleistocene period. The western and southeastern portions of the Otish Basin are extensively covered with glacial material of various forms, yielding an average outcrop exposure of approximately 5%. The ice advance was from the NE, at approximately 020°.

TABLE -1- Table of Formations.

CENOZOIC			RECENT + PLEISTOCENE	*River, lake, swamp deposits Till, sand + gravel.*
UNCONFORMITY				
PRECAMBRIAN	PROTEROZOIC	UPPER APHEBIAN (?)	OTISH MTS. GABBRO	*Dykes and sills of olivine gabbro, partly uralitic*
			INTRUSIVE CONTACT	
			OTISH GP / MISTASSINI GP	
			Temiscamie Fm.	*Iron Fm; chert, shale.*
			CONFORMABLE CONTACT	
			Peribonca Fm / *Albanel Fm* / *Cheno Fm*	*Arg. ss, dolomite, dolomite cemented arkose and sandstone*
			CONFORMABLE CONTACT	
			Indicator Fm / *Papaskwasati Fm*	*Qtz-pebble cong grading up to massive gritty arkoses + well laminated + cross-bedded quartzites + arkoses*
		UNCONFORMITY		
		LOWER APHEBIAN (?)	Diabase dyke	*NW-SE trending swarm, intrusive into all units below.*
			Granitic complex	*Granite + granodiorite, pegmatite intrusive into older rock (usually as sills), some granitization.*
			Metavolcanics and Metasediments	*Intermediate to basic tuffs, flows, fragmented volcanics; ss, cong, cherty Iron Fm, pelitic + graphitic schists, massive sulfides.*
	?	?	? — ? — ? — ? — ? — ?	
	ARCHEAN		*Migmatite, Gneiss Complex*	*Migmatite, qtz-feldspar gneiss, qtz-plag. biotite gneiss, cordierite, garnet)*

File / Doss. No. 395

6. INVESTIGATIONS

The following table outlines the surveys completed during the 1982 field season:

TABLE 2 - Surveys Completed - Lac Carmen Area

Type of Survey	Total	Contract	In-House
Airborne Spectrometer Survey (400 m line spacing)	316 line km		x
Geological Mapping	34 man-days		x
(incl. detailed mapping of Marc-André showing)	5 man-days	x	
Bulk Sampling (for age dating purposes)	8 man-days		x
Ground Follow-up of Anomalies	6 man-days (7 anomalies)		x
Ground Scintillometer Survey	23 man-days (45 km^2)		x
Detailed Scintillometer Survey (Marc-André Showing)	2 man-days		x
Helium Survey			
(a) 1 water sample per DDH; Lorenz Gully grid	12 samples (6 man-days)		x
(b) in soils along EM conductor; Lac Carmen grid	10 samples (2 man-days)	x	

7. RESULTS

7.1 LOCAL GEOLOGY

Outcrop exposure in the northern half within the Otish Mountain range is relatively good (approx. 50%) although in the south, where topography is dominated by glacial features, outcrops are less readily located. Isolated gabbro ridges and flat lying sedimentary outcrop can be found over approximately 5%-10% of this area.

The Otish Mountains range is composed of resistant elongate ridges of leucocratic granite, quartz diorite and migmatite with minor pegmatitic injections. East of Lac Carmen, a resistant gabbro cuesta which dips gently to the south overlies both basement granites and the Otish sediments.

A narrow metavolcanic belt, averaging 7 km in width, intersects the unconformity and plunges beneath the sedimentary cover at an oblique angle between Lac Carmen and a large migmatite ridge to the southwest. It is composed of mildly resistant metabasalt flows and minor tuffaceous intervals. Boudinaged pillow structures are common within the flow intervals and are roughly parallel to the general foliation (ESE). Certain acid tuff horizons contain up to 50% sulfides (chiefly pyrite).

The three main rock types encountered within the Otish Basin are conglomeratic sandstones and sandstones of the Indicator Formation and intrusive dykes of the Otish Mountains Gabbro. The conglomeratic sandstones are typically light grey, very coarse grained, moderately to poorly sorted arkoses and subarkoses. Quartz and minor feldspar clasts, ranging up to 64mm in diameter, make up between 10-40% of the rock. The main matrix constituents are quartz, feldspar and sericite. These units normally lack any internal sedimentary structure. The sandstones are characteristically grey to pink, medium-grained, moderately to well sorted subarkoses to orthoquarzites. Individual beds often display well developed internal sedimentary structures - parallel laminations and various forms of cross-bedding. Minor pink and red argillite and siltstone intervals ($\leq$ 1%) are interbedded with the sandstone unit.

The Otish sediments in this area are relatively undeformed, showing only occasional increases in dip (up to 20^{o}) where disrupted by local tectonic or intrusive activity.

Two main gabbro dykes outcropping east and west of Lac Laparre were investigated in detail and will be discussed in a later section. The two dykes appear to have been one main ridge trending 050^{o}-070^{o} that was subsequently offset along a NS fault passing through Lac Laparre. The gabbro is commonly medium to coarse grained, massive and dark green, weathering to a pale brown with scattered rusty patches. Where in contact with the Otish sediments, the gabbro is much finer grained. The ferromagnesian minerals are often chloritized and uralitized. Some epidote alteration is also found.

7.2 AIRBORNE SPECTROMETER SURVEY

The results of the airborne spectrometer survey are given on Map 2, outlining the area flown along with the number and location of each anomaly. In the Lac Carmen area, a total of 7 anomalies were recovered - 3 first order anomalies, 2 second order anomalies and 2 high background areas. A detailed report along with the survey maps showing all flight lines, fiducials and anomalies can be found in Appendix 2.

7.3 GROUND FOLLOW-UP SURVEY

The ground follow-up survey results are summarized on Map 2 and Appendix 3. All 7 anomalies in the Lac Carmen area were ground checked and every one of the anomalies recovered radioactive sandstone boulders. Chemical analyses of the more significant ones indicated thorium to be the main source of radioactivity. (Appendix 4 contains the rock sample descriptions and chemical analyses).

7.4 GROUND SCINTILLOMETER SURVEY

The results of this survey are summarized on Map 2 as well. Two separate uranium occurrences, the J. Robert Boulder Train and the Marc-André Showing, were located west of Lac Laparre along the same ENE striking structural lineament. This lineament is easily recognizable on airphotos and is also distinguishable on regional airborne magnetometer maps as a narrow zone of high magnetic susceptibility.

The J. Robert Boulder Train, 5 km SW of Lac Laparre, consists of sixty-two mineralized boulders found along a very narrow well defined 100 m long boulder train. The source is interpreted to be very close to the northernmost radioactive boulder. Most of the boulders are gabbros although a few radioactive altered quartzites were found as well. The average assay of ten selected gabbro boulders returned 0.3% U_3O_8 (max: 0.5% U_3O_8) and the assay value of a selected quartzite boulder returned 0.1% U_3O_8.

The gabbros are usually quite strongly altered to the assemblage chlorite-tourmaline-quartz-leucoxene. Relict phenocrysts of plagioclase (or pyroxene) and coarse patches of leucoxene are still visible, indicating a medium to coarse grained original rock. The abundant tourmaline (5-7% suggests strong hydrothermal activity in the area. The mineralized quartzite boulder, containing chlorite, sericite and some kaolinite and hematite in the matrix, appears to have originated from sedimentary outcrop adjacent to the gabbro intrusive. Disseminated tourmaline in the matrix and tourmaline-rich veins cutting the rock indicate that the hydrothermal activity, believed to have affected the gabbro, has also altered a portion of the adjacent sediments. The rock contains abundant pores of up to a few millimeters diameter.

The Marc-André Showing occurs 2.5 km west of Lac Laparre within the prominent ENE trending gabbro ridge that outcrops over a length of several kilometers (Map 2). The mineralization, grading up to 0.26% U_3O_8, is found adjacent to a NE trending fault contact between the gabbro and the Indicator Formation sediments. The direction of the movement along this fault is not known definitely although a similar gabbro ridge fround east of Lac Laparre would indicate an overall right-handed movement. Field examinations of the gabbro ridge along strike have shown it to be quite variable in composition, ranging from a predominantly massive coarse-grained gabbro to phases that are more felsic and fine-grained as well as porphyritic in texture. This composite dyke might be interpreted to represent a "multiple-intrusion" where the more felsic

portions are a later stage phenomena. The late stage portions of this differentiation might have accounted for the alteration and uranium mineralization that are presently found at the Marc-André Showing as well as at the J. Robert Boulder Train.

A detailed compilation of the geology, alteration and radioactivity at the Marc-André Showing is outlined on Map 3. The alterations identified in the field include hematization (including specular hematite veinlets), green alteration (tourmalinization and epidotization), silicification, limonitization, sericitization and albitization (salmon pink alteration along joints). The radioactivity is enhanced where the hematite, tourmaline and limonite alterations are most intense. Away from these zones of pervasive alteration, a stockwork pattern of alteration is common in both the gabbro and in the sandstone. In addition, the alteration within the sandstone appears to be concordant with certain sedimentary horizons possibly resulting from preferential movement of hydrothermal fluids along more porous or highly jointed strata.

Maximum counts within the gabbro are in the order of 12,000 c/s and within the sandstone, 3000 c/s. This four to one ratio (approx.) between the gabbro mineralization and the sandstone mineralization is characteristic of the J. Robert Boulders as well.

Apart from the above two occurrences, a small uraniferous boulder field was located approximately 3 km down-ice from the Marc-André Showing (Map 2). The boulder field contained several radioactive sandstone and gabbro boulders, registering up to 3000 c/s (SPP-2NF). The visible alterations associated with the mineralization are very similar to those encountered at the Marc-André Showing and the boulders are therefore presumed to be derived from that showing. The width of the radioactive boulder field, perpendicular to ice direction, is approx. 50 meters.

The remaining radioactive occurrences found this year turned out to be either thoriferous or not significant enough to warrant further follow-up work.

7.5 AGE DATING - BASEMENT LITHOLOGIES

Rb/Sr age dating was performed on two separate suites of rocks from the Lac Carmen area that were sampled in 1981. They are:

(1) Deformed coarse-grained pegmatitic granites within the Lorenz Gully grid.
(2) Coarse-grained granodiorite gneisses outcropping 4 km to the southwest of Lorenz Gully.

The results yielded the following ages:

(1) Pegmatitic Granite: 2525 $\pm$ 26 m.y.
(2) Granodiorite: 2362 $\pm$ 40 m.y.

There appears to be, therefore, no statistical difference between the ages of these two rock suites although additional sampling of the Pegmatitic Granite was required in order to fill in a large gap in the Rb/Sr isochron. There is also evidence that the Granodiorite suite underwent partial or total anatexis (negative SiO_2/Rb correlation) where the above age would reflect a period of high grade metamorphism (i.e. Kenoran Orogeny) indicating an Archean age of formation. Several years ago, a gneissic suite from drill core at Lorenz Gully was dated at 1719 $\pm$ 13 m.y., using the Rb/Sr method. This data appears to be the result of a later metamorphic or possibly metasomatic event related to the uranium mineralization in that area. Appendix 5 contains a comprehensive report on this age dating study.

In addition to the above rock suites, eight bulk samples from the Lac Carmen metavolcanic belt were forwarded to a laboratory in Bonn, Germany for Rb/Sr age determination. Three additional bulk samples from the pegmatitic-granite suite in the Lorenz Gully grid were also forwarded to Bonn in order to fill in the large gap in the Rb/Sr isochron for that suite (refer to Figure 1 in Appendix 5). The results from these samples are not yet available. Appendix 4 contains the rock sample descriptions.

7.6 HELIUM SURVEYS

7.6.1 Helium in Drill Hole Waters

Helium is theoretically an ideal tracer for buried U deposits since it is an inert gas, nonadsorptive, and a stable end product of the U decay series. For this reason, an ongoing program was undertaken to evaluate the He dispersion around buried U occurrences using drill hole waters and to apply this knowledge to areas where drill holes intersected little or no mineralization. Water samples from all the accessible drill holes in the Lorenz Gully grid were taken and analyzed for their He concentration. Due to cave-ins and/or lack of casing, only 12 of the 35 holes drilled in the area were accessible for sampling. (See Map 4 and Appendix 6).

The purpose of the survey in the Lac Carmen area was twofold - (1) to test the He method in the vicinity of a known U-occurrence and (2) to establish the U potential of the Lac Carmen conductor by sampling several holes that occur midway between the Lorenz Gully structure and this conductor. However, because most drill holes in that area could not be probed, the second part of this survey was not significantly tested. All but one of the sampled holes occur within the Lorenz Gully structure and these returned several anomalous values (up to 77,300 nl $He/1H_2O$). The one sample that occurs outside the structure and within the Otish cover returned a value of 22,000 nl $He/1H_2O$. Because of the local groundwater flow, the amount of mineralization in the Lorenz Gully structure is believed to be sufficient to explain this value.

7.6.2 Helium in Soils

A He in soil survey was completed over the axis of the main metallic conductor within the Lac Carmen grid in order to evaluate its potential by comparing the average background values here with the average background values over a known uraniferous conductor (i.e. Camie River area). The results of this survey are summarized on Map 5 and Appendix 6.

In the Lac Carmen grid, all the values fall within the background population as established by larger data set taken the previous year. The background value is in the order of 150 nl He/l mud. The maximum value encountered on this grid (173 nl He/l mud) is significantly lower than the range of values encountered over the Camie River mineralization (700-2100 nl He/l mud). As a result, the He data does not appear to indicate the presence of a significant amount of uranium associated with the conductor.

7.7 NON-URANIUM MINERALS

Due to the increased drilling activity of Placer Development for gold on what appears to be a conductive horizon within the Lac Carmen metavolcanic belt, 15 km northwest of UEM's claim block, a total of 14 samples from a conductor within UEM's block were taken for subsequent gold analysis (see Map 2 for location and Appendix 4 for sample descriptions and chemical analyses). Because of the general SE trend of the metavolcanics in this area, the conductor within UEM's claim block might be the lateral equivalent of the conductor that PLACER is presently evaluating. This gossan-rich horizon is essentially a light green acid metatuff containing variable amounts of pyrite (10%-50%) and minor black, partly graphitic nodules (usually $<5\%$ of the total rock volume). However, no pyrhotite was visible in the hand specimen collected which, according to old assessment reports from the area, appears to be an important constituent of the auriferous horizon. All but one of the samples returned values between 5 ppb and 20 ppb Au. The one sample, where the partly graphitic nodules were selectively extracted from the rock and sent away for analysis, returned a value of 160 ppb Au.

8. CONCLUSIONS

A major portion of the Otish Basin sediments within the Lac Carmen area was relatively well evaluated over the past two years using several exploration techniques. Apart from the showings outlined to date, there is little likelihood of finding additional uranium mineralization with a significant surface expression in this area. Although the airborne spectrometer survey did outline the major uranium occurrences within the basin, it failed to recover several other uranium occurrences that were found through block prospecting. Therefore, providing one has a sufficient amount of time to evaluate an area, systematic block prospecting is, in the author's opinion, a much more effective method for outlining surface uranium mineralization.

The two most significant U-occurrences in the Lac Carmen area were found within the same ENE trending gabbro ridge. They are (1) the J. Robert Boulder Train, 62 uraniferous gabbro (and minor quartzite) boulders grading up to 0.5% U_3O_8 and (2) the Marc-André Showing, outcropping mineralization, grading up to 0.26% U_3O_8 that is similar in composition and related alterations to the J. Robert Boulders. This gabbro ridge was examined in greater detail and found to be compositionally and texturally more variable than expected. This variation appears to have been the result of differentiation during one main intrusive event as witnessed by the often gradational contact between the various lithological and textural units. Such magmatic differentiation might have introduced the necessary late stage hydrothermal fluids that produced the observable alterations and subsequent uranium mineralization. The major ENE magnetic anomaly that coincides with this ridge towards the west, in fact, becomes obliterated in the vicinity of the two showings. The magnetic signature of this portion of the dyke could have been destroyed during this late stage differentiation process. Uranium occurrences within mylonitized gabbro have been reported by other companies working in the Otish Basin although it is uncertain whether the associated alterations are the same. A further evaluation of these prospects and other gabbro intrusives with geophysics, mapping, prospecting and some stripping would be justifiable.

The He survey in the Lorenz Gully grid, where water samples from existing diamond drill holes were anlayzed, has outlined several anomalous values within the mineralized structure and one anomalous value south of the mineralized structure. Because the local groundwater flow regime is from north to south, all the anomalies, including the one south of the Lorenz Gully structure, are considered to be the result of the known U-mineralization within the Lorenz Gully structure.

The "He in soil" survey over the main conductor in the Lac Carmen grid was completed in order to compare its average background value with the average background over the Camie River mineralization. The results indicate that there does not appear to be any significant U-mineralization associated with the conductor on this grid.

An age dating survey, which sampled two separate suites of rocks from the basement north of Lac Carmen, has indicated a likely Archean age of formation for both suites (a migmatite and a pegmatite suite). The basement appears to have undergone partial or total anatexis during the Kenoran Orogeny (late Archean - early Aphebian). Bulk sampling of the metavolcanic suite, as well as further sampling of the pegmatite suite, were undertaken during the 1982 summer campaign in order to acquire additional information on the age of formation of the different lithologies and their relationship to one another. The results of the latest sampling survey have not yet been received.

Because of increased drilling activity for gold mineralization by Placer Development northwest of UEM's Lac Carmen claim group, several samples from a sulfide-rich metavolcanic horizon, within the Lac Carmen group, were analyzed for their gold content. This horizon could conceivably be the lateral equivalent of the conductor presently being evaluated by Placer Development. However, the results of the gold analyses returned values only slightly above detectable limits.

APPENDIX 1

LIST OF UEM LAND HOLDINGS

LAC CARMEN AREA

LAC CARMEN AREA

CLAIM No.	TOWNSHIP	STAKED ON	DATE OF RECORD
368703 (1-4)	2335	23 February 1978	June 15, 1978
(5)	2335	27 February 1978	June 15, 1978
368704 (1-4)	2335	24 February 1978	June 15, 1978
(5)	2335	26 February 1978	June 15, 1978
368705 (1-3)	2335	25 February 1978	June 15, 1978
(4-5)	2335	26 February 1978	June 15, 1978
368706 (1-3)	2335	27 February 1978	June 15, 1978
(4-5)	2335	28 February 1978	June 15, 1978
368707 (1-2)	2335	28 February 1978	June 15, 1978
(3-5)	2335	1 March 1978	June 15, 1978
368708 (1-3)	2335	2 March 1978	June 15, 1978
(4-5)	2335	3 March 1978	June 15, 1978
368709 (1-2)	2335	27 February 1978	June 15, 1978
(3-4)	2335	28 February 1978	June 15, 1978
(5)	2335	1 March 1978	June 15, 1978
368710 (1-2)	2335	27 February 1978	June 15, 1978
(3-4)	2335	28 February 1978	June 15, 1978
(5)	2335	1 March 1978	June 15, 1978
368711 (1-2)	2335	1 March 1978	June 15, 1978
(3)	2335	26 February 1978	June 15, 1978
(4)	2335	25 February 1978	June 15, 1978
(5)	2335	24 February 1978	June 15, 1978
368712 (1-2)	2335	2 March 1978	June 15, 1978
(3)	2335	26 February 1978	June 15, 1978
(4)	2335	25 February 1978	June 15, 1978
(5)	2335	24 February 1978	June 15, 1978
368713 (1-2)	2335	2 March 1978	June 15, 1978
(3)	2335	26 February 1978	June 15, 1978
(4)	2335	25 February 1978	June 15, 1978
(5)	2335	24 February 1978	June 15, 1978
368714 (1)	2335	24 February 1978	June 15, 1978
(2-5)	2335	23 February 1978	June 15, 1978

LAC CARMEN AREA

CLAIM NO.	TOWNSHIP	DATE OF STAKING
369858 (1)	2335	25 July 1978
371407 (1-5)	2335	20 July 1978
371408 (1-5)	2335	21 July 1978
371409 (1-5)	2335	22 July 1978
371410 (1-5)	2335	23 July 1978
371411 (1-5)	2335	24 July 1978
371412 (1-5)	2335	25 July 1978
371413 (1-5)	2335	26 July 1978
371414 (1-5)	2335	27 July 1978
371415 (1-5)	2335	28 July 1978
371416 (1-5)	2335	29 July 1978
371417 (1-5)	2335	20 July 1978
371418 (1-5)	2335	21 July 1978
371419 (1-5)	2335	22 July 1978
371420 (1-5)	2335	23 July 1978
371421 (1-5)	2335	24 July 1978
371422 (1-5)	2335	25 July 1978
371423 (1-5)	2335	26 July 1978
371424 (1-5)	2335	27 July 1978
371425 (1-5)	2335	28 July 1978
371426 (1-5)	2335	29 July 1978
371427 (1-5)	2335	20 July 1978
371428 (1-5)	2335	21 July 1978
371429 (1-5)	2335	22 July 1978
371430 (1-5)	2335	23 July 1978
371431 (1-5)	2335	24 July 1978
371432 (1-5)	2335	25 July 1978
371433 (1-5)	2335	26 July 1978
371434 (1-5)	2335	27 July 1978
371435 (1-5)	2335	28 July 1978
371436 (1-5)	2335	29 July 1978

LAC CARMEN AREA

N° de claim	Canton	Date de jalonnement
393137 (1-5)	2335	14 août 1980
393138 (1-5)	2335	15 août 1980
393139 (1-5)	2335	16 août 1980
393140 (1-5)	2335	17 août 1980
393141 (1-5)	2335	18 août 1980
393154 (2-5)	2335	17 août 1980
393155 (1-5)	2335	18 août 1980
393060 (5)	2335	17 août 1980
393061 (5)	2335	18 août 1980
393121 (1-5)	2335	14 août 1980
393122 (1-5)	2335	15 août 1980
393123 (1-5)	2335	16 août 1980
393124 (1-5)	2335	17 août 1980
393125 (1-5)	2335	18 août 1980
393183 (2-4)	2335	14 août 1980
393184 (1-5)	2335	15 août 1980
393185 (1-5)	2335	16 août 1980
393186 (1-5)	2335	17 août 1980
393187 (1-5)	2335	18 août 1980

APPENDIX 2

REPORT ON AIRBORNE GAMMA-RAY SPECTROMETER SURVEY

Table of Contents of Appendix 2

1. INTRODUCTION

This report describes a helicopter gamma-ray spectrometer survey that was performed during June and July 1982 in the areas west and north of Indicator Lake (please refer to Map 1). The objective of this survey was to locate areas of anomalous uranium mineralization within the Otish sandstones, following the discovery in 1981 of uranium mineralization within a train of sandstone boulders which led to the location of the A.A. Matoush Showing.

A total of approximately 1705 line-kilometres were flown at a line spacing of 400 metres between June 11th and July 3rd, 1983.

The spectrometer installation was operated aboard a Bell 206B Jet Ranger owned by Trans Québec Helicopters Ltd. The operations were based at the UEM camp on Indicator Lake.

The following personnel was involved in the survey:

UEM:	G. Lambert, Geophysicist/Navigator
	M. Leppin, Geophysicist/Navigator
	L. Shattler, Operator
TRANS-QUEBEC:	Brian Postans, Pilot
	Tom Taal, Engineer

2. GENERAL PROCEDURES

The instrumentation used consisted of a Scintrex GAM-2S gamma-ray analyser operated in the differential (window) mode measuring the radiation intensity in the 1.46, 1.76 and 2.62 MeV energy levels plus the broadband ($\geq$ 0.12 MeV) spectrum. The data in the uranium and potassium bands are corrected for compton scattering of the higher energy radiations into the lower energy bands. A radiometric ratio computer (Scintrex RRC-2) continuously monitors the U/K and U/Th ratios (only the U/Th ratio was used and displayed on the recorder). A radar altimeter continuously measures the vertical distance from the aircraft to the ground surface. The sensors used were a Scintrex GSA-74 consisting of four cylindrical 4" x 6" dia. sodium iodide crystals (totalling 452 cu.in.) and a GSA-42 consisting of two prismatic 4" x 4" x 16" crystals (512 cu.in.) for a total sensor volume of 964 cu.in. A one second time constant was used. Terrain clearance was maintained as close to 150 feet as safely possible and airspeed was kept around 100 km/h. The count rates are not corrected for altitude variations and atmospheric variations.

The flight path was recovered by marking recognizable topographic features on a 1:50,000 scale map which was also used as the plotting base. The marks are spaced at approximately 1 to 2 kilometres. Airspeed is assumed to be constant between each fiducial.

The calibration of the system consisted in first matching the gain of each individual photomultiplier and preamplifier unit and then peaking the gain of the thorium single channel analyser (SCA) using a pure thorium source. Once this was done, all four SCA's were calibrated. The uranium and potassium window widths were somewhat misadjusted as it was found out after completion of most of the survey. This resulted in reduced count rates of 75% and 65% respectively for the uranium and potassium channels. The broadband and thorium channels were unaffected by this miscalibration.

3. SURVEY RESULTS

Gordon's Lake Area

1074 line-kilometres flown

4 1st order U anomalies
18 2nd order U anomalies
9 3rd order U anomalies
1 High Background anomaly
35 Thorium anomalies

Beaver Lake Area

315 line-kilometres flown

6 1st order U anomalies
5 2nd order U anomalies
5 3rd order U anomalies
1 High Background anomaly
21 Thorium anomalies

Carmen Lake Area

316 line kilometres flown

3 1st order U anomalies
2 2nd order U anomalies
No 3rd order U anomalies
2 High Background anomalies
2 Thorium anomalies

4. CONCLUSION AND RECOMMENDATIONS

All the radiometric anomalies should be checked on the ground, but the following groups should be treated as first priority targets, due to their overall characteristics and their spatial distributions:

8520A, 8524A, 8521A, 9059A, 9066A, 48E.

APPENDIX - Anomaly List, Airborne Gamma-Ray Spectrometer

URANERZ EXPLORATION & MINING LTD. — AIRBORNE SURVEY RESULTS

Project No. 7185 Flight No. _____ Page 1 of 3

AREA _____ SURVEY DATE _____ BASE _____ CRYSTAL VOLUME 1000 cu.in. AIRCRAFT C-GMJH

ANOMALY NUMBER	FLIGHT LINE	ANOMALY FIDUCIAL	URANIUM cts/sec background		THORIUM cts/sec background		TOTAL COUNT cts/sec character		ALTITUDE	TIMES BACKGROUND (URANIUM)	U/TH RATIO	U/K RATIO	COMMENTS	PRIORITY
2A	2	1.74	6	12	0	18							Distinct peak, low K	3+
3A	3	20.55	off scale		off scale								Beaver Lake Showing	1
4A	4	6.73	5	12	0	14							On high ground, weak	3
4B	4	2.54-4.32											High background - Th, U, K	
23A	23	4.6	6	9	0	12							Low Th; K, generally poor	3
24A	24	3.35	4	15	0	24							In area of high Th background	3
24B	24	5.61											Th anomaly, high background, U, K	
4804A	4804E	7.76	18	11	14	14							Good strong U anomaly	1
4809A	4809W	2.7	20	12	20	20							Sharp, could be noise U + K	2
4813A	4813W	7.82											Th + U + K anomaly	
4815A	4815W	2.8											Strong Th, U, K	
4816A	4816E	8.4	17	11	25								Sharp. - Flanking Th	2
4821A	4821W	3.00	16	10	13	13			125'				Sharp, fair anomaly, U	1
4822A	4822E	4.78	15	8	12	12			170'				Broad, fair anomaly, U + K	1
8510A	8510W	12.3	6	2	14	9	1000		140'	3	1.5		Sharp	1
8512A	8512W	6	8	3	21	21			140'	> 2	0.8		Weak	2
8512B	8512W	25.15	7	2	18	10	1200		150'	> 3	1.0		Maybe statistical noise	3
8514A	8514W	34.82	9	3									U peak with Th	3
8515A	8515E	14.88	8	3	18	18	1300		160'	> 2	1.0		Weak but valid U anomaly	2
8517A	8517E	9.9	7	3	14	12	1800	1500	160'	> 2	1.5		Possibly a valid U anomaly	2
8519A	8519E	31.33	9	4									Minor U peak	2
8520A	8520A	27.52-27.60	6	3	17	17	1700	1500	140'	2	1.1		Valid, weak U anomaly	1
8521A	8521E	11.4-12.6	6	2	15	15			130'	3	0.9		Consistently high U/Th ratio	2
8521B	8521E	23.3	8	1.5	15	15	1200		200'	> 5	1.0		Probably valid U anomaly	1

NAME _____ DATE _____ ALTITUDE CORRECTION YES _____ NO _____

URANERZ EXPLORATION & MINING LTD. — AIRBORNE SURVEY RESULTS

Project No. 7185 Flight No. _____ Page 2 of 3

AREA _____ SURVEY DATE _____ BASE _____ CRYSTAL VOLUME 1000 cu.in. AIRCRAFT C-GMJH

ANOMALY NUMBER	FLIGHT LINE	ANOMALY FIDUCIAL	URANIUM cts/sec	URANIUM background	THORIUM cts/sec	THORIUM background	TOTAL COUNT cts/sec	TOTAL COUNT character	ALTITUDE	TIMES BACKGROUND (URANIUM)	U/TH RATIO	U/K RATIO	COMMENTS	PRIORITY
8522A	8522W	38.05	8	2	15	15			115'	4	1.0		Probably valid U anomaly	2
8523A	8523E	2.4											Th + U	2
8524A	8524W	33	8	2			1300		115'	4	1.1		Area of high U/Th	2
8525A	8525E	34.9	7	2									Th + U	2
8526A	8526W	13.3	4	1									Minor U peak	2
8526B	8526W	25.5	7	2	12	12			150'	3	1.3		Valid uranium anomaly but weak	2
8527A	8527E	11.2	5	1									Minor U peak	2
8527B	8527E	42	11	2	21	13			150'	> 5	1.8		Soquem's concretion showing	
8528A	8528W	5.76	7	2.5									Minor U peak	2
8528B	8528W	29.74	7	2	24	15			130'	> 3	0.6		Could be statistical noise	3
8529A	8529E	1.32											Minor U peak	2
8530A	8530W	3.7											Th + U + K	3
8530B	8530W	6.7	6	2	15	16			165'	> 3	0.9		Weak	2
8530C	8530W	14.11	6	3	18	12			130'	> 2	0.9		Valid???	3
8532A	8532W	9.32	9	2	24	15			160'	> 4	0.8		May be statistical noise	3
9004A	9004E	Past 6	9	3	21	18	1900		150'	3	1.4		Valid U anomaly	2
9006A	9006E	4.1	7	2.5									Small U peak	2
9013A	9013W	1.4@1.7											Th + U anomaly - strong	2
9021A	9021W	1.95	6	2									Minor U peak	3
9048B	9048W	29.2	8	2	14	12	900	800	200'	4	1.3		Probably valid U anomaly	1
9050C	9050W	25.98	6	2	15	12	1000	900	180'	3	1.0		Valid??	3
9051A	9051E	4.05	8	3	20	15	1200	1000	160'	> 2	1.0		Valid??	3
9052B	9052W	21.8	9	3	21	18	1300	1200	130'	> 3			Possibly related to high background	
9053A	9053E R/E	5.6	8	2	21	18	1400	1200	100'	4	> 1		Lake edge ?	2
9059A	9059W	25.42-25.7	6	2	12	10	1000	800	150'	3	1.1		Valid U anomaly	1

NAME _____ DATE _____ ALTITUDE CORRECTION YES _____ NO _____

URANERZ EXPLORATION & MINING LTD. — AIRBORNE SURVEY RESULTS

Project No. 7185 Flight No. _____ Page 3 of 3

AREA _____ SURVEY DATE _____ BASE _____ CRYSTAL VOLUME 1000 cu.in. AIRCRAFT C-GMJH

ANOMALY NUMBER	FLIGHT LINE	ANOMALY FIDUCIAL	URANIUM cts/sec	background	THORIUM cts/sec	background	TOTAL COUNT cts/sec	character	ALTITUDE	TIMES BACKGROUND (URANIUM)	U/TH RATIO	U/K RATIO	COMMENTS	PRIORITY
9061A	9061W	26.1	9	3	21	20	1500	1200	140'	3			Strong, sustained U anomaly	1
9066A	9066E	4.43	10	3.5	18				190'	3	1			2
9066B	9066E	11.21	7	3									Small U peak	2
9067A	9067W	24.62	8	2	15				140'	4	0.9		Valid U anomaly (weak)	2
9068A	9068E	6.7	8	3	15				130'	> 2			Sharp U anomaly	2
9069A	9069W	27.42	12	4	30	18	2000		130'	3	1		Beaver Lake	1
9069B	9069W	27.79	17	5	o/s	?	3000		130'	> 3	1		Beaver Lake	1

NAME _____ DATE _____ ALTITUDE CORRECTION YES _____ NO _____

APPENDIX 3

GROUND CHECK OF AIRBORNE SPECTROMETER ANOMALIES

LAC CARMEN AREA

LAC CARMEN

GROUND CHECK OF AIRBORNE SPECTROMETER ANOMALIES

Anomaly No.	Area		Date	CPS (in situ)		Priority	Cause of Anomaly
	N.T.S. No.	Subproject		BKGD.	Max.		
4804A	23D/4 Mosaic	85-05	10/08/82	75	115	1	Subarkose boulders, hem., much outcrop in area (topo effect)?
4809A	23D/4 Mosaic	85-05	10/08/82	80	115	2	Subarkose boulders on hill
4813A	23D/4	85-05	13/08/82	90	600		Hi-background; QPC-A; lim. alt. associated with ↑ c/s in 600 c/s boulder
4815A	23D/4	85-05	13/08/82	90	700		9 boulders, 300-700 c/s; A-Ac, QPC — highest counts
4816A	23D/4	85-05	13/08/82	85	600	2	Ac; mg; boulders, lim & hem. alt.
4821A	23D/4 Mosaic	85-05		45	150	1	Subarkose boulders
4822A	23D/4 Mosaic	85-05	05/08/82	45	300	1	Quartzite, conglomeratic; boulder; hem. alt.

APPENDIX 4

ROCK SAMPLE DESCRIPTIONS & CHEMICAL ANALYSES

LAC CARMEN

GEOCHEMICAL SAMPLE DATA SHEET

- ROCKS -

PROJECT: 7185/90

SAMPLE #	AREA	ROCK TYPE	SCINT cps	U_3O_8 ppm	ThO_2 ppm		Au (ppb)		COMMENTS
9902 (OWH-462)	LAC CARMEN LORENZ GULLY	Biotite-chloritie-rich pegmatite-- affinity towards metamorphosed volc.							-Rb/Sr Age Dating -OTC
9903 (OWH-465)	LAC CARMEN LORENZ GULLY	v.c.g. Pegmatite with clumps of muscovite phlogopite							-Rb/Sr Age Dating -OTC
9904 (OWN-468)	LAC CARMEN LORENZ GULLY	v.c.g. reddish pegmatite clusters of biotite & amphibole (could have some carbonate)							-Rb/Sr Age Dating -OTC
9905	LAC CARMEN SW OF BANANA LAKE	Sulfide-rich acid volcanics					20		-contains some graphite; light green; silceous; 5% sulfides -OTC
9906	LAC CARMEN SW OF BANANA LK	Sulfide-rich acid volcanics					20		-similar to 9905 (same trench) 10% py -OTC
9907	LAC CARMEN SW OF BANANA LAKE	Sulfide-rich acid volcanics					5		-5% Py - OTC
9908	LAC CARMEN SW OF BANANA LAKE	Sulfide-rich acid volcanics					5		-botryoidal graphite(?) clumps; similar to 9905 and 9906 - OTC
9909	LAC CARMEN SW OF BANANA LAKE	Sulfide-rich acid tuff					<5		-phyllitic cleavage, trace f.g. pyrite -OTC

LAC CARMEN

GEOCHEMICAL SAMPLE DATA SHEET

- ROCKS -

PROJECT: 7185/90

SAMPLE #	AREA	ROCK TYPE	SCINT cps	U_3O_8 ppm	ThO_2 ppm			Au (ppb)	COMMENTS
9910	LAC CARMEN SW OF BANANA LAKE	Sulfide-rich acid volcanics						5	Laminated, 50% Py -OTC
9911	LAC CARMEN SW OF BANANA LAKE	Sulfide-rich acid volcanics						20	- po?, 30% Py, bluish green alt on rusty surface - OTC
9912	LAC CARMEN SW OF BANANA LAKE	Sulfide-rich acid volcanics						5	dk green, 5% Py, f.g.
9918	LAC CARMEN LC-1	Metabasalt tuff, dk. grey-green							-trace Py (5%) well lam. -Rb/Sr Age Dating
9919	LAC CARMEN LC-2	Metabasalt tuff, meta-amphibolite flow,m.g.-f.g.some c.g.							-massive in appearance -Rb/Sr Age Dat.
9920	LAC CARMEN LC-3	Meta-Amphibolite							-massive, m-c.g. equigranular -Rb/Sr Age Dat.
9921	LAC CARMEN LC-4	Int-Acid Metatuff							-5-10% sulfides (py, cp 2) m.g.-f.g. ext. lim. alt. along fractures -Rb/Sr Age Dat.
9922	LAC CARMEN LC-5	Metabasalt Tuff							-f.g. well laminated dk grey green -Rb/Sr Age Dat.

LAC CARMEN

GEOCHEMICAL SAMPLE DATA SHEET

- ROCKS -

PROJECT: 7185/90

SAMPLE #	AREA	ROCK TYPE	SCINT cps	U_3O_8 ppm	ThO_2 ppm				COMMENTS
9923	LAC CARMEN LC-6	Gabbro (?) Meta-amphibolite							-massive in c.g. equigranular contains plenty of plagioclase 40% -Rb/Sr Age Dat.
9924	LAC CARMEN LC-7	Lt. green-dk. grey-green metatuff(metabasalt)							-well lam; tr epid te; f.g. -Rb/Sr Age Dat.
9925	LAC CARMEN LC-8	Metabasalt Tuff - dk. green; well lam.							-well lam; f.g. -Rb/Sr Age Dat.
9955	LAC CARMEN 8505 (4822A)	Quarzite; conglomeratic	300/90	6.5	275				(qtz. clasts up to 3 cm) c.g.-v.c.g. massive: ↑c/s along a hem. fracture
9966	LAC CARMEN 85-05 (4815A)	Quartz pebble cong;c.g. arkosic matrix qtz & Kspar clasts	500/200	14.9	1403				-B -some lim alt; -extenisve hem. alt.
9973	LAC CARMEN 85-05(4816A)	Arkose; gritty, (c.g.-v.c.g.; cong; X-bedded	600/180	12.8	968				-B -↑c/s ass. with ext lim. alt. -(|| to bedding); hem. halo
9974	LAC CARMEN 85-05(4813A)	Arkose; cong; m.g.-c.g.; detrital black oxides and dark hem. alt ass ↑c/s	550/120	6.8	469				-B
9980	LAC CARMEN 23 D/4(8-53)	Arkose; cong; c.g.; ↑ c/s ass. hem. front(ext)	1000/270	21.0	1121				-B

LAC CARMEN

GEOCHEMICAL SAMPLE DATA SHEET

- ROCKS -

PROJECT:

SAMPLE #	AREA	ROCK TYPE	SCINT cps	U_3O_8 ppm	ThO_2 ppm		LOI	Au ppb	COMMENTS
9982	LAC CARMEN 23D/4(7-55c)	Arkose; ↑c/s ass. with lim. alt. (discontinuous along bed) c.g.	500/140	9.3	342				-B -well bedded -local hem. alt.
301	LAC CARMEN 7185-05 SW OF BANANA LAKE	Black graphitic?nodules from acid volc. tuff					7.3%	160	BL-1
302	"	Acid tuff, py rich; siliceous, black nodules						10	BL-1
303	"	Acid tuff, sil; 20-30% py						5	BL-2
304	"	Similar to 303 Acid tuff						<5	BL-3
305	"	Acid tuff, massive; diss py (5%)						<5	BL-4
307	"	Altered (oxidized) siliceous tuff (10-30%py)						<5	BL-8

BONDAR-CLEGG & COMPANY LTD.

764 BELFAST ROAD, OTTAWA, ONTARIO, K1G 0Z5 PHONE: 237-3110

SEMI-QUANTITATIVE ANALYSIS

No: 112-1705

Sample No. 301 From: Uranerz Exploration & Mining Ltd

Method: XRF Date: October 13, 1982

No. of Elements: 32 Analyst:

MAJOR ELEMENTS (%)	<.003	.003-.01	.01-.03	.03-0.1	0.1-0.3	0.3-1.0	1.0-3.0	3.0-10.0	> 10.0	REMARKS
SiO_2									X	
Al_2O_3								X		
Total Fe (Fe_2O_3)									X	
MgO						X				
CaO					X					
Na_2O							X			
K_2O						X				
TiO_2					X					
TRACE ELEMENTS (%)										
V		X								
Cr				X						
Mn	X									
Co	X									
Ni	X									
Cu	X									
Zn		X								
As		X								
Sr	X									
Y	X									
Zr	X									
Nb	X									
Mo	X									
Ag	X									
Sn	X									
Sb	X									
Ba		X								
La	X									
Ce	X									
W	X									
Pb	X									
Bi	X									
Th	X									
U	X									

BONDAR-CLEGG & COMPANY LTD.

764 BELFAST ROAD, OTTAWA, ONTARIO, K1G 0Z5 PHONE: 237-3110

SEMI-QUANTITATIVE ANALYSIS

No: 212-0934

Sample No. 9906 From: Uranerz Exploration & Mining L

Method: XRF Date: July 30, 19 82

No. of Elements: 32 Project # 71-85/90

Analyst:

MAJOR ELEMENTS (%)	<.003	.003-.01	.01-.03	.03-0.1	0.1-0.3	0.3-1.0	1.0-3.0	3.0-10.0	> 10.0	REMARKS
SiO_2									X	
Al_2O_3									X	
Total Fe (Fe_2O_3)									X	
MgO						X				
CaO							X			
Na_2O								X		
K_2O						X				
TiO_2						X				
TRACE ELEMENTS (%)										
V		X								
Cr			X							
Mn	X									
Co	X									
Ni	X									
Cu	X									
Zn	X									
As	X									
Sr			X							
Y	X									
Zr		X								
Nb	X									
Mo	X									
Ag	X									
Sn	X									
Sb	X									
Ba			X							
La	X									
Ce	X									
W	X									
Pb		X								
Bi	X									
Th	X									
U	X									

BONDAR-CLEGG & COMPANY LTD.

764 BELFAST ROAD, OTTAWA, ONTARIO, K1G 0Z5 PHONE: 237-3110

SEMI-QUANTITATIVE ANALYSIS

No: 212-0934

Sample No. 9907 From: Uranerz Exploration & Mining Ltd

Method: XRF Date: July 30, 1982

Project # 71-85/90

No. of Elements: 32 Analyst: 60-

MAJOR ELEMENTS (%)	<.003	.003-.01	.01-.03	.03-0.1	0.1-0.3	0.3-1.0	1.0-3.0	3.0-10.0	> 10.0	REMARKS
SiO_2									X	
Al_2O_3									X	
Total Fe (Fe_2O_3)									X	
MgO							X			
CaO							X			
Na_2O								X		
K_2O				X						
TiO_2						X				
TRACE ELEMENTS (%)										
V		X								
Cr			X							
Mn				X						
Co	X									
Ni	X									
Cu		X								
Zn		X								
As	X									
Sr		X								
Y	X									
Zr		X								
Nb	X									
Mo	X									
Ag	X									
Sn	X									
Sb	X									
Ba		X								
La	X									
Ce	X									
W	X									
Pb	X									
Bi	X									
Th	X									
U	X									

BONDAR-CLEGG & COMPANY LTD.

764 BELFAST ROAD, OTTAWA, ONTARIO, K1G 0Z5 PHONE: 237-3110

SEMI-QUANTITATIVE ANALYSIS

No: 212-0934

Sample No. 9909 From: Uranerz Exploration & Mining Ltd.

Method: XRF Date: July 30, 1982

No. of Elements: 32 Analyst: AL

MAJOR ELEMENTS (%)	<.003	.003-.01	.01-.03	.03-0.1	0.1-0.3	0.3-1.0	1.0-3.0	3.0-10.0	> 10.0	REMARKS
SiO_2									X	
Al_2O_3									X	
Total Fe (Fe_2O_3)								X		
MgO						X				
CaO						X				
Na_2O							X			
K_2O								X		
TiO_2						X				
TRACE ELEMENTS (%)										
V		X								
Cr		X								
Mn				X						
Co	X									
Ni	X									
Cu	X									
Zn		X								
As	X									
Sr			X							
Y	X									
Zr			X							
Nb	X									
Mo	X									
Ag	X									
Sn	X									
Sb	X									
Ba				X						
La	X									
Ce	X									
W	X									
Pb	X									
Bi	X									
Th	X									
U	X									

BONDAR-CLEGG & COMPANY LTD.

764 BELFAST ROAD, OTTAWA, ONTARIO, K1G 0Z5 PHONE: 237-3110

SEMI-QUANTITATIVE ANALYSIS

No: 212-0934

Sample No. 9910 From: Uranerz Exploration & Mining Ltd

Method: XRF Date: July 30, 1982

No. of Elements: 32 Analyst:

MAJOR ELEMENTS (%)	<.003	.003-.01	.01-.03	.03-0.1	0.1-0.3	0.3-1.0	1.0-3.0	3.0-10.0	> 10.0	REMARKS
SiO_2									X	
Al_2O_3									X	
Total Fe (Fe_2O_3)									X	
MgO							X			
CaO						X				
Na_2O								X		
K_2O						X				
TiO_2						X				
TRACE ELEMENTS (%)										
V		X								
Cr			X							
Mn				X						
Co	X									
Ni	X									
Cu	X									
Zn		X								
As	X									
Sr		X								
Y	X									
Zr		X								
Nb	X									
Mo	X									
Ag	X									
Sn	X									
Sb	X									
Ba			X							
La	X									
Ce	X									
W	X									
Pb		X								
Bi	X									
Th	X									
U	X									

BONDAR-CLEGG & COMPANY LTD.

764 BELFAST ROAD, OTTAWA, ONTARIO, K1G 0Z5 PHONE: 237-3110

SEMI-QUANTITATIVE ANALYSIS

No: 212-0934

Sample No. 9911 9911 From: Uranerz Exploration & Mining Ltd

Method: XRF Date: July 30, 19 82

No. of Elements: 32 Analyst:

MAJOR ELEMENTS (%)	<.003	.003-.01	.01-.03	.03-0.1	0.1-0.3	0.3-1.0	1.0-3.0	3.0-10.0	> 10.0	REMARKS
SiO_2									X	
Al_2O_3									X	
Total Fe (Fe_2O_3)									X	
MgO							X			
CaO						X				
Na_2O							X			
K_2O							X			
TiO_2						X				
TRACE ELEMENTS (%)										
V		X								
Cr			X							
Mn					X					
Co	X									
Ni	X									
Cu	X									
Zn		X								
As		X	Det ~ 120 ppm							
Sr	X									
Y	X									
Zr		X								
Nb	X									
Mo	X									
Ag	X									
Sn	X									
Sb	X									
Ba		X								
La	X									
Ce	X									
W	X									
Pb	X									
Bi	X									
Th	X									
U	X									

BONDAR-CLEGG & COMPANY LTD.

764 BELFAST ROAD, OTTAWA, ONTARIO, K1G 0Z5 PHONE: 237-3110

SEMI-QUANTITATIVE ANALYSIS

No: 212-0934

Sample No. 9912 From: Uranerz Exploration & Mining Ltd

Method: XRF Date: July 30, 19 82

No. of Elements: 32 Analyst:

MAJOR ELEMENTS (%)	<.003	.003-.01	.01-.03	.03-0.1	0.1-0.3	0.3-1.0	1.0-3.0	3.0-10.0	> 10.0	REMARKS
SiO_2									X	
Al_2O_3									X	
Total Fe (Fe_2O_3)								X		
MgO							X			
CaO	X									
Na_2O						X				
K_2O								X		
TiO_2						X				
TRACE ELEMENTS (%)										
V		X								
Cr			X							
Mn				X						
Co	X									
Ni	X									
Cu	X									
Zn			X							
As	X									
Sr	X									
Y	X									
Zr			X							
Nb	X									
Mo	X									
Ag	X									
Sn	X									
Sb	X									
Ba				X						
La	X									
Ce	X									
W	X									
Pb	X									
Bi	X									
Th	X									
U	X									

BONDAR-CLEGG & COMPANY LTD.

764 BELFAST ROAD, OTTAWA, ONTARIO, K1G 0Z5 PHONE: 237-3110

SEMI-QUANTITATIVE ANALYSIS

No. 212-0934

Sample No. 9905 From: Uranerz Exploration & Mining Ltd.

Method: XRF Date: July 30, 1982

No. of Elements: 32 Analyst: la

MAJOR ELEMENTS (%)	<.003	.003-.01	.01-.03	.03-0.1	0.1-0.3	0.3-1.0	1.0-3.0	3.0-10.0	> 10.0	REMARKS
SiO_2									X	
Al_2O_3									X	
Total Fe (Fe_2O_3)									X	
MgO						X				
CaO							X			
Na_2O								X		
K_2O						X				
TiO_2						X				
TRACE ELEMENTS (%)										
V		X								
Cr			X							
Mn		X								
Co	X									
Ni	X									
Cu	X									
Zn	X									
As			X							
Sr			X							
Y	X									
Zr		X								
Nb	X									
Mo	X									
Ag	X									
Sn	X									
Sb	X									
Ba			X							
La	X									
Ce	X									
W	X									
Pb		X								
Bi	X									
Th	X									
U	X									

APPENDIX 5

REPORT ON AGE DETERMINATIONS OF SAMPLES FROM OTISH WEST

1. Rb/Sr age determination of the basement rocks

For the Rb/Sr age determination five samples of the granodiorite-gneiss suite of Area A (UEB No. CNa 939-943) and four samples of the granite-pegmatite suite of Area B (UEB No. CNa 944-947) have been analyzed. The analytical results are given in Table 1.

The sample points of Area A fit within a range of $\pm 2\,\sigma$ a straight line in the isochrone diagram (Fig. 1) yielding an age of 2362 $\pm$ 40 m.y. (The lower part of Fig. 1 shows the weighted deviations of the sample points from the straight line.)

For the granite-pegmatite suite of Area B only three samples scatter around a straight line yielding an age of 2525 $\pm$ 26 m.y. The sample CNa 947 not fitting this straight line shows a later metamorphic influence which may have disturbed the Rb/Sr-system. Also the sample CNa 944 does not appear to be unaltered but due to the low Rb/Sr ratio for this sample the alteration effect on the Rb/Sr-system was less pronounced. Taking into account only the samples CNa 945 and 946 the two-point-isochrone would yield a somewhat lower age of 2470 $\pm$ 29 m.y.

Due to the small number of samples it is not possible to decide whether there is a real difference between the ages of the granite-pegmatite suite and the granodiorite suite.

Relatively to the high ages and the low Rb concentrations both sets of samples yielded unusual high $^{87}Sr/^{86}Sr$ initial ratios of 0.7112 and 0.7101. These high initial ratios indicate a derivation of the granodiorite-gneiss and the granite from a Rb-rich source rock. The RF analyses (Tab. 2) show a negative correlation of SiO_2 and Rb content for the granodiorite-gneiss samples which could be taken as indication for a differentiation by anatexis.

The Rb/Sr whole rock, age of the granodiorite-gneiss suite therefore may be interpreted as the age of a high grade metamorphism (up to anatexis).

Table 1: Rb/Sr whole rock data

Sample	UEB-Nr.	Rb^{87} ppm	Sr^{86} ppm	Rb^{87}/Sr^{86}	Sr^{87}/Sr^{86}
9713	CNa 939	46,95	16.15	2,874	0,81120
9714	CNa 940	81,94	15,38	5,266	0,89252
9715	CNa 941	43,09	20,67	2,061	0,78083
9716	CNa 942	67,15	17,53	3,787	0,83655
9717	CNa 943	45,86	16,67	2,719	0,80493
9718	CNa 944	23,86	46,51	0,5071	0,72782
9719	CNa 945	62,14	6,780	9,060	1,03618
9720	CNa 946	37,33	30,58	1,207	0,75583
9721	CNa 947	44,42	12,65	3,471	0,80251

1-δ-errors: Rb^{87}/Sr^{86}: 1 %
Sr^{87}/Sr^{86}: 0,05 %

	Slope	$(Sr^{87}/Sr^{86})_o$	χ^2-Test	Age Ma
Granodiorite	0,03411 ± 56	0,7112 ± 17	2,1	2362 ± 40
Granit-Pegmatite ohne 9721/CNa947	0,03650 ± 38	0,7101 ± 5	3,7	2525 ± 26

Decay constant: $\lambda_{Rb} = 1,42 \cdot 10^{-11}\ a^{-1}$

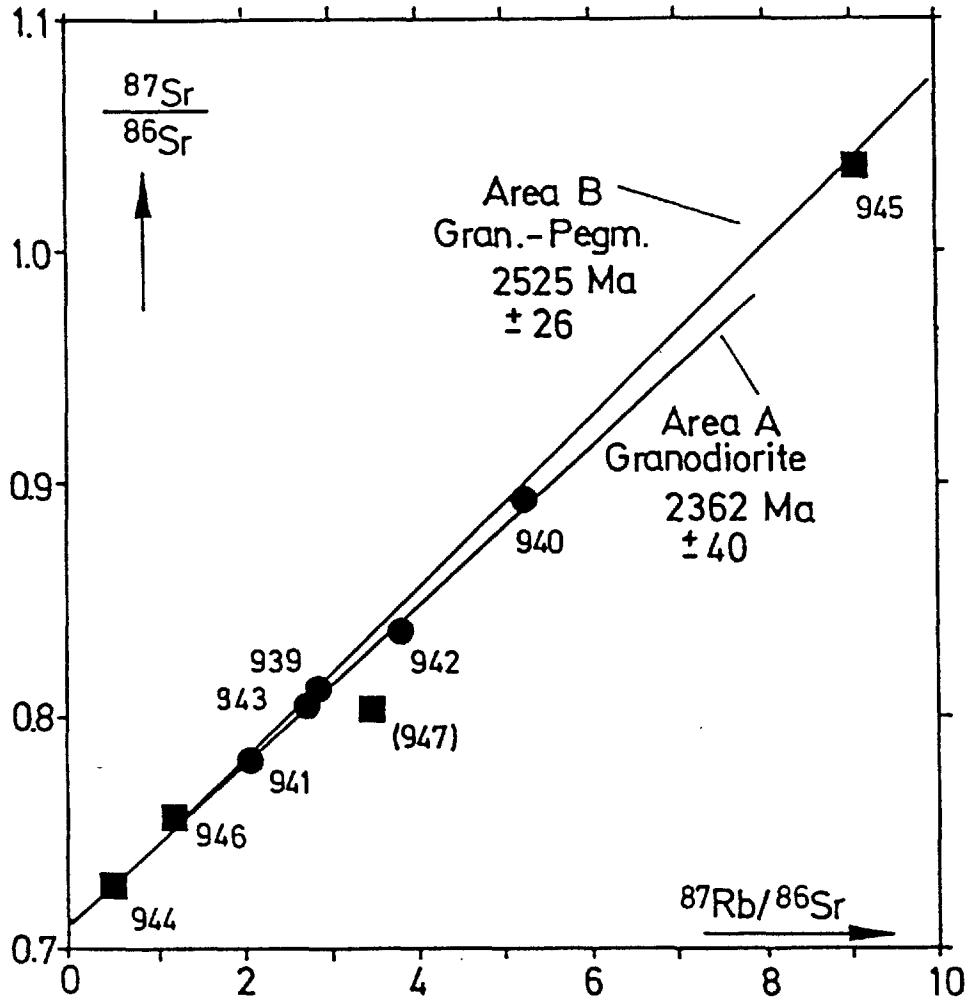
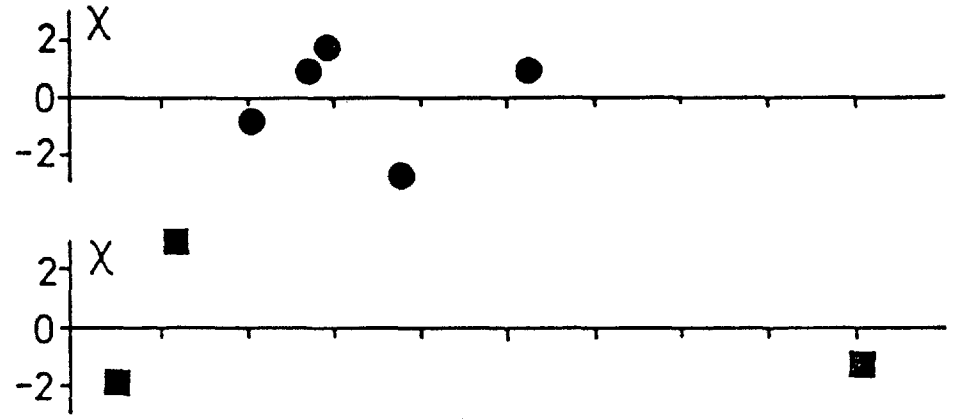


Fig.1: Rb/Sr Isochrone diagram



BGR - 4.13 Tab. 2 RF.-Analysen Hannover, den 4.2.1982

Einsender: Dr. Hoehndorf
Probenart: Granit,Gneis/Kanada
Konzentrationsangaben in Gew.-%

RF.Nr	Ab.Nr	Pr.Nr	SiO2	TiO2	Al2O3	Fe2O3	MnO	MgO	CaO	Na2O	K2O	P2O5	SO3	LOI	Summe
36714	31336	CNa 939	73.01	0.10	14.19	1.22	0.02	0.31	0.91	3.52	5.50	0.02	0.00	0.63	99.43
36715	31337	CNa 940	60.54	0.65	16.80	7.40	0.09	2.71	1.33	3.81	4.94	0.08	0.00	1.13	99.46
36716	31338	CNa 941	72.96	0.28	13.12	3.25	0.04	1.28	1.19	3.29	3.14	0.02	0.00	0.88	99.46
36717	31339	CNa 942	55.07	0.79	18.06	8.99	0.10	4.26	1.39	3.08	4.80	0.15	0.00	2.75	99.45
36718	31340	CNa 943	73.88	0.13	14.06	1.46	0.02	0.45	0.79	3.38	4.84	0.03	0.00	0.50	99.54
36719	31341	CNa 944	75.18	0.08	11.07	1.22	0.02	0.23	1.36	3.55	2.48	0.03	0.92	1.38	97.52
36720	31342	CNa 945	75.13	0.03	13.86	0.78	0.01	0.09	0.40	3.59	4.54	0.04	0.00	0.88	99.34
36721	31343	CNa 946	75.81	0.03	12.49	0.74	0.01	0.08	0.56	3.16	4.48	0.01	0.29	0.75	98.43
36722	31344	CNa 947	75.20	0.35	11.68	3.21	0.04	0.98	0.96	1.80	3.45	0.08	0.00	1.63	99.39

Analytiker: Lodziak/Requard

Sachbearbeiter: Raschka

BGR - 4.13 Tab. 2 (cont.) RF.-Analysen Hannover, den 10.2.1982

Einsender: Dr. Hoehndorf
Probenart: Granite, Gneis/Kanada
Konzentrationsangaben in ppm

RF.Nr	Ab.Nr	Pr.Nr	As	Bi	Cu	Mo	Nb	Ni	Pb	Rb	Sn	Sr	Ta	Th	U	W	Y	Zn	Zr
36714	31336	CNa 939	6	<6	10	<3	4	16	63	177	<20	184	<5	24	10	6	34	27	112
36715	31337	CNa 940	<5	6	18	6	17	80	37	286	<20	164	<5	29	18	<5	53	122	154
36716	31338	CNa 941	<5	<6	44	13	15	48	53	163	45	231	5	28	25	7	24	60	157
36717	31339	CNa 942	<5	<6	21	5	12	121	29	239	<20	187	<5	16	5	<5	24	144	133
36718	31340	CNa 943	<5	<6	31	4	8	16	48	172	<20	184	6	38	<3	10	50	28	181
36719	31341	CNa 944	6	<6	18	6	5	8	26	91	25	547	<5	26	14	7	23	8	51
36720	31342	CNa 945	8	<6	14	12	15	13	39	243	<20	78	<5	12	15	10	16	17	27
36721	31343	CNa 946	6	<6	16	6	5	15	43	142	27	339	<5	10	21	9	31	10	24
36722	31344	CNa 947	12	<6	11	<3	4	33	10	164	<20	135	<5	7	13	7	11	32	112

Analytiker: Lodziak/Requard

Sachbearbeiter: Raschka

APPENDIX 6

GEOCHEMICAL SAMPLE DATA

-He in Drill Hole Waters
-He in Soils

DRILL HOLE WATER

Sample Number	Station	Date	(m) Depth	Temperature Water	Temperature Air	Pressure (mb)	Helium Concentration (manoliters He per liter water)
	Lorenz Gully Grid						
LG-1	7+05W, 22+09N	25/8/82	83.2	6	14	952	22,100
Lg-2	7+16W, 21+82N	24/8/82	80.2	5	12	951	1,750
LG-4	6+97W, 22+02N	25/8/82	69.5	6	14	952	574
LG-5	6+73W, 22+43N	25/8/82	83.2	6	13	952	76
LG-6	7+01W, 22+72N	25/8/82	57.9	6	12	951	90
LG-8	7+25W, 22+00N	24/8/82	50.3	5	12	951	15,100
LG-10	7+25W, 22+00N	24/8/82	28.3	5	12	951	382
LG-13	6+53W, 21+77N	25/8/82	49.7	5	10	951	82
LG-14	7+85W, 22+47N	25/8/82	67.4	5	13	950	3,500
LG-16	6+45W, 21+00N	25/8/82	59.4	5	12	951	77,300
LG-17	6+88W, 21+28N	25/8/82	96.3	5	12	951	3,600
LG-19	2+85W, 19+85N	25/8/82	75.6	5	11	950	22,200

Track Etch, Helium, Soil Survey

LEGEND

TOPO :

TOP OF HILL	1
STEEP SLOPE	2
SHALLOW SLOPE	3
DEPRESSION	4
RIVER BANK	5
BOULDER FIELD	6

SOIL : Veget —

CONIFER	1
ALDER	2
SWAMP	3
BARREN	4

Color —

WHITE	1
BUFF	2
YELLOW	3
ORANGE	4
PINK	5
RED	6
BROWN	7
DARK BROWN	8
BLACK	9
GREY	10

GRAIN SIZE :

CLAY	1
SILT	2
FINE SAND	3
COARSE SAND (Including Pebbles)	4

DATE : INSTALLED, REMOVED > Track Etch

SAMPLING He , Soil

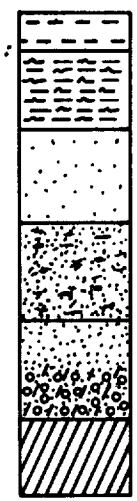
GRID : N: Northing

E: Easting

SOIL TEMP : (c°)

AIR PRESSURE : (m b)

HORIZON :



- A_0 — Partly Decomposed Organic Debris
- A_1 — Humus. Zone of Organic Accumulation. Dark Colored
- A_2 — Zone of Leaching (Eluviation). Light Colored
- B — Zone of Accumulation (Illuviation) Brown to Red — brown . Compact
- C — Zone of Weathering Bedrock. Vestigial Bedrock Structures
- D — Bedrock

% of ORGANICS :

T.E. CUP : TRACK ETCH CUP #

CPS : COUNTS/SECOND (SPP-2 NF)

File/Doss. No. 25

S O I L S

Sample Number	Station	Date	Topography	Vegetation	Horizon	Color	% Organics	Grain Size	Depth (m)	Temperature Soil	Temperature Air	Pressure (mb)	Helium Concentration (manoliters He per liter mud)
LC-0	0+00E,34+55N	30/8/82	5	1	B	7	80	1	0.5	8	10	957	173
LC-4	4+00E,36+00N	"	1	1	A_1	8	90	2	0.5	8	10	957	104
LC-6	6+00E,36+85N	"	3	1	A_1	8	90	2	0.5	8	10	957	120
LC-8	8+00E,37+65N	"	3	1	A_1	8	80	2	0.5	8	11	957	99
LC-10	10+00E,38+75N	"	4	1	A_1	8	80	1	0.5	8	11	957	22
LC-12	12+00E,39+40N	"	3	1	B	7	60	1	0.5	9	12	957	120
LC-14	14+00E,40+30N	"	3	1	B	7	60	1	0.5	9	12	957	75
LC-16	16+00E,40+00N	"	3	1	B	7	60	1	0.5	8	11	957	98
LC-18	18+00E,42+00N	"	1	1	A_1	8	80	2	0.5	8	11	957	62