QUESTOR SURVEYS LIMITED

AIRBORNE GAMMA RAY SPECTROMETER SURVEY

AREA 1970 - 36B

HORNBY LAKE AREA

ONTARIO

PREPARED FOR

COCHENOUR EXPLORATIONS LIMITED

SEPTEMBER 1970
The gamma ray spectrometer channels show an increase in the count rate upwards and the altimeter channel shows an increase in terrain clearance upwards. The altimeter scale is not linear; an example is shown at the end of this report.

**SURVEY PROCEDURE**

An approximate speed of 90 miles an hour was used at a terrain clearance of 250 feet. A normal S-pattern flight path with 1/2 mile turns was employed. An equipment operator monitored the instruments and logged the flight details. Navigational mosaics at a scale of 1" = 1/4 mile were used for control.

**MAP COMPILATION**

The base maps are uncontrolled mosaics constructed from 1" = 1 mile National Air Photo Library photographs. These mosaics were reproduced at a scale of 1" = 1/4 mile on stable transparent film from which white prints can be made.

The profile maps are on white transparent overlays. Flight path recovery was accomplished by comparison of the prints of the 35 mm camera film with the mosaic in order to locate the fiducial points.

**DATA PRESENTATION**

Symbols used to designate the uranium anomalies are shown on each map sheet. Widths of the anomalies have been approximated by taking 1/2 peak width points of the anomaly curve. Narrow anomalies are represented by the anomaly symbol alone since 1/2 peak width points would lie within the bulls-eye symbol. All the anomalies are listed on data sheets at the end of this report. In addition to the positions, widths and values of the uranium anomalies, also listed are the corresponding thorium, potassium, total count and altimeter values. A circle around the bulls-eye symbol indicates a uranium-thorium ratio equal to or greater than 2. Uranium and thorium profiles have been plotted along the flight lines on an overlay. The uranium and thorium values have been squared.
INTRODUCTION

Questor Surveys Limited performed a gamma ray spectrometer survey totalling 430 line miles in the Hornby Lake Area on August 23, 1970. A Beaver (CF-JKG) on floats was utilized for the survey and the operating base was Deer Lake, Ontario. A line spacing of 1/8 mile was used. An area outline is shown at the end of this report; this is part of the National Topographic Series sheet number 53C.

EQUIPMENT

The aircraft was equipped with an Exploranium Corporation DGRS-1000 four channel differential gamma ray spectrometer and a Bonzer radar altimeter was used for vertical control. The outputs of these instruments together with fiducial timing marks were recorded on an MFE (Mechanics for Electronics) recorder using heat sensitive paper. A 35 mm continuous strip film camera was used for recording the actual flight path.

Three 6" x 4" Sodium Iodide crystals were used to detect the gamma rays, and a source of cesium 137 was used as reference for the Spectrum stabilizer. The window widths of the differential analysers were set at 12 1/2% of the energy peaks of bismuth 214, thallium 208 and potassium 40. For example, bismuth 214 has an energy peak of 1.76 Mev and therefore the window width is 2.20 Kev.

The sensitivity of the potassium, thorium and uranium channels was set at 1 cm = 20 count/second and the total count at 1 cm = 160 counts/second.

A time constant of two seconds was used. Spectral interaction was eliminated by the use of subtraction circuits.

The channel positions from top to bottom are:

Altimeter
Total Count
Thorium
Uranium
Potassium
RESULTS

It has been shown in several case histories that uranium-thorium and uranium-potassium ratio maps are extremely helpful in the discrimination of uranium anomalies. Care must be taken, however, that discrimination is used only to eliminate outcrop and not legitimate uranium anomalies with thorium and/or potassium association. It has been proven that the count rate of potassium and thorium generally increases sympathetically with the uranium count. Anomalies may also result when altitude decreases. These, however, are easily recognized and can be eliminated.

Anomalies arise from several sources. One of these is from actual deposits of uranium or pitchblende. Others may result when passing over boulder fields, or when passing over outcrop after flying over covered areas. Geologic contacts may also be spotted such as between sandstone and granite. The background is much higher and more erratic over granitic areas.

As mentioned earlier, the high ratios of U-Th and U-K are important and they could well indicate a deposit of uranium or pitchblende. In addition, however, small subtle changes in the uranium count rate may be significant in that they may indicate an interesting area where no specific anomalies have actually been picked up. The aircraft has to pass directly over a deposit to obtain maximum results. Thin covers of overburden may also reflect the rock types below the surface which is the reason that the background readings do not fall to the minimum over covered areas.

BRIEF DESCRIPTION OF THEORY INVOLVED

Uranium 238, uranium 235 and thorium 232 are long lived alpha emitters and together with potassium 40 (gamma emitter), they contribute all the natural environment radiation.

Uranium 238 is measured indirectly from bismuth 214 which is a gamma emitter. Similarly, thorium 232 is measured indirectly from thallium 208, also a gamma emitter. Bismuth 214
and thallium 208 are daughter products of uranium 238 and thorium 232 respectively. Potassium, however, is measured directly from potassium 40.

Bismuth 214 and thallium 208 were selected because their energy peaks are above the 1 Mev level and in airborne applications energies below 1 Mev are difficult to resolve. Equilibrium in the decay series must be present in the U and Th series to give an accurate indication of uranium and thorium. This equilibrium is assumed to be present in our surveys as no indication to the opposite has evolved.

Detection of gamma rays is by means of the Sodium Iodide thallium activated crystals which emit light when a gamma particle is absorbed by them. Photo multiplier tubes pick up the light and produce electric pulses which are proportional to the incident light. These electric pulses are integrated and recorded on the analog chart.

Discrimination to the various channels is by means of the gated windows which are positioned to sample the energies of potassium, thorium and uranium.

**DISCUSSION OF THE RESULTS**

In general, the profile maps correspond favourably with the anomaly map. To accentuate the anomalous zones and suppress the background, the thorium and uranium values have been squared and plotted on a scale of 1" = 400 counts/second. This presentation facilitates the selection of anomalies for ground investigation and could possibly extend the known occurrences of U₃O₈. Since the client is more familiar with the geology in the area concerned and with the occurrences of U₃O₈, no attempt is made by the writer to discriminate the uranium anomalies and make specific recommendations for a ground investigation programme.

It is suggested, however, that a correlation be made with the known deposits and the gamma ray spectrometer survey to select other anomalies which are similar. It is felt that the most important uranium anomalies are those that do no have a
corresponding thorium response. This, however, should be substantiated with the knowledge that is in the hands of the people making the investigation.

Since the anomalous areas are small in extent, it is recommended that all of the anomalous zones be given an investigation on the ground.
June 21, 1971

NOTIFICATION OF RECORDING OF ASSESSMENT WORK CREDITS

Date of Recording of Work: June 17, 1971
Recorded Holder: Coin Lake Gold Mines Limited
Township or Area: Hornby Lake, Area M, 2172 & Kennedy Lake, Area M, 3029

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NOTICE TO RECORDED HOLDER

Survey reports and maps in duplicate must be submitted to the Projects Section, Toronto within 60 days from the date of recording of this work.

Reports and maps are being forwarded to Projects Section with this letter.

P. T. Thompson
Mining Recorder.

cc. Coin Lake Gold Mines Limited

August 6.
TECHNICAL ASSESSMENT WORK CREDITS

Recorder Holder: Coin Lake Gold Mines Ltd.

Township or Area: Hornby and Kennedy Lakes.

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NOTICE OF INTENT TO BE ISSUED

☐ Credits have been reduced because of partial coverage of claims.

☒ Credits have been reduced because of figures of applicant.

☐ NO CREDITS have been allowed for the following mining claims as they were not sufficiently covered by the survey:

<table>
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<th>Mining Claims</th>
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<td>KRL 201850 to 65 incl.</td>
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<tr>
<td>237358 to 414 incl.</td>
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<tr>
<td>237417 to 22 incl.</td>
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<td>280565 to 76 incl.</td>
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The Mining Recorder may reduce the above credits if necessary in order that the total number of approved assessment days recorded on each claim does not exceed the maximum allowed as follows: Geophysical – 80; Geological – 40; Geochemical – 40;
Kennedy Lake Area - M.3029

Hornby Lake

District of Kenora (Patricia Portion)
Red Lake Mining Division

Scale: 1-Inch = 40 Chains

Legend:
- Patented Land
- Crown Land Sale
- Leases
- Located Land
- Mining Rights Only
- Surface Rights Only
- Roads
- Improved Roads
- Kings Highways
- Railways
- Power Lines
- Marsh or Muskeg
- Mines
- Cancelled

Notes:
400 Survey Rights Reservation around all lakes and rivers.

Date of Issue: Jul 21, 1971

Ontario Department of Mines and Northern Affairs

National Topographic Series 53C
Plan No. M.-2172
URANIUM/THORIUM PROFILE MAP
Surveyed for:
COCHENOUR EXPLORATIONS LTD.
HORNBY LAKE AREA
Scale—1 inch : 1 miles
Legend
URANIUM
THORIUM
— absolute Values squared
Profile Seal*: 1 inch s 400 counts per t
Drawn By
Data Plotting
Dates Flown
Aug 1970
Flight Path Recovery
J.W.D. - M.C.
Data Reduction
M.C.
Completed
Sept 22, 1970
File No.
1970-36 SP
GAMMA RAY SPECTROMETER SURVEY
URANIUM/THORIUM PROFILE MAP
FMgM Path Recovery
Surveyed for:
COCHENOUR EXPLORATIONS LTD
HORNBY LAKE AREA