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CHARLES LAKE URANIUM PROJECT

(QUARTZ MINERAL EXPLORATION PERMIT NO. 61)

DYNALTA OIL & GAS CO. LTD.
Calgary, Alberta

August, 1969

R.M.P. Jones,
P. Geol.

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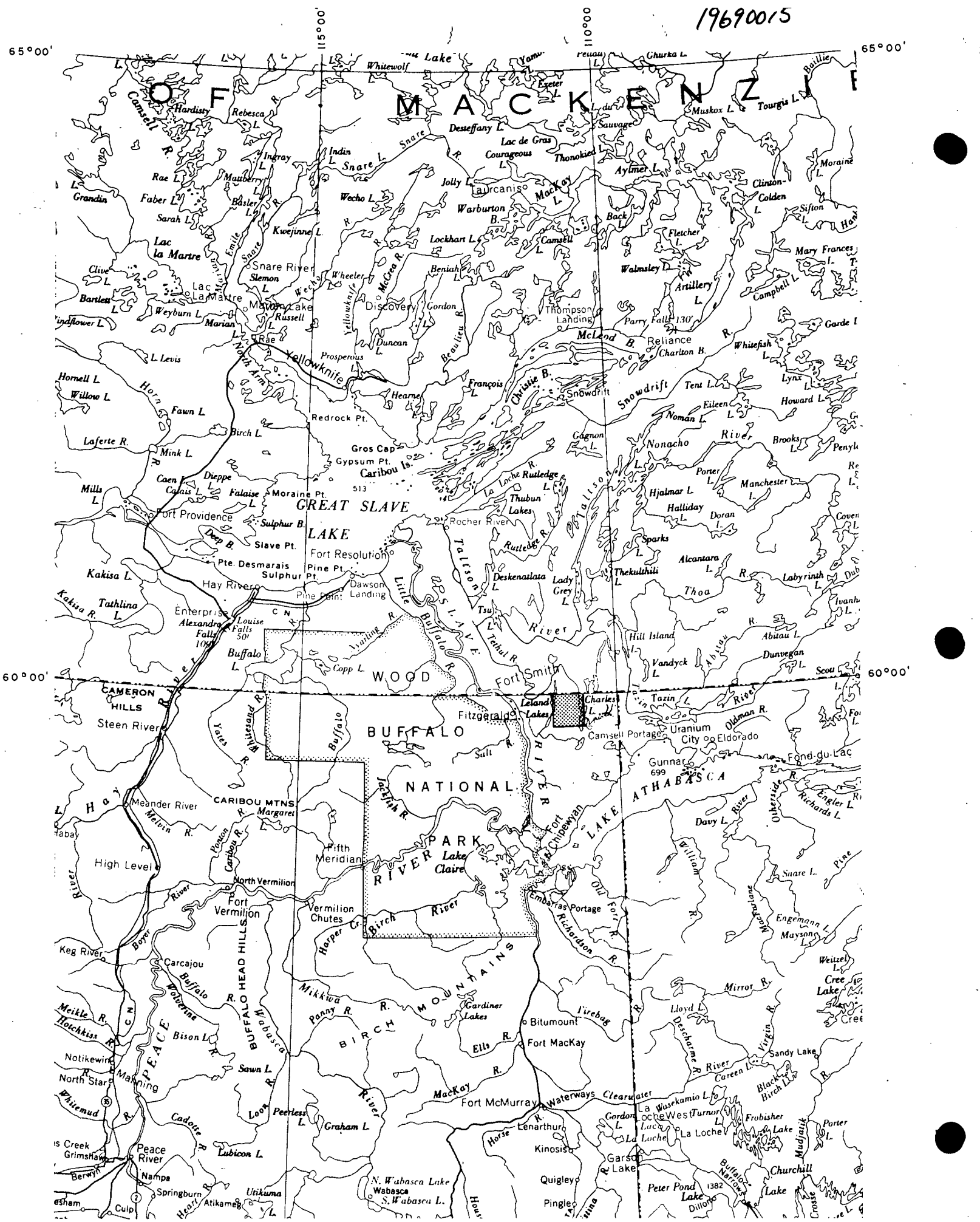

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CHARLES LAKE PROJECT

MAP NO. 1

INTRODUCTION

This project was planned as an aeroradiometric survey of a north-south trending area of igneous and highly metamorphosed Precambrian sediments lying west of Charles Lake in northeastern Alberta. A brief ground check was to be made to evaluate a few of the better anomalies.

The aeroradiometric program was started on June 10th and finished on June 21st, 1968. The party consisted of five men - an air crew comprising pilot, navigator and instrument operator, and a geologist and draftsman on the ground.

Aeroradiometric survey equipment and procedures are described in Appendix A.

A day (June 23rd) was also spent checking several of the anomalies found in the survey by two geologists, one of whom was also supervising the aeroradiometric program. They used a Sharpe GIS-2 portable spectrometer and operated from a Cessna 185 aircraft, equipped with wheels and amphibian floats, and with the Robertson STOL (short takeoff and landing) wing conversion.

BACKGROUND ON PROJECT AREA

Location and Access

The project lies in the extreme corner of northeastern Alberta between Latitude 59°45' to 60°00' North and Longitude 110°00' to 111°00' West, with Permit No. 61 in the northwestern portion of the area.

The area is readily accessible for survey flying from the Fort Smith Airport.

Access for development would probably be initially by float plane. (The project area would be about 40 to 50 miles from the Slave River or Lake Athabasca.) However, a road survey is aparently being made east of the Slave River at Fort Smith probably to terminate in Fort Reliance or possibly Uranium City. It is reported that a photo study has already been made by the Federal Government of the route to Fort Reliance.

Geology

Sediments in the northeast corner of Alberta consist mainly of granites - often porphyritic, granite gneisses, metamorphosed sediments (quartzites and schists), mylonites and minor amphibolites.

There are a number of apparently major north-south faults and several northwest-southeast faults. The north-south faults are marked by strongly mylonitized zones.

Mineralization

Molybdenite is found in several occurrences to the east of the Permit (near Andrew Lake area), possibly in association with the Bonny northwest-southeast Fault. Arsenopyrite and minor chalcopyrite have also been found in the general area. No mineral occurrences - other than radioactive - have been noted within Permit No. 61.

Radioactive Occurrences

Radioactive occurrences (probably uranium) have been noted in the general area particularly along the Bonny Fault where (apparently) McIntyre Porcupine are doing some drilling. Within or near Permit No. 61, two radioactivity shows were noted in the granite west of Charles Lake, one west of Selwyn Lake in the quartzite, and two northwest of Dawson Lake in or near the quartzite.

References

1. Geological Survey of Canada Preliminary Map 10-1959 (Fort Fitzgerald, 4 mile, G.C. Riley, 1960).
2. Research Council of Alberta, Geological Division Bulletin No. 1 - "Aerial Photographic Interpretation of Precambrian Structures North of Lake Athabasca" (J.D. Godfrey, 1958).
3. Research Council of Alberta Preliminary Report 58-3 - "Geology of the Andrew Lake, North District" (J.D. Godfrey, 1961).
4. Research Council of Alberta Preliminary Report 58-4 - "Mineralization in the Andrew, Waugh and Johnson Lakes Area, Northeastern Alberta" (J.D. Godfrey, 1958).

5. Research Council of Alberta Preliminary Report 61-2 - "Geology of the Andrew Lake, South District, Alberta" (J.D. Godfrey, 1963).

6. Research Council of Alberta Preliminary Report 62-1 - "Geology of the St. Agnes Lake District, Alberta" (J.D. Godfrey, E.W. Peikert, 1963).

7. Research Council of Alberta Preliminary Report 62-2 - "Geology of the Colin Lake District, Alberta" (J.D. Godfrey, E.W. Peikert, 1964).

8. Research Council of Alberta Preliminary Report 65-6 - "Geology of the Bayonet, Ashten, Potts and Charles Lakes District, Alberta" (J.D. Godfrey, 1966).

9. Geological Survey of Canada, Geophysics Paper No. 7161 (Fitzgerald, 4 mile, Airborne Magnetic Series).
(N.B. - This area also available on 1" = 1 mile airborne magnetometer sheets.)

RESULTS

Aeroradiometric Survey (For details on airborne anomalies, see Appendix B.) The aeroradiometric survey covered a total of 450 surveyed flight miles on one-quarter mile spacing.

A total of 194 individual anomalous high kicks or zones of related high kicks were recorded (see Map No. 2 opposite Page 11). A reading on the tape was considered anomalous if it registered 50 counts per second or more on the uranium log above the background which, in this case, was about 25 counts per second, i.e. anomalies were only considered that registered three times background or more. This rather high criteria of 50 counts per second excess uranium over background used in anomaly selection was found necessary as the "noise" kick or apparent meaningless variation in background appeared to run well above 25 counts per second above background. However, a number of clean kicks running less than 50 counts per second above background have been plotted on the maps and are noted in Appendix B as it was thought they might have some significance in extending the radiation patterns around the main anomalies.

Geologically, the rocks in this anomalous area are mapped as mainly porphyritic red granites. They vary from coarse to fine grained, and are foliated and lineated - possibly gneissic. The aeromagnetic map (Geophysics Paper 7161 Aeromagnetic Series) shows a prominent fault zone (the Warren Fault) directly west of this anomalous area. High magnetic values are also

present on the east in the Mercredi Lake area, with the trend running north-south.

This northwestern portion of the Charles Lake project can be summed up as a region containing numerous local areas of high radioactivity, many of which persist up to a mile in length along the flight lines. Much of this radioactivity is due to thorium but many areas also exhibited quite high uranium anomalies.

Ground Reconnaissance (For details, see Appendix C.)

This ground check was severely limited by time, but during the course of a single day, five anomalies were visited in two separate areas.

CONCLUSIONS AND RECOMMENDATIONS

The very numerous anomalies of both uranium and thorium in the northwestern part of the project single it out as an area well worth a detailed investigation. While the content of radioactive material in the rocks examined in the very brief one day ground check was not ore grade, it must be remembered that the aeroradiometric survey is probably, in practice at least, more qualitatave than quantitative. The very widespread nature of low grade uranium and thorium radioactivity makes it logical that detailed spectrometer measurements plus geologic mapping be conducted to find any uranium concentrations.

With this in mind, the following recommendations are made:

1. That complete flight line recovery of this area be made on photomosaics or air photographs in this recommended area.
2. That a detailed ground examination be made of all anomalies using radio metric equipment and mapping the geology.
3. That further exploration would naturally be based on this ground examination.

[redacted]

August, 1969

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APPENDIX "A"

AERO-RADIOMETRIC SURVEY EQUIPMENT AND PROCEDURES

The reconnaissance aero-radiometric survey was executed using the following equipment installed in a Beechcraft Baron twin-engined aircraft.

1. Dual Scintrex SC-1 single channel, threshold-type, integral spectrometers were employed. One of these was set with its threshold at about 1.65 MeV level, i.e. to exclude all K40 gamma radiation but to accept uranium and thorium radiation. The threshold of the second SC-1 was set at about 2.50 MeV level, i.e. to exclude all K40 and uranium energy but to accept the higher energy thorium radiation. By means of an analogue computer network the output of the second SC-1 was used to "strip", from the output of the first SC-1 the gamma radiation component due to thorium, thus leaving only uranium radiation. In this fashion two channels of information are recorded, one reflecting only uranium gamma radiation and the second only thorium radiation.

   The sensor-detector system for the dual channel spectrometer consisted of three matched thallium-activated sodium iodide crystals 4" in thickness by 5" in diameter each coupled to a photomultiplier tube assembly.

2. Bonzer radio altimeter. This was fed into an encoder which converted the altimeter output from analogue form to a series of timed impulses. The pulse interval is proportional to the altimeter output, i.e. to the height of flight.

3. Moseley two-channel graphic recorder, each channel recording one channel of the spectrometer output. The radio altimeter output pulse train was expressed by one side-pen marker.

4. Vinten 16 mm continuous recording positioning camera.

5. Intervalometer synchronizing the camera exposures and one side-pen marker on the Moseley trace.

The following survey specifications were employed:

a) Spectrometer time constant - 1 second.

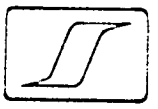
b) Mean survey terrain clearance - 150 ft.

c) Mean survey velocity - 170 m. p. h.

d) Mean reconnaissance line spacing - 2 miles.

In order to check on the complete system conditions a standard sample of refined Th was placed in a standard position relative to the detector heads approximately once per hour. In addition a "zero drift" check was made at the same time and with the same frequency.

The flight crew consisted of a pilot, navigator, and instrument operator. Whereas the continuous strip 16 mm camera film provides a precise record of the aircraft survey path, the navigator, for expediency, also makes a record of visual "fixes" on his navigation plan (National Topographic Plan on scale 1" = 4 miles) and on the Moseley chart. These visual fixes have been employed for the actual reconnaissance flight path recovery, as the abundance of easily recognizable land features renders this form of recovery both adequate and expeditious for the widely spaced reconnaissance lines. It has been planned that, for the detail flying at more closely spaced intervals, the photographic



flight path recovery would be employed as a matter of routine.

There is no easy quantitative relationship between the observed counts per second output of the gamma ray spectrometer and the grade in U or Th of the source material. Factors such as the geometry of the source, its position and distance relative to the detector, the amount and nature of the surface cover and leaching, etc., will all markedly affect the observed response. Only minimum grades, assuming very broad disseminations (semi-infinite case) can be established. For example, with the present equipment, it is estimated that 0.01% U will give rise to about 300 c.p.s. on Channel 1 and 0.01% Th will give rise to about 100 c.p.s. on Channel 2.

On this basis, a doubling of the usual background count levels could be caused by a uniform dissemination of as little as .0001% U or Th (1 part per million). This testifies to the high degree of sensitivity of this detection system. Because of the various limitations mentioned above, the actual in-situ grade will usually be considerably in excess of this figure.

APPENDIX B - LIST OF ANOMALIES

CHARLES LAKE AERORADIOMETRIC SURVEY

Line No.	Surveyed Mileage	Film Roll No.	*List of Anomalies
			*First figure or figures represent the fiducial number or numbers on film and tape. Second figure (bracketed) represents the amount of excess uranium radiation in counts per second (cps.) above the background of 25 cps.
59- 1W	33.5	51	2920-2936-(>25<50), 2955-2970-(>25<50), 2995-3009-(>25<50), 3015-3036-(>50), 3050-3069-(>25<50), 3098-(51)
59- 2E	33.0	51	3390-3398-(>25<50), 3410-(56), 3453-(57), 3457-(53), 3460-(50), 3474-(61), 3479-(52), 3503-(53), 3569-(61), 3579-(73), 3585-(60), 3595-(58)
59- 3W	34.0	51	5556-(54), 5646-5670-(>25<50), 5693-5697-(>50), 5695-(91), 5723-5738-(>25<50)
59- 4E	33.0	51	6041-(56), 6069-6080-(>50), 6113-6117-(>50), 6140-(51), 6216-(51), 6229-(55), 6231-(50), 6234-(50), 6237-(50)
59- 5W	34.0	51	8194-(51), 8247-8273-(>50), 8266-(95), 8315-(55), 8329-8334-(>50), 8368-(51), 8375-(57), 8399-(50)
59- 6E	32.0	52	190-195-(>50), 200-(58), 251-(57), 255-(53), 330-335-(>50)
59- 7W	33.0	52	2159-(56), 2179-(52), 2210-(51), 2214-(60), 2233-2240-(>50), 2236-(77), 2282-(49), 2286-(47), 2335-(52), 2369-(69)
59- 8E	32.5	60	152-(35), 167-(37), 176-190-(>25 50), 223-(54), 233-(37) 281-288-(>50), 301-328-(>25<50), 352-377-(>25<50), 386-(36)
59- 9W	32.0	60	2158-(54), 2193-(55), 2197-2203-(>50), 2344-2364-(>25<50), 2400-2410-(>25<50), 2422-(41)
59-10E	32.0	60	2726-(72), 2815-(55), 2856-(51), 2880-(69), 2894-(65), 2928-2934-(>25<50)
59-11W	32.5	60	4750-(70), 4855-(55), 4914-(54), 4934-(50), 4937-(50), 5020-(39), 5032-5046-(>25<50)
59-12E	31.5	60	5292-(40), 5320-(40), 5340-(45), 5418-(47), 5473-5495-(>25<50), 5514-(41), 5524-(55), 5539-(45), 5557-(58)
59-13W	32.0	61	1031-(59), 1038-1043-(>50), 1147-(60), 1157-1178-(>25<50), 1191-1199-(>25<50), 1207-1220-(>25<50)
59-14E	32.5	61	534-(60), 593-615-(>25<50), 648-(73), 710-718-(>25<50)
59-15W	32.5	61	2670-(57), 2750-2755-(>25<50), 2813-(36), 2853-(37), 2883-(37), 2896-2902-(>25<50)
59-16E	33.0	67	334-(47), 360-(39), 372-380-(>25<50), 384-(46), 420-435-(>25<50), 492-528-(>25<50), 539-(64), 556-(55), 580-(62), 621-(63)

Line No.	Surveyed Mileage	Film Roll No.	List of Anomalies
59-17W	33.5	67	2506-2519-(>25<50), 2548-(50), 2588-(59), 2598-(47), 2636-(59), 2654-(46), 2675-(38), 2709-(54), 2725-(40), 2795-(35), 2799-(41), 2827-(40)
59-18E	33.5	67	3013-3023-(>25<50), 3039-3044-(>25<50), 3090-(55), 3128-3134-(>25<50), 3147-(52), 3160-(59), 3175-(60), 3189-(39), 3218-3234-(>25<50), 3251-(47), 3256-3265-(>50)
59-19W	34.0	67	5283-(65), 5325-(57), 5328-(52), 5402-(50), 5430-(63), 5433-(51), 5461-(45), 5472-5484-(>25<50), 5496-5508-(>25<50), 5515-5540-(>25<50), 5588-5608-(>25<50), 5621-(51)
59-20E	33.0	67	5809-(46), 5816-(42), 5847-(51), 5851-(50), 5884-(48), 5918-(40), 5933-(49), 5964-(50), 6004-(46), 6060-(56), 6089-(55), 6140-(56)
59-21W	33.0	67	8148-8155-(>50), 8174-8179-(>50), 8175-(76), 8188-8197-(>50), 8204-(51), 8205-(50), 8287-(52), 8288-(53), 8340-(52), 8416-(35)
59-22E	33.0	68	142-(35), 202-(34), 208-(36), 214-219-(>25 50), 240-246-(>25<50), 257-(40), 280-(52), 294-(63), 341-(54), 347-352-(>50), 363-(58), 432-445-(>25<50)
59-23W	33.5	68	2395-(66), 2454-(53), 2458-(56), 2504-(58), 2510-(60), 2545-2550-(>50), 2621-2628-(>25<50), 2704-2709-(>50), 2711-(53), 2715-(64)
59-24E	34.0	68	2885-(39), 2949-2956-(>25<50), 2977-2993-(>25<50), 3026-(67), 3126-3136-(>25<50), 3141-3147-(>25<50), 3178-(51), 3202-(61), 3252-(44)
59-25W	34.0	68	5316-(53), 5330-(59), 5353-5363-(>50), 5371-5380-(>50), 5408-(83), 5429-(54), 5475-(52), 5485-(54), 5508-(55), 5550-(56), 5580-5588-(>25<50), 5608-(47), 5619-5631-(>25<50), 5665-5670-(>25<50)
59-26E	33.5	69	347-359-(>25<50), 373-(39), 379-(45), 424-(52), 440-(60), 449-(55), 457-(65), 466-(63), 476-(53), 509-(51), 540-551-(>50), 564-(63), 594-(60), 603-614-(>50), 606-(80)
59-27W	33.5	69	2664-(36), 2771-2778-(>50), 2803-(55), 2831-(62), 2862-2867-(>50), 2915-(51), 2945-(61), 2956-(53), 3009-(61), 3016-(55)
59-28E	27.0	69	3238-3245-(>50), 3258-3262-(>50), 3283-3301-(>50), 3316-(59), 3336-(64), 3380-(53), 3413-(55), 3418-(51), 3448-(52)
59-29W	33.5	69	5399-5408-(>25<50), 5442-(57), 5520-(59), 5542-5551-(>50), 5545-(85), 5578-(55), 5588-5598-(>50), 5595-(85), 5613-(54), 5620-(61), 5629-(63), 5635-(60)
59-30E	33.5	74	173-(52), 193-(50), 228-(53), 244-(69)

59-31W	34.0	74	2362-(62), 2404-(60), 2461-(50), 2469-(53), 2507-(56), 2568-(54), 2575-(52), 2605-(53)
59-32E	31.5	74	2749-(50), 2802-(58), 2824-(66), 2851-(56), 2912-2921-(>25<50), 2956-(51), 3045-(50), 3056-(50), 3068-(55)
59-33W	33.0	74	5002-5009-(>25<50), 5050-(55), 5061-(56), 5079-(59), 5100-(74), 5119-(56), 5155-(58), 5162-(56), 5184-(50), 5195-(51), 5228-(54), 5243-(73), 5290-(64), 5324-(60)
59-34E	32.0	74	5488-(51), 5518-(57), 5536-(57), 5559-(58), 5575-(76), 5586-(53), 5612-(50), 5672-(115), 5683-(58), 5685-(53), 5745-(70)
59-35W	32.0	74	7727-(57), 7750-(50), 7759-(55), 7786-(50), 7800-7821-(>25<50), 7850-7867-(>25<50), 7870-7892-(>25<50), 7913-(55), 7916-(59), 7940-(55), 7961-(59)
59-36W	15.0	75	461-490-(>25<50)
59-37E	19.0	75	1045-(40), 1086-(42)
59-38W	17.0	75	
59-39E	16.0	75	2375-(47), 2405-(47)
59-40W	18.0	75	3642-(54), 3652-(55)
59-41E	19.0	75	

APPENDIX C - DETAILED ACCOUNT OF GROUND RECONNAISSANCE
(See Map No. 2)

On June 23rd, 1968, an area on Line No. 59 - 34E, with an airborne anomaly of 115 cps., was traversed on the northeastern shore of a small lake using a GIS-2 spectrometer. Here the rock consisted of a fine to medium grained porphyritic granite with readings of 10 to 11 counts per second on a threshold setting of 5.00 (UTh). At Location No. 1 (shown on Map No. 2), higher readings were obtained as follows:

Threshold Setting 5.00 (UTh) - 24 cps; Background - 4 cps.

Threshold Setting 7.65 (Th) - 7 cps; Background - 2 cps.

Using the formula:

$$\% \text{ Uranium} = \frac{(CPS_{UTh} - BGCPS_{UTh}) - 2.7\ (CPS_{Th} - BGCPS_{Th})}{830}$$

the rock (a finer grained red granite) calculated out at 0.008% uranium. The area of the airborne anomaly appeared to mark the contact between two different types of rock - a porphyritic granite with readings of 10 to 11 cps. to the west, and the red granite with 20 - 25 cps. (Near the lake shore itself, there was also a small diorite area with counts of 4 - 5 cps.) The high ridge close to the lake shore may have had a topographic effect on the airborne readings. Going east, the high counts continued with Location No. 2 giving similar readings of 23 cps. on 5.00 (UTh) setting and 8 cps. on 7.65 (Th) setting. This was also a red granite with a fairly high mafic content.

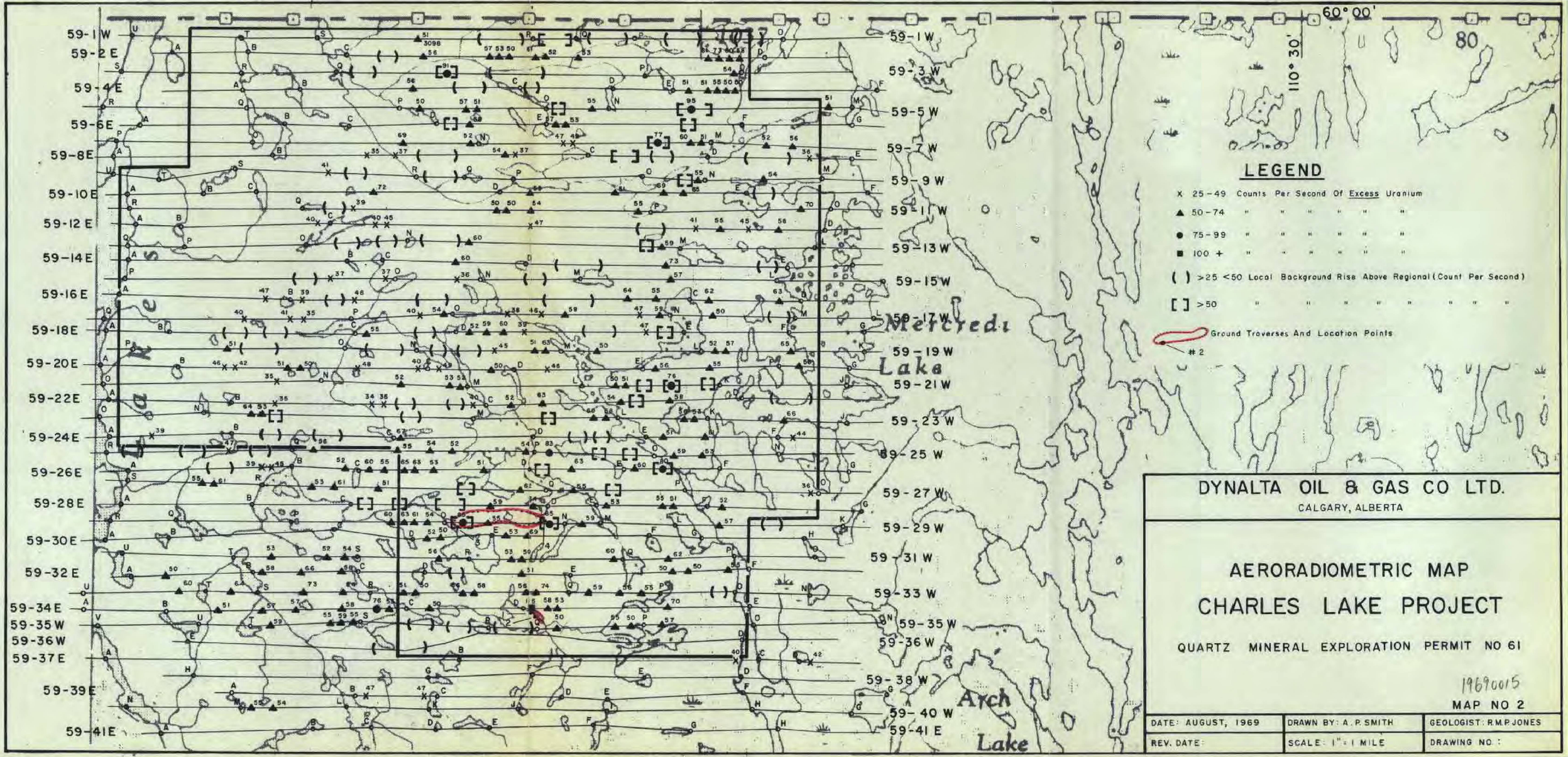
A second area was also examined from another small lake about a mile and a half north-northwest of the first area. The area lies along Line No. 59-29W.

The rocks were mainly pink porphyritic granite (which gave the background readings shown below), and over a few square feet, a finer granite was found surrounded by the more common, coarser porphyritic type. Readings on the fine granite were as follows:

Threshold Setting 5.00 (UTh) - 20 cps; Background - 3 cps.

Threshold Setting 7.65 (Th) - 5 cps; Background - 1 cps.

The traverse was continued due east along Line No. 59-29W as far as Location No. 4. At this point, a reading of 15 cps. on 5.00 (UTh) setting and 3 cps. on 7.65 (Th) setting was obtained. Rock type was a dark grey ?gneiss with porphyroblasts of pink potash-feldspar. No other significant readings were obtained, though a number of granite ridges and outcrops lying between the two location points were covered twice during this traverse.



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AERORADIOMETRIC MAP
CHARLES LAKE PROJECT

QUARTZ MINERAL EXPLORATION PERMIT NO 61

19690015

MAP NO 2

DATE: AUGUST, 1969	DRAWN BY: A. P. SMITH	GEOLOGIST: R.M.P.JONES
REV. DATE:	SCALE: 1" = 1 MILE	DRAWING NO.:

QUARTZ MINERAL EXPLORATION PERMIT No. 61

19690015