MAR 19690033: NORTHEASTERN ALBERTA

Received date: Dec 31, 1969

Public release date: Jan 01, 1971

19690033

Alberta Mineral Deposits and Occurrences

Commodity: Uranium *NTS Area:* 74L/15 *DepN* IE13195

Name: Hammer Lake *Map Symbol:*

DLS Coordinates: LSD Sec 9 Tp 113 R 8 Mer 4 *Status:* Showing

UTM Coordinates: *Easting:* 503171 *Northing:* 6517576

Nature of Deposit: Drill core and assays *Size Classification:* small

Geological Formation: Granitized sediments with occasional biotite *Age:* Precambrian

Economic Use:

Description of Deposit:

Surface Autunite mineralization with Uranospathite just below the surface of syenite pegmatite rock. Previously surface blasted with 2 diamond drill holes (New Delhi Mining Ltd.?). The main are is 200' N30E and 76' wide within a 10,000 cpm area. Background is 1,000 cpm

Chemical Analysis: Average 0.064% U3O8 with 0.03% Thorium.

Mineral Analysis:

Geophysical Survey: Airborne gamma ray spectrometry with ground scintillometer testing.

Geochemical Survey:

Recoverability: *Accessibility:* Withing 1 mile of lake

Owner or Operator: North Canadian Oils Ltd.: Quartz Mineral Permit #105

Development: Lease taken.

References: A.G.S. Mineral Assessment File: U-AF-063(1), U-AF-063(2)

19690033

ECONOMIC MINERALS
FILE REPORT No.
U-AF-061(1)

U-AF-062(1)
U-AF-063(1)
U-AF-064(1)
U-AF-065(1)
U-AF-066(1)

700102
700103
700105
700107
700108

INDEXING DOCUMENT NOS. 700110

A REPORT ON A

HELICOPTER BORNE

GAMMA RAY SPECTROMETER SURVEY

QUARTZ MINERAL PERMITS

103, 104, 105, 106, 107 and 108

NORTHEASTERN ALBERTA

FOR

NORTH CANADIAN OILS LIMITED

640 - 7 AVENUE S.W.

CALGARY, ALBERTA

by

JOHN T. COOK, P. GEOL.

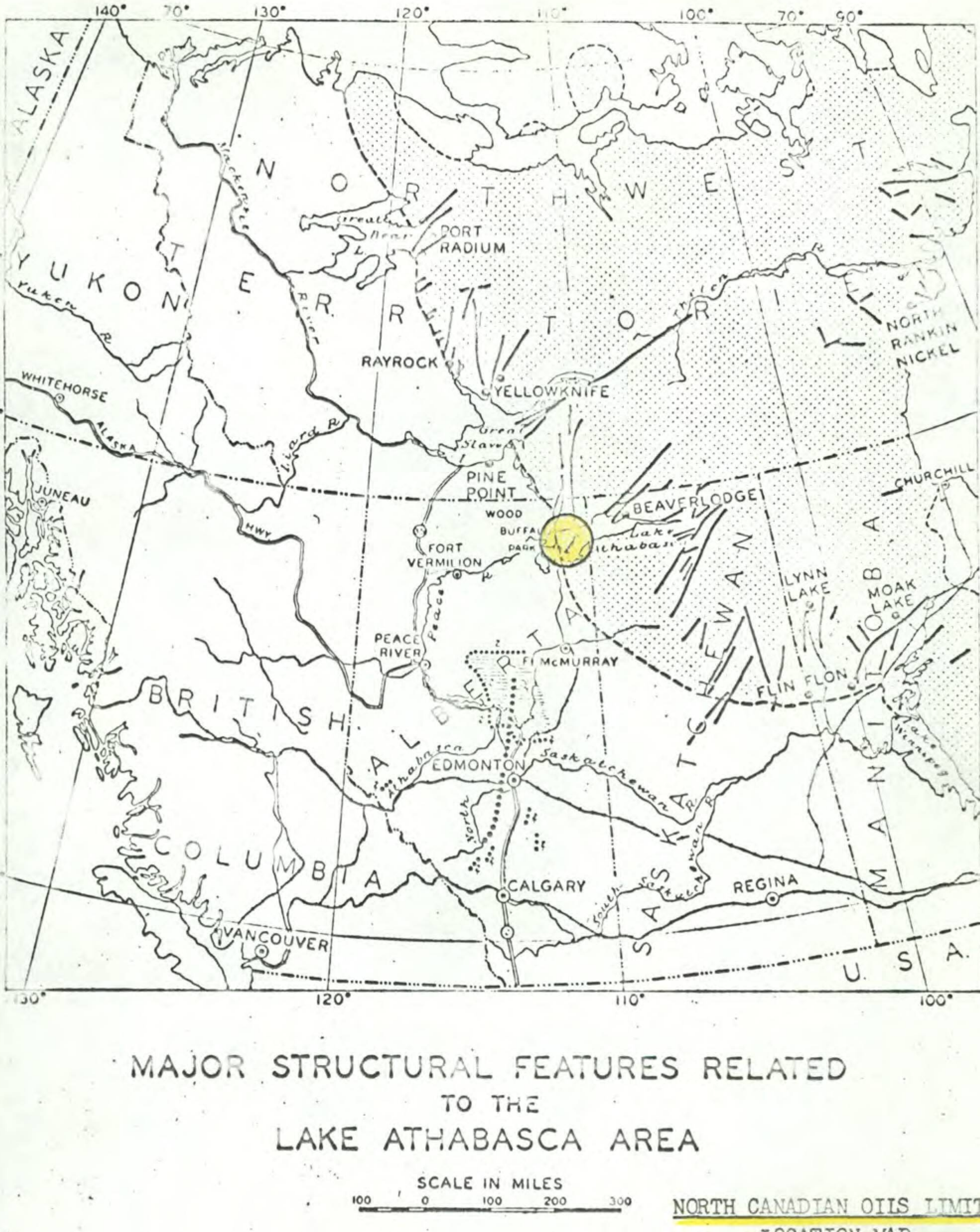
ROVING EXPLORATION SERVICES LTD.

1969?

5

TABLE OF CONTENTS

19690033



MAJOR STRUCTURAL FEATURES RELATED TO THE LAKE ATHABASCA AREA

SCALE IN MILES
100 0 100 200 300

NORTH CANADIAN OILS LIMITED
LOCATION MAP
QUARTZ MINERAL PERMITS

LEGEND

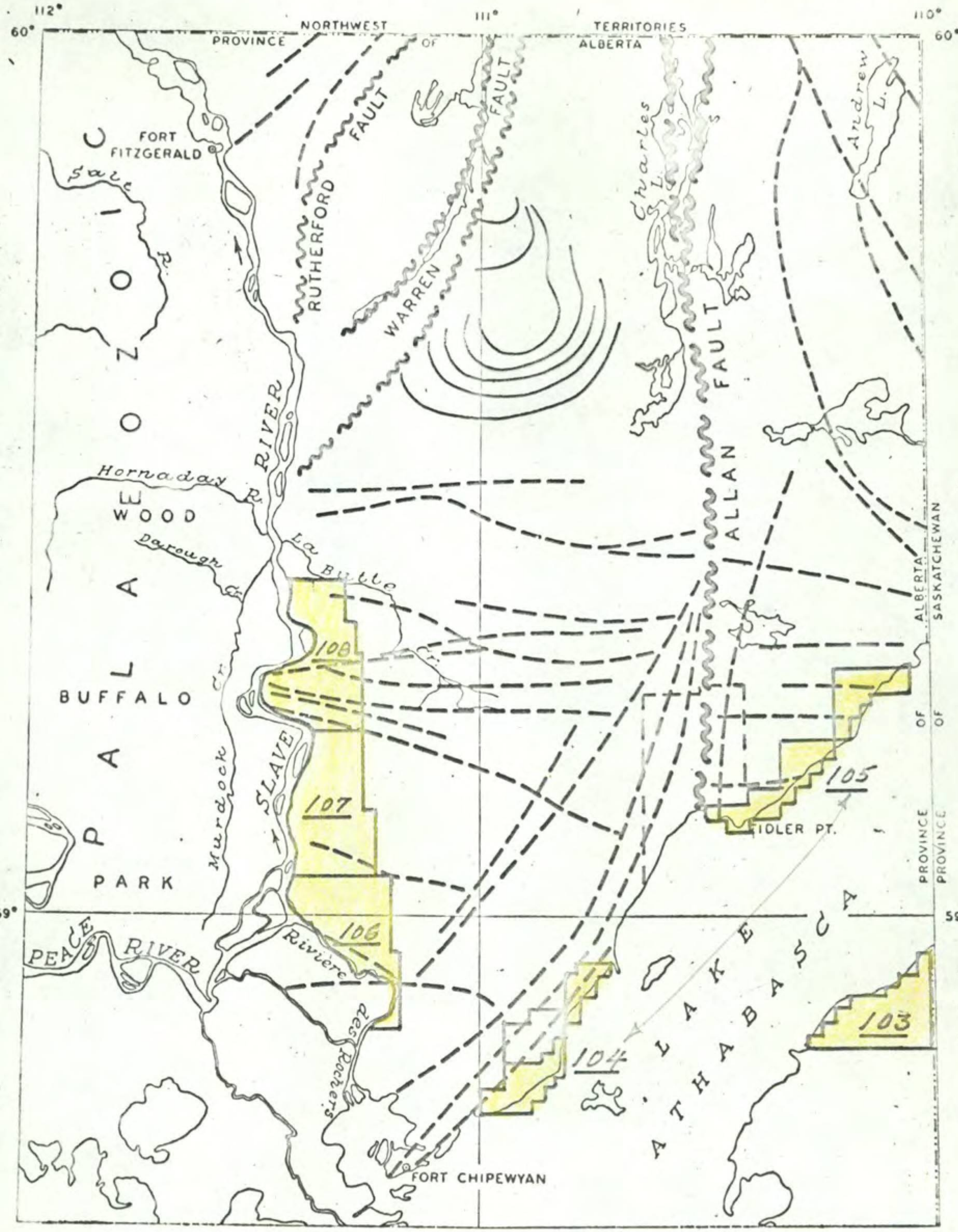
Highway
Railway
River
International Boundary
Provincial Boundary
Park Boundary
Settlement
Mining Centre

Major Fault Structures on Shield
Reef Trends
Grosmont Reef Complex
Precambrian Shield

PART OF DATA FROM: H.R. BELYEA 1952, 1955, 1957.
D.R. DERRY ET AL 1950.

FIGURE: I

19690033



PRINCIPAL STRUCTURAL ELEMENTS OF THE PRECAMBRIAN NORTH OF LAKE ATHABASCA

SCALE IN MILES

4 0 4 8 12 16

LEGEND

Faults, major

Faults, minor

Sedimentary and Metamorphic Structures

INDEX MAP
NORTH CANADIAN OILS LIMITED
QUARTZ MINERAL PERMITS
103,104,105,106,107,108

DRAWN BY
THE RESEARCH COUNCIL OF ALBERTA
EDMONTON, ALTA.

FIGURE: 3

After John D. Godfrey,
CIMM Bulletin, April 1960

INTRODUCTION:

An airborne radiometric survey was conducted by Roving Exploration Services Ltd. over Quartz Mineral Permits 103, 104, 105, 106, 107 and 108 in Northeastern Alberta. The survey was flown between June 16 and July 8, 1969 on behalf of North Canadian Oils Limited, of Calgary, Alberta. Ground checks of the more interesting anomalies were also carried out.

PROPERTIES:

Quartz Mineral Permits 104, 105, 106, 107 and 108 are all located between Townships 113 and 119 and between Ranges 1 and 9 along the north and south shores of Lake Athabasca and along the Slave River. Total acreage included in these permits is 184,839 acres. Individual plats showing the exact areas covered by each permit are included in the report.

PERSONNEL:

The field crew was comprised of the following men:

Glen M. DuPre	Party Manager
Howard Stevens	Instrument Technician
Donald Buchanan	Helicopter Pilot

Mr. John D. Hale, consulting geologist, was present on behalf of North Canadian Oils Limited throughout the field work. Mr. Hale in company with Roving personnel examined and sampled the anomalous areas.

GENERAL GEOLOGY:

The permits on the north shore of Lake Athabasca and along the Slave River are situated near the western margin of the Precambrian Shield. The prevailing rock types are a complex of igneous and metamorphic rocks being predominantly granitic gneisses. Pegmatitic zones are frequent in some areas. The closest area covered by a detailed geological report is approximately 30 miles north. This is the Bayonet, Ashton, Potts and Charles Lakes District report (Research Council of Alberta, Preliminary Report 65-6) by John D. Godfrey.

The prevailing structural trend or "grain" of this mapped area is about N10°E and the rocks are mainly biotite and hornblende granite gneisses as well as quartzites and biotite schists and other allied metamorphic types. Amphibolite and horblendite are mapped in the Charles Lake area.

The rocks examined in the Report Area on the north shore of Lake Athabasca were exclusively granitic gneisses and pegmatitic granite gneisses.

Permit No. 103 lies on the south shore of Lake Athabasca and is underlain by Athabasca sandstone. This sandstone examined here was rather coarse, fairly uniform grained and massive.

A report "Aerial Photographic Interpretation of Precambrian Structures North of Lake Athabasca" by John D. Godfrey of the Alberta Research Council (Geological Division Bulletin No. 1, 1958) covers the Report Area. A complex of faults and fractures is interpreted traversing the region of which the predominating trend is northeast-southwest. Strongest fault feature is known as the Allan fault which strikes north-south and traverses Permit No. 104 just west of Fidler Point.

An aerial photo lineation striking N80°W crosses the south-east corner of Permit No. 108 in Section 4, Township 118, Range 8, West of the Fourth Meridian. A strong Thorium anomaly was found in this area.

THE SURVEY:

All of the permits (103, 104, 105, 106, 107 and 108) were flown at flight line spacing of 7 lines per mile or 750 feet between lines. All lines were flown in a north-south direction except for Permit No. 103 which was flown east-west.

Flying was conducted at approximately 175 feet above ground level and at air speeds of 50 to 60 miles per hour. Control of the flight lines was maintained by visual navigation with the assistance of air photo mosaics. Fiducial points were recorded during flight on the photo mosaics and simultaneously on the spectrometer chart with a mechanical marking device. Flight lines were plotted on 2" per mile scale enlargements of the photo mosaic.

Pre-flight checks were made with samples of Potassium, Uranium and Thorium immediately prior to each "take-off" to verify the proper functioning of the instrumentation. These "checks" are shown on each flight chart.

No radioactive samples were carried in the Helicopter during survey and the aircraft was decontaminated with respect to radiation from luminous dials, etc.

The instrumentation was flown in a Hughes 269A Helicopter.

A Bonzer Altimeter (radar device) was used to record actual flight elevation above ground level. The Bonzer curve on the spectrometer chart shows the elevation above ground.

Ground examinations were carried out with the assistance of Helicopter, float equipped fixed wing aircraft and motor boat on Lake Athabasca and the Slave River.

SAMPLING:

Samples were collected from various localities of interest on each of the permits. Mr. John D. Hale sampled anomalies on each permit while some areas were also sampled by John T. Cook. Samples from each permit were submitted for assay to Core Laboratories Canada Limited in Calgary by Mr. John D. Hale. A copy of the assay report is included herewith.

Permit No. 103 was visited and sampled by Messrs. John D. Hale, P. Geol. and John T. Cook, P. Geol., on July 1, 1969. Access was gained by float equipped Cessna aircraft. Samples 1, 2 and 3 were collected.

Permit No. 104 was visited July 1, 1969 by Messrs. Hale and Cook and sampled along the coast near Cypress Point. Access was gained by float equipped Cessna 185. Samples 4 to 7, inclusive, were collected.

Permit No. 104 was again visited by John D. Hale on July 6 and on July 8, 1969, in the area of Fidler Point and inland from there. Access was gained by Helicopter. An old mining exploration camp site was found inland from Fidler Point near Locality 104E, which was apparently the location of activity by Goldfields Uranium Mines Ltd. Samples 12 to 18, inclusive, and 25 to 33, inclusive, were collected.

<u>Permit No. 105</u> was examined and sampled July 1, 1969 by Messrs. Hale and Cook. Sample No. 8 was collected. The area was entered by float equipped Cessna 185. An abandoned drill camp was found here. A previous visit to Permit No. 105 was paid by Messrs. John D. Hale and Glen M. DuPre on June 21, 1969. No samples were collected, although minor hand scintillometer readings were observed in the area of the abandoned drill camp.

<u>Permit Nos. 106, 107 and 108</u> were visited and sampled by John D. Hale on July 5, 1969. Access was gained by motor launch along the Slave River. Samples 9, 10 and 11 were collected.

Permit No. 108 was again visited and sampled by Mr. Hale by helicopter on July 7, 1969. The area of the Thorium anomaly (Locality 108-1) was examined. Mr. G. M. DuPre paid another visit to Permit 108 in July in a further effort to investigate the Thorium anomaly, but no samples were collected. The source of the Thorium anomaly was not revealed in samples collected and assayed. Samples 19 to 24,inclusive, were collected.

The sampling program was hampered by erratic malfunction of the hand scintillometer. It was not operating on various occasions such as during collection of Samples 4 to 8, inclusive, and 16 to 33, inclusive, and was not taken to the field to assist in collecting Samples 9 to 11, inclusive, ~~and 16 to 33, inclusive,~~ on Permits 106, 107 and 108. As it turned out the malfunction of the scintillometer was caused by faulty installation of one set of batteries which often jarred loose in the field.

EQUIPMENT & INSTRUMENTATION:

The Model DGRS -1000 differential Gamma Ray Spectrometer has been developed to provide the mining and survey industry with a system to obtain precise radioactive quantative analysis from aircraft and ground vehicles.

The system has a maximum capacity of four channels. The four channels are: (1) Potassium -40, (2) Bismuth -214, (3) Thallium -208, (4) total count or integral. Spectral interaction has been eliminated by using specially developed techniques, which result in 100% discrimination between the three radioactive elements in case of secular radioactive equilibrium.

The pulse height at the output of the detector is maintained constant as function of temperature by using spectrum stabilization techniques. As a reference element, the radioactive isotope Cesium -137 is used. The system conforms to the USAEC recommended standard instrument module and bin design as covered by TID - 20893.

Integrated circuits have been used throughout the system, which resulted in an unique and small package and also provides maximum reliability. All analogue and pulse processing circuitry has been temperature compensated by using the latest integrated circuits. Plug-in modular construction allows system building from one to four channels. Temperature compensated analogue computer circuits are used to eliminate spectral interaction resulting in 100 per cent discrimination. The system has been designed, incorporating nuclear instrumentation techniques, with an extended operating temperature range.

THE DETECTOR:

Exploranium Corporation of Canada Limited contracts the Harshaw Chemical Company for the manufacturing of thallium activated sodium-iodide crystals measuring 8" x 4", coupled to three photo-multiplier tubes and having guaranteed resolutions of 8.3% or better at .662 Mev at 1000 volts. The crystal is housed in a low background stainless steel housing and the photomultiplier tubes have high flux magnetic shields. The complete detector is mounted in a protective enclosure. This enclosure is necessary to protect the crystal from thermal shocks. Smaller crystals, in general, do not require any protection against sudden temperature changes but crystals with sizes 8" x 4" and larger are extremely fragile. The larger crystal may be permanently destroyed if not properly protected. In general, it can be said that a 8" x 4" crystal may not experience a temperature deviation of more than 10° C per hour. The enclosure is lined with six inches of polyurethane foam. It has been calculated that six inches will provide enough temperature reduction to prevent the 10° C limitation being exceeded providing the unit does not experience more than the 100° F atmosphere temperature change per hour.

THEORY:

Radioactive Equilibrium

Uranium and Thorium are determined indirectly by gamma spectrometry. The direct determination of the actual parents such as Uranium -238 is impossible in air-borne applications because Uranium -238 and Thorium -232 are alpha emitters.

The determination is accomplished by measuring the daughter products of both series.

One must assume therefore, secular radioactive equilibrium. Bismuth -214 is the only daughter product from the Uranium -238 series with major characteristic gamma emissions above the 1 Mev line. In air-borne applications, gamma emissions below the 1 Mev line are very difficult to resolve, due to the contributions of scatter, Compton, pair production and a much higher air attenuation coefficient. If radioactive equilibrium is not considered then the determination of Thorium and Uranium may give possible uncertainties, because Uranium -238 is determined by measuring a post Radon -222 daughter, Bismuth -214.

Uranium and to some extent radium, have a tendency to migrate out of the upper layers of the soil during the soil forming and weathering processes, whereas Potassium and Thorium are more resistant to leaching.

The production of the gaseous daughter Radon -222 and it's subsequent emanation into the soil, air and migration into the atmosphere or deeper into the ground before decay, provides another mode of removal of the gamma emitting daughters of Radium -226 from the upper layers of the soil.

A very similar process takes place in the Thorium series with the production of Radon -220, but it's short half life (52 seconds) reduces the effect of its movement within the soil to small proportions. In general, it can be said that appreciable precipitation, freezing or snow cover, will tend to seal the ground, causing a build-up of the radon concentration in the important uppermost layer, which results in an increase in gamma ray source strength in the ground. A reduction of the gamma emitting field at the surface may take place with heavy precipitation, because some of the radon will be washed down to deeper layers and the water will increase the effective gamma ray absorption coefficient in the ground.

<u>Radio-Active Element Spectral Interaction</u>

To obtain 100% discrimination between Thorium, Uranium and Potassium is impossible without introducing special techniques to eliminate the spectral interaction of the Thorium -232 series gamma spectrum into the Bismuth -214 and Potassium -40 spectrum.

In other words, if no correction is applied, when one would analyse a Thorium sample, the Thallium -208 series will contribute counts in the Bismuth -214, 1.76 Mev channel, and the Potassium -40, 1.47 Mev channel.

If one would only analyse Bismuth -214 or Potassium -40, no counts are contributed in the Thallium -208 channel, 2.62 Mev; and Bismuth -214 has its highest gamma emission at 2.43 Mev.

Since the spectra of the three elements are overlapping, certain proportions of each detected element has to be subtracted from the element which is being analysed.

In general, the determination of the exact amount for subtraction is complex and many variables are involved.

Gamma Ray Spectrometer for Aerial Surveys of Terrestrial Gamma Radiation Selection of Gamma Lines

Aerial quantative determinations of Uranium and Thorium, except Potassium are obtained by indirect gamma spectrometry.

Potassium has a single gamma line at 1.47 Mev and a quantative measurement can be made direct.

The 1.76 Mev gamma line of Bismuth -214 has been selected because it is the only gamma line with the highest peak - valley ratio of the Bismuth -214 series.

The 2.62 Mev Gamma line of Thallium -208 has been selected because this gamma line is higher than the highest gamma line of Bismuth -214, the 2.43 Mev line.

Therefore, Bismuth -214 and Potassium -40 will cause minimum interference.

Detection of Gamma Rays

To detect gamma rays, alpha or beta particles, a phosphor is required. When the gamma ray is absorbed by a phospher, the result will be a light emission.

The intensity of this light emission is directly proportional to the energy in Mev or Kev of the incident gamma ray.

The phospher is then coupled to a photo sensitive cathode of a photomultiplier which converts the light emission to an electrical pulse. Again, here the amplitude of the electrical pulse is proportional to the incident gamma ray. As phosphor, an inorganic material such as thallium activated sodium iodide NaI(TI) has been chosen. A very important parameter of the crystal is the stopping power. Only NaI(TI) has this high stopping power because of the high density, 3.67 gm/CC^3. It also has a relatively high light output or pulse height. As explained, the amplitude of the electrical pulse at the output of the photomultiplier is proportional to the incident gamma ray, which will enable us to differentiate between two different gamma rays. The differential between two gamma rays is not infinite. The detector, however, has a specific resolution which determines the detail in a gamma ray spectrum, or is the ability to record a specific energy interaction with a minimum spread of pulse height. The resolution, in per cent, is a very important parameter in gamma ray spectrometers. The resolution of most crystals is determined by using a Cesium -137 radioactive source. Cesium -137 has a single gamma line of .662 Mev and is therefore mono-energetic.

Another important parameter is the detection efficiency which is determined by the geometry of the crystal. When the source is far away from the crystal as in the case of air-borne surveys, the path of the gamma rays is more or less perpendicular to the surface of the crystal. When the distance is constant, but the thickness of the crystal is varied, the efficiency of the detector is about exponential. To obtain a sensitive system, it will be necessary to have a large volume crystal. In general, the prospector is interested in Uranium, Thorium as well as Potassium. This interest results in a wide range of energy to be used. Since Thorium has the highest gamma line, the crystal must have a certain thickness which will ensure almost total absorption at 2.62 Mev. In general, a 4" thick crystal will absorb at 2.62 Mev only 75% of the gamma rays intersecting the crystal. While the thickness determines the absorption coefficient for a specific gamma line, the diameter determines the overall sensitivity. If the crystal diameter is increased twice, the crystal becomes 4 times more sensitive.

INTERPRETATION:

Xerox copies of the spectrometer charts with the more interesting anomalous areas found are included in the report. One complete set of original spectrometer charts is provided.

The spectrometer charts show five curves; being as follows:

Potassium - K40 0 - 100 c.p.s.

Bismuth 214 - Uranium 0-100 c.p.s.

Thallium 208 - Thorium 0-100 c.p.s.

Total Count 0-800 counts per second.

Altimeter - height above ground in feet.

The flight lines and anomalous areas are plotted at 2" = 1 mile on maps included with this report. The values of the Uranium anomalies plotted are in counts per second - above background. Intensity of background varies depending on the prevailing country rock types as well as type and amount of overburden.

Of the six permits flown significant Uranium counts were found on Permits Nos. 104 and 105. A large Thorium anomaly was found on Permit No. 108.

Permit No. 103 on the south shore of Lake Athabasca did not reveal Uranium or Thorium counts. This Permit is entirely underlain by Athabasca sandstone. Much of the Permit is swamp covered. Samples of Athabasca sandstone taken from outcroppings on the Permit assayed nil to trace amounts of Uranium and nil Thorium. The Permit was examined on the ground July 1, 1969, by Messrs. John D. Hale and John T. Cook.

__Permit No. 104__ on the north shore of Lake Athabasca near Fidler Point revealed a number of Uranium anomalies with counts per second above background ranging up to a maxium of 44 c.p.s. The anomalous areas are designated 104A to 104L, not in order of relative significance. The highest Uranium readings occur at Locality 104H. Anomalous Uranium readings appear in clusters. These clusters mainly appear to be associated with pegmatitic granite grading to gneissic granite and pegmatitic granite gneiss outcroppings. These are often manifested in topographically higher ground as shown by the altimeter curve. Each anomalous Uranium zone appears to be accompanied by increased Potassium K-40 and Thorium readings as well as total count consistent with the presence of granitic gneisses or pegmatitic granites, often termed "hot" granites.

On Permit No. 104, Locality 104A, an inlier remnant of schist or phyllite within a pegmatitic granite was noted by John D. Hale occupying the lower ground on the southeastern edge of this anomaly.

Samples were collected July 1, 1969 by Messrs. John D. Hale and John T. Cook from several localities which confirmed the presence of granitic and pegmatitic gneissic rocks. Assays of samples collected yielded non-commercial grades of Uranium, ranging up to a maximum of 0.035% U_3O_8. This sample came from Locality 104B, about 2.5 miles northeast of Fidler Point.

__Permit No. 105__ located along the north shore of Lake Athabasca yielded five areas of low intensity radioactive anomalies labeled 105A through 105E. Readings range up to a maximum of 20 c.p.s. Uranium. Locality 105A was visited July 1, 1969 by the writer and John D. Hale.

An old diamond drill camp was found by the lake side. Examination of the environs revealed granitic gneiss rock types only. Samples taken assayed trace Uranium and nil Thorium. The remaining anomalous areas at Permit No. 105 showed lesser radioactive intensities.

Permit No. 106 situated about 10 miles north of Ft. Chipewyan along the Slave River was found to be remarkably low in radioactive occurrences. Any anomalies found measured less than 8 counts per second above background. A large portion of the permit is low and swampy.

Permit No. 107 situated immediately north of No. 106 was found to be similar to No. 106 in intensity of radioactive occurrences, all occurrences found being 8 counts per second or less. The areas of radioactivity are designated 107A to 107C inclusive for reference purposes. A large part of the permit is low and swampy.

Permit No. 108 also located along the Slave River approximately 35 miles north of Ft. Chipewyan. The permit has also remarkably few anomalies of low radioactive intensity. One cluster of such readings labeled 108A ranges up to 14 c.p.s. above background. Locality 108B is a strong Thorium anomaly. The anomalous Thorium readings appear on flight lines 5 through 14 in the southeast corner of the permit. Thorium counts reach full scale - i.e. 100 c.p.s., and approximately 5 times background. The Thorium anomaly is accompanied by weak Potassium K-40 and U_3O_8 anomalies of about 2 times background. The altimeter reveals a topographic high corresponding. Two separate trips to the area by the field crew failed to locate the sources. Samples collected assayed nil Thorium and trace Uranium.

The possibility that commercial U_3O_8 might be associated with the Thorium anomaly at depth should not be overlooked. It is suggested that a limited drilling program should be considered.

CONCLUSIONS AND RECOMMENDATION:

The most attractive U_3O_8 anomalies occur on Permits 104 and 105. The limited ground examinations, sampling and assaying carried out did not reveal commercial Uranium deposits. However, the examinations conducted were in the nature of "spot checks" only and exhaustive prospecting and mapping on the ground of each area discussed in the report should be seriously considered. This should be undertaken in the summer by experienced field crew equipped with hand scintillometer or spectrometer. Particular reference is made to the following localities 104A, B, C, D, G, H, I, J, K and L.

The Thorium anomaly (108B) is recommended for further study. A limited drilling program should be considered to ascertain whether or not economically interesting U_3O_8 might be associated with the Thorium anomalies. Possibly an X-ray or Packsack Drill might be utilized.

In attempting to assess the true merit of the spectrometer anomalies mapped, it should be borne in mind that Gamma radiation can often be blanketed out completely, or subdued, by certain types of overburden, muskeg, swamp, water or snow.

ROVING EXPLORATION SERVICES LTD.

THE ASSOCIATION OF
PROFESSIONAL ENGINEERS
OF ALBERTA
PERMIT NUMBER
P 322
ROVING EXPLORATION
SERVICES LTD.

John T. Cook, P. Geol.

 Roving Exploration Services Ltd.

SUPPLEMENTAL REPORT - (See Report on Permits Nos. 104, 105, 106, 107 & 108)

HELICOPTER BORNE GAMMA RAY SPECTROMETER SURVEY

Townships 116, 117 & 118, Ranges 3 & 4, West 4th M., Alberta.

An area totalling more or less 53,120 acres located in Townships 116, 117 and 118, Ranges 3 and 4, West of the Fourth Meridian, were flown at 1/4 mile line spacing on behalf of North Canadian Oils Limited.

The same equipment used to fly Permits 103 - 108 was used, being the Exploranium DGRS 1000 Gamma Ray Spectrometer mounted in a Hughes 269A Helicopter.

An anomalous area is indicated in the southeastern corner of this area, being in Sections 10, 11, 14 and 15, Township 117, Range 3 W4M. U_3O_8 readings range up to 26 counts per second, in the same range as the anomalies to the south which appear to be caused by pegmatitic gneisses. The zone appears to be an extension of Locality 104B on Permit No. 104.

Roving Exploration Services Ltd.,

THE ASSOCIATION OF PROFESSIONAL ENGINEERS OF ALBERTA
PERMIT NUMBER
P322
ROVING EXPLORATION SERVICES LTD.

John T. Cook, P. Geol.

CORE LAB

CORE LABORATORIES - CANADA LTD.

Petroleum Reservoir Engineering

P.O. BOX 5670, POSTAL STATION "A"
CALGARY 9, ALBERTA
TELEPHONE: 253-3391

July 29, 1969

File: CAL-2-578

Received 7/30/69 JH
Permit Nos. given JH

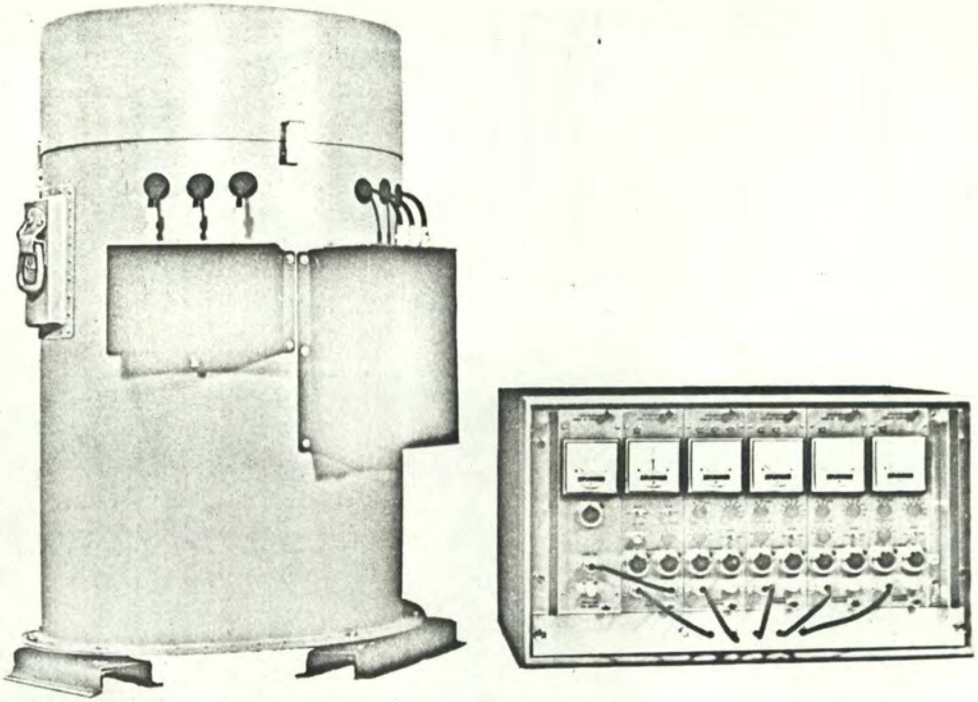
John D. Hale Consulting Ltd.,
23 - 640 - 7 Avenue S. W.,
Calgary, Alberta.

Composite Sample
Collected by JDH
6/7/69 H

Alta. QME Permit No.	SAMPLE NO.	U_3O_8%	Thorium%
	1	0.001	0
103	2	Trace	0
	3	Nil	0
	4	0.008	0
104-S	5	0.006	0
	6	0.010	0
	7	0.005	0
105-S	8	0.006	0
108	9	0.007	0
107	10	0.010	0
106	11	0.010	0
	12	0.018	0
	13	0.010	0.08
104S	14	0.035	0
	15	0.008	0
	16	0.009	0
	17	0.012	0
104-S	18	0.016	0
	19	0.008	0
	20	0.010	0
108	21	0.005	0
	22	0.005	0
	23	0.008	0
	24	0.009	0
	25	0.005	0
	26	0.010	0
	27	0.010	0
	28	0.006	0
104S	29	0.014	0
	30	0.010	0
	31	0.010	0
	32	0.005	0
	33	0.007	0

FOUR CHANNEL DIFFERENTIAL GAMMA RAY SPECTROMETER

Model DGRS - 1000



DESCRIPTION

The Model DGRS-1000, four channel differential gamma ray spectrometer has been developed to provide the survey and mining industry with a system to obtain precise radioactive quantative analysis from aircraft, and ground vehicles.

The system may be used for bore hole logging with a special detector, in laboratories, or at base camps.

The four channels are: 1. potassium -40 2. bismuth -214 3. thallium -208 4. total count or integral.

Spectral interaction has been eliminated by using specially developed techniques. which results in 100% discrimination between the three radioactive elements.

A large volume detector, 8" x 4" NaI (Tl) coupled to three matched photomultiplier tubes is used to obtain high sensitivity. The pulse height at the output of the detector is maintained constant as function of temperature by using spectrum stabilization techniques. As a reference element, the radioactive isotope Cesium -137 is used. The system conforms to the USAEC recommended standard instrument module and bin design as covered by TID-20893.

FEATURES

Integrated circuits have been used throughout the system, which resulted in a unique and small package and also provides maximum reliability. All analogue and pulse processing circuitry has been temperature compensated by using the latest integrated circuits. Each channel may be used for spectrum analysis by using spectrum scanning techniques. Plug-in modular construction allows system building, from one to four channels.

Temperature compensated analogue computer circuits are used, to provide spectral interaction elimination, resulting in 100% discrimination.

The system has been designed, incorporating nuclear instrumentation techniques, with an extended operating temperature range.

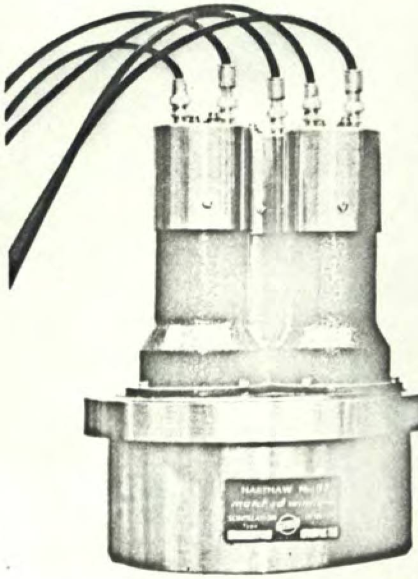
ROVING EXPLORATION SERVICES LTD.
520 - 5th AVENUE S.W.
CALGARY, ALBERTA

NUCLEAR INSTRUMENT DIVISION

1415 LAWRENCE AVENUE WEST • TORONTO 15, ONTARIO, CANADA

TELEPHONE: 248-6463 (AREA CODE 416)

JANUARY, 1969



DETECTOR

The Harshaw Chemical Company selects specially for Exploranium Corporation sodium iodide thallium activated crystals with unique resolutions of 8.3% or better at .662 Mev at 1,000 volts. The diameter is 8" and the thickness is 4". Larger or smaller crystals to special order. The crystal is coupled to three selected photomultiplier tubes. The gain and focus of each photomultiplier tube can be varied individually. The crystal is mounted in a low background stainless steel case with a thin entrance window. The three photomultiplier tubes are magnetically shielded and are mounted with stainless steel tube bases. The crystal assembly is mounted in a protective enclosure, which is lined with 6" of polyurathene foam to protect the crystal from thermal shocks. An ambient temperature change of 75°C per hour will cause a change of temperature inside the enclosure of not more than 10°C per hour. The crystal is suspended in 6" of semi-hard foam.

Pre-Amplifier – Main pulse amplifier

The pre-amplifier is a low noise, low gain m.o.s. amplifier. The outputs of the photomultiplier tubes are summed at the input of the pre-amplifier. To prevent loading of the photomultiplier tubes, a very high input impedance is required. The pulse shape appearing at the output is R-C shaped, with a decay constant of about 30 μs. The main pulse amplifier consists of an amplifying section of which the gain can be selected, a pulse current limiter, a delay line pulse shaping network and a low impedance output buffer. The output pulse is gaussian shaped with a pulse width of about 1 μs. The maximum output is 10 volts. Both amplifiers are mounted on the detector enclosure.

PRE-AMPLIFIER SPECIFICATIONS

Input impedance: 1 M Ohms – negative going pulses.
Input capacity: 5 pf
Gain: X1.
Input pulse time constant: 30 μs.

SYSTEM SPECIFICATIONS

Power Requirement: 110 V.A.C. or 12 V.D.C., or 28 V.D.C. at 75 Watts.
Instrument Weight: 55 lbs.
Detector Weight: 8" x 4" crystal housing–75 lbs.

MAIN AMPLIFIER SPECIFICATIONS

Gain: 1 – 2 – 4 – 8 – 10.
Overload recovery: for 250 x overload about 20 μs.
Pulse shape: Gaussian – pulse width 1 μs.
Output: 0 to 10 volt maximum – positive going.
Maximum output load: 50 Ohms.
Stability: .1%/°C.
Differential linearity: ± 1%
Output impedence: .5 Ohms.

WARRANTY

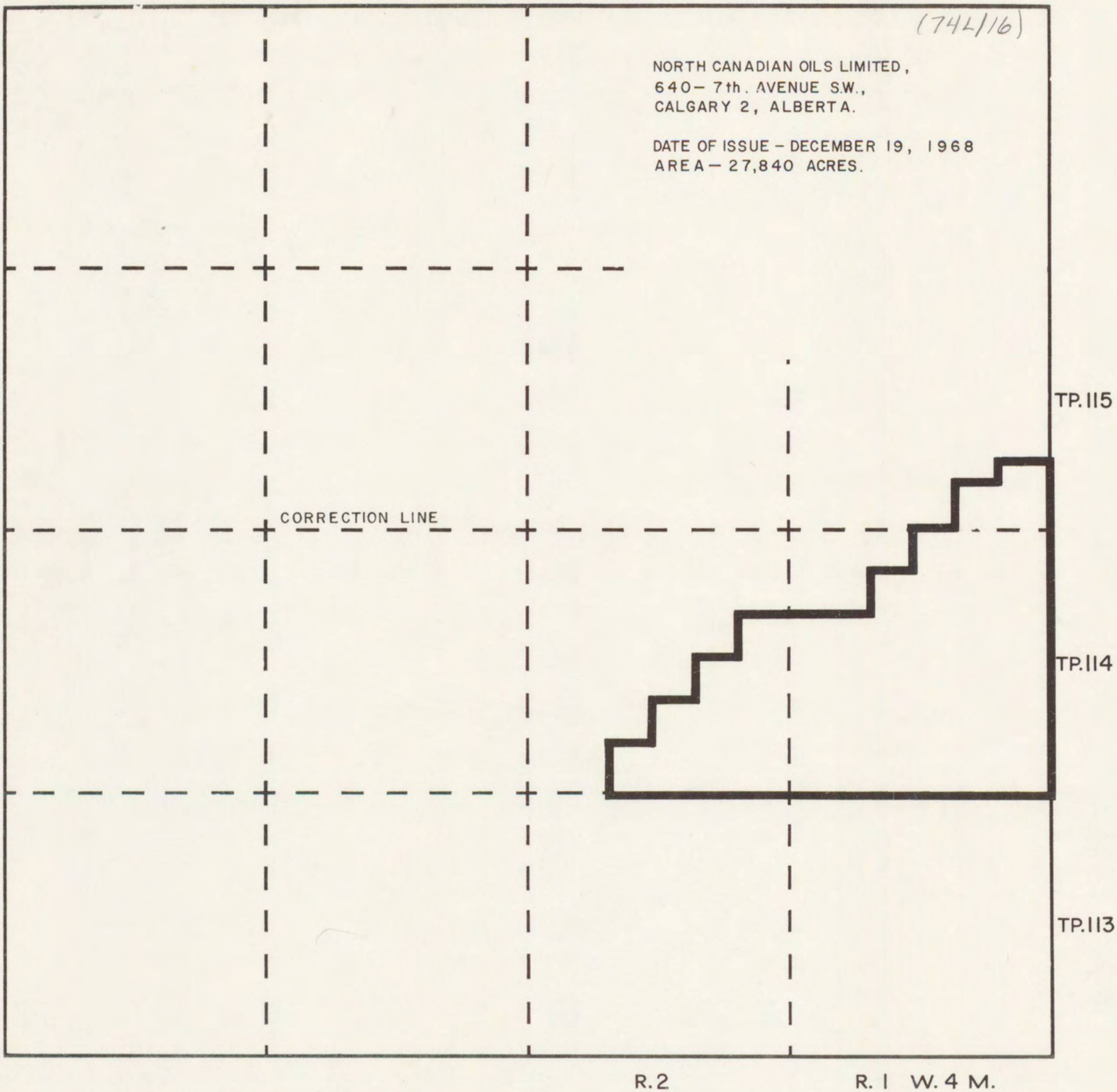
The instrument is warranted free from material defects and poor workmanship for a period of one year from the date of shipment and defective material will be replaced free of charge during this period unless the equipment has been modified, adjusted and/or changed as a result of misuse, in which case this warranty is void.

Should repairs outside the warranty be required, then repairs will be made at our standard service rates.

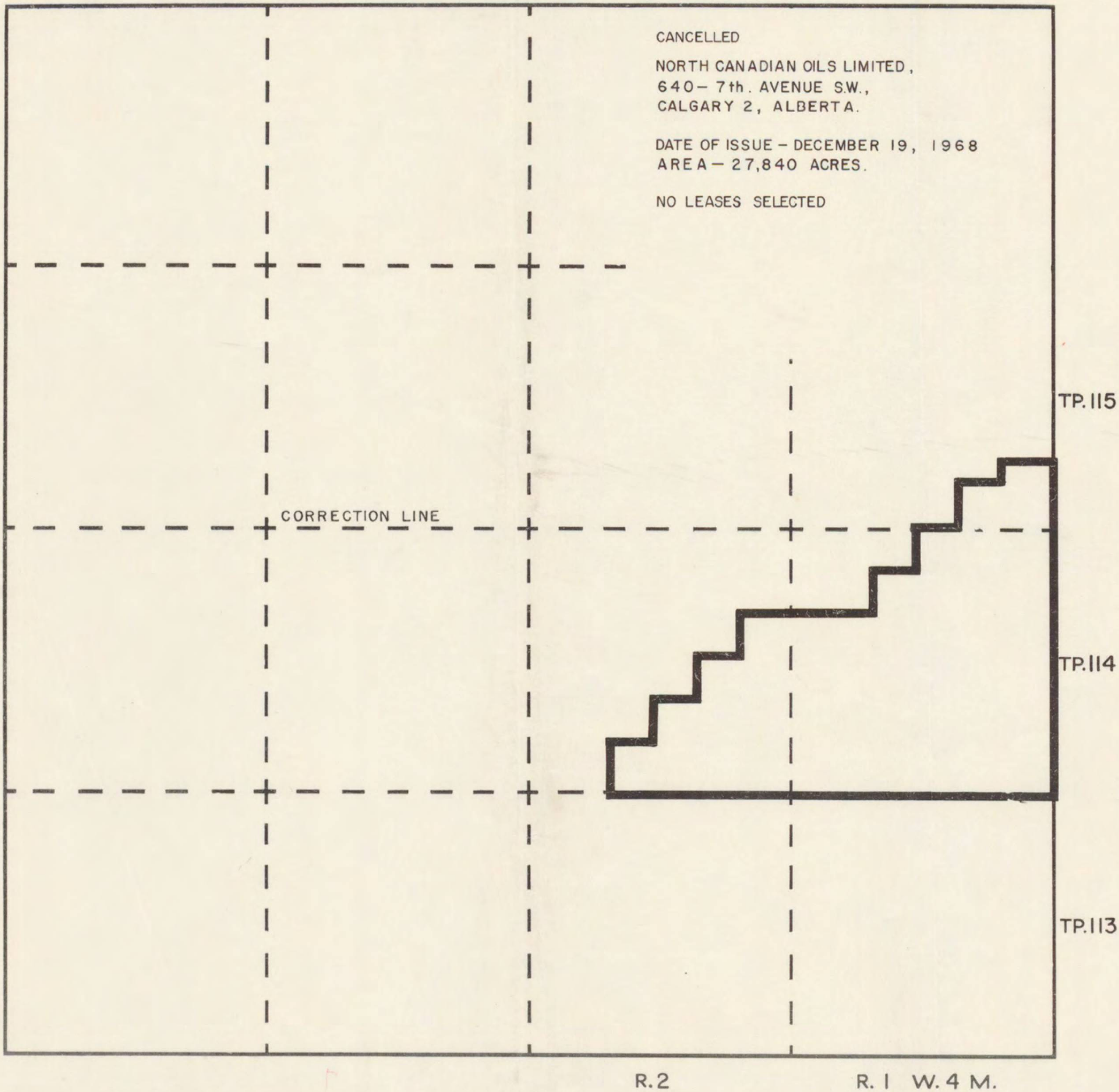
RESERVED RIGHTS

Exploranium Corporation of Canada Ltd., reserves the right to adjust engineering specifications in the best interests of maintaining high quality instrumentation.

QUARTZ MINERAL EXPLORATION PERMIT No. 103

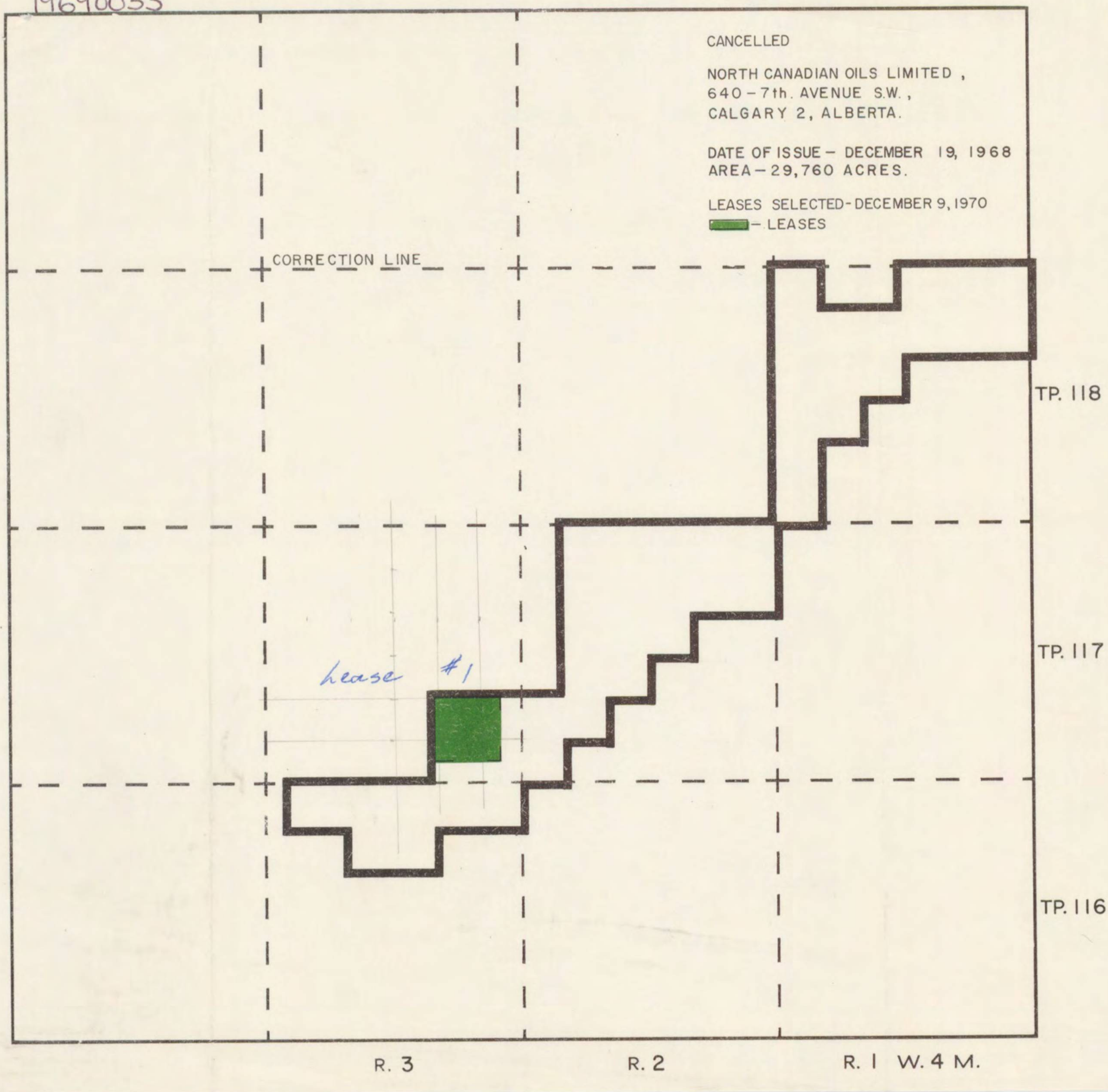


QUARTZ MINERAL EXPLORATION PERMIT No. 103

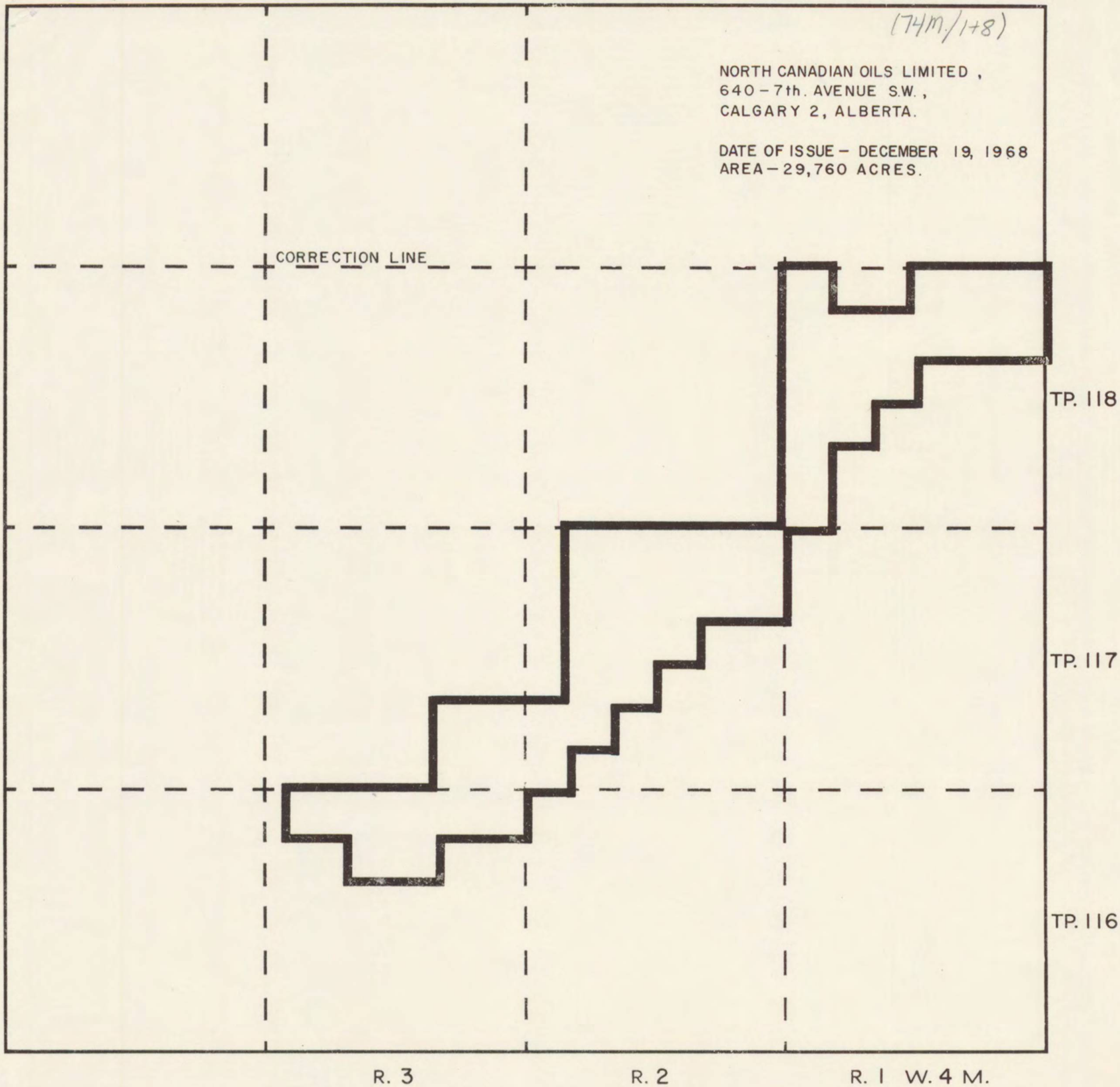


QUARTZ MINERAL EXPLORATION PERMIT No. 104

19690033

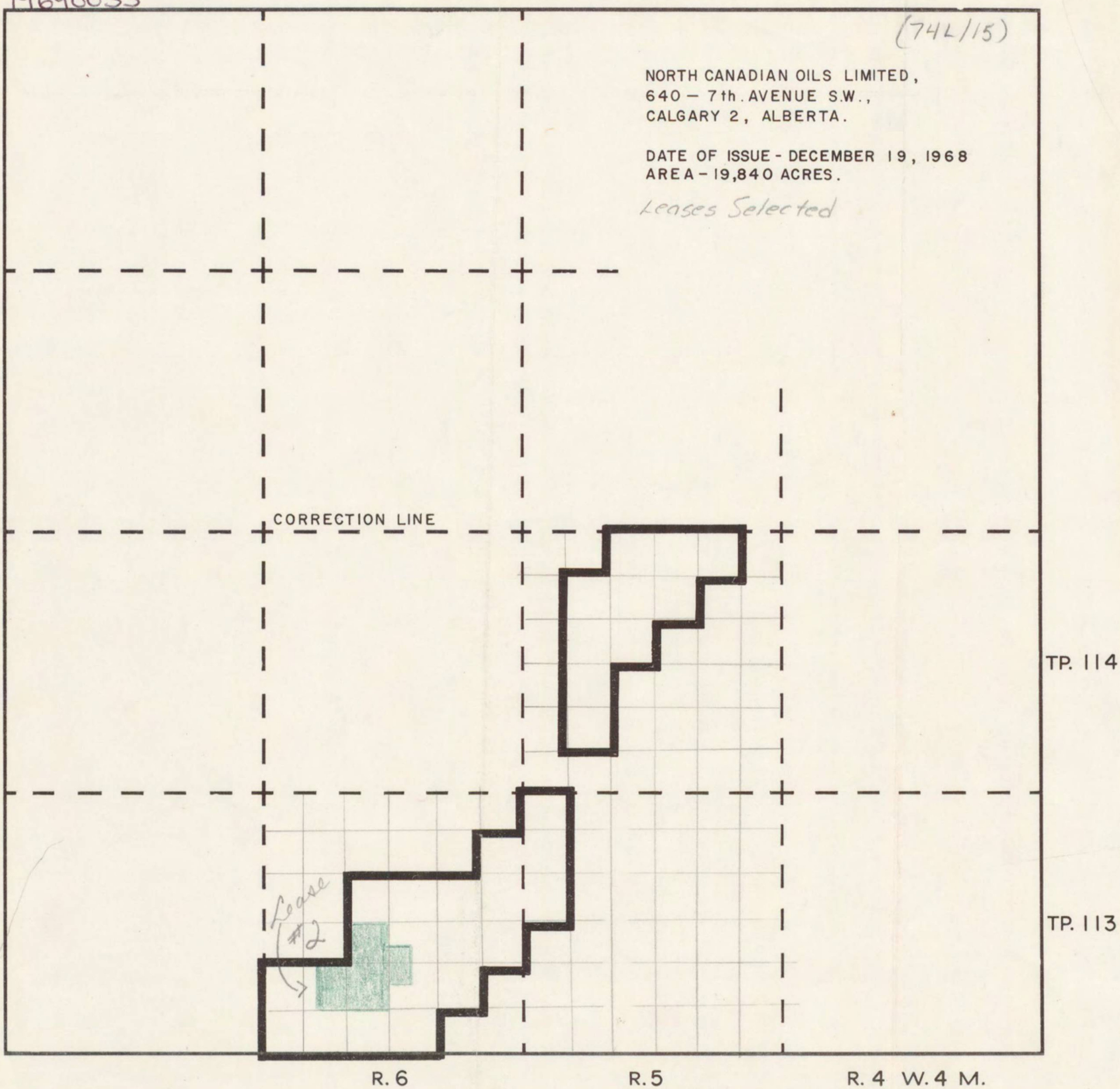


QUARTZ MINERAL EXPLORATION PERMIT No. 104



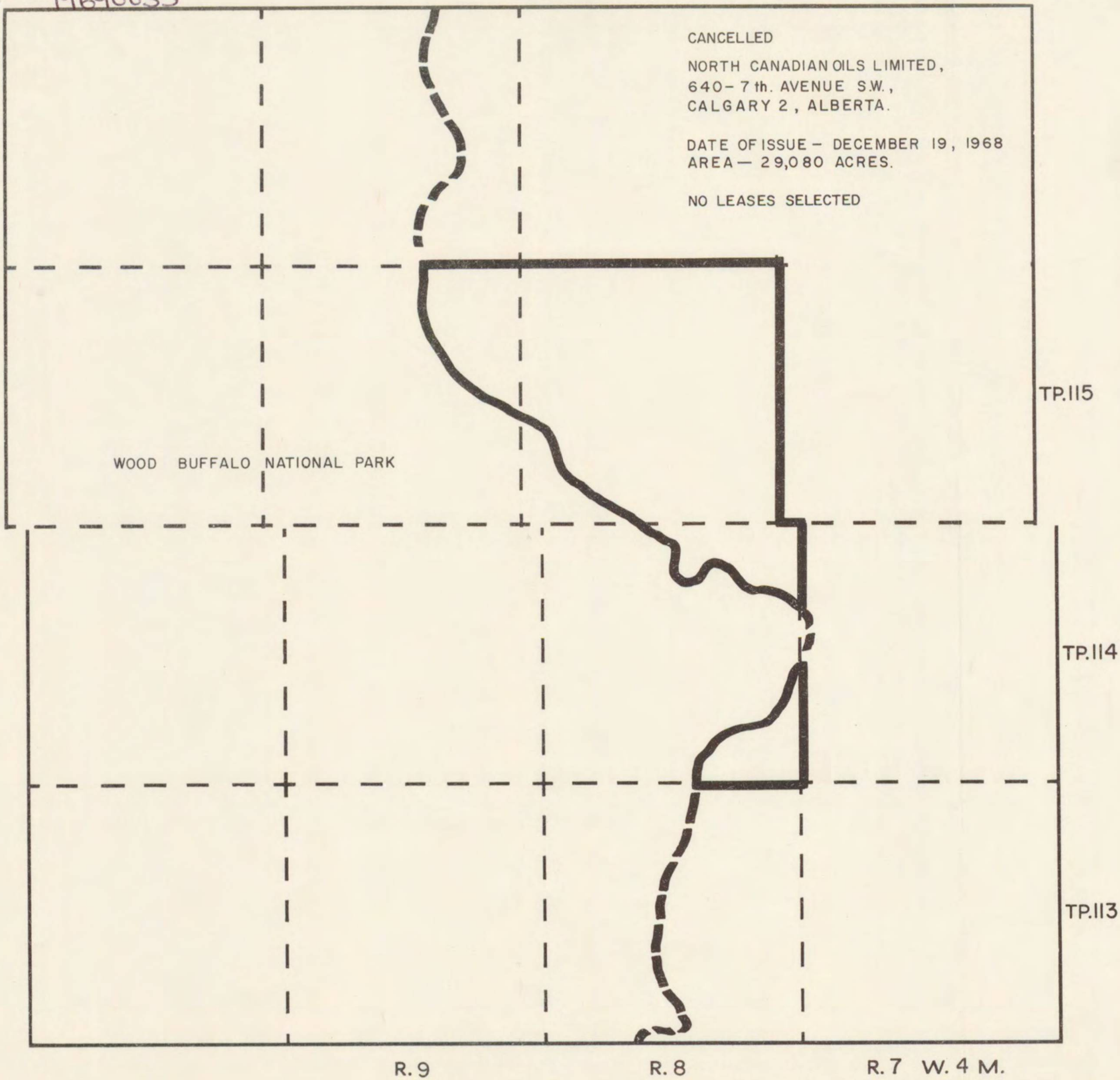
QUARTZ MINERAL EXPLORATION PERMIT No. 105

19690033

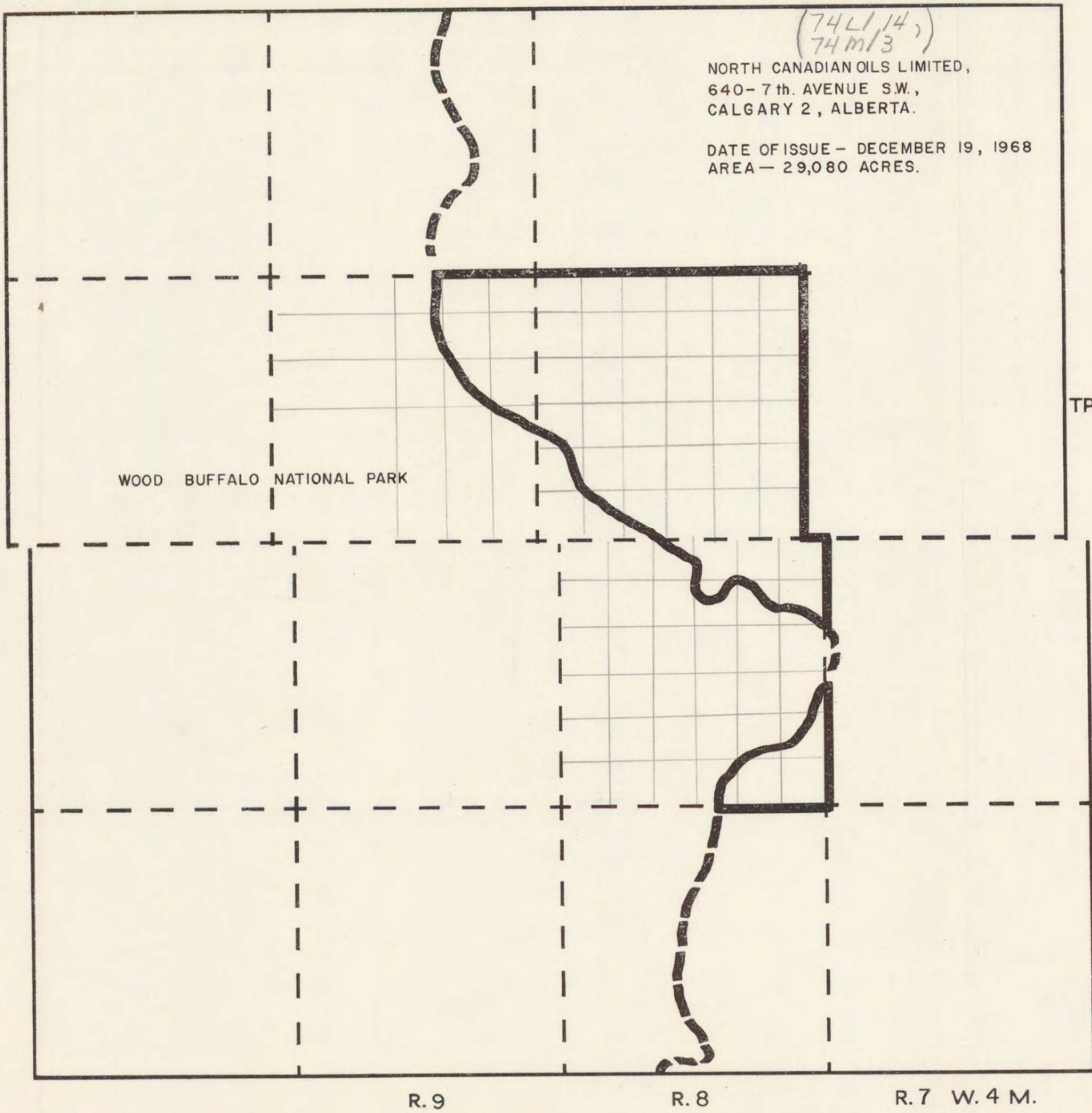


QUARTZ MINERAL EXPLORATION PERMIT No. 106

19690033

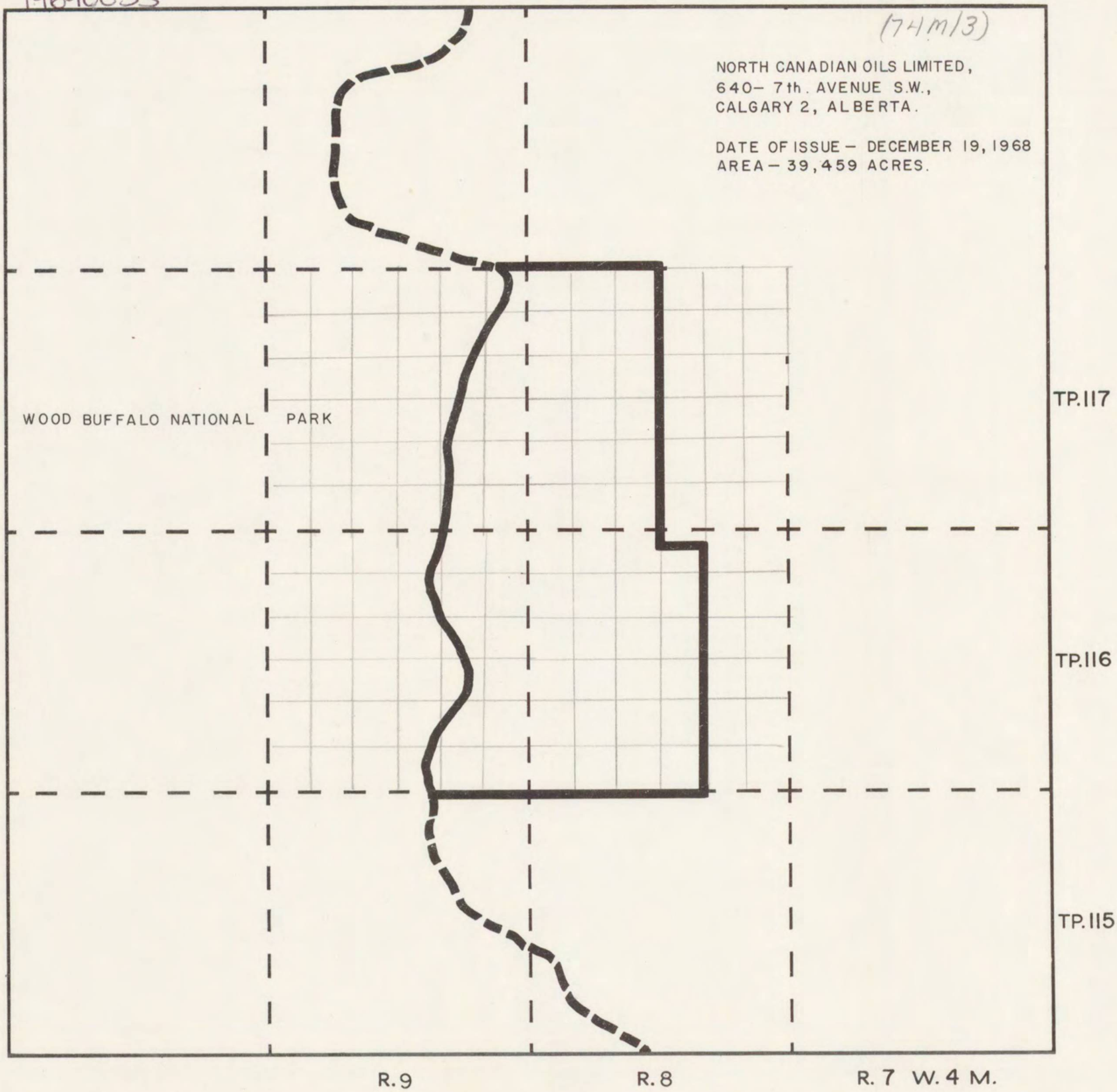


QUARTZ MINERAL EXPLORATION PERMIT No. 106

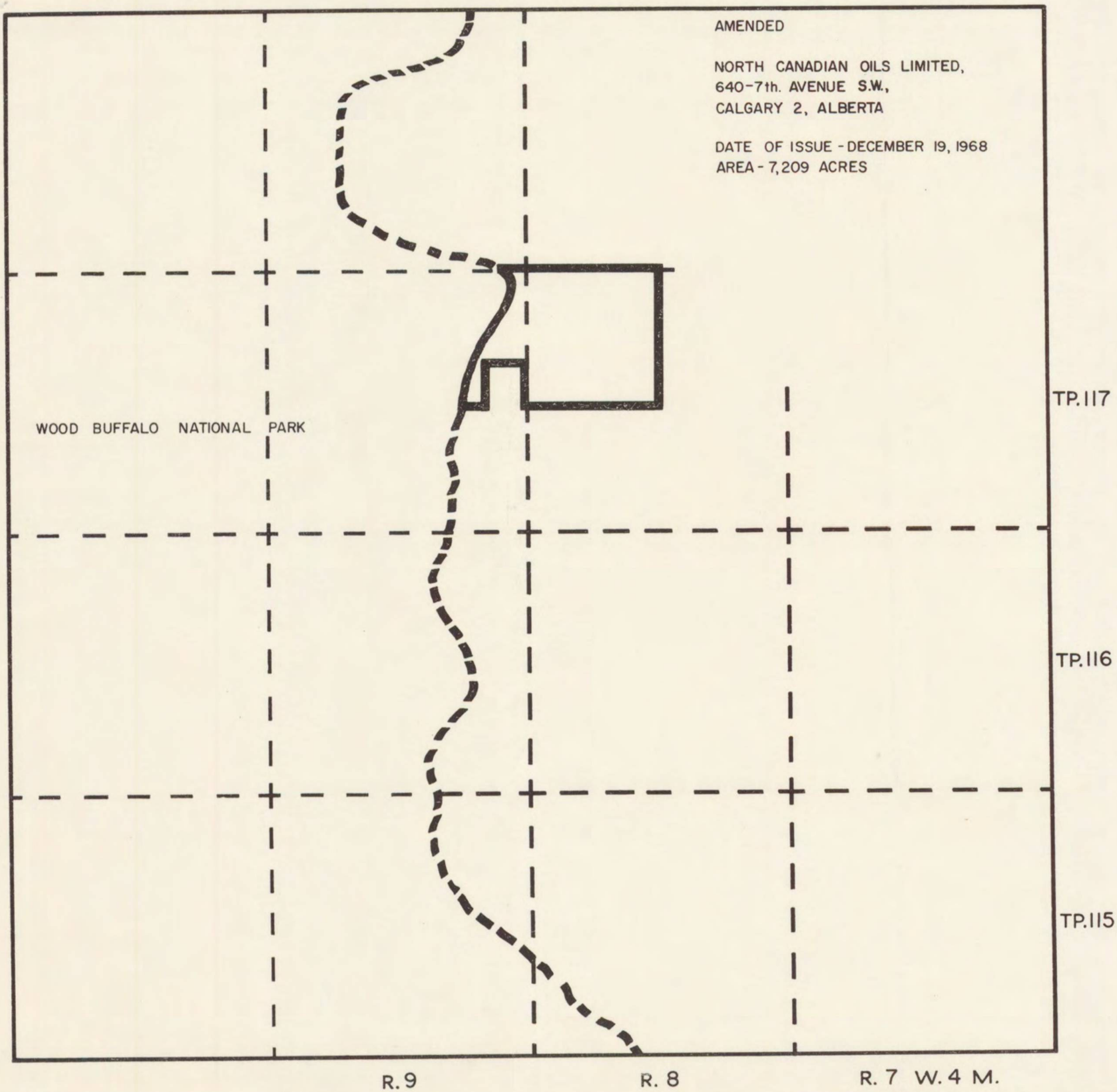


QUARTZ MINERAL EXPLORATION PERMIT No. 107

19690033

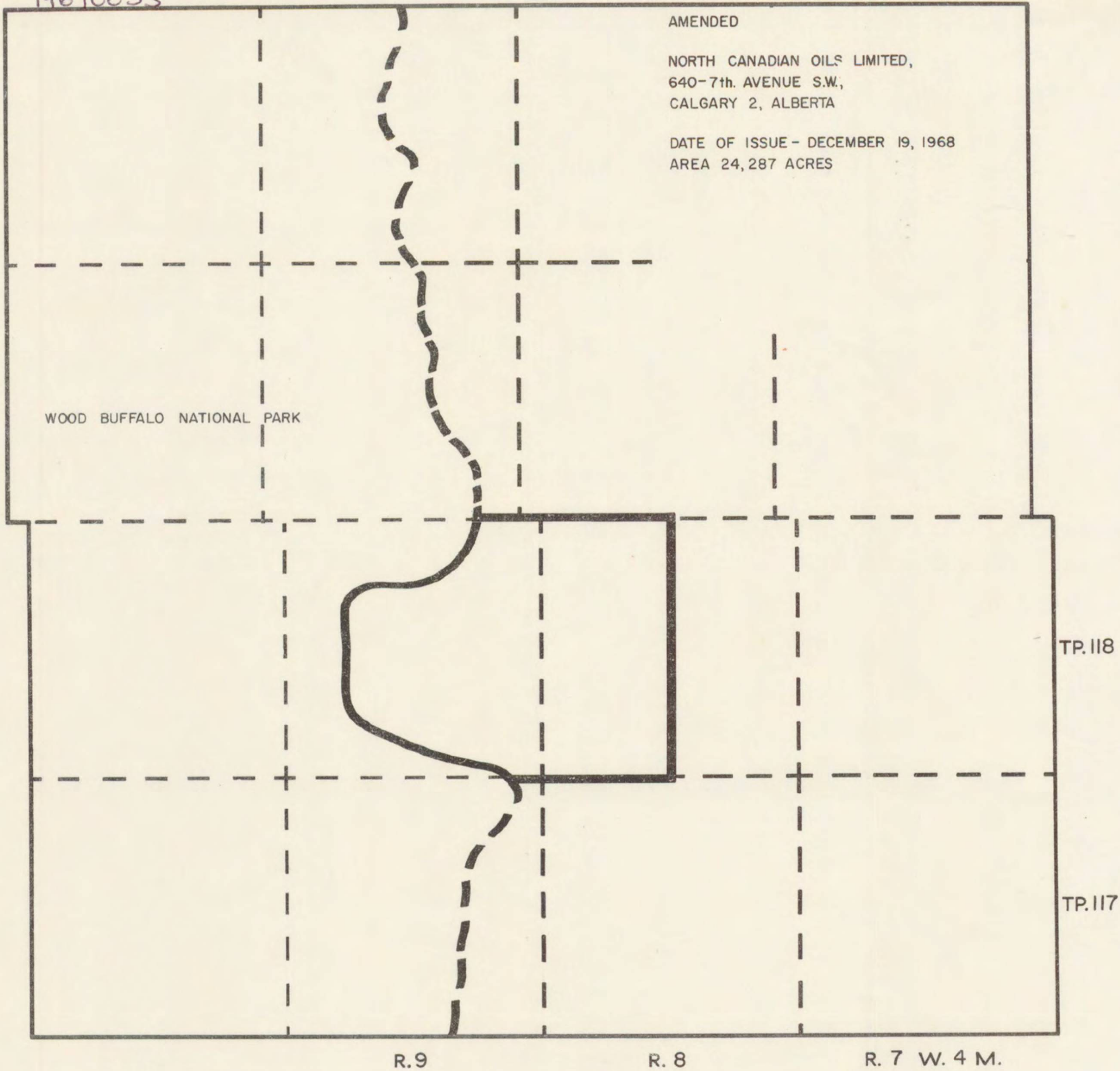


QUARTZ MINERAL EXPLORATION PERMIT No. 107

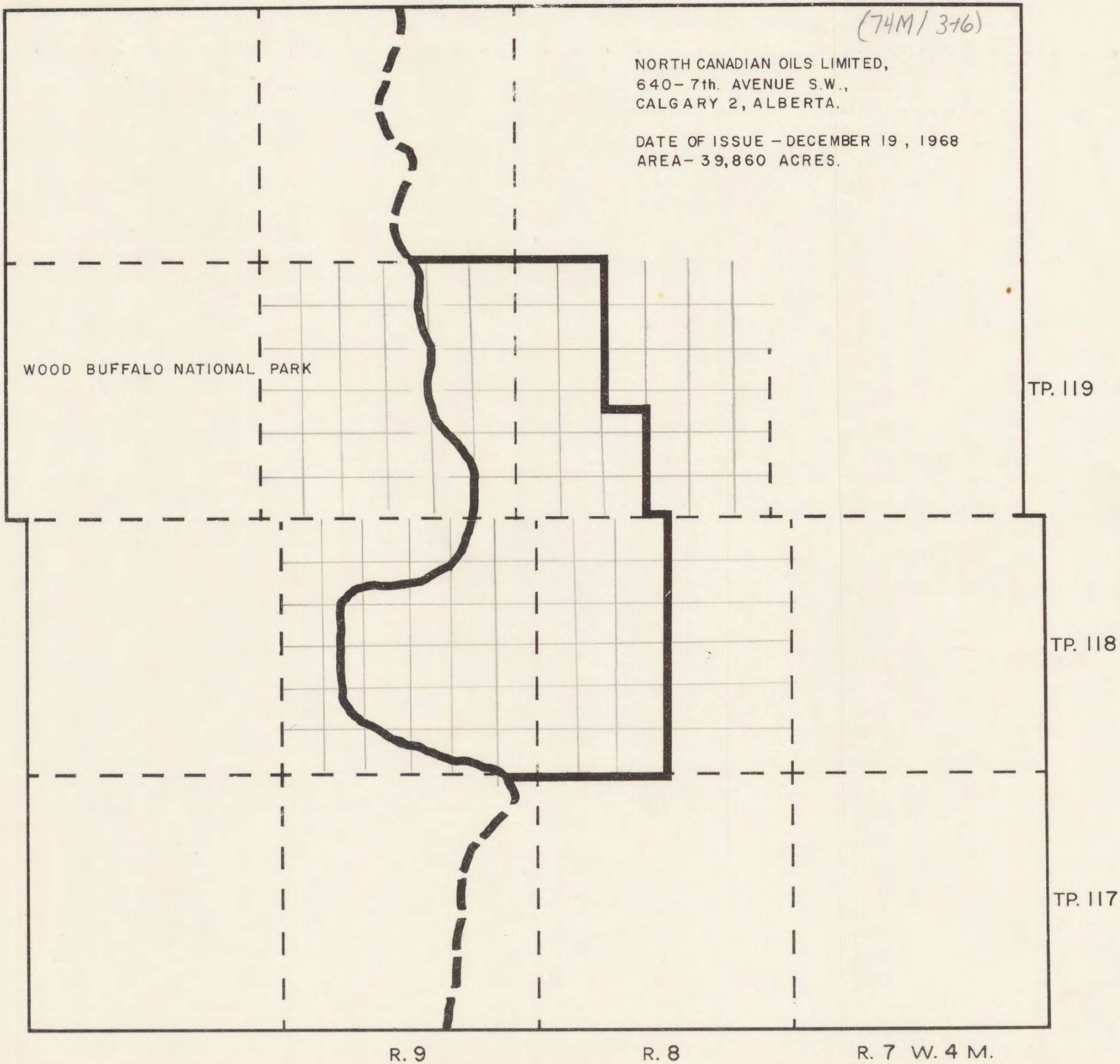


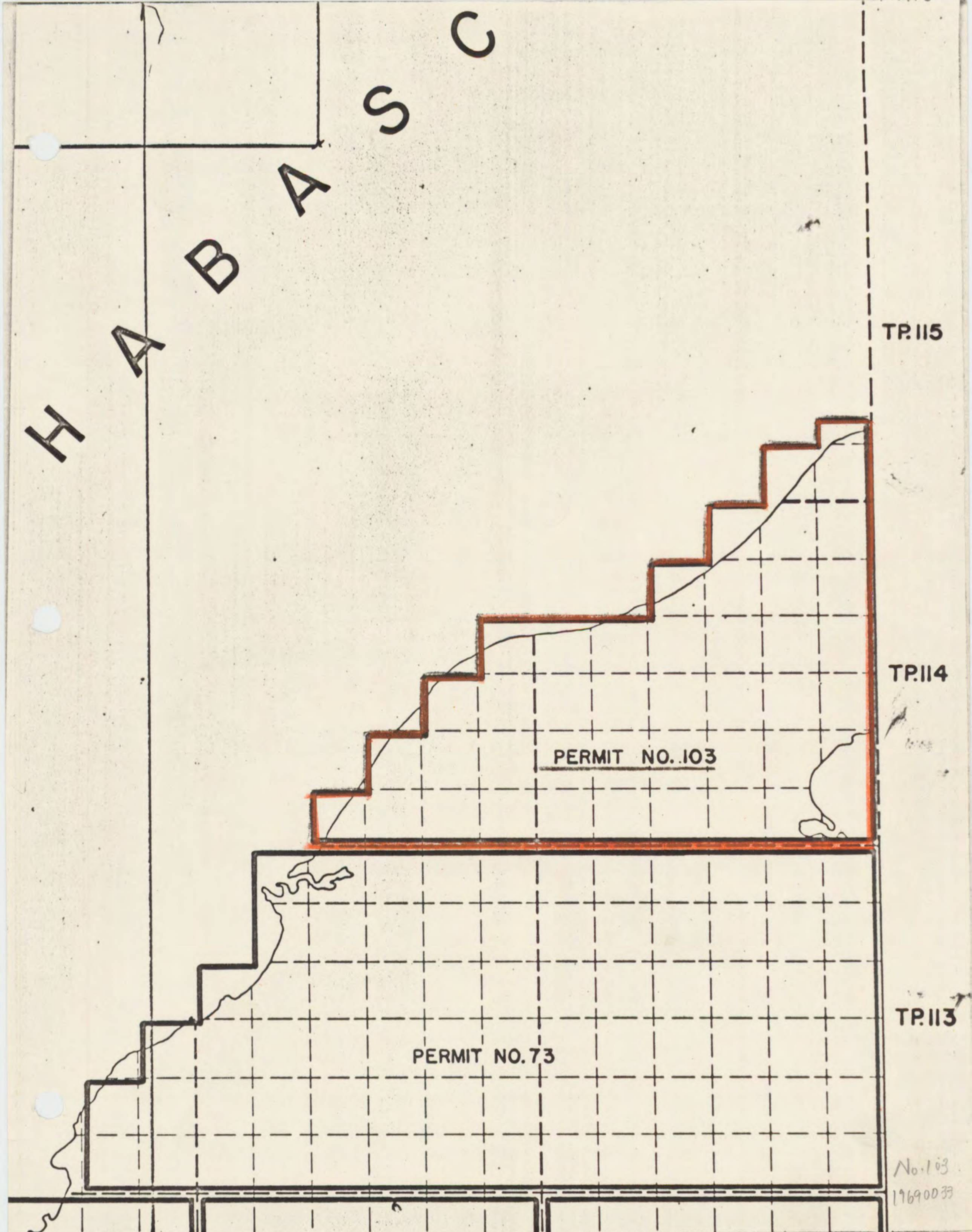
QUARTZ MINERAL EXPLORATION PERMIT No. 108

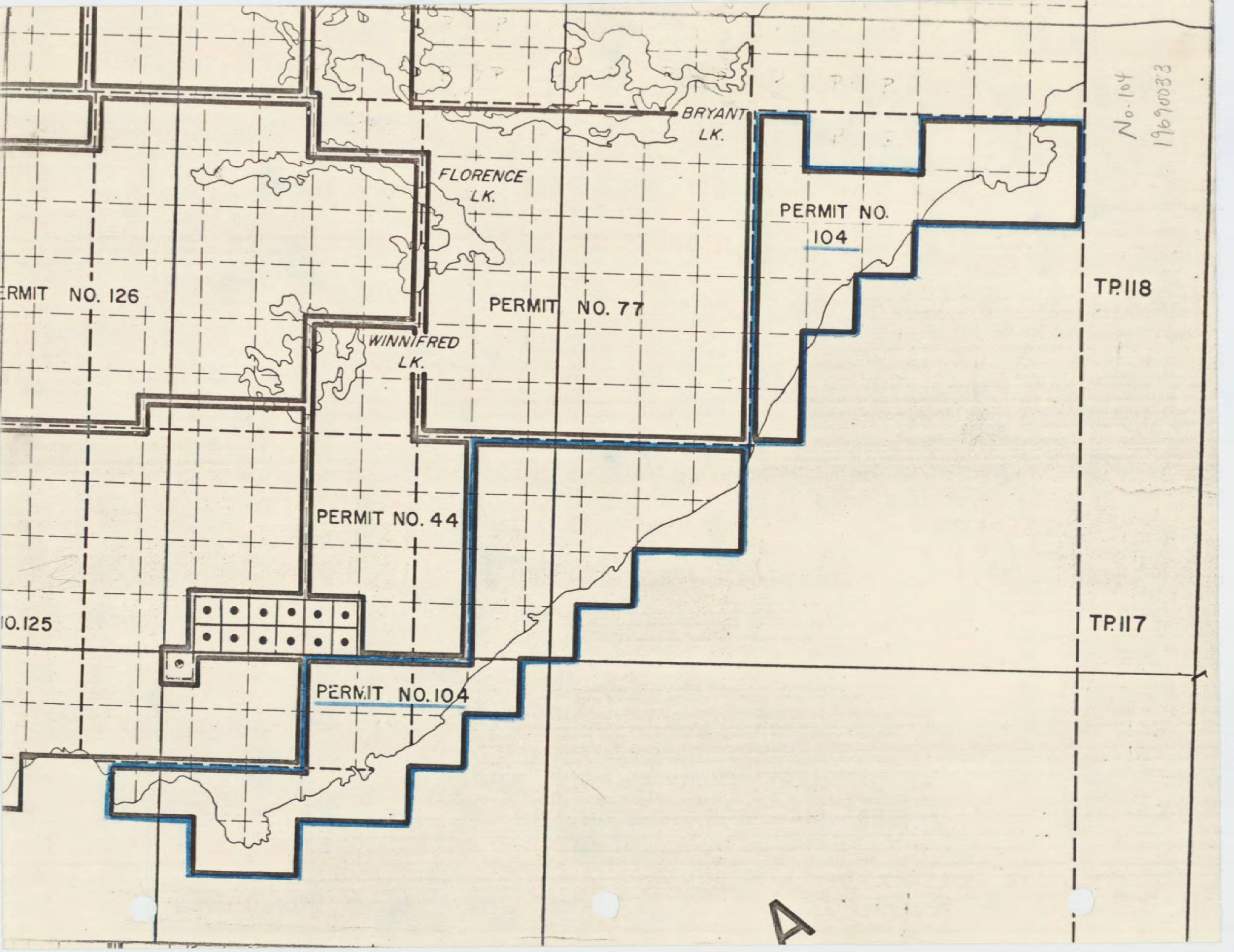
19690033



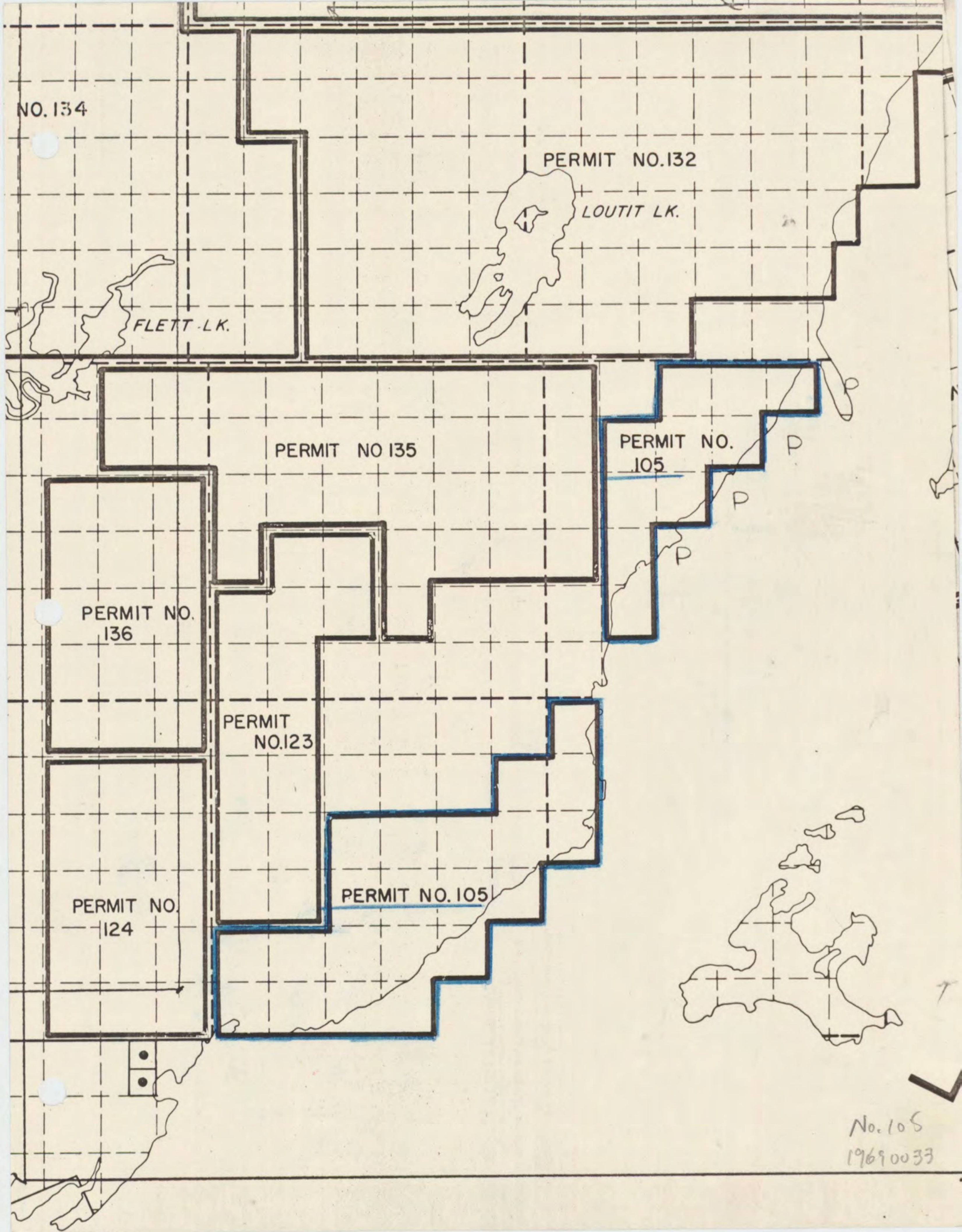
QUARTZ MINERAL EXPLORATION PERMIT No. 108

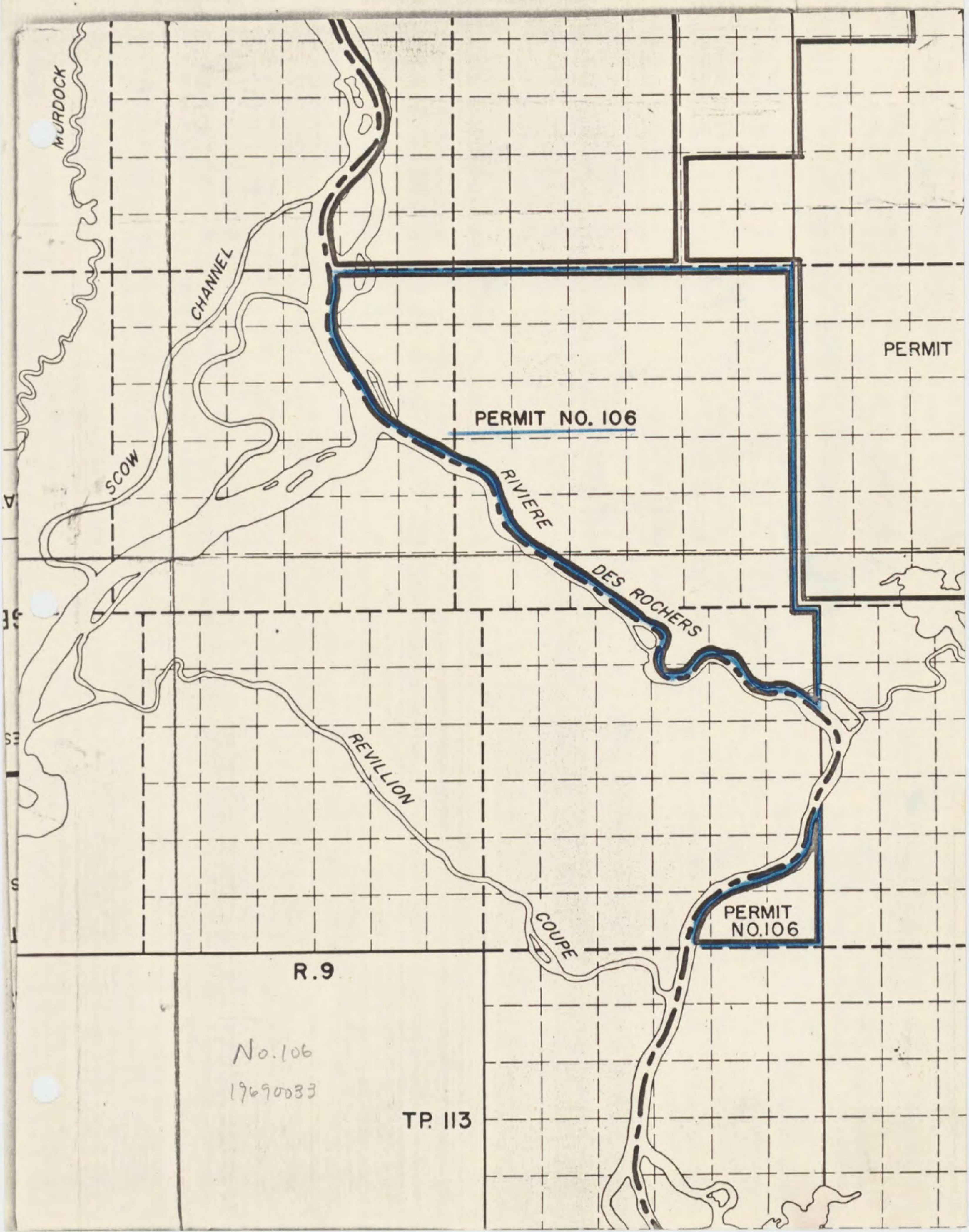


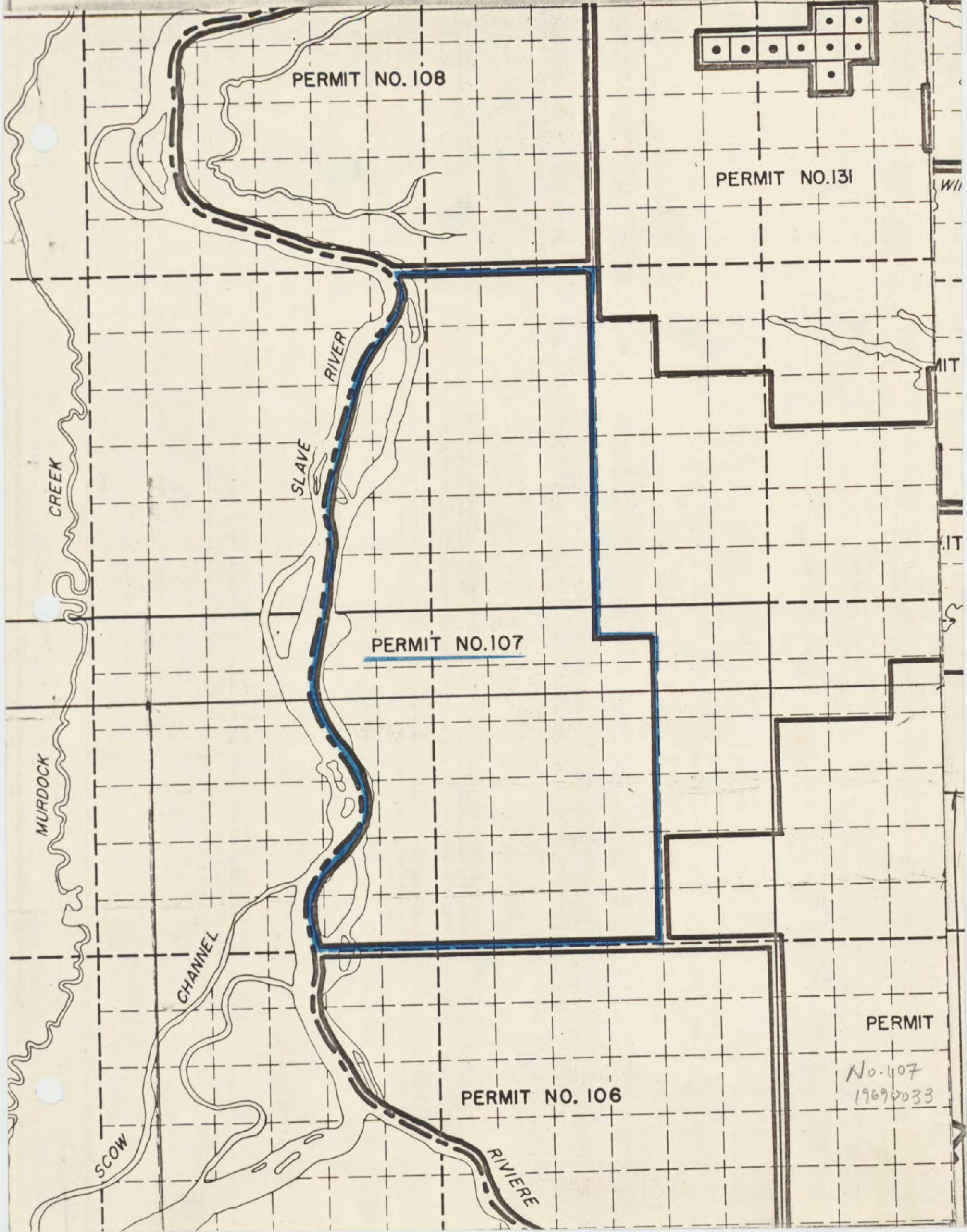

HABASC
TP. 115
TP. 114
TP. 113
PERMIT NO. 103
PERMIT NO. 73
No. 103
19690033

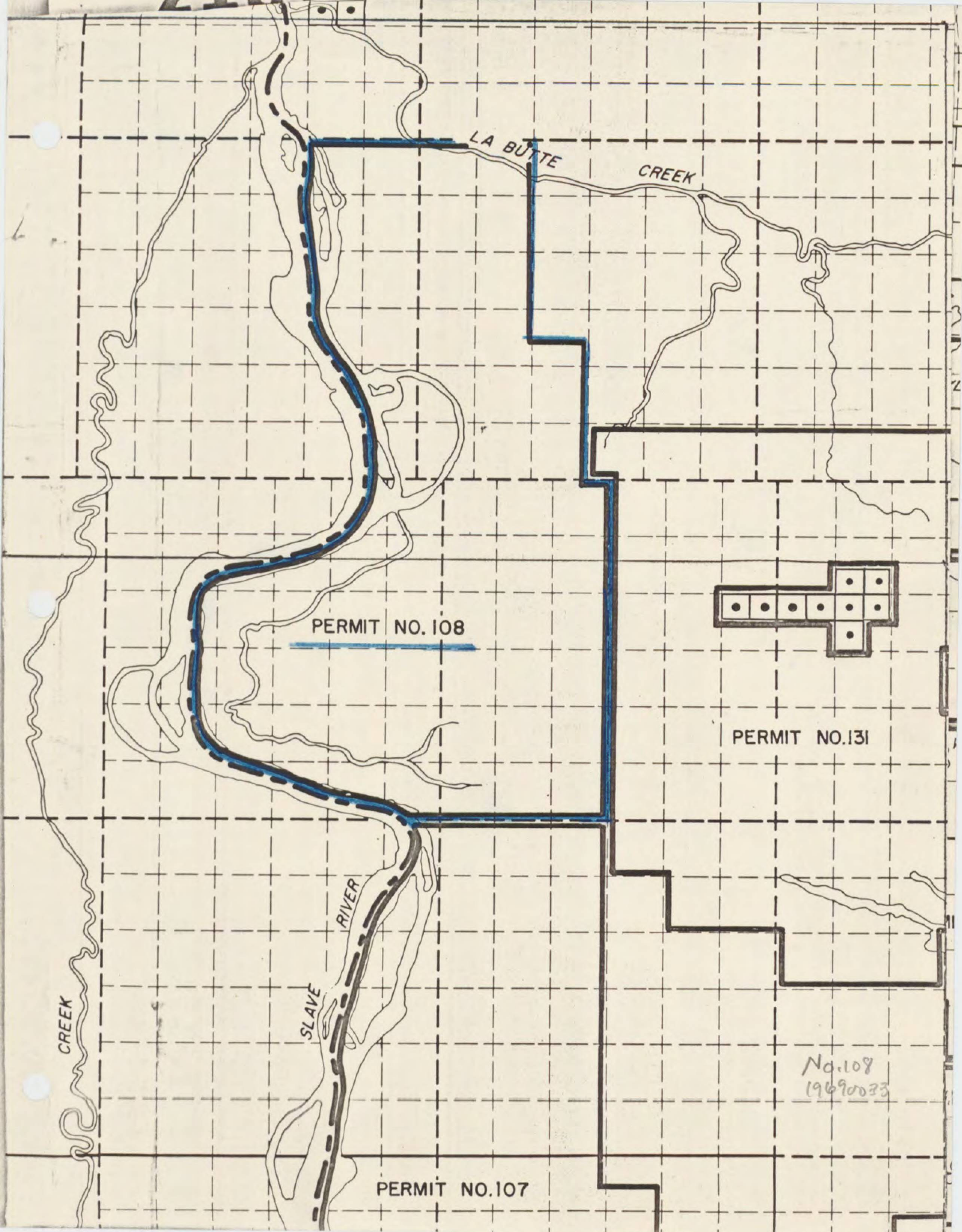


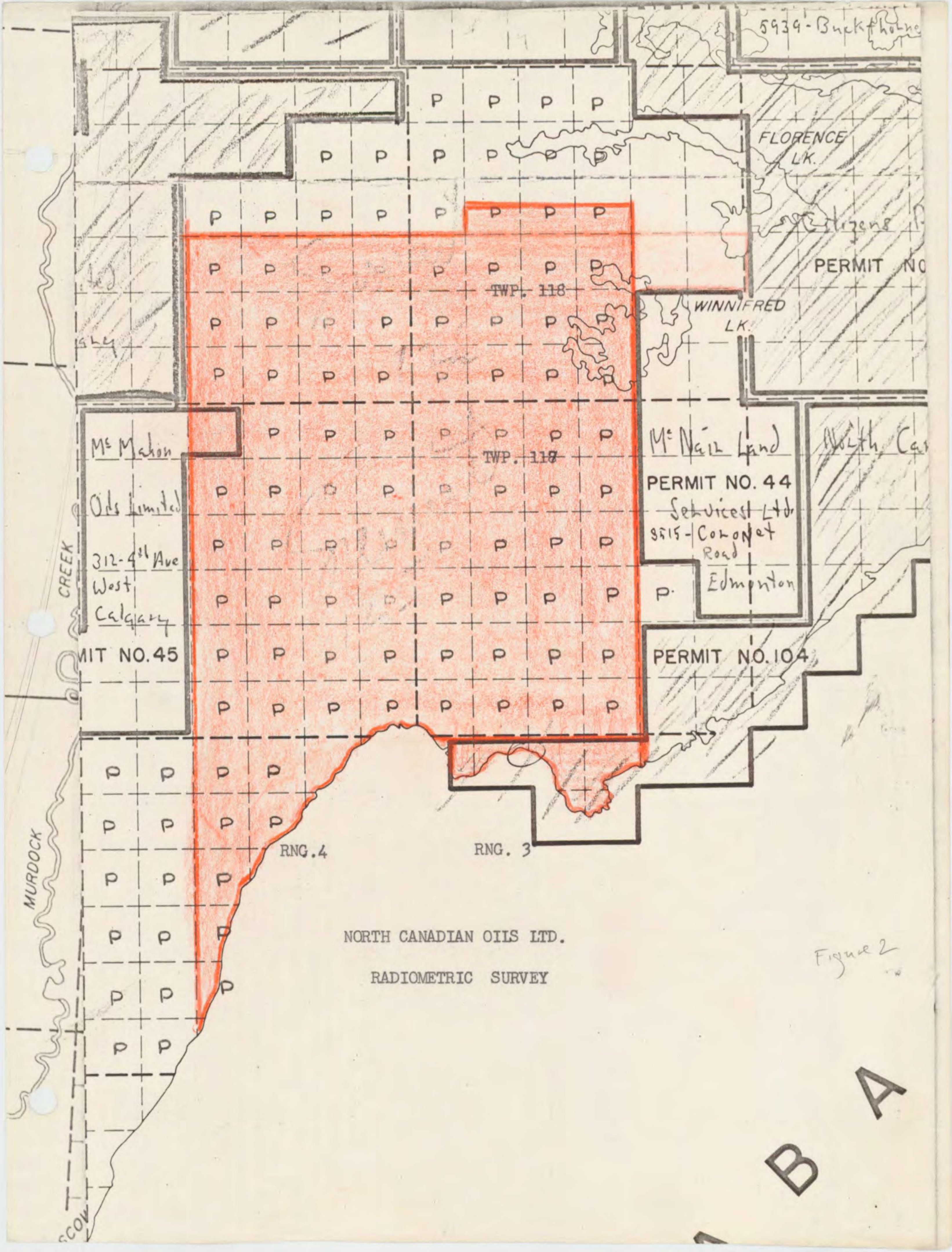
BRYANT LK.
FLORENCE LK.
PERMIT NO. 104
ERMIT NO. 126
PERMIT NO. 77
WINNIFRED LK.
TP.118
PERMIT NO. 44
IO.125
TP.117
PERMIT NO.104
A
No. 104
19690033


NO. 134
PERMIT NO. 132
LOUTIT LK.
FLETT LK.
PERMIT NO 135
PERMIT NO. 105
P
P
P
PERMIT NO. 136
PERMIT NO. 123
PERMIT NO. 105
PERMIT NO. 124
No. 105
19690033


MURDOCK
SCOW
CHANNEL
PERMIT
PERMIT NO. 106
RIVIERE
DES ROCHERS
REVILLION
COUPE
PERMIT
NO.106
R.9
TP. 113
No. 106
19690033

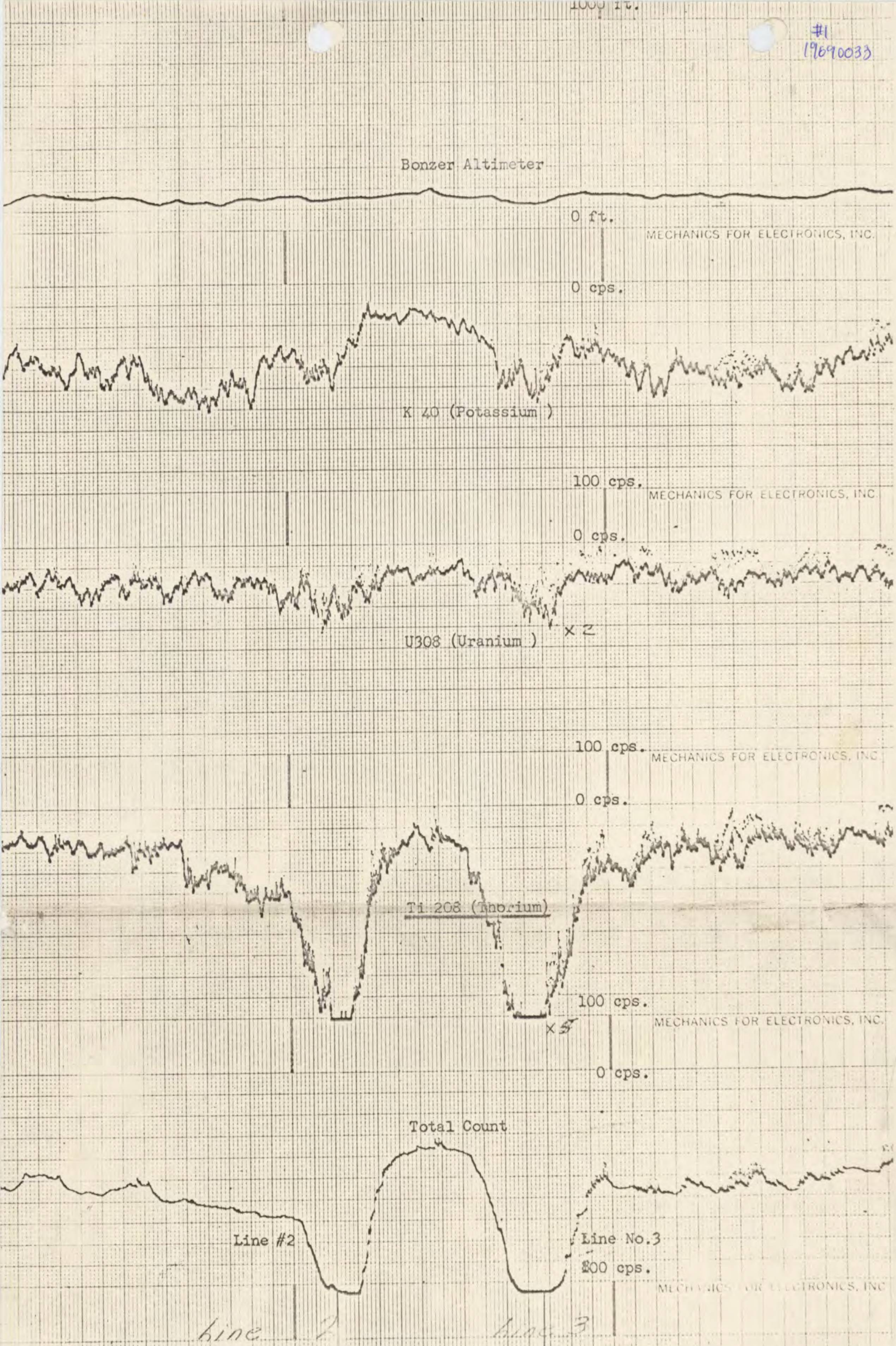

PERMIT NO. 108
PERMIT NO.131
PERMIT NO.107
PERMIT NO. 106
PERMIT
SLAVE RIVER
MURDOCK CREEK
SCOW CHANNEL
RIVIERE
No. 107
19690033


LA BUTTE
CREEK
PERMIT NO. 108
PERMIT NO.131
RIVER
SLAVE
CREEK
PERMIT NO.107
No.108
19690033



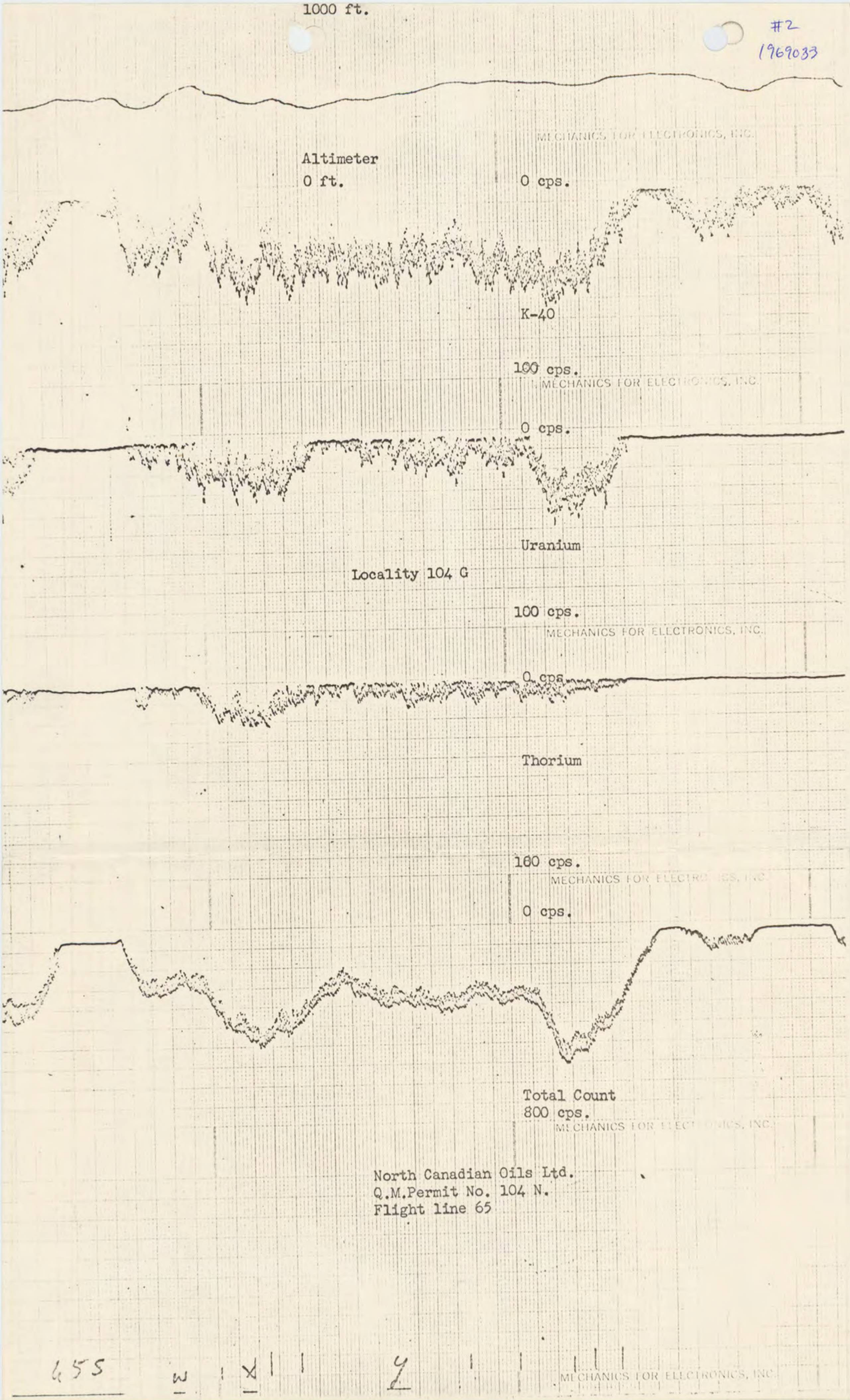
FLORENCE LK.
PERMIT NO
WINNIFRED LK.
TWP. 118
TWP. 118
Mc Mahon Oils Limited
312 - 4th Ave West Calgary
MIT NO. 45
Mc Nair Land Services Ltd.
9515 - Coronet Road Edmonton
PERMIT NO. 44
PERMIT NO. 104
RNG. 4
RNG. 3
CREEK
MURDOCK
NORTH CANADIAN OILS LTD.
RADIOMETRIC SURVEY
Figure 2

#1
19690033

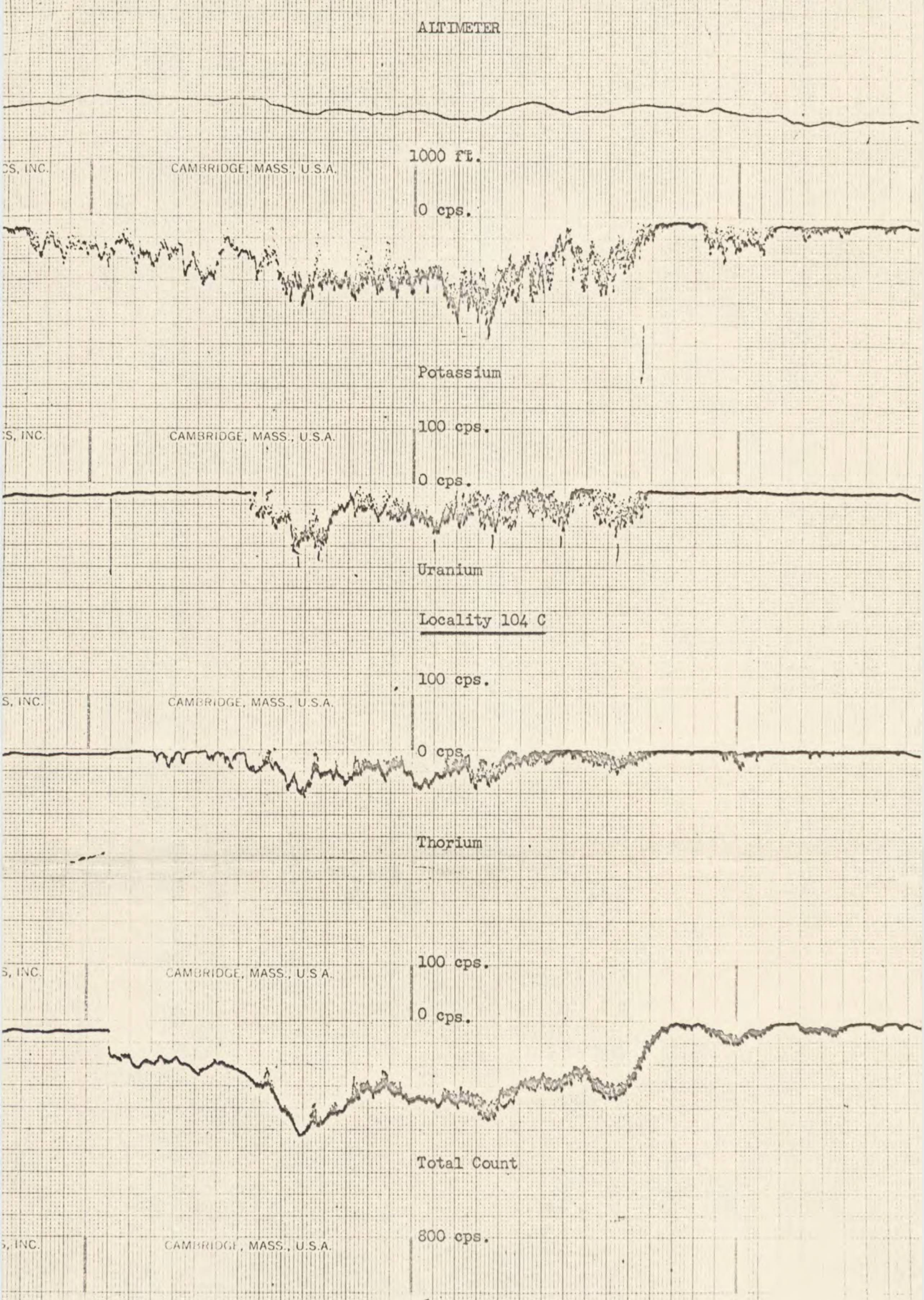


Roving Exploration
Services Ltd.

Gamma Ray Spectrometer Chart
Anomaly located at Sec. 4 Twp. 118 Range 8 W4M
Alberta Quartz Mineral Permit No. 108

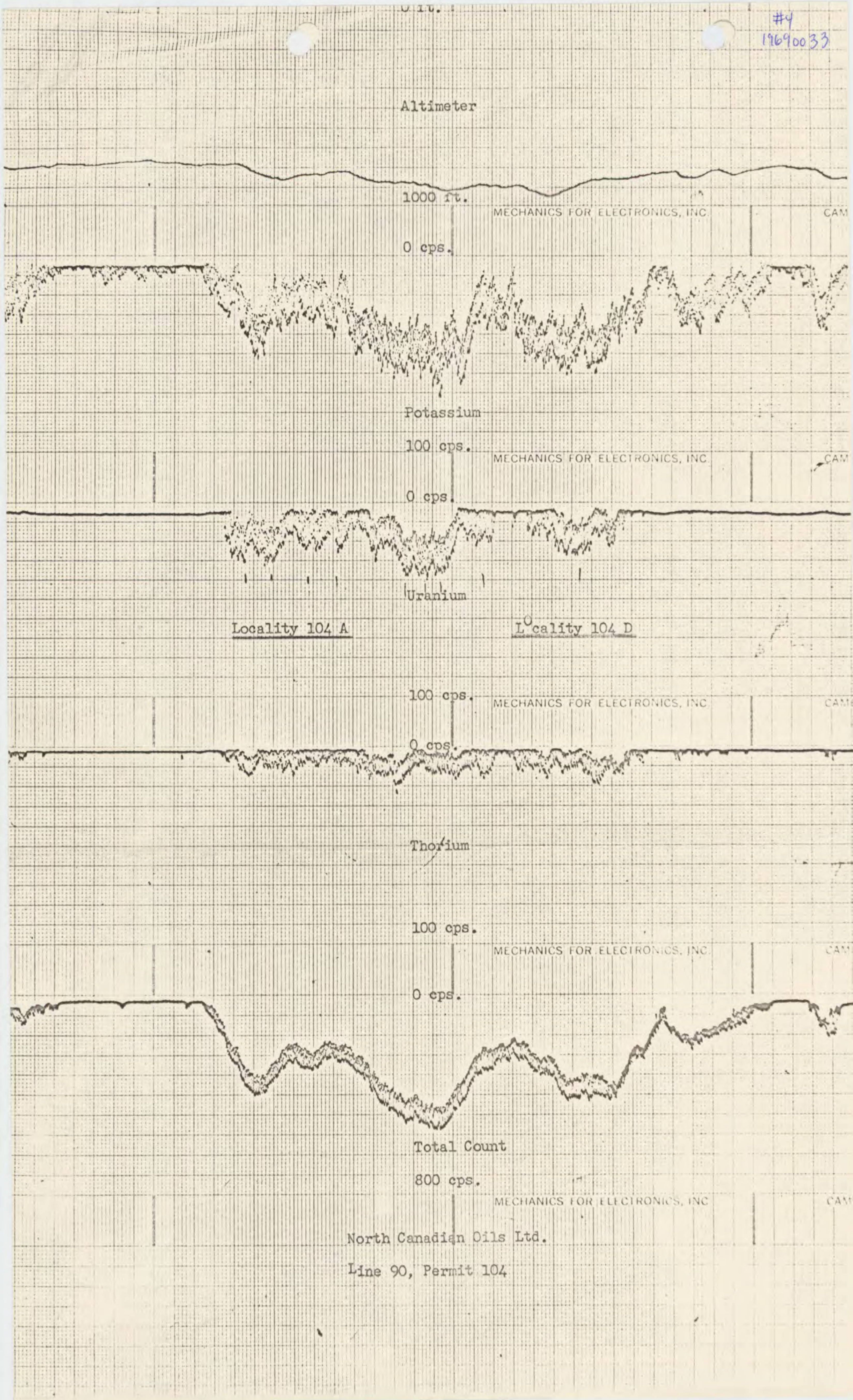

#2
1969033
1000 ft.
Altimeter
0 ft.
0 cps.
K-40
100 cps.
0 cps.
Uranium
Locality 104 G
100 cps.
0 cps.
Thorium
100 cps.
0 cps.
Total Count
800 cps.
North Canadian Oils Ltd.
Q.M.Permit No. 104 N.
Flight line 65
455
W
X
Y
MECHANICS FOR ELECTRONICS, INC.

#3
1969033

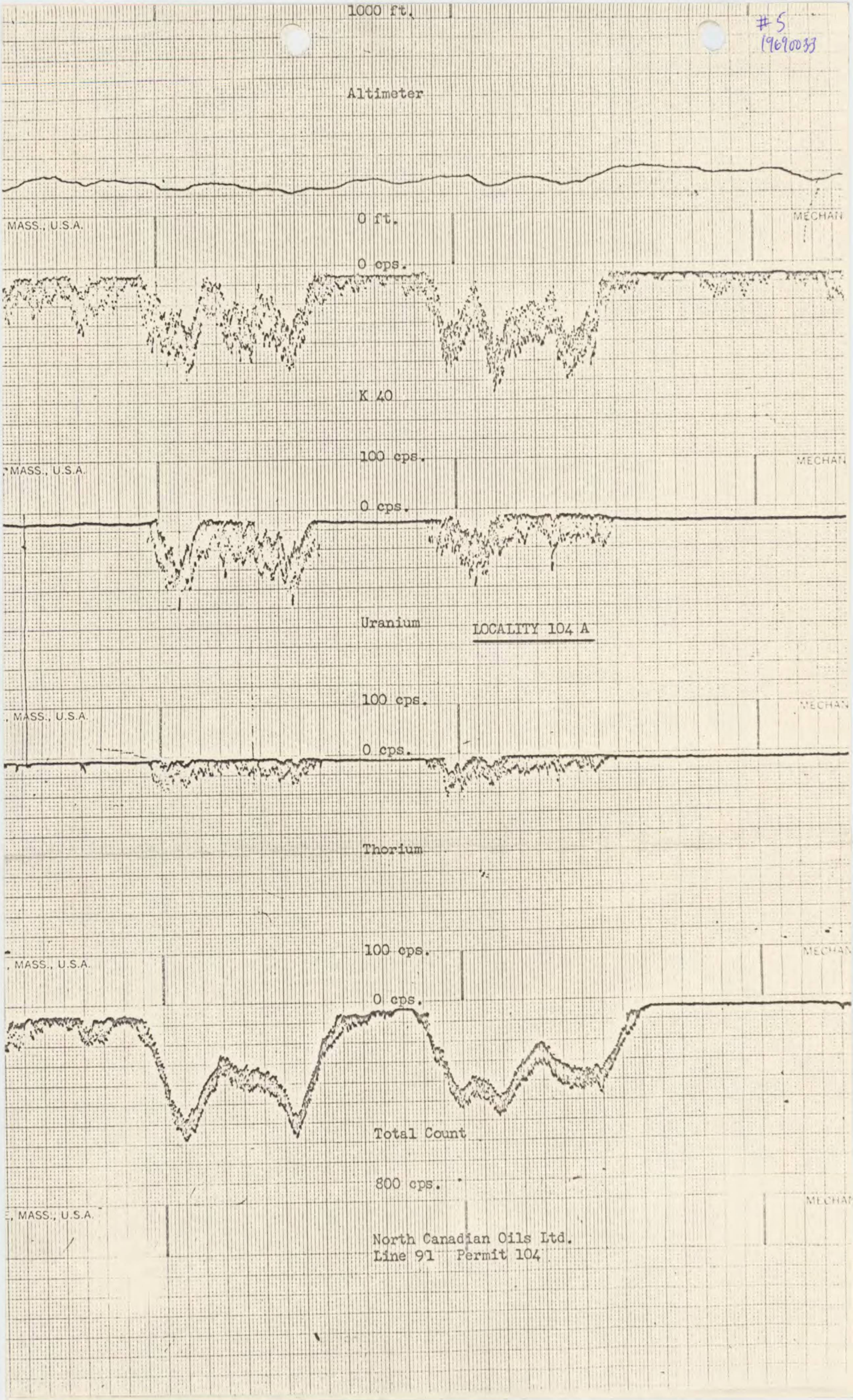


North Canadian Oils Ltd.
Line 87, Permit 104

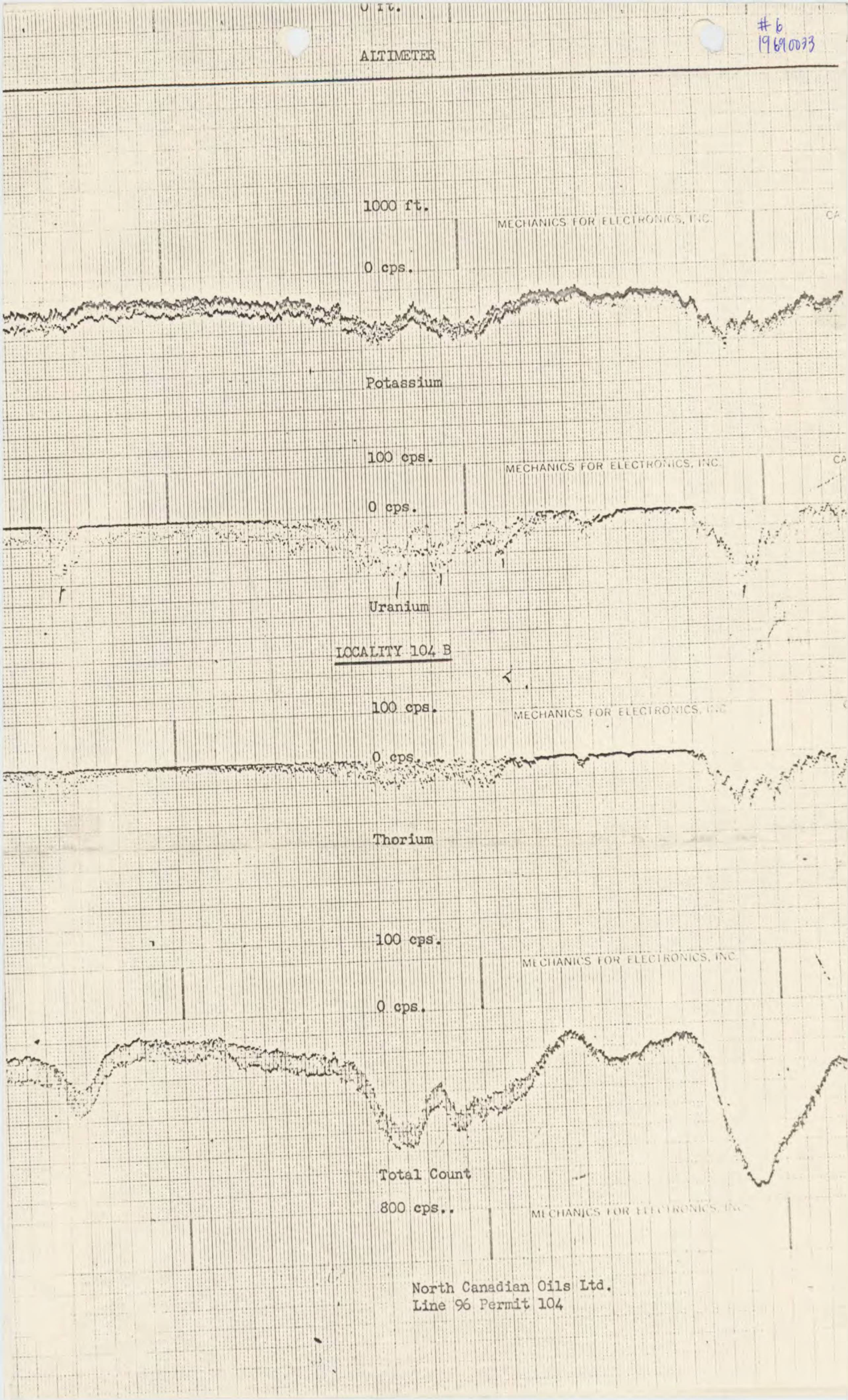
#4
19690033

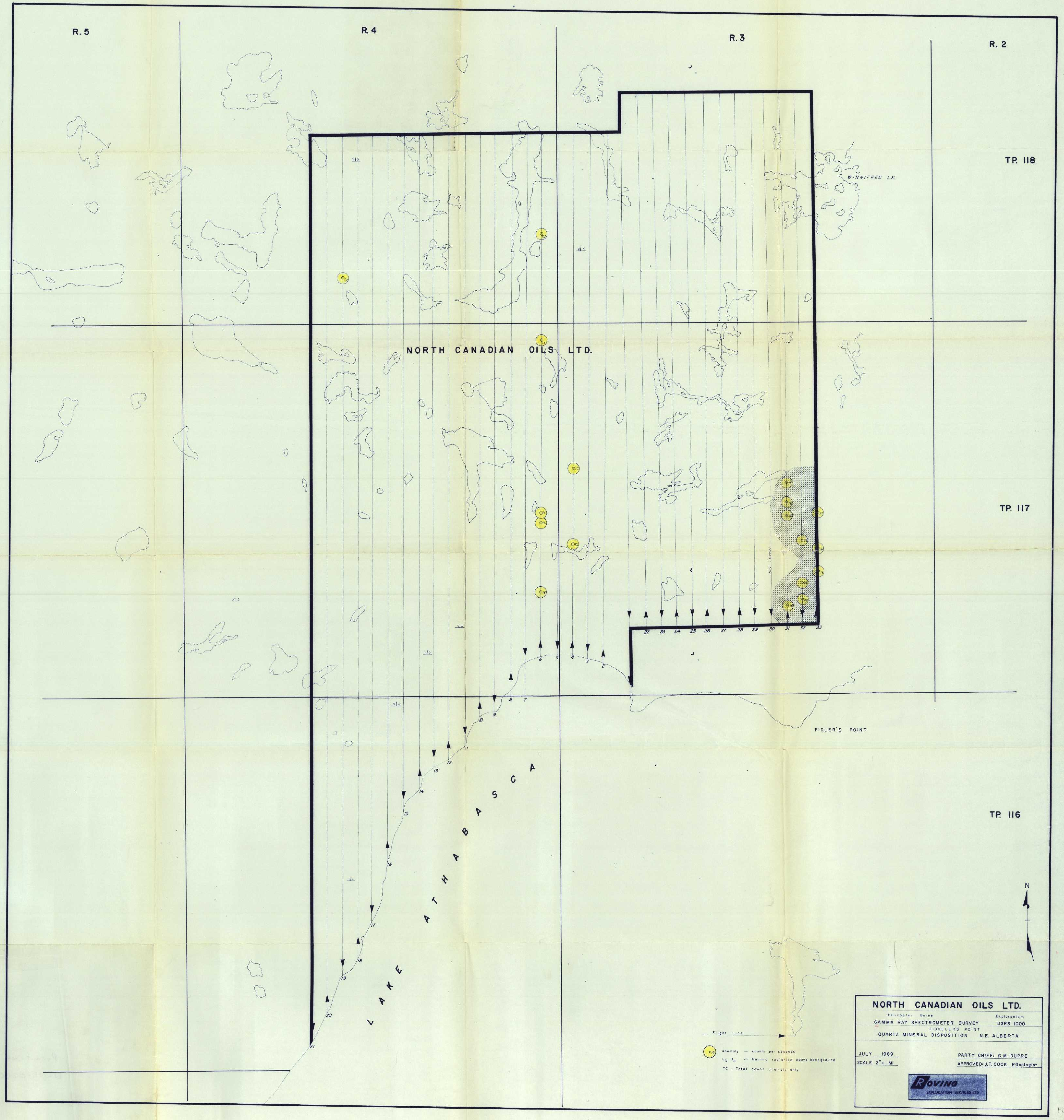

0 ft.
Altimeter
1000 ft.
MECHANICS FOR ELECTRONICS, INC.
0 cps.
Potassium
100 cps.
MECHANICS FOR ELECTRONICS, INC.
0 cps.
Uranium
Locality 104 A
Locality 104 D
100 cps.
MECHANICS FOR ELECTRONICS, INC.
0 cps.
Thorium
100 cps.
MECHANICS FOR ELECTRONICS, INC.
0 cps.
Total Count
800 cps.
MECHANICS FOR ELECTRONICS, INC.
North Canadian Oils Ltd.
Line 90, Permit 104

#5
19690033


1000 ft.
Altimeter
MASS., U.S.A.
0 ft.
MECHAN
0 cps.
K 40
MASS., U.S.A.
100 cps.
MECHAN
0 cps.
Uranium
LOCALITY 104 A
MASS., U.S.A.
100 cps.
MECHAN
0 cps.
Thorium
MASS., U.S.A.
100 cps.
MECHAN
0 cps.
Total Count
800 cps.
MASS., U.S.A.
MECHAN
North Canadian Oils Ltd.
Line 91 Permit 104

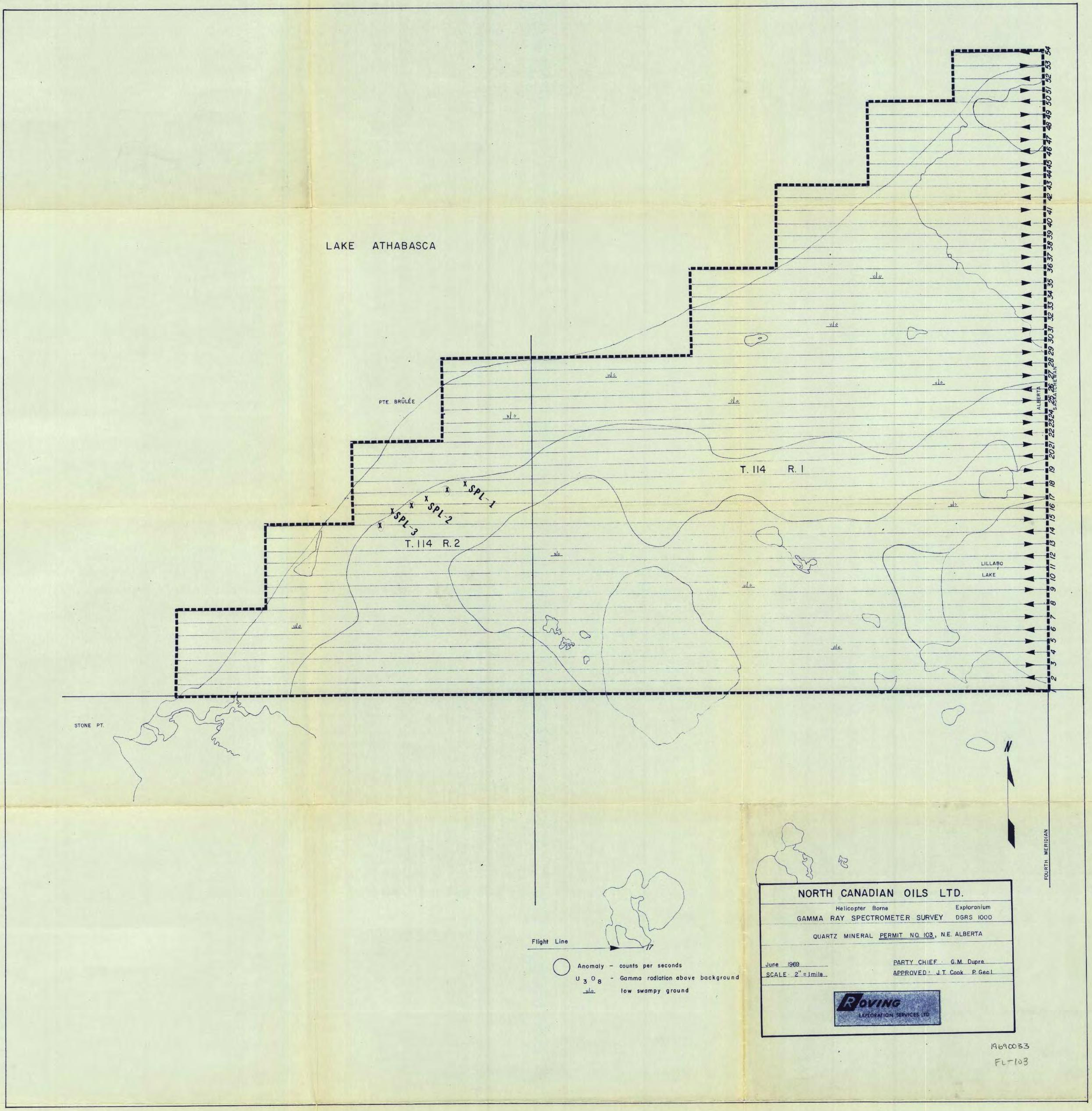
#6
19690073


0 ft.
ALTIMETER
1000 ft.
MECHANICS FOR ELECTRONICS, INC.
0 cps.
Potassium
100 cps.
MECHANICS FOR ELECTRONICS, INC.
0 cps.
Uranium
LOCALITY 104 B
100 cps.
MECHANICS FOR ELECTRONICS, INC.
0 cps.
Thorium
100 cps.
MECHANICS FOR ELECTRONICS, INC.
0 cps.
Total Count
800 cps.
MECHANICS FOR ELECTRONICS, INC.
North Canadian Oils Ltd.
Line 96 Permit 104

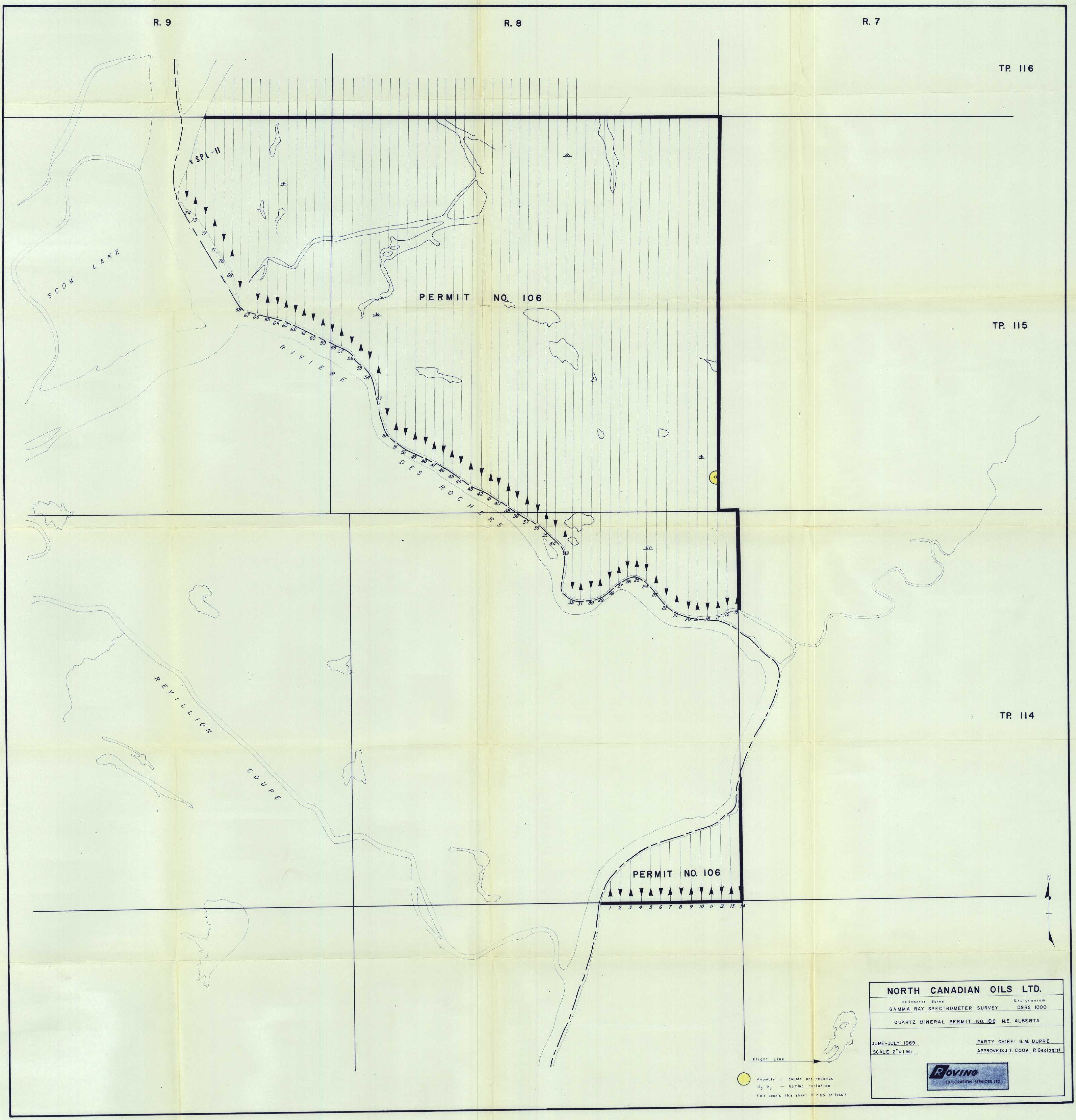


FL-1

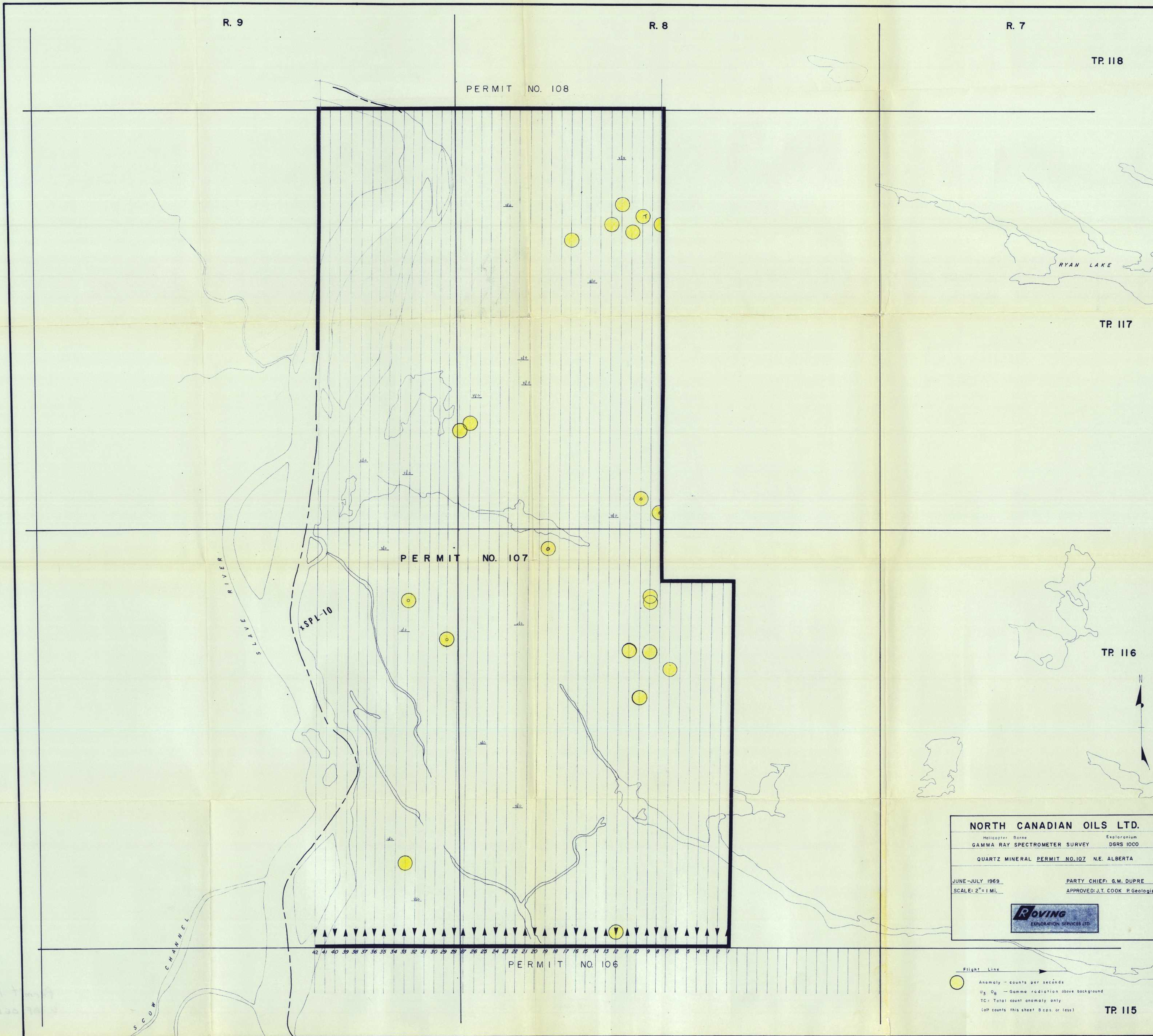
19690033


LAKE ATHABASCA
PTE BRÛLÉE
SPL-1
SPL-2
SPL-3
T. 114 R. 2
T. 114 R. 1
LILLABO
LAKE
ALBERTA
SASKATCHEWAN
STONE PT.
N
FOURTH MERIDIAN
NORTH CANADIAN OILS LTD.
Helicopter Borne
Exploranium
GAMMA RAY SPECTROMETER SURVEY
DGRS 1000
QUARTZ MINERAL PERMIT NO. 103, N.E. ALBERTA
June 1969
SCALE 2" = 1 mile
PARTY CHIEF G.M. Dupre
APPROVED J.T. Cook P.Geol.
ROVING
EXPLORATION SERVICES LTD.
Flight Line
17
Anomaly - counts per seconds
U_3O_8 - Gamma radiation above background
low swampy ground
19690033
FL-103

[redacted]

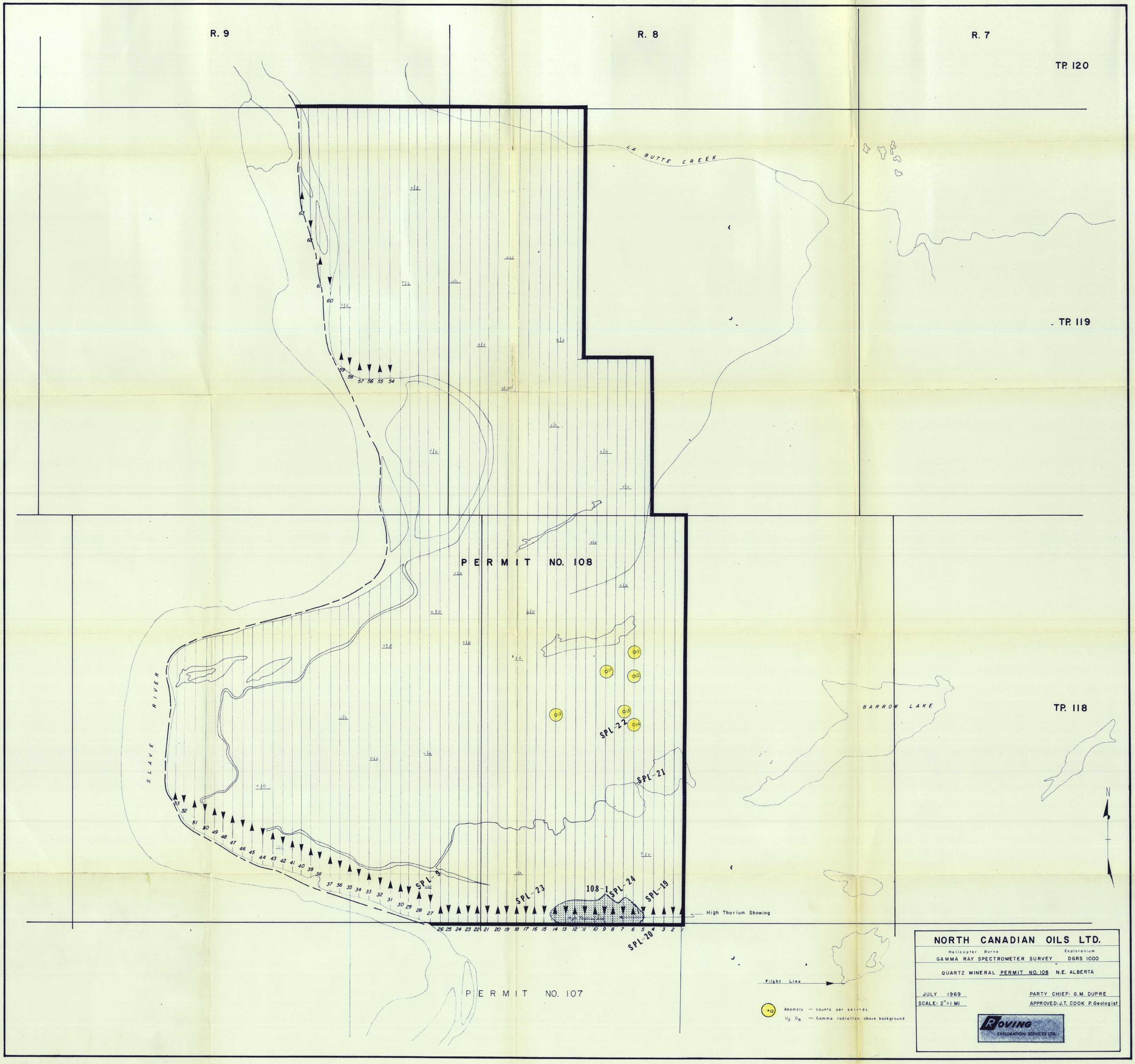


FL-106
19690033
12e



FL-107

19690033



FL-108
19690033