


CENTRAL PACIFIC MINERALS N.L.

FLORINA N.T. 33

COMPLETION REPORT ON EXPLORATION
LICENCE 382 , FLORINA AREA.

March, 1973

F. Baarda
B. Pietsch
C. Shipway



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SUMMARY

Reconnaissance exploration indicated that the Upper Proterozoic - Palaeozoic unconformity and the Palaeozoic Jinduckin Formation had little economic potential. A review of the environs of the E.L. area indicated that the Fergusson River system had potential for sedimentary uranium deposits. This was enhanced by the presence of an airborne radiometric anomaly covering the lower reaches of the Fergusson River, which was verified on the ground. However a multichannel spectrometer survey over this area indicated that the anomaly had a thorium source. No more work was completed on the area and it was surrendered.

11/2

INTRODUCTION

Exploration Licence 382 covering 418 square miles was granted on the 17th July 1972. Adjacent Exploration Licences 505 (35 square miles), 506 (17 square miles) and 507 (10 square miles) were all granted on the 18th August 1972. Exploration was conducted on these four areas concurrently and it is impossible to split the results. This report will contain all of the results and cross reference will be made to it in the summary reports of E.L.'s 505, 506 and 507.

SITUATION AND ACCESS

Exploration Licence 382 is situated approximately 38 miles due west of Katherine, on the Fergusson River 1:250,000 Bureau of Mineral Resources geological map (Map 1).

Access by 4-wheel-drive vehicles to the area east of Daly River is by a gravel road to "Florina Homestead". This is called the Katherine Farms road and leaves the Stuart Highway 15 miles north of Katherine. Road distance is approximately 55 miles.

Access to the area west of the Daly River may be obtained either by a crossing near "Florina Homestead" or by a crossing along the Dorisvale formed gravel road. The Daly River impedes road travel in the 'wet season' and can only be crossed between April and November.

An airstrip near "Florina Homestead" is suitable for use by light aircraft.

TOPOGRAPHY AND CLIMATE

Outcrop is poor and relief is generally subdued. West of the Daly River, ridges occur with a maximum relief of 100-130 feet. Annual rainfall varies from 40 to 50 inches and is experienced during the summer months.

GEOLOGY

The geology of this region is described by Walpole et al -"Geology of the Katherine-Darwin Region N.T." Bur. Min. Res. Bull. 82 Vol 1. A brief description is given below:

The Daly River Basin consists of Upper Proterozoic, Cambrian, Ordovician and Mesozoic sediments, unconformably overlying

Lower Proterzoic basement rocks. The basin had generally been regarded as being sedimentary, but may be, in part, formed by Cainozoic warping.

Tolmer Group (Upper Proterozoic)

The Tolmer Group is an arenite, carbonate-lutite assemblage, about 3000 feet thick and is subdivided into three formations: the Buldiva Sandstone, the Hinde Dolerite and the Waterbag Creek Formation. Only the Waterbag Creek Formation occur in the E.L. area. It rims the south west boundary of the area trending north westerly and dipping gently to the north east. Most of the exposures seen inside the area were of ferruginous sandstones and siltstones which in most cases are exposed on the lower slopes of mesas or ridges.

Antrim Plateau Volcanics (Lower Cambrian)

Volcanic rocks do not crop out on the E.L. area but they have been intersected by Water Resources drill holes. Considered to be Lower Cambrian, these volcanics lie unconformably on the Tolmer Group and are unconformably overlain by the Middle Cambrian sediments.

Near the Katherine, Flora and Roper Rivers the basalt crops out as black weathered soil with scattered boulders and pebbles of quartz and gypsum.

Minor mineralization occurs in the volcanics 13 miles west northwest of Tipperary Homestead, where malachite and azurite occur at the contact with the underlying ferruginous sandstone.

Daly River Group (Cambrian-Ordovician)

The Group consists of limestone, sandstone and siltstone, deposited in shallow water in a slowly sinking basin. They

have been divided into three formations: the Tindall Limestone, Jinduckin Formation and Oolloo Limestone. These formations dip gently into the centre of the structural basin and outcrop consists of about 20-30% of the total area of the E.L.

B.M.R. regional mapping shows the Tindall Limestone of Middle Cambrian age resting unconformably on the Waterbag Creek Formation but with the unconformity concealed under a wide soil cover. Two small outcrop areas of Tindall Limestone as mapped by the B.M.R. are present in the extreme southwestern corner of the area. Field examination of these areas indicated a thin sequence of flaggy sandstones and thin-bedded limestones overlain by more massive limestone. In no outcrop was more than 50-60 feet of sediment observed and the same general sequence was present in each area observed. These rock types are not strictly typical of the Tindall Limestone but possibly comprise the basal beds in this area. Aside from these few small areas the Tindall Limestone is completely obscured by heavy soil and/or later rock cover. These rocks dip gently to the north east.

Conformably overlying the Tindall Limestone is the "Jinduckin Formation" of the Cambrian-Ordovician age. This formation is moderately well-exposed in the central and southern parts of the area, although it is often capped by Cretaceous rocks. Where observed in outcrop, ferruginous sandstones comprise the bulk of the formation with minor limestones and marly siltstones.

Small lenses up to 300 feet long of very white sugary sandstone occur throughout the ferruginous sandstones. These lenses are possibly selective replacements of limestone or dolomite as in some outcrops the white sugary sandstone rests directly upon grey limestone.

In the south-western part of the area a wide band of country has been mapped by the B.M.R. as soil cover with red soil. However, light bulldozing along a fence line just to the north of the E.L., in this soil type, has revealed boulders of massive limestone, indicating that limestone comprises the bulk of the formation in the more western part of the E.L. As exposures are limited by soil and Cretaceous rock cover, it is not possible to say whether this represents a minor facies change or whether two different sections of the formation are exposed in east and west. A third possibility is that the massive limestones under soil cover in the western part of the area are a part of the Tindall Limestone.

Further north the Jinduckin Formation is in turn conformably overlain by the Ooloo Limestone. This formation was only briefly examined in the reconnaissance.

Mullaman Beds (Lower Cretaceous)

Overlapping and obscuring the Palaeozoic and Proterozoic sediments are discontinuous remnants of the Cretaceous Mullaman Beds. These rocks occur capping mesa-type topography and also form large areas of slightly elevated highlands. In the latter case the Cretaceous is usually represented by reddish sandy soils probably forming over fairly thin (20 feet) soft sandstones. Both types of Cretaceous occurrences are extensively and discontinuously lateritised. The mesa cappings are variable; in places a 'pisolitic iron capping predominates, and in others a white silicified 'quartzite' or porcellanite is present. A Mesozoic plant fossil was observed in this latter 'quartzite' capping palaeozoic sediments about 5 miles south-west of Mt. Bowman.

Quaternary

Quaternary alluvial soil and sand covers a large area of the E.L.

STRUCTURE

Upper Proterozoic

The Tolmer Group forms the margins of the Daly River Basin and has shallow depositional dips (less than 10°) into the basin. Faulting is common along joint plans and in places strike faults occur. Small monoclinal folds are locally developed.

Cambrian

The Daly River Group was deposited in the Daly River Basin with shallow depositional dips and numerous slump structures. Faulting is rare and on a small scale.

Lower Cretaceous

The Mullaman beds occur as widespread horizontal sheets with little folding, in places faulting has affected the beds, probably in post Tertiary times, because lateritic capping is also disturbed.

Cainozoic warping of sediments has been partly responsible for the formation of the Daly Basin (Hays).

EXPLORATION RESULTS

The initial exploration of the area consisted of reconnaissance prospecting along the Upper Proterozoic-Palaeozoic unconformity. This unconformity is indistinct in most places on the ground. It is invariably covered by alluvium, heavy soil cover or Cretaceous rocks. The soil type similarity between the Waterbag Creek Formation and the Tindall Limestone also makes the exact position difficult to locate.

Scintillometer and magnetometer traverses were run across the zone of the unconformity and the results are shown on the Maps 2 and 3. The results are not considered encouraging. Field traversing noted no signs of mineralization or prior prospecting. No anomalous scintillometer readings were noted and the maximum reading in the vicinity of the unconformity was 65 counts per second.

As the unconformity runs for 12-14 miles along the south-western border of the E.L., it cannot be said to have been thoroughly examined in the time available, particularly as high grass throughout the area obscured outcrops and impeded mobility. However, on available evidence the economic potential near the unconformity is considered to be low and no further work is recommended.

The Jinduckin Formation was briefly traversed away from the unconformity and some spot scintillometer readings taken. These are shown on Map 2. No traversing was carried out east of the Daly River and field work was largely confined to the eastern and southern margins of the E.L. west of the Daly River.

Generally, it is considered that the E.L. is a "grass roots" prospect of low to average potential. While the lithologies in the Palaeozoic succession are not unfavourable for base-metal prospecting, there are no obvious controlling factors and no mineralization has been recorded in the area. In addition, soil and Cretaceous sediments conceal most of the more prospective Palaeozoic rocks.

Nevertheless, it must be remembered that the area has received little attention in the past and has apparently not been extensively prospected.

It is considered that stream sediment geochemistry could be tried, at least in the drainage area of the Lower Palaeozoic rocks west of the Daly River. The lithologies topography and climatic conditions indicate that the technique may be successful in this area. Although the country is fairly flat, there are a number of small streams, which should yield reasonable samples. A sampling frequency of 2-3 per square mile should be generally sufficient.

After the failure of this initial programme to produce any worthwhile targets consideration was given to prospecting for sedimentary uranium within Cainozoic sediments within the Fergusson River drainage system. The rationale behind this decision is outlined below.

Source Rocks

Two rock units within the environs of the area contain known uranium occurrences; and a third rock unit is considered significant as a "source rock" (Map 4).

A. The Cullen Granite

The Cullen Granite forms a large batholith in the centre of the Pine Creek Geosyncline, and crops out over an area of about 1100 square miles. It has not been mapped in detail, but five types of granite have been distinguished, namely: pink coarse porphyritic granite, pink and green coarse porphyritic adamellite, grey coarse porphyritic granite, grey fine porphyritic adamellite, and grey even-grained granite. On the adjoining Mt. Todd and Lewin Springs 1-mile sheets (1962) the granites have been mapped separately, namely as: fine grained granite, coarse-grained porphyritic hornblende granite, fine grained and hybrid granite, and coarse-grained granite. Known uranium prospects are confined to the latter two types.

The group of known uranium prospects in the Cullen Granite are confined to the Edith River Siding area. The prospects include: the Fergusson River Prospect, the YMCA Prospects, Tennysons Prospects, Hore and O'Connors Prospect and the Yenberrie Prospect, all within a 5 mile radius from Edith River Siding, except for the Fergusson River Prospect (10 miles). They all consist of small quartz veins and disseminations with predominantly secondary uranium minerals, generally on N.N.W. trending shear zones associated with silicification and greisenisation of the surrounding granite.

The individual prospects are in themselves not considered a very important source, due to their small size, but they testify to the higher than usual radioactive content of the granites in the area. Airborne radiometric surveys cover only part of the Fergusson River Drainage Basin, but verify the high background of the granite, as well as showing background variations for the various types of granite. Incomplete coverage by radiometric surveys, and lack of detailed mapping, precludes the accurate outlining of the "hot" portions of the Cullen Granite. However, the distribution of known prospects is completely within the Fergusson River Drainage Basin, and that due to its central position within the Basin, it is likely to have been entirely within it for a considerable period of geological time.

B. McAddens Creek Volcanic Member:

The McAddens Creek Volcanic Member of the Carpentarian Kombolgie Sandstone consists of interbedded tuff and amygdaloidal basalt, and outcrops in an ellipsoidal pattern near the edge of the Edith Falls Basin. The ABC Uranium Prospect occurs within it, but the mineralization appears to be fault-controlled, and may be unrelated to the volcanics. A small portion of the volcanic member was covered by the 1953 B.M.R. radiometric survey, and except for some anomalies

which occur throughout the area (regardless of rock unit) shows no abnormally high background.

Approximately half of the McAddens Creek Volcanic Member is located within the Fergusson River Drainage Basin, but the ABC Prospect itself is outside the Basin. The stream patterns indicate stream capture, so it is not known exactly what areas, and for what duration, have been drained by the Fergusson River in the past.

The McAddens Creek Volcanic Member is not considered significant as a "source rock" for uranium mineralization.

C. Edith River Volcanics

The Edith River Volcanics are an assemblage of lavas, ignimbrite, pyroclastic rocks, sediments, and tuffaceous sediments with marked lateral and vertical variations. Their age is Carpentarian, and given as 1760 m.y., which is almost identical to the age given for the Cullen Granite.

West of Edith Falls, the Volcanics consist of: 700 feet greywacke, shale, conglomerate, and tuffaceous sediments, 800 feet dolerite, 80 feet tuff and tuffaceous sediments, 1100 feet ignimbrite, and 1200 feet quartz-feldspar porphyry. In the Fergusson River Siding area, toscanite sills and porphyritic dykes of the Edith River Volcanics appear to have pierced the Cullen Granite, and been extruded as hoods over it.

No uranium mineralization is known within the Edith River Volcanics in this area. However, the Coronation Hill Mine in the South Alligator Field is located within a volcanic neck associated with rhyolites and tuffs of the Edith River Volcanics.

The exact relationship between the Cullen granite and the

Edith River Volcanics is not known, but there is little doubt that they are closely related, (they may even be comagmatic). The 1953 BMR radiometric survey covered that part of the Edith River Volcanics near Edith River Falls and Fergusson. The radiometric background of the formation, while not as high as the "hottest" portion of the Cullen Granite, was shown to be relatively high, and numerous anomalies were clearly associated with the Volcanics. Consequently the Edith River Volcanics are considered a significant potential source of radioactive minerals.

Host Sediments

The potential "host" area is mapped as Quaternary Alluvium overlying Cambrian carbonate rocks of the Daly River Group, with some remnants of the Lower Cretaceous Mullaman Beds.

The alluvium is not differentiated on available geological maps, and is described as: "includes gravel, sand, sandy silt, silt and clay; the greater proportion is silt and clay".

Swamps are present in the area of interest, and are shown on available topographic maps. Swamp areas shown on the 1:250,000 sheet, do not exactly coincide with swamps shown on the 1 inch= 1 mile sheet, thus different criteria were used to define "swamp". The 1-mile sheet, reveals some cut-off meanders, and the outcrop areas of the Mullaman Beds (mostly mesaform remnants), indicate the possible existence of a wide meander belt, between them.

The geomorphological history of the region is not known in useful detail. The area of interest is part of what is known as the "Koolpinya Surface", which is a "multicyclic surface developing at present". Dominant in the formation of the surface have been the processes of pedimentation and scarp-retreat, which have resulted in the deposition of large quantities of eroded material with a wide range of grain size and composition.

There is some evidence of warping affecting both the "source" and "host" areas, and this is expressed as the postulated "Pine Creek Upwarp", and by the Daly Basin. The age and extent of such warping is unknown, but there is no evidence of major warping since the formation of the "Wave Hill" surface (tentatively dated as Miocene-Pliocene). It can be safely assumed that the areal extent of the Fergusson River Drainage Basin has not undergone significant changes, (except perhaps for some minor alterations due to stream-capture) since at least the Late Tertiary.

Laterite profiles, developed at various stages since at least the Lower Cretaceous, indicate the prevalence of a hot wet-dry climate, similar to, or perhaps more tropical than the present climate, during most of the Tertiary-Recent period. Some aeolian deposits, however, indicate at least one arid break during the period.

The paleo-climate and paleo-geomorphology, appear to have been suitable for the deposition of porous sediments, and the accumulation of carbonaceous material in swamps, in the lower reaches of the Fergusson River.

No direct evidence of "boggy" deposits in the Florina Area was found in the literature, except for the mapped "swamps". However, in the northern Plains at Humpty Doo, (an area with virtually the same geomorphic history), drill holes have encountered up to 55 feet of black silt and sandy silt. There is no reason to suppose that similar sediments are not present in the Florina Area.

Locally, the underlying carbonate rocks may be expected to have significant effects, both chemically and geomorphologically. The extent of these features (i.e. part topography, pH changes) cannot be fully assessed without field evidence.

Theoretical Considerations

Apart from the above discussion on "source" and "host", further insight can be gained by studying the distribution of intensity changes shown on the 4 one-mile sheets partially covered by the 1953 B.M.R. airborne radiometric survey. Unfortunately the survey was flown using the older type of scintillometer, thus to what extent the background variations are due to radioactive minerals other than uranium, is not known.

The data has been reduced to the same scale as that used for the drainage net/source rock map (1:500,000). Within the limitations of the survey (1/5 mile line spacing and 500 feet height), good correlation of higher intensity areas with the Cullen Granite and the Edith River Volcanics is apparent.

An encouraging feature, is the high intensity area over the lower reaches of the Fergusson River Area, although again caution is needed, due to the possible non-uranium nature of the radioactivity. There is no obvious relationship between radioactive anomalies and swamp areas shown on the Florina 1-mile sheet, even though some coincide. However, because of the usually buried nature of the type of deposit under consideration this is not necessarily a discouraging feature, especially since the accurate distribution of swamps and fossil swamps is not known at this stage.

Laboratory studies on granites and on silicic volcanic rocks from the Western United States, indicate that 20 grams of uranium per metric ton of granite, is available as a source for sedimentary uranium deposits, in contrast to a maximum of 5 grams of uranium per metric ton of devitrified silicic volcanic rocks, (Rosholt et al, Econ. Geol. 1971). This may downgrade the Edith River Volcanics as a source rock, but it also demonstrates that the Fergusson River Drainage Basin has the greatest potential for sedimentary uranium, of any

of any drainage basin in the area.

The Katherine River Drainage Basin parallels the Fergusson River Drainage Basin and drains large areas of Edith River Volcanics, the Yeuralba Granite and that part of the McAddens Creek Volcanic Member containing the ABC Prospect area. However, this basin lacks a "hot granite" such as near Edith River Siding.

The area downstream from where the Fergusson River joins the Daly River is considered to have low potential, because the Daly River drains a very large barren area, resulting in considerable dilution. Near the junction however, there is some potential for "pre-Daly River" deposits.

To check the radiometric results outlined above five ground scintillometer traverses were completed. These were spaced one mile apart and totalled 15 miles, and were run from the old Florina track to the Fergusson River. Background readings of 15-30 cps were obtained over most of the area except for a zone about one mile wide near the Fergusson River where the readings rose abruptly to 60-80 cps (see Map 5).

This radiometric 'platform' was later surveyed by radiometric reconnaissance using multi-channel equipment. The survey was carried out by Australian Anglo American Ltd. as a prelude to a possible farm-in. The instrument used was a Cryogenic Ratemeter No. 690 with two 5 inch by 5 inch crystals, manufactured by Colorado Geophysical Corporation. The survey was flown at a height of 300 feet above ground level in a Cessna 337. The survey flight lines and some typical results are shown on Maps 6 and 7.

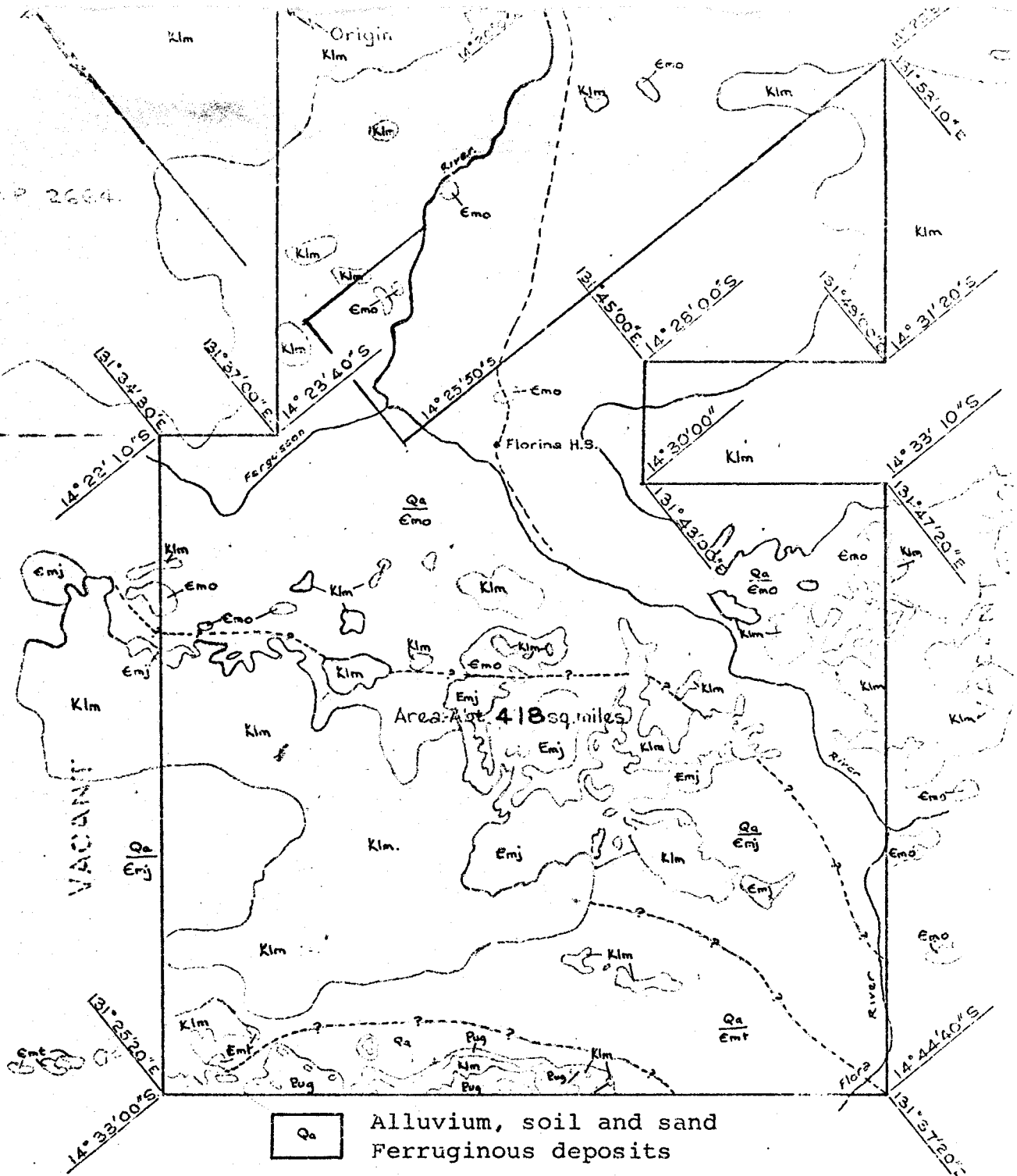
A low order anomalous area was detected on all channels (K+U+TH, U+TH, TH) indicating that the radiometric 'platform' is a thorium anomaly due most probably to thorium bearing detrital minerals transported by the Fergusson River system and derived

from the Cullen Granite to the north-east.

CR 73/125B

MAPS TO ACCOMPANY CR 73/125A
BY: CENTRAL PACIFIC MINERALS N.L.

A.P. 2664.



Mullaman Beds

Colloco Limestone

Jinduckin Formation

Manbulloo Limestone Member

Tindall Limestone

Waterbag Creek Formation

Qa

Alluvium, soil and sand
Ferruginous deposits

Klm

Undifferentiated sandstone and siltstone;
fresh-water and marine sediments

Emo

Silicified limestone, in places containing
algae

Emj

Medium and fine-grained sandstone and silt-
stone with halite casts, some limestone lenses

Emu

Silicified flaggy limestone

Emt

Fossiliferous
limestone with
chert bands
and nodules

Pug

Ferruginous
sandstone and
siltstone with
halite casts

CENTRAL PACIFIC MINERALS N.L.

FLORINA NT. 33
E.L. 382
Geological Sketch.

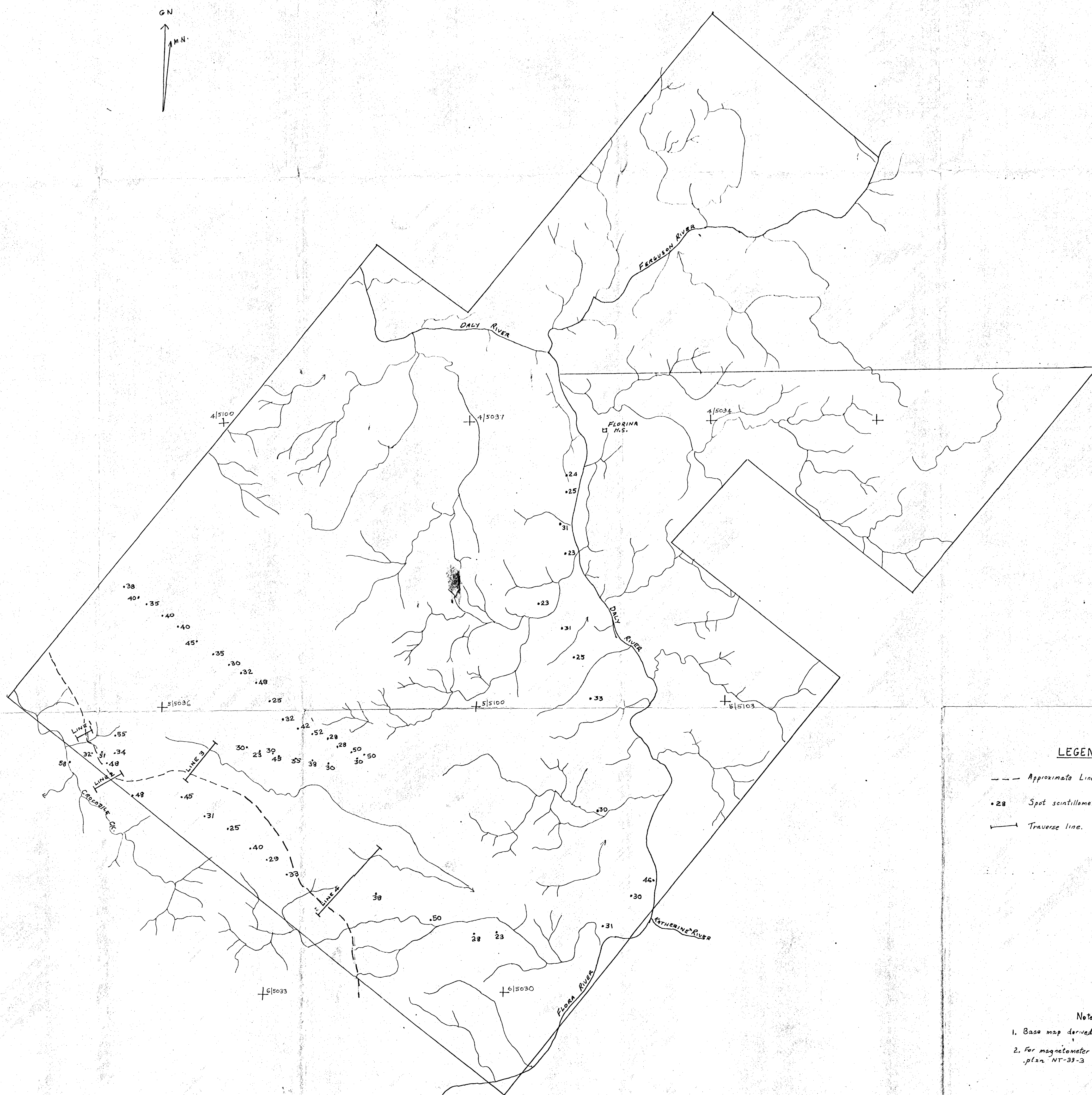
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Plan No.: NT 33-1

Date 16.2.1971

Drawn by: J.G.A.

MAP 1



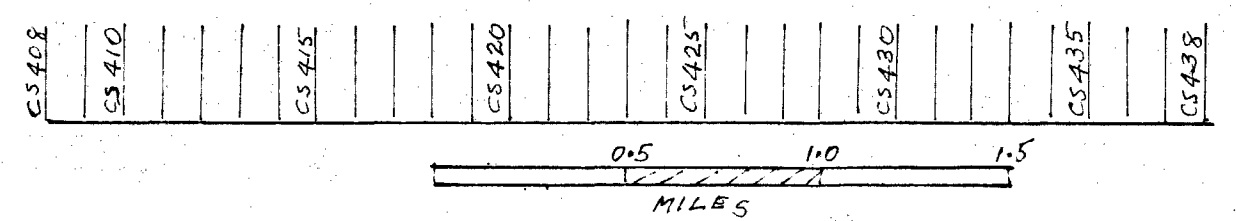
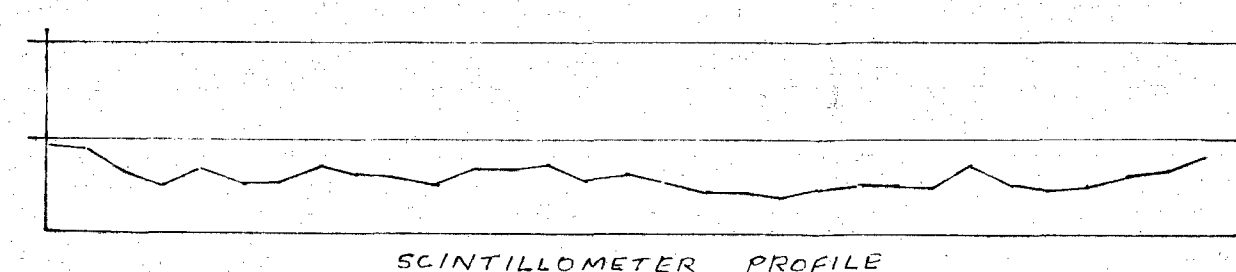
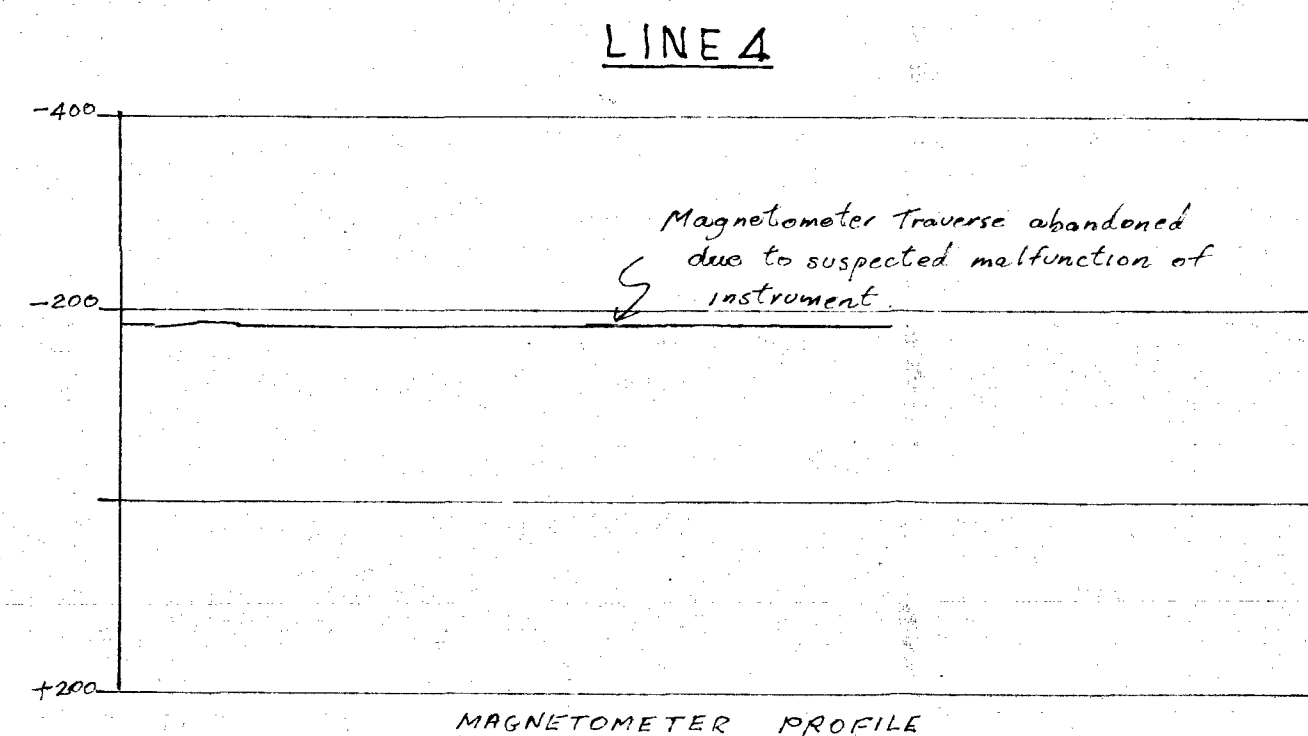
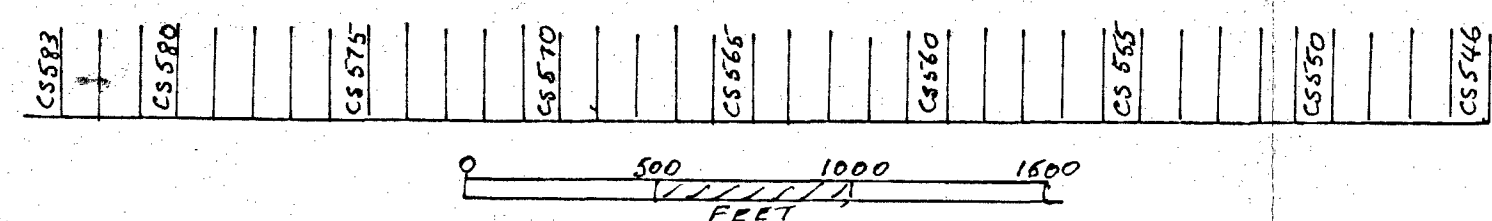
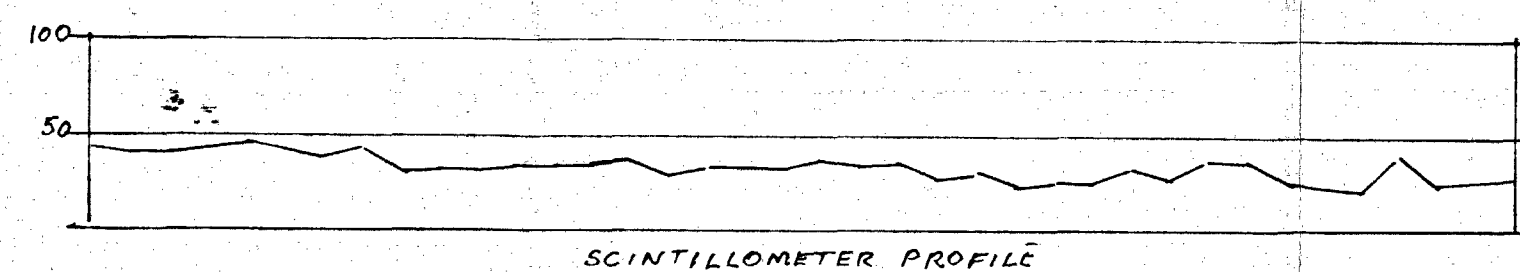
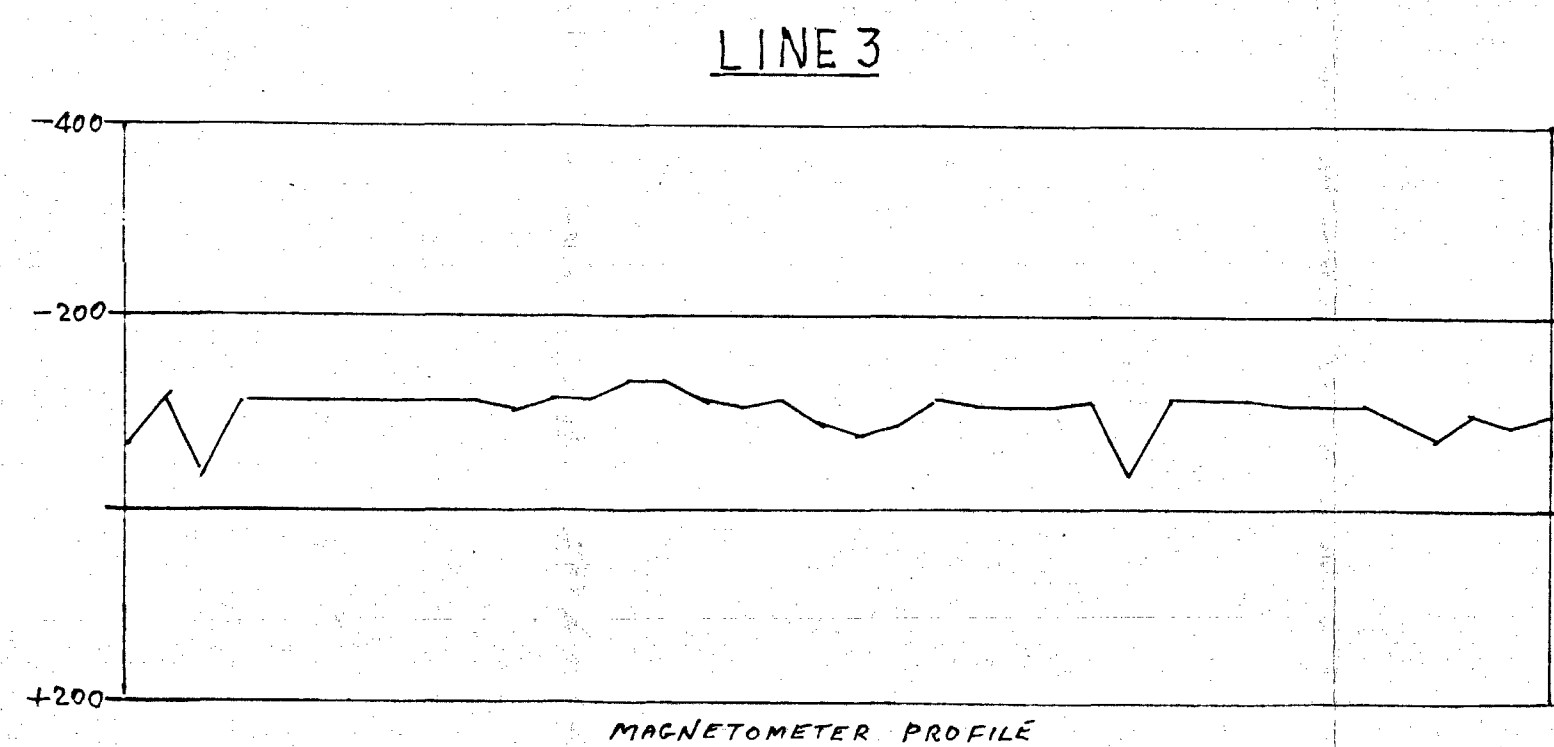
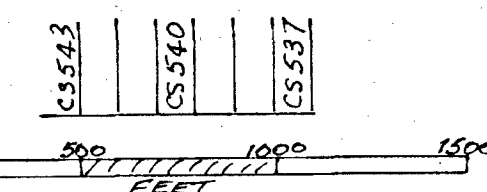
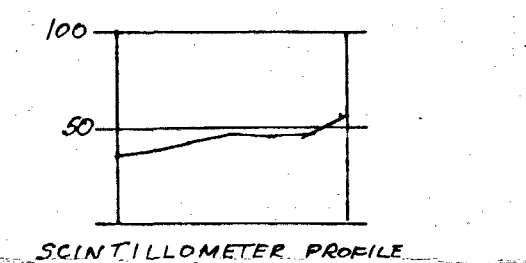
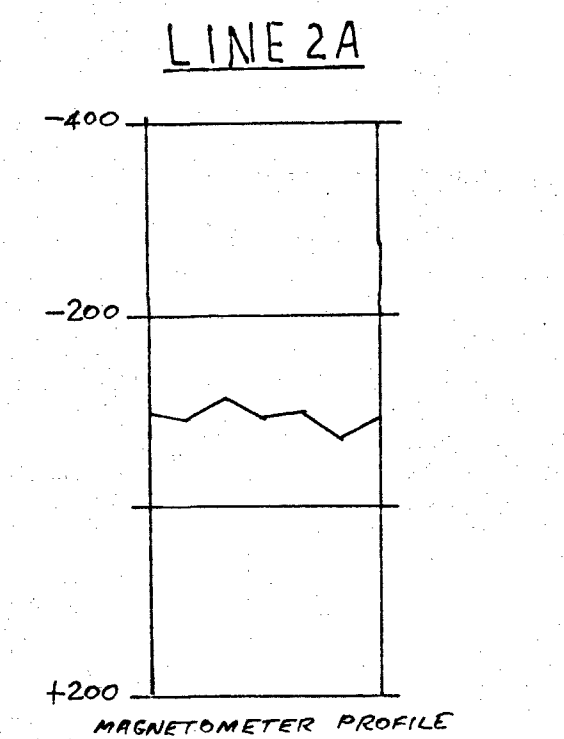
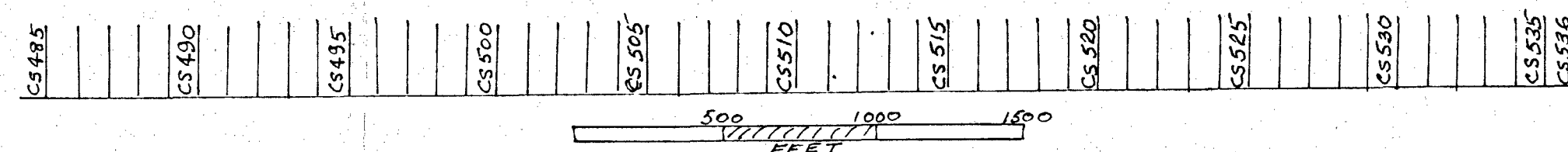
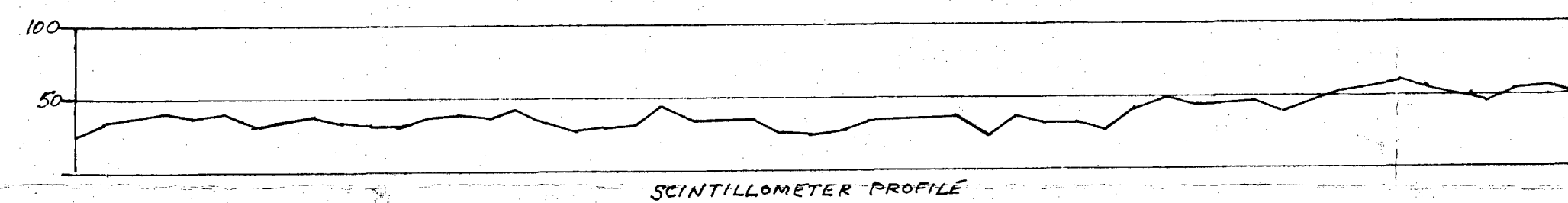
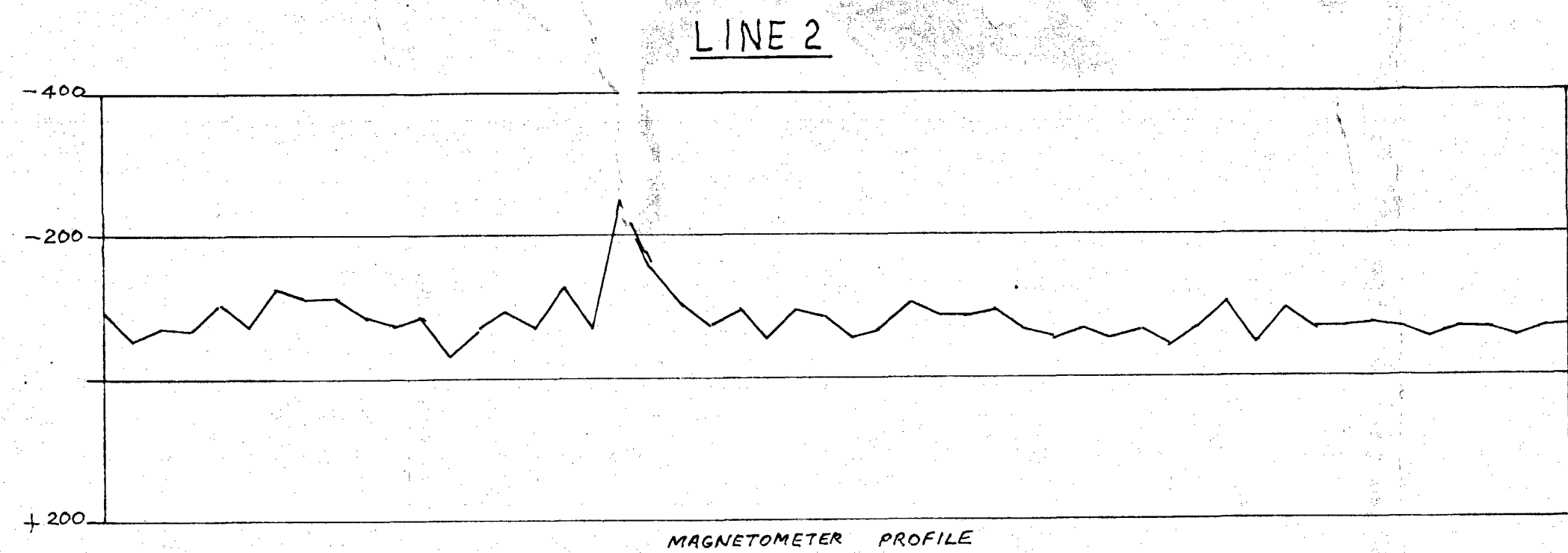
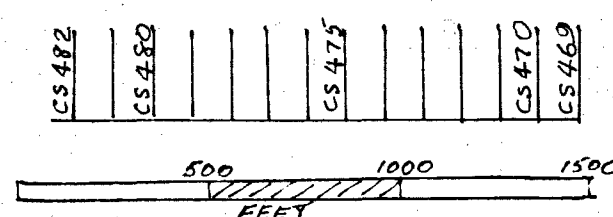
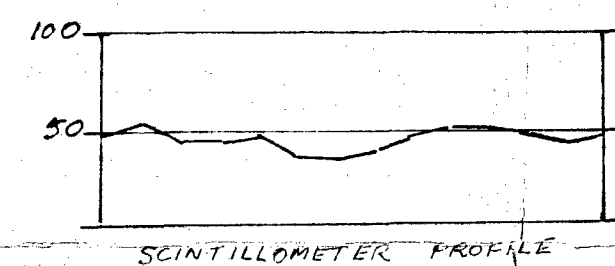
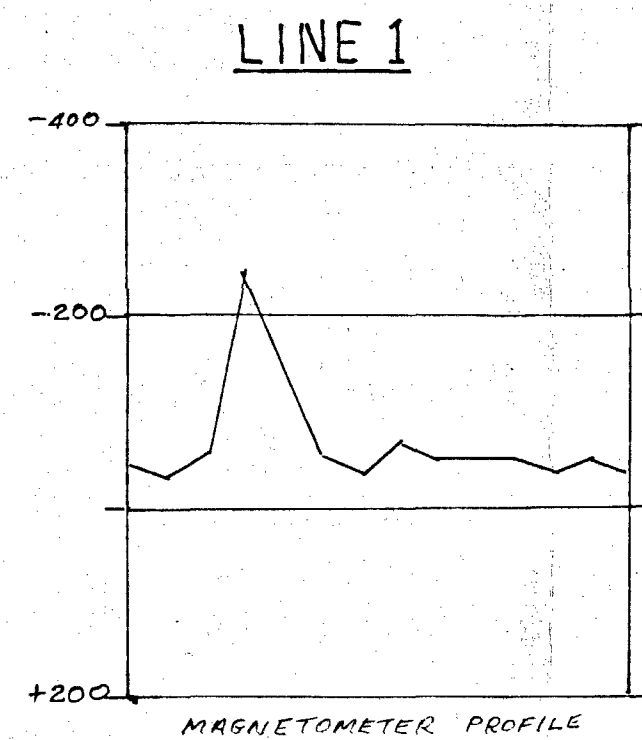
LEGEND

- Approximate Line of Unconformity
- 28 Spot scintillometer reading
- Traverse line.

Notes

1. Base map derived from plan NT-33, photo scale
2. For magnetometer and scintillometer profiles see plan NT-33-3











CENTRAL PACIFIC MINERALS NL	
N.T.33 - FLORINA-EL382	
RECONNAISSANCE SURVEY	
Scale 1:84,500	Plan No. NT-33-2
Date 11-11-71	Drawn by CHS

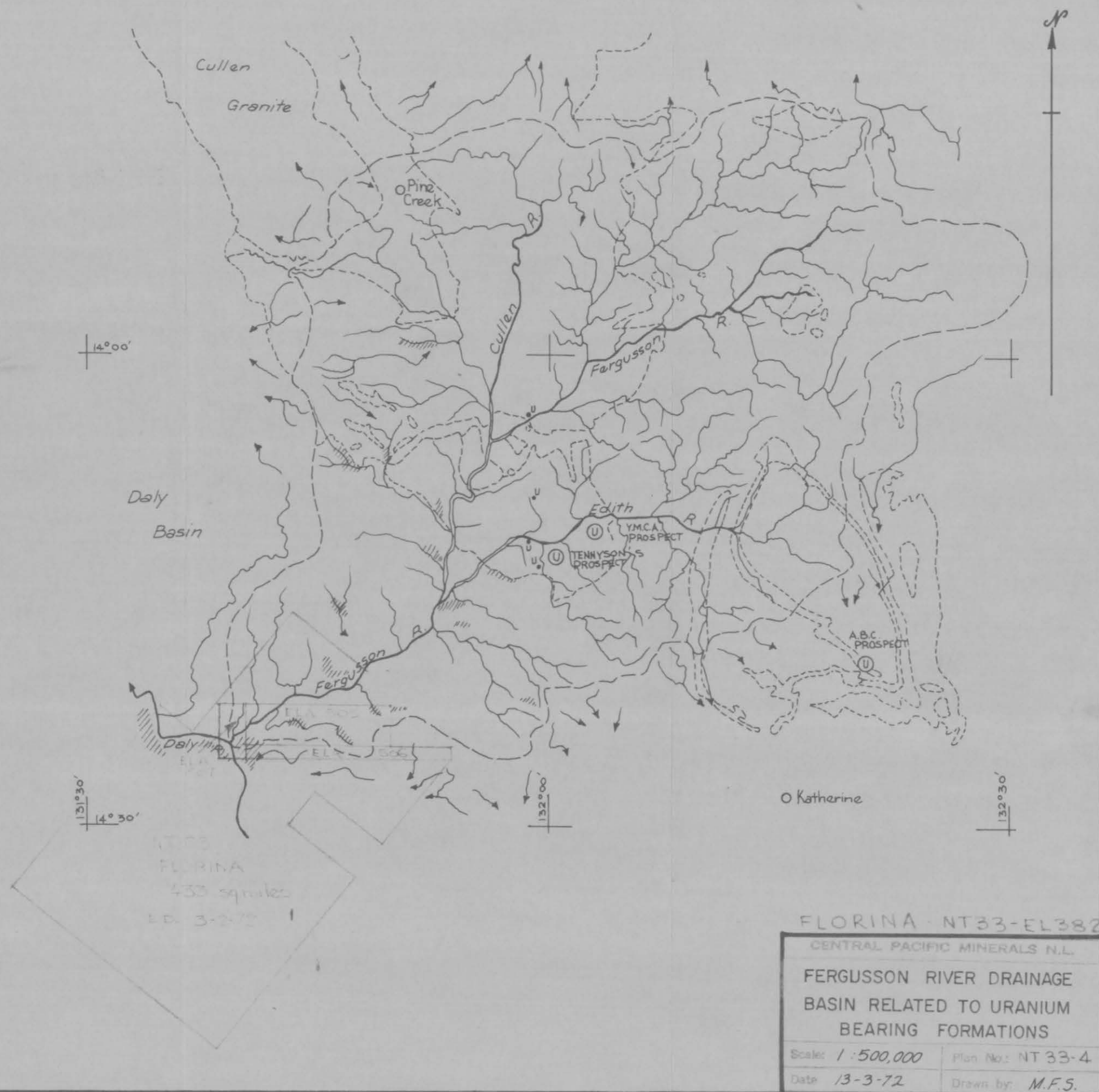


Note.
1. For location of lines see plan NT-33-2.

CENTRAL PACIFIC MINERALS N.L.	
N.T. 33 - FLORINA - EL382	
MAGNETOMETER AND SCINTILLOMETER PROFILES	
Scale: As per drawing	Plan No.: NT33-3
Date: 12.11.71	Drawn by: CHS

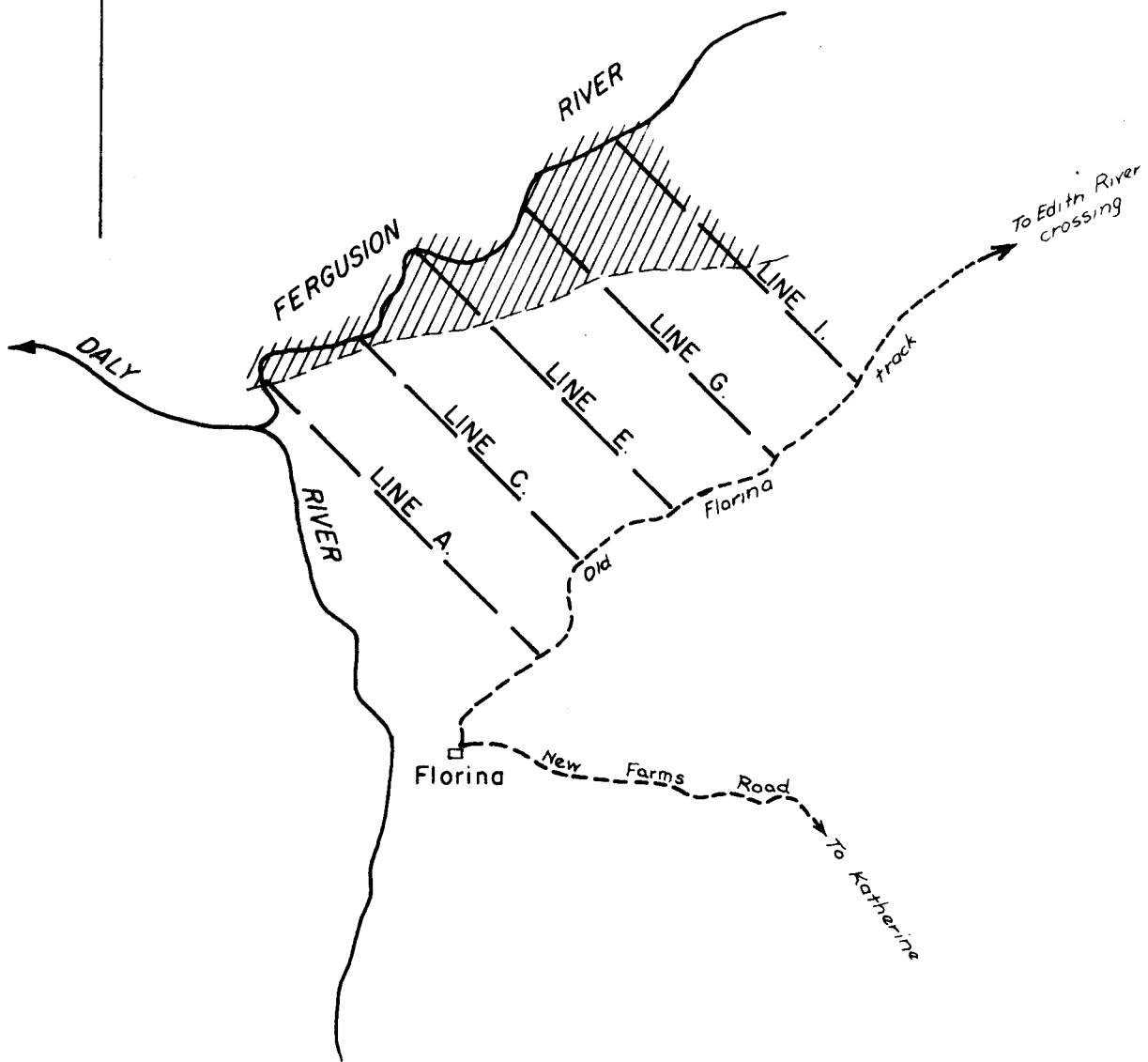
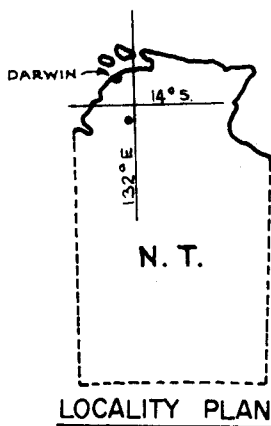
LEGEND

-  Edge of Fergusson River drainage basin
-  Granite outcrop area
-  McAdams Creek volcanic member
-  Edith River Volcanics
-  Major Uranium Prospects
-  Uranium occurrences
-  River
-  Major creek (named)
-  Unnamed creek
-  Swampy areas



FLORINA - NT33-EL382
 CENTRAL PACIFIC MINERALS N.L.
 FERGUSSON RIVER DRAINAGE
 BASIN RELATED TO URANIUM
 BEARING FORMATIONS
 Scale: 1:500,000
 Date: 13-3-72
 Plan No.: NT 33-4
 Drawn by: M.F.S.

T. M.



60-80 c.p.s



15-60 c.p.s

CENTRAL PACIFIC MINERALS N.L.

FLORINA N.T. 33

E.L. 382

GROUND SCINTILLOMETER TRAVERSE

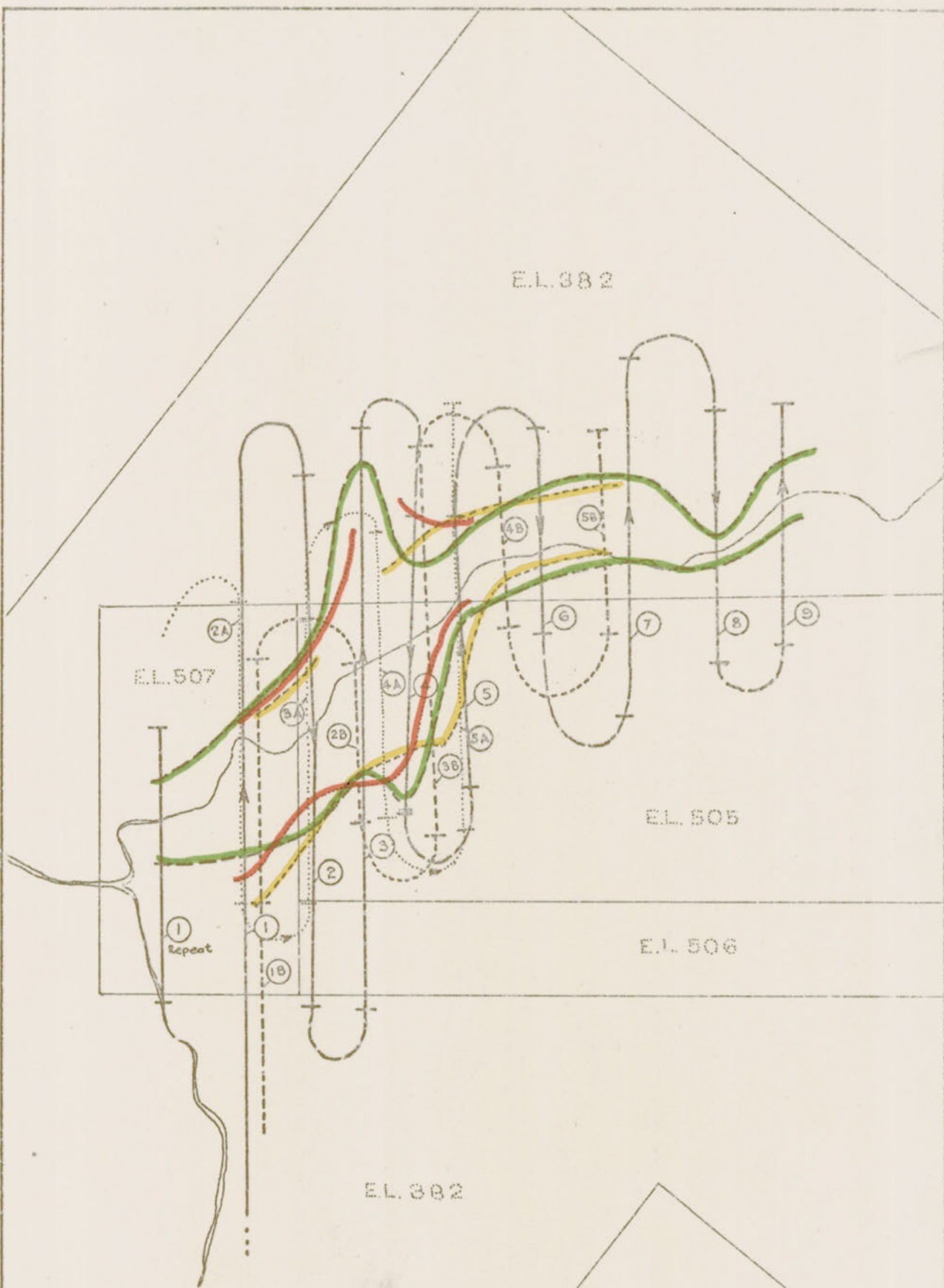
Scale: 1:100,000

Plan No.: NT 33-5

Date: 4-10-72

Drawn by: MFS

MAP 5



LEGEND

Flight Lines

- Thorium + Uranium + Potassium (3)
- Thorium + Uranium (3A)
- Thorium (3B)
- Area > 1200 c.p.m. Th + U + K
- Area > 1000 c.p.m. Th + U (Using Discriminator)
- Area > 1000 c.p.m. Th (Using Discriminator)

CENTRAL PACIFIC MINERALS N.L.

FLORINA NT33

EL 382

SPECTROMETER SURVEY
FLIGHT LINES

Scale: 1:100,000

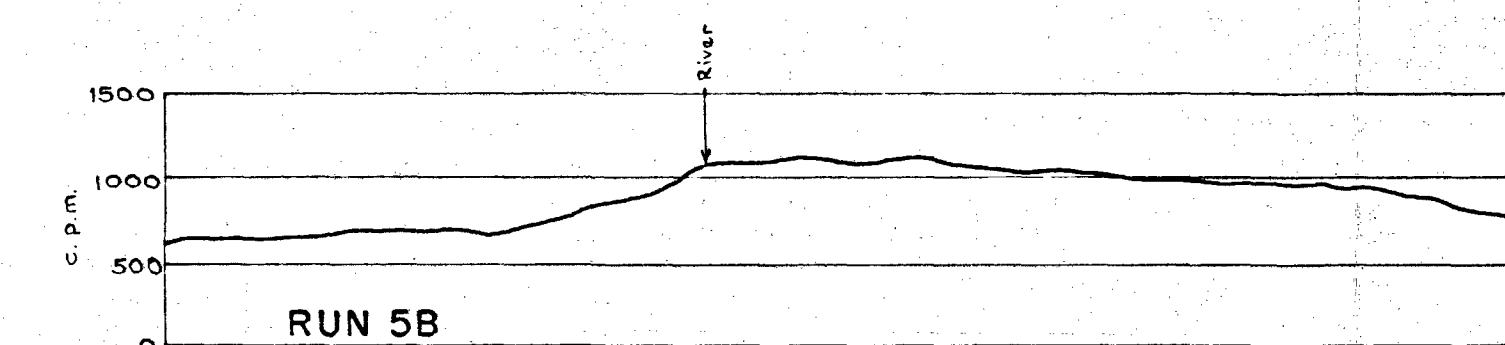
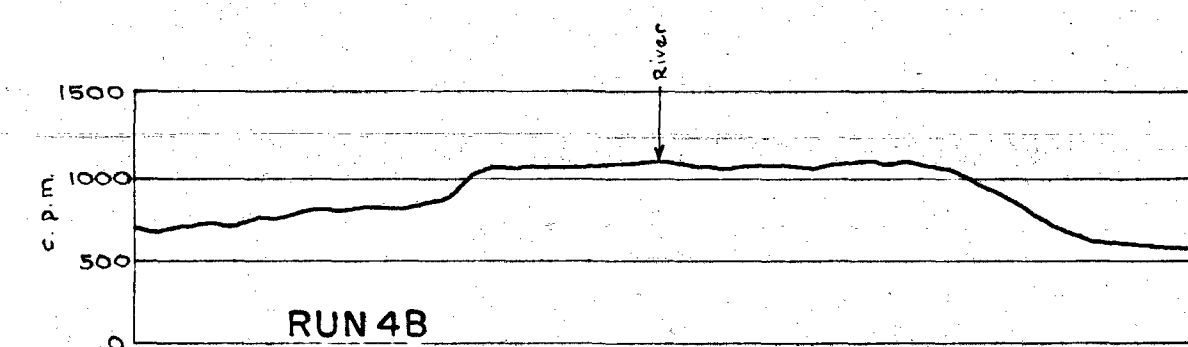
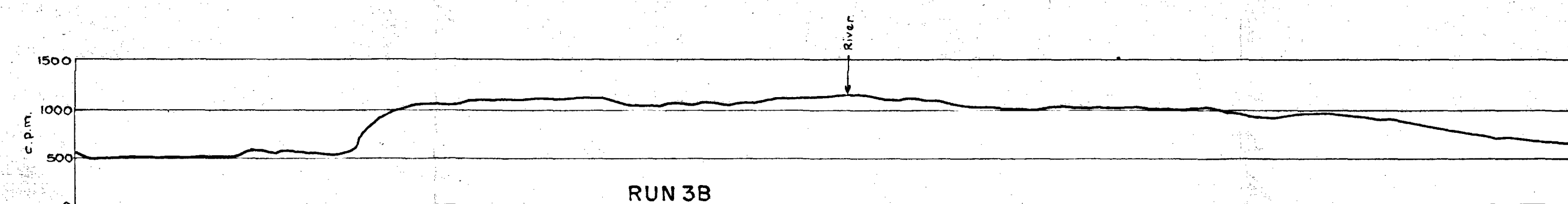
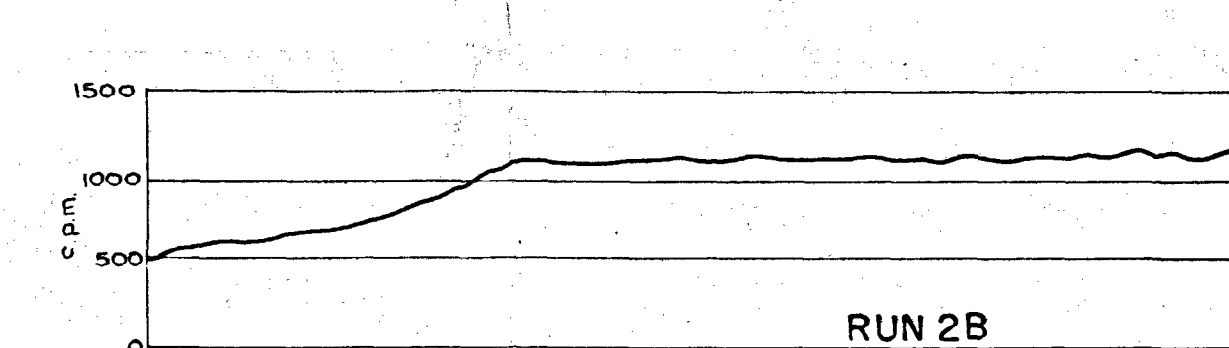
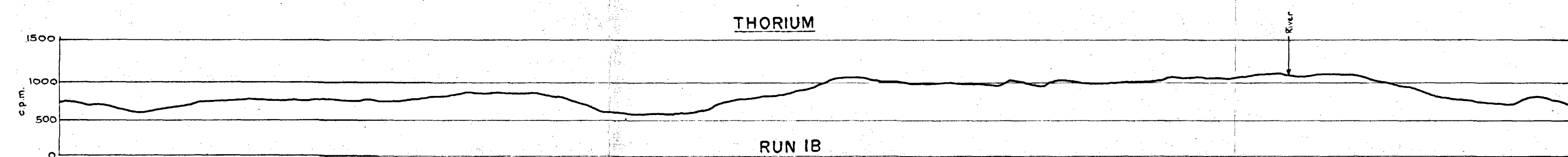
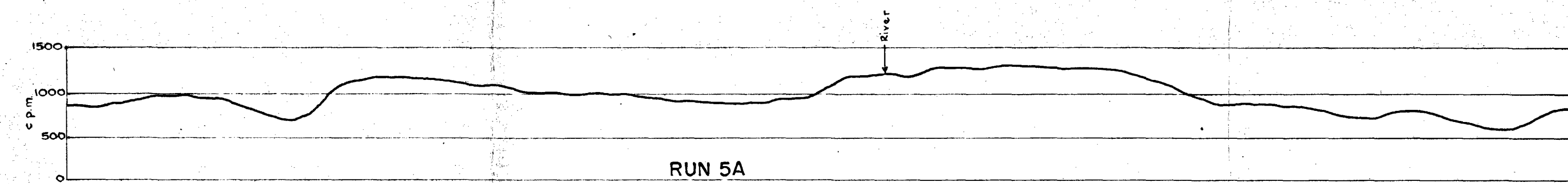
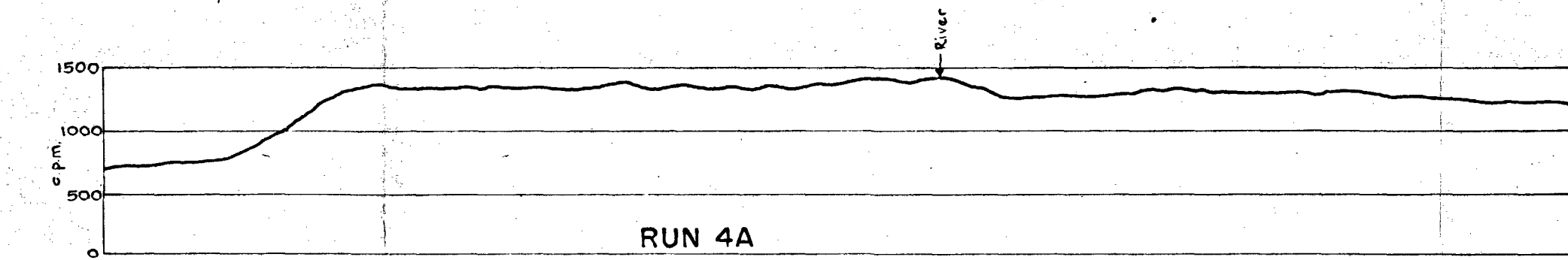
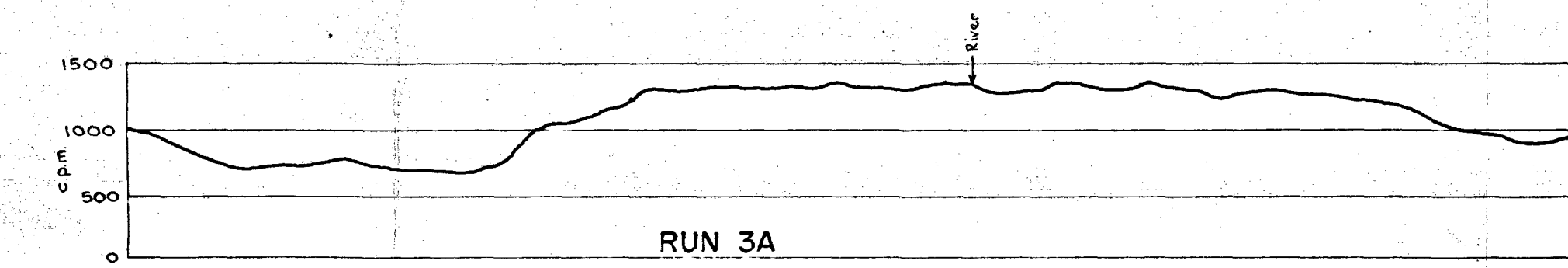
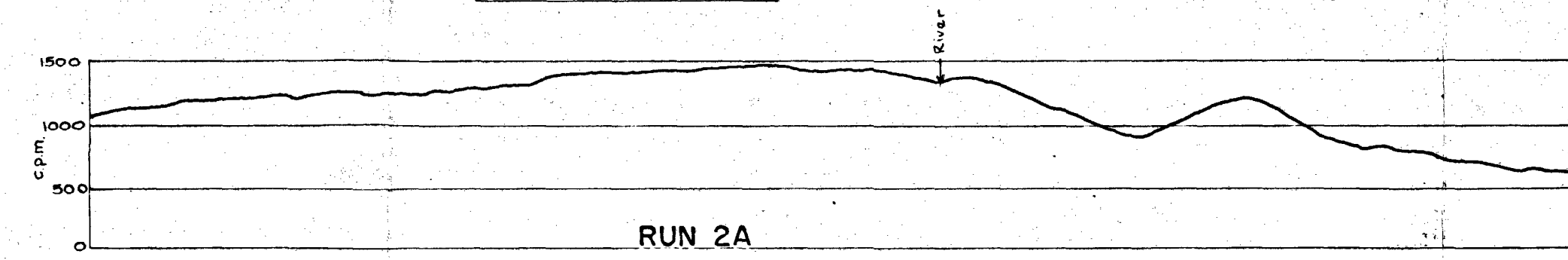
Plan No.: NT 33-6

Date June '73

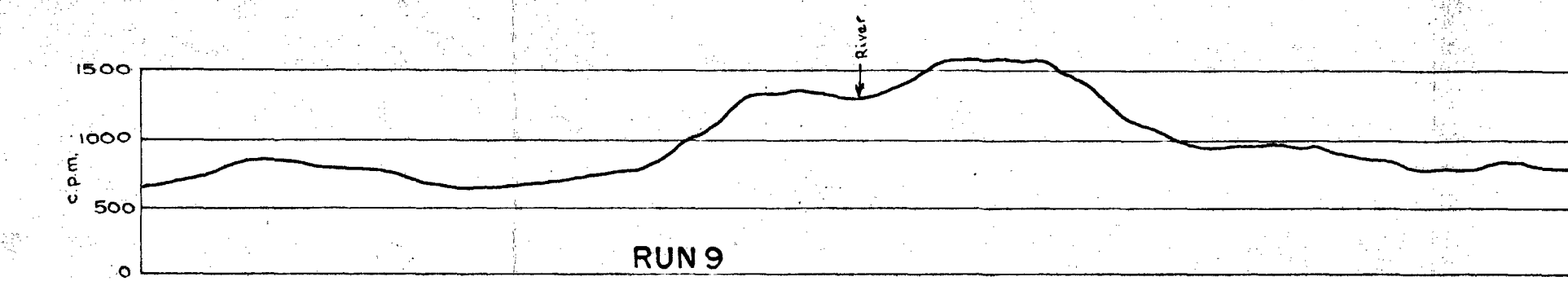
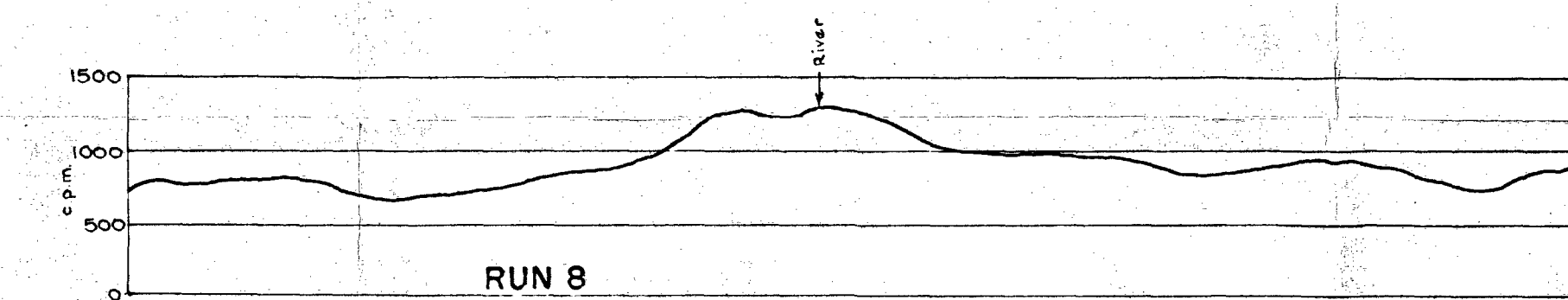
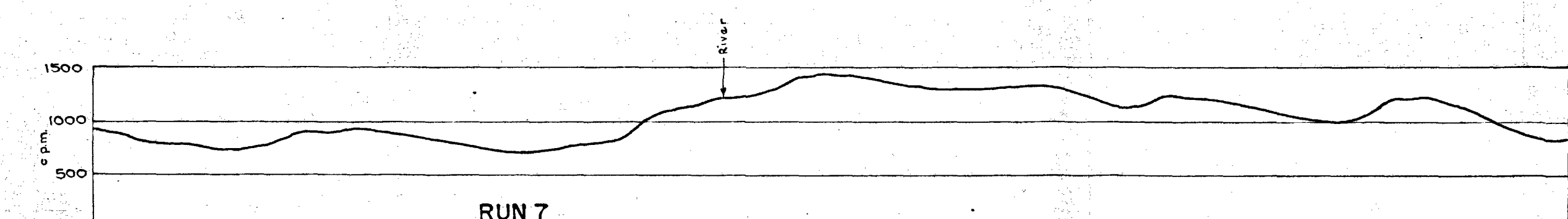
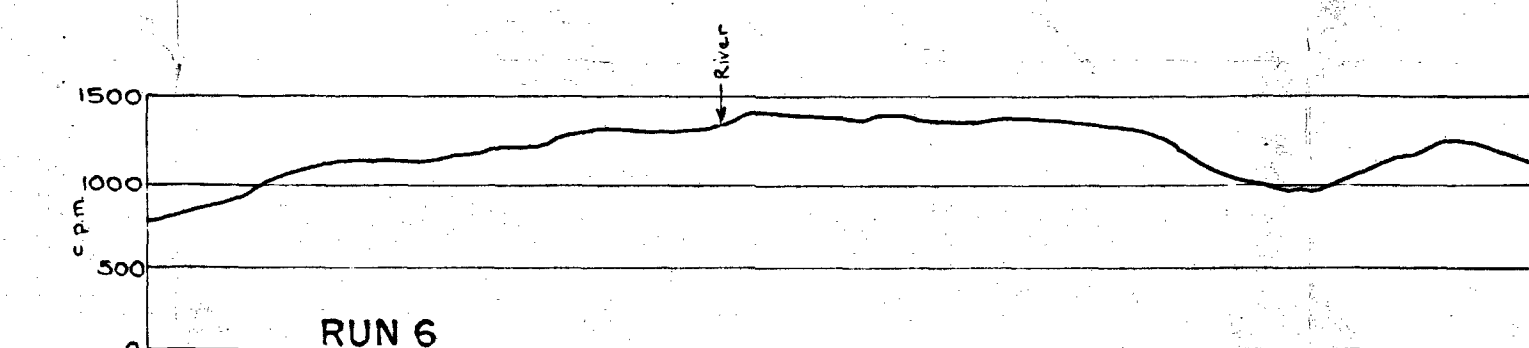
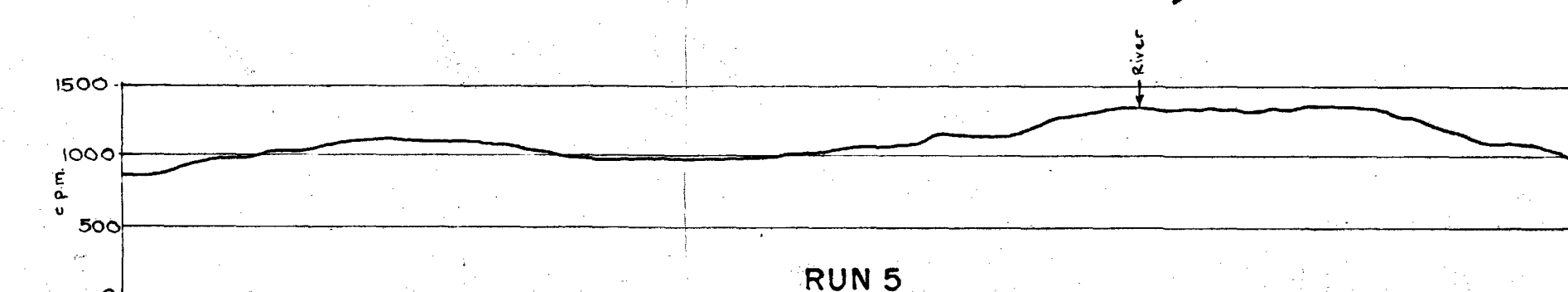
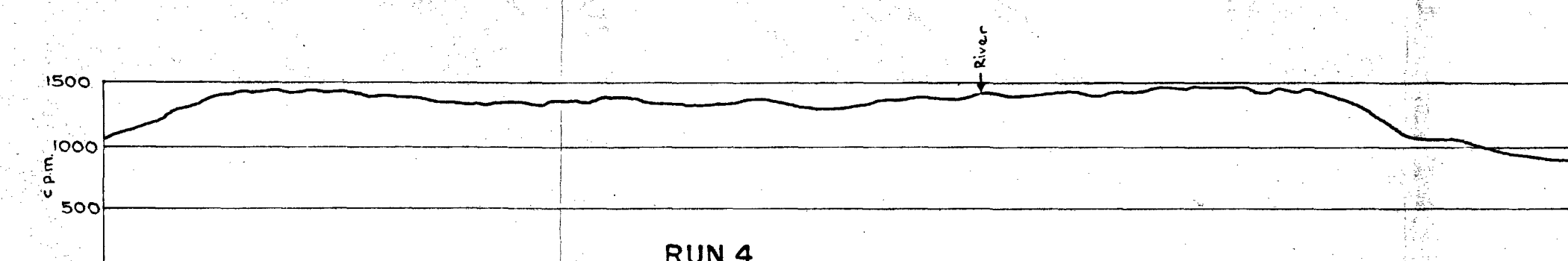
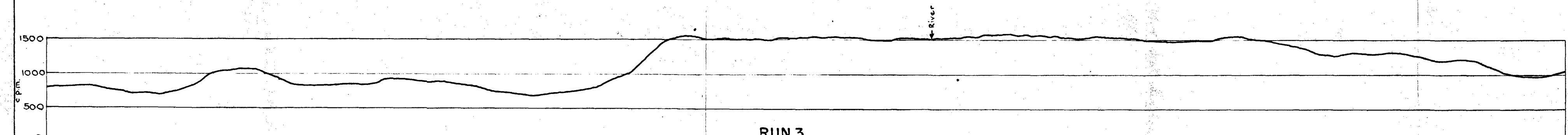
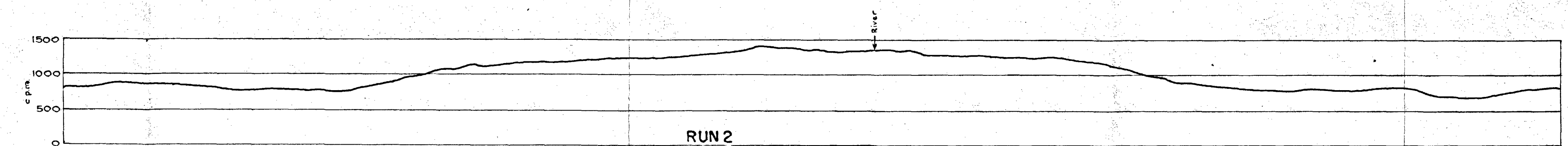
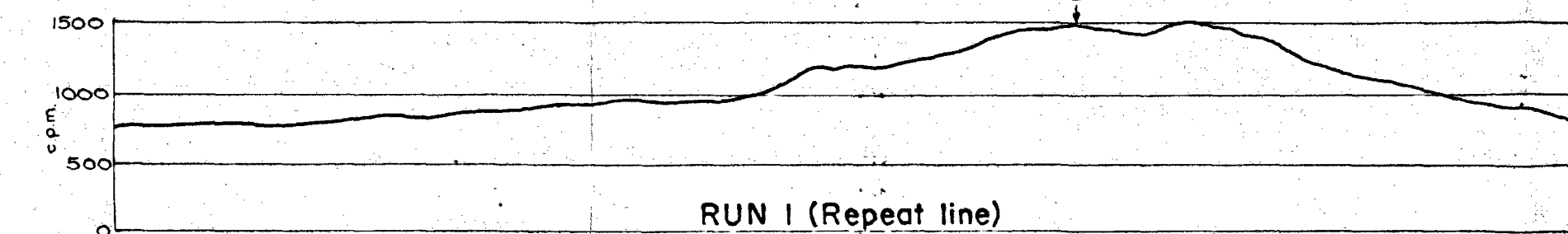
Drawn by: J.G.A.

MAP 6

THORIUM+URANIUM



THORIUM + URANIUM + POTASSIUM (Total counts)



NOTE - Run 1 - Instrument calibration.