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PRELIMINARY REPORT ON THE BRODRIBB URANIUM DEPOSIT , N.T.

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SUMMARY

The Brodribb deposit, located 13 miles north of the Rum Jungle mine was located by an aerial scintillometer survey in September 1952. A ground examination revealed an order of radioactivity sufficient to warrant geological and radiometric surveys. A total of 1026 feet of costeaning was bulldozed. The increase of radioactivity with little depth and the satisfactory sample values justify exploratory drilling and possibly underground development, which will be started in 1953.

The information available to date places the Brodribb deposit in an entirely different geologic category from that of the Rum Jungle deposit. Even if the Brodribb deposit proves to be only of very low grade uranium, an entirely new and extensive province for uranium exploration will be opened.

INTRODUCTION

The Brodribb anomaly is one of the highest intensity radiometric anomalies discovered by the recent Bureau of Mineral Resources aerial scintillometer survey over the Rum Jungle area in 1952. It is one of a group of anomalies extending in an east-west direction for approximately 8 miles. The deposit lies about 6 miles due west of the 40 mile peg on the Stuart Highway, and about 15 miles north of the Rum Jungle mine. Aerial photograph coverage is found on photographs numbered 5024, 5025, and 5026 in Run No.1 of the Darwin-Pine Creek aerial survey of 7 November 1950. The name, Brodribb, is derived from the name of the track used to reach the area. This track is in good condition during dry weather but occasionally will become impassable during the worst of the wet weather.

A preliminary inspection of the area was carried out by R.S. Matheson and D. Dyson in September 1952, following which radiometric and geological surveys of the anomalous area were initiated. These two surveys indicated that costeaning was warranted and a programme of bulldozed costeans totalling 1026 feet was carried out.

Drilling of the deposit will be undertaken, and the other anomalies indicated in the area will be investigated during 1953.

GEOLOGY

Regional

The radiometric anomaly occurs in an area of east-west striking, steeply north dipping slates and quartzites of the Brock's Creek Group. Reference to the geological map of the Rum Jungle structure shows that the deposit is on the northern flank of this domal structure and is about 3 miles north of the granite contact. A few minor north-south faults have displaced the beds a maximum of 200 feet in places.

Except for the resistant quartzite ridges the area is covered by alluvium, laterite, and red slate detritus. Fragments and veinlets of quartz are irregularly scattered throughout the area.

Other first and second order anomalies discovered by the aerial survey are oriented east and west along the strike of these up-turned beds, suggesting that the radioactivity is associated with one particular stratigraphic horizon.

Geology of the Deposit

Structure. In the immediate vicinity of the anomaly no good "marker" bed is exposed on which structure can be mapped. About 2000 feet to the south, however, is a prominent quartzite ridge which is vertical and apparently conformable with the radioactive bed. A study of this quartzite ridge on the aerial photographs and a ground reconnaissance has shown that two north striking faults occur in the area. The east fault, located near the 00 peg has an apparent horizontal displacement of about 150 feet (Plate I) and the east side has moved south. The other fault, approximately 3500 feet west of the 1800 foot peg, has a similar displacement, again with the east side moved south about 100 feet. Other minor displacements exist but they cannot be accurately traced at this time.

Lithology. The soil and detrital cover over the area obscures the exact nature of the lithology rather effectively. Small fragments of red hematitic slate and laterite pebbles cover ninety per cent of the surface, apart from that covered by alluvium.

The few resistant outcrops are laterite, quartzite, hematized slates, and silicified grey slates. In the anomalous area quartzites form less than 5 per cent of the rock section and are in part thinly interbedded with the slates. In the costeans no well defined quartzites are exposed. There are, however, zones of hematite and quartzite fragments which on close study appear to have been quartzite beds largely replaced by hematite. At depth these hematite zones are probably pure quartzite.

Some of the slates explosed in the costeans are more highly lateritized than others. Those portions of the costeans having the highest radioactivity are the most lateritized. Another important feature of these slates is their extremely porous character, a result of lateritization. The mass of the rock consists of about 30 per cent voids which are connected, and are as large as 4 inches in diameter. These voids afford ready and effective access for leaching solutions.

Radioactivity. The maximum radioactivity found in the undisturbed surface is in a small area within the anomaly where counts of 27 times background have been obtained with the "carpet sweeper" type of detector. This count of 27 times background was found about 720 feet west and 230 feet south of the 00 peg by the Geophysical Section of the Bureau of Mineral Resources. It was not precisely defined in terms of counts per minute.

The 4 times background contour encompasses roughly an area about 1800 feet long which ranges in width from a few feet to 350 feet. The radioactivity is associated with the sedimentary structure. The anomaly is found over a section of red slates containing what appears to be a horizon of thin lenticular quartzites interbedded with dark slates which are partially silicified and altered to a red color. The highest count is centered over this bed of thin lenticular quartzites and dark slates.

With the removal of the surface rock and soil the radioactivity increased markedly and became less widely spread and uniform, with depth it tends to become more concentrated in certain beds, with the quartzites practically barren. The highest count is to be found in hematitic pods in the lateritized slates. In costean D these pods were found to be irregularly distributed downwards and not continuous vertically nor horizontally. However, they might properly be considered as the "roots" of the laterite cap over the area.

The softer and amorphous form of the hydrous iron oxides in the laterite is lower in count, probably because that form is still being leached. The finely crystalline hematite, on the other hand, has probably locked some of the radioactive elements in its crystal structure and is no longer susceptible to leaching. Therefore, because the hematitic portions of the laterite are much more radioactive than the rest of the rock, the hematite can be considered as not enriched, but rather, less effectively leached.

The most intense radioactivity is to be found in costean D at a depth of 10 feet. The next best count is to be found in costean A which is much shallower. The other costeans have comparatively weak radioactivity. A comparison of costeans A, B, and C can be made on the basis of the radiometric profiles. Costean D, however, can not be compared with the others on this basis because the depth of the pit would give an excessively high background to readings taken on the bottom. For this reason costean D was sampled across the width of the deeper portion.

Sample results (all channel samples except A908) expressed as equivalent U_3O_8 are as follows:-

Costean	Number	Feet	%U_3O_8	Remarks
A	A910	3.0	0.047	See Plate II for locations.
"	A911	3.0	0.037	"
"	A912	1.5	0.049	"
"	A913	4.2	0.045	"
"	A914	4.8	0.136	"
"	A915	2.5	0.038	"
C	A916	1.2	0.164	See Plate IV for location. Very weak radioactivity on each side of sample.
D	A904	2.5	0.089	See Plate I for locations. Numbers 904 through 907 are consequtive
"	A903	1.1	0.023	and adjacent from north to south.
"	A902	1.1	0.037	"
"	A905	0.8	0.022	"
"	A906	1.1	0.044	"
"	A907	3.0	0.026	"
"	A908	---	0.283	This sample is from a "hot" spot, Taken uniformly from a circle 10" in diameter.

When sample values are studied it must be borne in mind that they are taken from "hot" spots which are hematitic pods which have no great vertical or lateral dimension. They are not, therefore, representative of the uranium content of the particular section of slates in which they occur. An exception to this situation are samples A902 through A907 (total weighted average equals 9.6' of 0.043% eU_3O_8) taken in D costean. These samples were not taken across a "hot" spot and <u>are</u> fairly representative of the uranium content in the lateritized slate section from which they were taken. In the other shallower costeans the lateritized slates surrounding the hematitic pods were so weakly radioactive as to not warrant sampling.

<u>Mineralogy</u>. No visible uranium minerals have been found to date in this deposit. An examination of the high count areas with a "mineral light" failed to reveal any fluorescent minerals. The chemical environment apparently was not suitable for the formation of insoluble secondary uranium minerals. If the phosphate iron, for instance, had been originally present in the rock mass, insoluble secondary uranium minerals could have been formed.

A sample of surface rock taken by Mr. R.S. Matheson from a spot showing a 12 times background count, located about 300 feet west and 200 feet south of the 00 peg, was submitted to Mr. W.B. Dallwitz for examination. Mr. Dallwitz reports on the material as follows:

light, more strongly in short wave than in long wave. It was not possible to separate enough of the fluorescing mineral to determine its identity, though many attempts to do so were made, so it will be necessary for you to send samples containing more of the radioactive mineral. The mineral appears to be one of the so-called uranium micas.

Examination of a thin section shows that the rock is composed almost entirely of quartz and hematite. The hematite acts as a cement between fragments of quartz, which have been invariably recrystallized to a fine mosaic of grains. Small quartz grains and a few flakes of a colourless mineral of micaceous appearance and moderate D.R. occur in the hematite. It is possible that this is the mineral responsible for the radioactivity, but the grains were too small for determinative work. The thin section was cut from a specimen which showed a fair number of minute fluorescing grains".

A small amount of green mineral was found in a quartz fragment and has been determined as psuedomalachite. Additional samples of rock from the highest count area are being submitted for examination and/possible determination of the radioactive source.

CONCLUSIONS

Costeaning in this deposit has revealed two very important facts: firstly, radioactivity increased to a very considerable degree with 10 feet of depth*; secondly, the radioactivity is found in a very porous environment and is certainly subject to intense leaching and oxidation. The most intense radioactivity found so far has been in hematitic pods within radioactive, lateritized slates. Two alternate views are held as to the significance and genesis of the higher radioactivity found in these pods. The writer believes that it is not the result of enrichment, but rather, is the leached residue of a richer and more uniform mineralization. The alternative view (R.S.M.) is that there has been enrichment at the base of the old laterite profile, below which a leached zone is to be expected, with a further enrichment near the water table followed by primary mineralisation.

Either interpretation gives the Brodribb deposit encouraging prospects and further testing is warranted. It is expected that diamond drilling, probably followed by development work will be undertaken in 1953. An early evaluation of the Brodribb prospect is recommended as a guide to assessing the prospects at the numerous other anomalies occurring in the same environment in the area. Even if the Brodribb deposit proves to have very low grade uranium content an entirely new and extensive province for uranium exploration will be opened.

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* In D costean radioactivity increased from 7 times background at the surface to an intensity which assayed 9.6 feet of 0.043%eU, or 40 times background as estimated with the Halross scintillometer.

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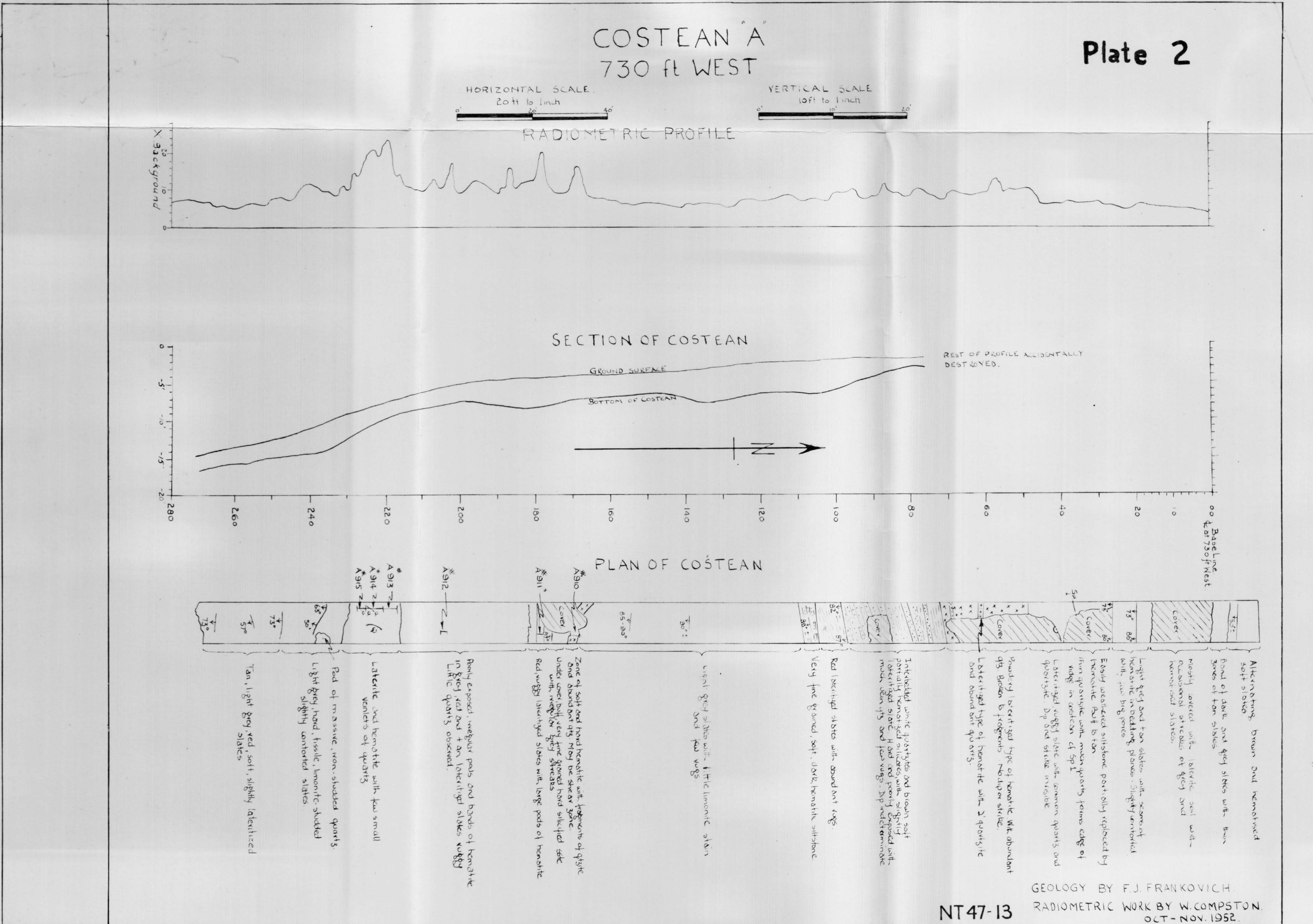
Wood, F.W. and McCarthy, E.	1952:	Airborne Surveys over the Rum Jungle Area and other portions of the Northern Territory. Bur.Min.Res., Geophys. Record Rept. 79/1952.
Matheson, R.S.	1953:	Rum Jungle Investigations 1951 and 1952, Progress Report. Bur.Min.Res., Geol. Records Rept. 24/1953.
Noakes, L.C.	1949:	A Geological Reconnaissance of the Katherine-Darwin Region, N.T., Bur.Min. Res., Bull. 16.


Plate 1
GEOLOGICAL MAP
BRODRIBB DEPOSIT
RUM JUNGLE AREA
NORTHERN TERRITORY, AUSTRALIA.
SCALE
Feet
Feet
Reference
QUATERNARY
Alluvium
TERTIARY
Ferruginous Laterite
PRE-CAMBRIAN
Lower Proterozoic
Brocks Creek Gp.
Quartzite
Grey and red Slates
INTRUSIVES
Quartz veins.
Geological boundaries (approximate)
Faults - inferred
Costeans
Strike and dip
Roads and highways
Drainage channels
Contours at 5 ft intervals
Radiometric contours (showing multiple background effect.)
LOCALITY PLAN
Reference
Area Mapped
Scale
BASE LINE
FAULT
B1
B2
B3
B4
B5
B6
Red slates
Laterite
6·5 miles to Stuart Highway
Plane table and telescopic alidade survey and geology by
F. J. FRANKOVICH.
Oct - Nov 1952.
NT47-12



COSTEAN "A"
730 ft WEST
Plate 2
HORIZONTAL SCALE
20 ft to 1 inch
VERTICAL SCALE
10 ft to 1 inch
RADIOMETRIC PROFILE
X Background
SECTION OF COSTEAN
GROUND SURFACE
BOTTOM OF COSTEAN
REST OF PROFILE ACCIDENTALLY DESTROYED.
N
Base Line ℄ at 730 ft West
PLAN OF COSTEAN
A 910
A 911
A 912
A 913
A 914
A 915
Cover
Sp 1
Alternating brown and hematised soft slates
Band of dark and grey slates with thin zones of tan slates
Mostly covered with laterite soil with occasional streaks of grey and hematised slates.
Light grey and tan slates with seams of hematite in bedding planes. Slightly contorted with few big pores
Easily weathered siltstone partially replaced by hematite. Buff to tan.
Thin quartzite with much quartz forms edge of ridge in costean cf Sp 1.
Lateritized, vuggy slate with common quartz and quartzite. Dip and strike invisible
Powdery lateritized type of hematite with abundant qtz. Broken to fragments. No dip or strike.
Lateritized type of hematite with 2' quartzite and abundant quartz.
Interbedded white quartzites and brown soft partially hematized silicates, with slightly lateritized slate. Hard and poorly exposed with much vein qtz and few vugs. Dip indeterminate
Red lateritized slates with abundant vugs.
Very fine grained, soft, dark, hematitic siltstone.
Light grey slates with little limonite stain and few vugs
Zone of soft and hard hematite with fragments of qtzite and abundant qtz. May be shear zone.
Under cover, buff, very fine grained hard silicified slate with irregular grey streaks
Red, vuggy lateritized slates with large pods of hematite
Poorly exposed, irregular pods and bands of hematite in grey, red and tan lateritized slates vuggy. Little quartz observed.
Laterite and hematite with few small veinlets of quartz
Pod of massive, iron-studded quartz.
Light grey, hard, fissile, limonite-studded slightly contorted slates.
Tan, light grey, red, soft, slightly lateritized slates
GEOLOGY BY F.J. FRANKOVICH.
RADIOMETRIC WORK BY W. COMPSTON.
OCT-NOV. 1952.
NT47-13

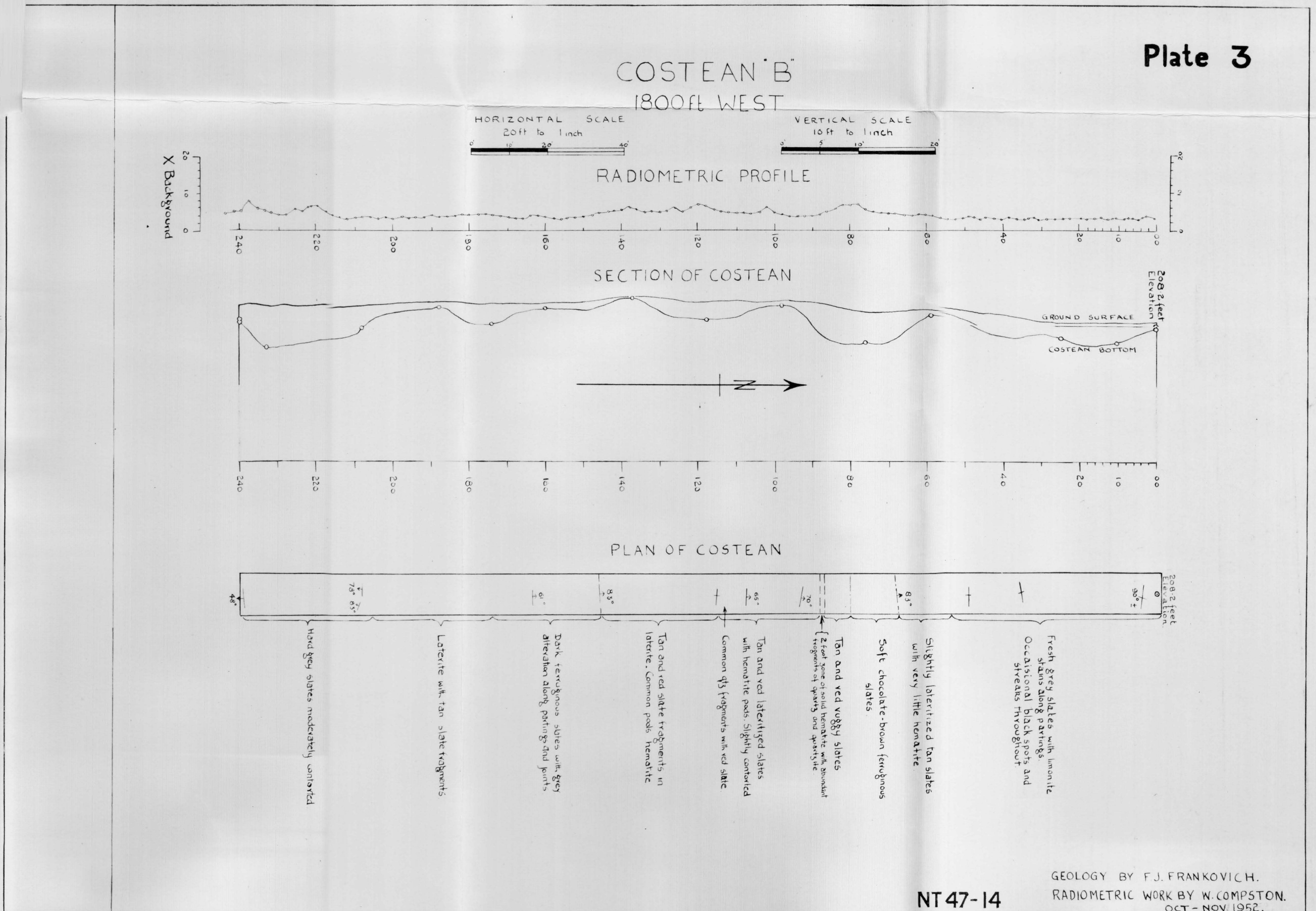
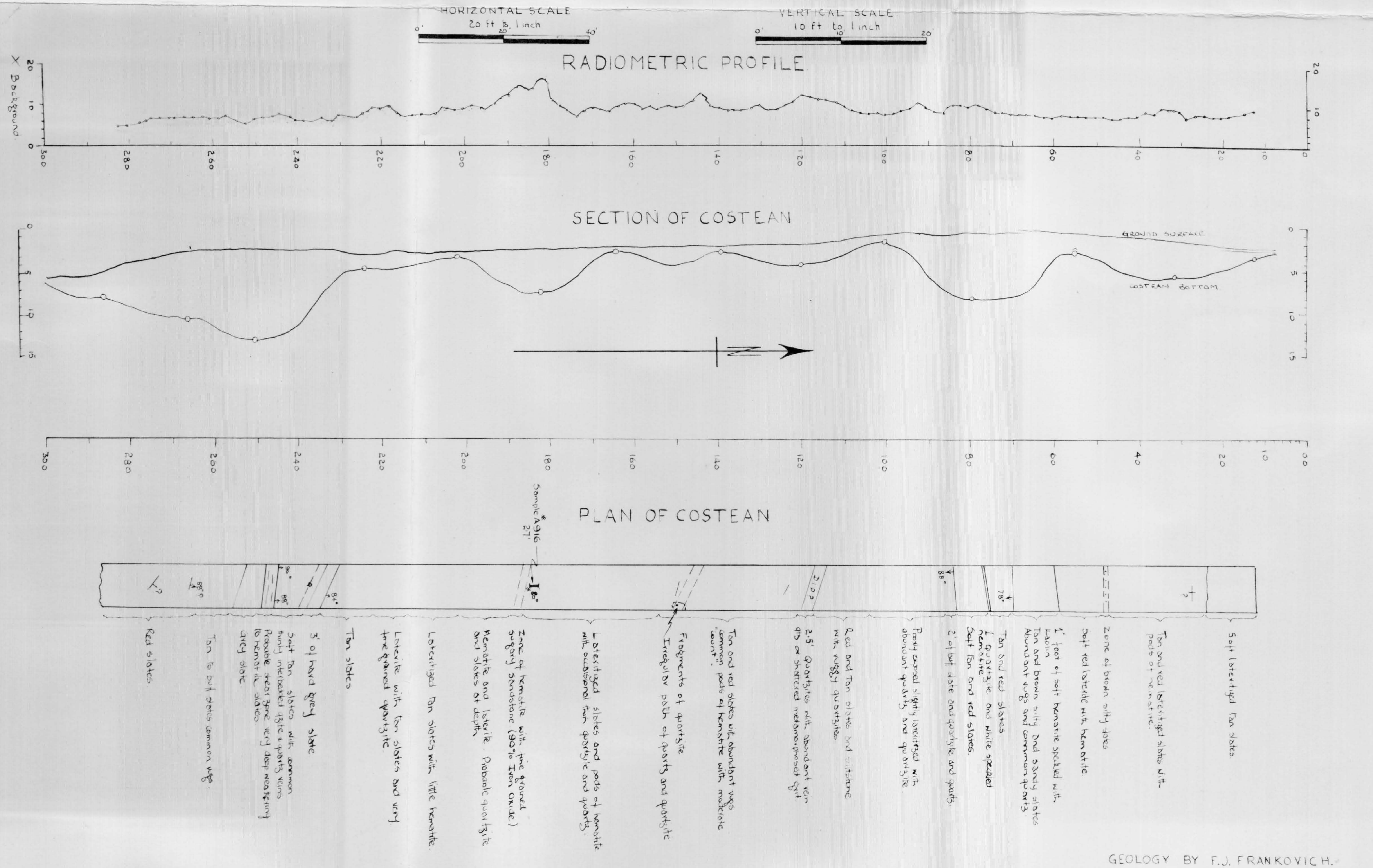


Plate 3
COSTEAN "B"
1800 ft WEST
HORIZONTAL SCALE
20 ft to 1 inch
VERTICAL SCALE
10 ft to 1 inch
RADIOMETRIC PROFILE
X Background
SECTION OF COSTEAN
208.2 feet Elevation
GROUND SURFACE
COSTEAN BOTTOM
N
PLAN OF COSTEAN
208.2 feet Elevation
Hard grey slates moderately contorted
Laterite with tan slate fragments
Dark ferruginous slates with grey alteration along partings and joints
Tan and red slate fragments in laterite. Common pods hematite
Common qtz fragments with red slate
Tan and red lateritized slates with hematite pods. Slightly contorted
2 foot zone of solid hematite with abundant fragments of quartz and quartzite
Tan and red vuggy slates
Soft chocolate-brown ferruginous slates.
Slightly lateritized tan slates with very little hematite
Fresh grey slates with limonite stains along partings. Occasional black spots and streaks throughout.
GEOLOGY BY F.J. FRANKOVICH.
RADIOMETRIC WORK BY W. COMPSTON.
OCT - NOV. 1952.
NT 47-14

COSTEAN 'C'
300 ft WEST

Plate 4



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GEOLOGY BY F.J. FRANKOVICH.
RADIOMETRIC WORK BY W. COMPSTON.
OCT-NOV 1952.