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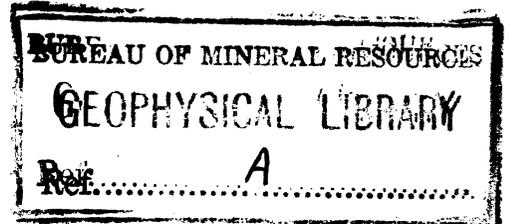
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SUPPLEMENTARY REPORT ON RADIOACTIVE OCCURRENCES, CLONCURRY  
MINERAL FIELD, QUEENSLAND.

by



E. K. Carter

Canberra. November, 1955.

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CONTENTS.

	Page
SUMMARY	1
INTRODUCTION	1
PROSPECTING AND MINING ACTIVITY	1
CLASSIFICATION OF DEPOSITS	3
PROSPECTS FOR FUTURE DEVELOPMENT OF THE FIELD.	3
CONCLUSIONS	4
ACKNOWLEDGEMENTS	4
APPENDIX - REPORTS ON LEASES INSPECTED	

### SUMMARY.

Approximately three weeks were spent by the author during July 1955 in further examinations of radioactive deposits in the Cloncurry Mineral Field in the company of D. Ostle, of United Kingdom Atomic Energy Division, and J. H. Brooks of Geological Survey of Queensland. Six leases, or groups of leases, were visited for the first time and twelve were revisited (see Carter, 1955). Descriptions of individual deposits are contained in the appendix to this report.

Prospecting activity in the search for uranium in the district is at a very greatly reduced level compared with that of August 1954. It is mainly being done by prospecting companies. Professional prospectors have, for the most part, returned to the search for and mining of copper. At the time of the author's recent visit only three companies were engaged actively in the search for new uranium deposits and three companies and a syndicate were testing or developing properties.

With the exception of the Mary Kathleen lease, for which data were not made available (but which is believed to hold promise of being a substantial producer of uranium oxide) no deposit or group of deposits found on the field to date is likely to contain sufficient ore of the requisite grade to warrant the establishment of an official buying point and treatment plant in the district. The Counter lease appears to contain a compact lode of 0.20% U<sub>3</sub>O<sub>8</sub> or better, but it is thought unlikely that ore from this deposit could be treated in any plant set up to treat ore from the Mary Kathleen lease.

### INTRODUCTION.

This report is based on observations made during a ~~tour~~ of inspection of radioactive deposits of the district from 8th to 22nd July, 1955, in the company of D. Ostle of the United Kingdom Atomic Energy Division and J. H. Brooks of the Geological Survey of Queensland. An earlier inspection was made by the author in August and September 1954 (Carter, 1955). During the recent visit the Duke No. 1, Batman, Elaine Dorothy, Milo, Mariposa and Helafells leases were examined by the author for the first time and the Flat Tyre, Mother's Day No. I, Easter Egg, Skal, Hopeful, The Pile, Counter, Battery, New Ring, Queen's Gift, Mary Kathleen and Pelican leases were revisited.

The main purpose of the visit was to assist Mr. Ostle, who made an independent assessment of the field. Mr. Ostle also visited the Tinboll leases and made a detailed examination of the Mary Kathleen lease and company records.

Descriptions of, and specific observations on, individual leases are contained in the Appendix to this report.

### PROSPECTING AND MINING ACTIVITY.

The general level of prospecting and exploration has fallen to a small fraction of what it was in September 1954. Such work as is in progress is largely being done by prospecting and mining companies.

In mid-September 1954 over 500 applications for leases to mine radioactive minerals had been received by the Mining Registrar, Cloncurry. By 20th September 1955 the number was approximately 600, and 99 had been forfeited for non-payment of rental. In the same period about 180 new applications for leases to mine copper had been received. The position is due mainly to (a) the return of the professional prospector to

copper "gouging" as, with the present high price of copper, copper mining is remunerative and returns are more certain and immediate than from uranium, (b) the decline of interest by the part-time prospectors because most deposits found to date have proved too low grade for economic development and prospecting companies are no longer willing to pay large sums in advance for options over leases.

It is generally believed in the district that, in view of the high cost of mining in the area, no lease or group of leases (apart from the Mary Kathleen lease) is likely, on present indications, to warrant the capital outlay necessary for a treatment plant nor to justify the establishment by the Australian Atomic Energy Commission of an official buying point and treatment plant. It is further considered (a) that the Mary Kathleen lease, if it becomes a producer, would have its own treatment plant, (b) that it would be unprofitable to transport ore from most of the known deposits to the Mary Kathleen lease, and (c) that ore of the type generally found in the basaltic succession, e.g. from Counter lease, could not be treated in the same plant as that required for the Mary Kathleen ore.

At the time of my recent visit the following companies were operating in the area:

Mount Isa Mines Ltd. had a greatly reduced number of ground prospecting teams operating in the area. Further airborne scintillometer work was being delayed by unserviceable equipment. Rio Tinto Management Services Ltd. were actively engaged in testing the Mary Kathleen deposit under the terms of an option agreement with Mary Kathleen Uranium N.L. and Australasian Oil Exploration Ltd. Six drills were in operation. A total of over 12,000 feet of drilling had been done. An adit had been driven into the deposit to obtain a bulk sample for pilot treatment tests. It was reported to be 190 feet long, but had not passed through the lode. In addition, extensive services, accommodation and amenities had been provided.

Australasian Oil Exploration Ltd. had one drill on the Counter lease. The deepest hole was slightly more than 300' vertical. Extensive pitting and sampling was in progress to obtain a true estimate of the overall grade at or near the surface, including non-outcropping areas.

Mineral Ventures N.L. had drilled six holes in the two main anomaly areas on the Elaine Dorothy lease and planned several hundred feet more drilling.

Metals Exploration N.L. hold several leases on the east of the field but are actively engaged in testing non-radioactive metalliferous deposits only.

A syndicate of three men, which holds the Milo lease, hand picked during July a parcel of ten tons of high grade, torbernite-bearing material for transport to Rum Jungle treatment plant as a trial parcel.

No other activity came to the notice of the author. Details of development and exploration work done on the various leases since the inspection in 1954 are given in the appendix.

1954

### CLASSIFICATION OF DEPOSITS.

Of the six deposits examined for the first time the Duke No. 1 and Batman deposits occur in the basaltic succession and fall into Type B, Group I (See Carter 1955, p. 7) - deposits forming definite lode bodies and having a siliceous gangue; the Elaine Dorothy deposits occur in the same stratigraphic unit as the Mary Kathleen deposits and are identical in mineralogy with the latter. The deposits on the Elaine Dorothy are, however, much more scattered and appear to lack the compactness of the single deposit on the Mary Kathleen lease. The Milo, Mariposa and Helafells deposits belong to Group II but differ in some respects from deposits previously examined. The most abundant torbernite recorded so far in the district is to be seen in the workings on the Milo lease. It occurs in a kaolinitic body, apparently derived by the (hydrothermal?) alteration of an igneous rock and therefore forms a distinct type within Group II. Specimens are reported to have assayed up to 2.4% U<sub>3</sub>O<sub>8</sub>. The Mariposa and Helafells deposits occur in brecciated zones in slate. Torbernite has been discovered in both deposits.

Commonly in the deposits in Group II some measure of structural control seems to have been exercised over the position of the secondary minerals. It is possible, therefore, that transport of uranium has not been a very significant factor in the weathering processes which have produced the secondary minerals, but that alteration of primary minerals has occurred more or less in place. Some degree of transport has almost certainly also taken place, however.

### PROSPECTS FOR FUTURE DEVELOPMENT OF THE FIELD.

As a result of an extensive exploration programme on the "Skal" lease, involving nine drill holes and several hundred feet of core, Mount Isa Mines Ltd. have concluded that the deposits are too low grade for profitable development and have allowed their option to lapse. (See Appendix, p. 11 for results of drilling). These deposits are regarded, on surface indications, to be among the best of those in the basaltic succession. No large scale production can be expected, therefore, from any of the deposits which occur on the western side of the field, with the possible exception of Anderson's lode (Counter lease).

Small portions of some of these deposits could undoubtedly be worked by selective mining by "gougers", if a buying point were established at or near Mt. Isa, but they would not contribute a very large tonnage of ore. It should be noted that for material of grade 0.15-0.20% U<sub>3</sub>O<sub>8</sub> the economic cut-off would be raised 0.01% U<sub>3</sub>O<sub>8</sub> for each additional 10-15 miles of cartage required depending on grade, assuming the cost of cartage is 1/- per ton-mile (1/6 per ton-mile is the normal contract rate in the district for hauling over rough tracks).

Drilling on the Counter lease (Anderson's Lode) has not yet been adequate to give reliable figures for tonnage or grade. The company's (Australasian Oil Exploration Ltd.) original estimate of 690 tons/vertical foot at the surface has been reduced to 350 tons/vertical foot. The grade is thought to be between 0.20 and 0.25% U<sub>3</sub>O<sub>8</sub>. Work at present in progress should improve the accuracy of these figures. A vertical drill hole has indicated radioactive material (grade at present unknown) to a depth of 300 ft.

It is of interest to note that the grade obtained in every drill hole on the Skal lease at and around 100 ft. vertical depth is higher than that at the surface and 200 ft. depth. Mr. Knight of Mount Isa Mines Ltd. considers that this is due to secondary enrichment at and about a depth of 100 ft., due to leaching at the surface. Drilling on the Counter lease available to date seems to indicate slightly higher grades between 85 ft. and 140 ft. (see drill hole No. 2 - Counter lease - Appendix) but as the drill holes at this depth are believed to be in the central position of the lode, which has lower values at the margin, and as the values around 100 ft. depth are not appreciably higher than at the surface, the evidence does not support surface leaching and secondary enrichment at depth. On the Mary Kathleen lease an inspection of the adit revealed strong joint and fault zones down which weathering has extended, leaving blocks of massive, unaltered primary material between, which extends to the surface. This may give rise to a zone of higher values at or near the watertable if Mr. Knight's explanation of secondary enrichment on the Skal lease due to weathering is correct.

#### CONCLUSIONS

No information was made available to the author about the results of exploration work on the Mary Kathleen lease, but it is believed that there is a good prospect that reserves and grade will justify mining and the erection of a treatment plant nearby. At this juncture the best method of treatment has not been finally determined.

If a treatment plant should be erected on the Mary Kathleen lease presumably ore from any similar nearby deposits, such as the Elaine Dorothy, could be treated. At present no lode body of a size sufficient to interest a company has been indicated on the Elaine Dorothy lease, although mineralization is extensive.

It is considered unlikely that ore from deposits in the basaltic succession could be treated in the same plant as ore from the Mary Kathleen. However, even should this be possible the Counter is the only lease from which it would appear to be feasible to mine ore in quantity for shipment to a plant in the vicinity of the Mary Kathleen (see Appendix). The only other possibility remaining - and that appears a remote one - is that on-the-site concentration, e.g. by dilute acid leaching, would reduce bulk sufficiently to reduce transport costs significantly.

Excluding the Mary Kathleen lease, there is no body, or closely grouped bodies, of overall grade and size likely to warrant the erection of a treatment plant.

Of the leases examined for the first time the Milo lease is the most interesting and requires further examination. On present indications the deposit at present being worked should be tested by a shaft sunk to the primary zone to determine the nature and extent of the primary body. If favourable, other anomalies on the lease should be investigated. However, a tonnage of ore from the lease sufficient to justify a treatment plant cannot be expected.

#### ACKNOWLEDGEMENTS.

The co-operation and assistance extended by Company geologists in the area, particularly Mr. D. Dimmick of

Australasian Oil Exploration Ltd. and Mr. C. L. Knight of Mount Isa Mines Ltd., is gratefully acknowledged. The author thanks Mr. G. Anderson, manager of operations on the Mary Kathleen lease, for hospitality received.

He also appreciates the experience gained by working with Mr. D. Ostle of the United Kingdom Atomic Energy Division and the assistance of Mr. Ostle and of Mr. J. H. Brooks of the Geological Survey of Queensland.

REFERENCES.

Australian Atomic Energy Commission and Department of National Development (1954): Prospecting and Mining for Uranium in Australia.

Carter, E.K. (1955): Radioactive Occurrences, Cloncurry Mineral Field, Queensland. Bur.Min.Resour.Aust. Rec. 1955/26.

APPENDIX.

REPORTS ON LEASES INSPECTED.

	<u>Contents</u>	<u>Page</u>
PART I	: LEASES NOT PREVIOUSLY VISITED	1
	The Duke No. 1	1
	Batman	2
	Elaine Dorothy	3
	Milo Nos. 1, 2 and 3	4
	Mariposa	6
	Helafells South, Helafells and Helafells North	7
PART II	: LEASES REVISITED	8
	Flat Tyre	8
	Mother's Day No. I	8
	Easter Egg	8
	Counter	9
	Battery	10
	New Ring	10
	Skal	10
	Hopeful	11
	The Pile	11
	Queen's Gift and Queen's Gift No. 2.	11
	Mary Kathleen	11
	Pelican	12

APPENDIX - REPORTS ON LEASES INSPECTEDPART I: LEASES NOT PREVIOUSLY VISITEDLEASE NO. 4309 - THE DUKE NO. I:

Applied for:- 26th May, 1954, by C.C.O. Walton and W. Farlow.

Area:- 30 acres

Locality: 50 miles slightly west of north from Mt. Isa; 6 miles north-north-east of Barney's Well.

Examined: 12th July, 1955.

Workings on date of inspection: Six costeans totalling less than 100 ft. and two pits 9 ft deep on the points of greatest radioactivity.

Regional Geology

The deposits occur in the succession of thinly interbedded altered basalt and sediments in which all the known radioactive occurrences north-west of Mt. Isa occur (see Carter (1955) - p4). The regional bedding strike is  $N10^{\circ}-20^{\circ}E$  and the sediments and basalts are moderately fractured and faulted. The nearest outcropping granite is 20 miles distant.

Geology of the Deposit

Three anomalies or groups of anomaly occur on the lease. Each is associated with lines of faulting across the strike of the interbedded sediments and basalt, which is roughly  $N10W^{\circ}$ .

One anomaly strikes at  $N40^{\circ}W$ , and lies en echelon to two similarly arranged quartz reefs. Two other insignificant anomalies are associated with a line of silicification and quartz paralld to and to the north of the first described anomaly.

A third anomaly south-west of No. 1 anomaly appears to be the most important. The long axis of this anomaly strikes  $N40^{\circ}E$ .

The sediments interbedded with the basalt are quartzite and carbonate rocks. All are highly fracture-cleaved.

The radioactive deposits are clearly epigenetic in that they are associated with cross-faults and are not related to particular beds of the deposits, at least occur in altered basalt. Radioactivity is associated, as is common with this type of deposit, with a pink colouration, due to finely divided introduced hematite.

Mineralogy

Primary: Owing to the fine grain size the primary radioactive mineral could not be identified in specimens forwarded to the Bureau in 1954.

Secondary: Secondary radioactive minerals are sparse. An unidentified bright green non-micaceous weakly-radioactive mineral was found as a coating on portion of a boulder from the workings on No. 3 anomaly.

### Radiometric Data

No. 1 anomaly: Length 82 ft. Average width 5-6 ft. Maximum width 13 ft. Highest reading obtained 3,200 c/m (i.e. counts per minute. Obtained on Austronic PRM 200)\*

No. 3 anomaly: Length roughly 40 ft x maximum width 14½ ft. Highest reading greater than 10,000 c/m.

### Conclusions.

The deposit is similar in type and intensity to many other deposits associated with the basaltic succession e.g. Queen's Gift. It is likely to be too low grade and too small for profitable development under present and foreseeable conditions.

### LEASE No. 4306 - BATMAN

Applied for:- 26th May, 1954 by C.C.O. Walton and W. Farlow.

Area: 5 acres

Locality: Adjoins the Duke No.1 lease on the north-east side of the latter.

Examined: 12th July, 1955.

Workings on date of inspection: 3 costeans and a shaft 17 ft deep.

### Geology

The geological setting of the deposit is similar to that of the Duke lease. Outcrops are poor and no control for the mineralization was recognised. The lode strikes N70°W.

### Mineralogy

Sparse yellow secondary mineral was observed but the primary radioactive mineral is unknown. It is presumably the same as on the Duke lease. Some coarsely crystalline carbonate mineral, probably ankerite, is present.

### Radiometric Data

The anomaly has a maximum length of roughly 160 feet and a maximum width of about 10 feet. Within this area, however, outcrop is sparse and the soil is non-radioactive. The eastern 25 feet of the anomaly gives readings of less than 1000 c/m. The highest reading obtained was 5,000 c/m in the two westerly costeans.

A chip sample over 10 feet across the anomaly, taken by J.H. Brooks and D.S. Carruthers, of the Geological Survey of Queensland, where geiger readings were highest, gave a radiometric assay of 0.14% U<sub>3</sub>O<sub>8</sub>.

### Conclusion

The grade and size of this deposit is not such as to warrant any further work. It is not likely to be a source of ore.

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\* All geiger readings were obtained on an Austronic PRM 200, unless otherwise stated.

LEASE NO. 4569 - ELAINE DOROTHY

Applied for: 7th September, 1954, by W.J. Polmeer, J.J. Spreadborough & R.H. Robinson. Under option to Mineral Ventures N.L.

Area: 320 acres.

Locality: 35 miles east of Mt. Isa; 4 miles south of Mary Kathleen uranium lease.

Examined: 16th July, 1955.

Workings on date of inspection: There are two main areas of anomaly on the lease, but several hundred anomalies - mainly point sources - are reported to have been located and marked. A number of costeans had been dug in the two main areas of anomaly and extensive drilling had been carried out. On the northern area of anomaly five holes had been drilled and drilling was in progress in the southern area. A total of 1700 ft had been drilled; the exploration programme provided for a total of 2,500 ft.

Regional Geology

The Elaine Dorothy deposits occur in the skarn rock succession in which the Mary Kathleen deposit occurs, and probably in roughly the same stratigraphic position within the succession as the latter. Further, they occur on the same overturned synclinal (basin) structure, near its north-pitching culmination. As a consequence of their structural position the skarn rocks are intensely deformed by crumpling and faulting. This is evidenced by the fact that the northern and southern areas of anomaly, which lie roughly 600 yards apart, occur on separate large folds whose axis lie at right angles one to the other and which are separated by a fault.

Geology of the Deposits

Northern area: The main values are associated with a tightly buckled west-pitching fold in skarn rocks, which is cut off to the south by a fault. Values are low and discontinuous at the surface. They appear to be related to a particular bed, i.e. they follow the structure, but weaken away from the fault.

Southern area: Anomalies are much more widely scattered in this area and are not confined to the one rock type. In addition to the generally well-bedded calc-silicate rocks, amphibolite, a massive garnet-bearing rock, calc-silicate breccia and a conglomerate were observed. In the course of the visit it was not possible to form any opinion about structural control of the uranium mineralization.

Other small areas of mineralization both within and outside of the lease are reported to have been found.

Mineralogy

Mineralization is identical in type with that of the Mary Kathleen deposit, insofar as mineral content is concerned. Uraninite has been identified and rare earth minerals are locally abundant. The host rock appears to be similar also. Pyrite is common in the drill cores and chalcopyrite is also present.

Radiometric Data

Although a very large number of anomalies have been located on the lease, most of these are very small and are not

very intense, (to the order of 400 c/m). Only a small proportion give readings of higher than 1000 c/m and these generally only over a few square feet. Of five drill holes put down in the northern area, four encountered radioactive material. The best intersection, which averaged 0.31%  $eU_3O_8$ , was of 5 ft, at a depth between 90 and 100 feet. Owing to the sporadic nature and small size of the surface showings there is no certainty that this intersection was of the same body as at the surface, although it probably is.

An intersection of radioactive material was subsequently reported from a drill hole inclined at  $60^\circ$  in the southern area roughly 100ft from the collar of the hole.

### Conclusions

The interest in this deposit lies in the similarity in mineral type and in the proximity to the Mary Kathleen uranium deposit. Assuming that a treatment plant is established at or near Mary Kathleen lease, any ore won from the Elaine Dorothy lease could, on metallurgical grounds, certainly be treated there.

At the present stage no orebodies of a size to interest a company have been indicated. There is a strong possibility that the mineralization only forms small bodies.

### LEASE NOS 4621-3 - MILO NOS 1, 2 and 3

Applied for: 28th September, 1954, by C.I. Robertson, G.H. Robertson and M.C. Shiel.

Area: 20 acres each lease.

Locality: 20 miles slightly south of west from Cloncurry.

Examined: 20th July, 1955.

Workings on date of inspection: Workings on the three leases are confined, except for a few test pits, to the one area where hand-picked ore was being mined at the time of inspection. Costeaming total 320 ft, pits and shafts total 60 ft and an adit had been driven 18 ft along the lode. From this adit ore was being mined by hand auger and then hand picked to make up a trial parcel of 10 tons for transport to the Rum Jungle, N.T. treatment plant.

### Regional Geology

The deposits occur in carbonaceous siltstone and shale, with some sandy beds. Calc-silicate rocks outcrop to the north. Stratigraphically the sediments belong to the skarn rock succession (see Carter 1955, p 4). The general strike of the bedding is  $N60^\circ-80^\circ W$ , but folding is complex. Regionally, faulting is particularly well-developed. The leases lie along a group of these faults, which are generally heavily ironstained and produce topographic ridges. Elsewhere the faults are commonly manganiferous. Within the leases the bedding appears to have been overturned from the north on the north side of the fault zone. Numerous pitch changes were observed.

### Geology of the Deposits

Radioactivity is reported to have been located throughout the length of the three leases. The area was not examined systematically but it is probable that there are a number of small areas of radioactivity associated both with

the faults and with the crests of the folds. In these positions sulphide mineralization is quite pronounced.

a / The deposit which is being developed differs from other possible deposits in that it is associated with a cross-feature, probably a fault. The lode strikes N10°E and the mineralization occurs in a white, granular koolinitic body which appears to have been derived from an acid (?) igneous rock by hydrothermal action. The koolinitic rock crops out as a fine yellow-brown iron-stained jaspery rock. The igneous rock has not been recognised in outcrop on the leases.

#### Mineralization

The only radioactive mineral so far recognised is torbernite. This is not exposed at the surface but is encountered near the interface of soil and weathered rocks. Here it is finely dissiminated. Within the weathered rock it is concentrated along joints.

Radiometric measurements are generally low at the surface. The leaseholders report that the highest reading they obtained was 1500 c/m (Austronic PRM200). This applied also to the present workings in which rich showings of torbernite were revealed at a four feet depth.

Specimens carrying sulphides have been assayed and show the presence of lead. A specimen from one of the costeans is reported to have contained 0.33% Pb. Considerably higher assays are reported to have been obtained from specimens farther west, but the values could not be confirmed.

#### Radiometric Data

The lode at present being worked has a probable length, as indicated by the costeans, of 130 ft and a maximum width of 15 ft. It dips steeply east. Generally the width is probably 5-8ft. The zone of high readings is considerably smaller than this. Within the adit values may be to the order of 0.4%U<sub>3</sub>O<sub>8</sub> over not less than 4 ft (determined by "in situ" readings on a Harwell 1292A ratemeter). Individual bulk specimens have been assayed to give values of 2.4%U<sub>3</sub>O<sub>8</sub>.

A smaller parallel body lies roughly 80 ft to the south-south-west of the mine deposit.

The sizes of other anomalies were not measured. The leaseholders claim that other anomalies are larger and more intense than the one being worked, the choice of anomaly to be tested being determined by ease of working. However structural controls of the other anomalies appear to be rather different from that of the deposit being worked. The leaseholders also claim that torbernite has been revealed in every test pit sunk on anomaly to date. The claims of the leaseholders should be viewed with considerable caution.

#### Conclusions

The deposits on these leases form the most interesting of those with secondary minerals at the surface, from the point of size and grade. Further examination of the deposits and testing of other anomalies appear to be warranted. It is, however, unlikely that a large tonnage of secondary ore can be won from the deposits, so that unless "on-the site" concentration can be effected or further deposits, of a size to warrant a treatment plant for this type of ore, found, no significant production from secondary ore alone can be expected.

The nature and size of the primary body should be determined. This could best be done by a shaft on the present workings (a vertical shaft, said to have been sunk to a depth of 45 ft by Mount Isa Mines Ltd., was collared in the lode and therefore failed to reveal any values at depth.) Such an enterprise is beyond the resources of the present leaseholders. Prospecting and mining companies in the area are unwilling to test the lease under the terms stipulated by the leaseholders.

LEASE No. 4737 - MARIPOSA

Applied for: 1st December, 1954 by J.W. Conolly. Sold to Merridale Minerals Pty. Ltd.,

Area: 150 acres.

Locality: 13 miles south of Selwyn.

Examined: 21st July, 1955.

Workings on date of inspection: Less than 50 ft of costean, on the northern prospect.

Regional Geology

The rock types in the area are sandy siltstone, argillaceous sandstone and carbonaceous slate. West of the two deposits on the lease there is a hematitic band which is parallel to the bedding, although it is believed to be introduced. This succession is the one which occupies a north-south trending belt of country from south of Kuridala to south of Mt. Cobalt. Within the lease there is a strong flexure in the generally northerly trending sediments. Minor folds within this large buckle are all overturned; fold axes dip 75-80°E and the folds pitch 50°-80°N. Some crushing and strike-faulting has occurred on the limbs of the main flexure. The two radioactive occurrences are associated with such zones of movements.

Geology of the Deposits

The two prospects are about 600 yards apart and occur in roughly the same stratigraphic position.

**Southern Prospect:** Radioactivity appears to be centred along the faulted contact of cherty quartzite (due to local silicification?) and contorted carbonaceous slates. The contact strikes N30°W and dips 63°E. The deposit occurs in the northern face (10ft high) of a small open cut which was originally worked for copper.

**Northern Prospect:** This occurrence is to the north-west of the southern prospect. The anomaly appears to be localized in a steeply east-dipping weak crush zone, of strike N30°E, in sandy siltstone and argillaceous sandstone. Carbonaceous slate lies to the east.

Mineralogy

Torbernite and malachite can be recognised in the southern prospect but torbernite has not been definitely identified in the northern prospect. Weak malachite staining is present. No primary minerals have been identified.

Radiometric Data

Anomalous readings may be obtained over a width of 12 ft in the face of the open cut on the Southern prospect, but these are probably due to dispersion during weathering of secondary material derived from a zone 6 inches wide at the fault contact. No indications of any extension of the deposit

to the north or south could be found. Another larger open cut 100 yds to the south-east was devoid of anomalous radioactivity.

On the northern prospect the anomaly extends over an estimated 125 ft x maximum 15 ft. Counts are generally less than 1000 c/m; the highest obtained was 3000 c/m near the north-western corner of the anomaly. Readings were generally higher on the footwall-western-side of the crush zone.

### Conclusions

No source of radioactivity which would indicate a significant body of primary material at depth was recognised in the northern prospect. The secondary source of radioactivity is too low grade to be of interest.

Although much higher readings were obtained on the southern prospect the source appears to be of negligible size.

### LEASE NOS 4728-30 HELAFELLS, SOUTH HELAFELLS, AND HELAFELLS NORTH

Applied for: 26th November, 1954, by Metals Exploration N.L.

Area: Helafells South - 40 acres  
Helafells - 80 acres  
Helafells North - 80 acres

Locality: 12 miles north-east of Malbon.

Examined: 22nd July, 1955. Only the main anomaly was visited.

Workings on date of inspection: One costean, roughly 20 ft long, through the main anomaly.

### Geology

The main deposit occurs in a succession of interbedded quartzite and slate. It appears to have been localized in a red, ferruginous, slightly brecciated zone at the interface of quartzite and slate. The slates strike N 20°W and dip roughly 40°E. A white drusy carbonate mineral is present, probably calcite. There is also a coarse boxwork which is probably due to the leaching of some of the carbonate mineral.

### Mineralogy

Sparse torbernite flakes can be seen on breaking the rock in the zone of greatest radioactivity. Malachite is also present, not only in association with the torbernite.

### Radiometric Data

The main anomaly extends discontinuously over some 200 ft, with the best counts over about 60 ft. Even these, however, are generally low; the highest reading obtained was 3,000 c/m. The true width of the anomaly could not be determined owing to the presence of rubble but it is less than 10 ft and may be only 3-4 ft.

Another much weaker anomaly is reported to occur 300 yards to the south and a third to the north of the main anomaly.

### Conclusion

The weak secondary mineralization at and near the surface is not considered to indicate a primary body of significant size and grade at depth. The secondary

mineralization is too low grade to be of interest.

PART II: LEASES REVISITED (See Carter (1955) Appendix)

LEASE NO. 4175 - FLAT TYRE

Examined: 8th July, 1955.

Additional workings since last inspection: 3 areas, one south of the shaft and two north of the shaft, have been bulldozed to expose rock in situ.

New Observations:

The southern bulldozed area (60 ft x 50 ft) revealed no new information.

In the central open-cut, which commences 3ft north of the shaft and is 18ft x 50 ft in area, the anomaly in which the shaft was collared can be seen to extend 16 ft north of the shaft and to have a maximum width of 3 ft 6 inches.

No anomaly was found in the northernmost open cut (24ft x 60 ft), which is between the two northernmost costeans.

The 50 ft cross-cut was inaccessible because of water. In the 32ft cross-cut use of a beta probe on a Harwell 1292A ratemeter revealed the lode to be 3 feet wide and dipping approximately 25°W. The lode is apparently displaced by numerous small faults against which values terminate abruptly. A sample from the 32 ft cross-cut is reported to have assayed 0.3%U<sub>3</sub>O<sub>8</sub>.

LEASE NO. 4229 - MOTHER'S DAY NO. 1

Examined: 8th July, 1955.

Additional workings: Six bulldozed costeans to the north and north-west of the shaft. Underground, a total of 101 ft of development has been done on the 50 ft level, as follows:  
East drive, bearing N 30°E, length 23 ft.  
West drive, " due W, " 36 ft, followed by length 22 ft, bearing N50°W.  
South cross-cut, bearing S5°E, length 20 ft.

New Observations

The costeans failed to reveal any further surface mineralization.

The underground development revealed patchy mineralization in the drives over 46 ft and maximum width of probably 3-4 ft. The lode is bounded on the south by a strong 60°S-dipping shear. In the cross-cut a small wedge of radioactive material was found. It is bounded to the north and south by faults.

The grade of lode material in the underground workings of the Mother's Day lease appears to be slightly lower than that on the Flat Tyre lease.

It is probable that faulting has played a greater part in determining the outlines of the lode than was previously recognised.

LEASE NO. 4153 - FASTER EGG

Examined: 8th July, 1955

Additional Workings: Nil.

New Observations

On the Midnight lease, adjoining the Easter Egg lease to the west, 5 vertical drill holes were put down to locate the "down-dip" extension of the main lode on the Easter Egg lease (which is believed to dip with the bedding 50-55°W). The holes were put down roughly 40-50 ft apart and at distances of from 50-100 ft from the lode outcrop.

One hole is reported to have passed through 9 ft of lode material assaying 0.3%U<sub>3</sub>O<sub>8</sub>.

LEASE NO. 4236 - COUNTER

Examined: 9th July, 1955

Additional workings: Two drill holes had been completed, totalling approximately 400 ft and a new programme involving about 700 ft of drilling was about to commence (This has since been completed).

Pit sinking on the areas of soil within the costeans, to determine the grade of the underlying rock, was in progress. This was being followed by a programme of sampling of near-surface values by drilling slightly upward-inclined holes by jack hammer from the test pits and collecti the sludges.

New Observations

No. 1 drill hole, drilled vertically near the north-east of the lode, intersected 120 ft of lode material, measured from the surface, of average grade 0.23%U<sub>3</sub>O<sub>8</sub> (chemical assay S.A. Mines Department) followed by 60 ft of average grade 0.15%U<sub>3</sub>O<sub>8</sub>. The overall average is therefore 0.20%U<sub>3</sub>O<sub>8</sub> over 180 ft.

The results of No. 2 hole, drilled from a point north of the lode body, on an inclination of 60°S are :-

0 - 65 ft	- barren		
65 - 85 ft	- average grade	0.145%	U <sub>3</sub> O <sub>8</sub>
85 - 140 ft	- "	"	0.245% "
140 - 170 ft	- "	"	0.14% "
170 - 200 ft	- "	"	0.07% "

Average 65 ft to 200 ft 0.177%U<sub>3</sub>O<sub>8</sub>

The true width of the zone of average grade 0.245%U<sub>3</sub>O<sub>8</sub>, assuming the lode to dip uniformly 75°N, is roughly 40 ft.

As a result of further testing of the areas beyond the outcrop which had previously been regarded as portion of the lode, company geologists have decided that the radioactivity present is probably due to contamination during weathering of the outcrop. The area of the lode has therefore been reduced to roughly 4,200 square feet (350 tons/vertical foot. This is a provisional figure only)

Within the lode itself there are numerous small zones, generally of chloritic rock, which is deeply weathered. Th programme of pit sinking has been designed to ascertain the true nature of these zones. It appears that they are usually barren or only weakly mineralized; they are commonly bounded by faults. They are much more plentiful at the western end of the lode than elsewhere. They may result in significant dilution of the overall grade of the minable body. The average grade at the surface is at present regarded as

0.2%U<sub>3</sub>O<sub>8</sub> or a little higher.

Exploratory work at present in progress should give a much clearer idea of the size and grade of the lode on this lease.

Minimum Economic Grade

Using the figures and assumptions (which are not available for inclusion in this report) adopted by C.L. Knight in his computations of operational costs for the Skal deposits, estimates have been made of the minimum grade which could be worked by open cut on the Counter lease, under the most favourable conditions. For the purposes of calculation the lode is assumed to have a uniform area of cross-section at all depths and to dip and pitch not less steeply than 65°. Ore is valued in accordance with the A.A.E.C. schedule and no allowance has been made for cartage.

It is concluded that the minimum grade which could be mined by open-cut methods to a depth of 100 feet without an operating loss is roughly 0.15%U<sub>3</sub>O<sub>8</sub>; to a depth of 200 feet the minimum grade is 0.20%U<sub>3</sub>O<sub>8</sub>. Mining to 100 feet would yield (assuming total recovery) 35,000 tons of ore.

As the requirements of the A.A.E.C. with regard to grade and tonnage of ore for the establishment of a purchasing point, do not at the present juncture appear likely to be met, the Counter deposit could only be exploited if the ore could be treated at any plant erected for the treatment of the Mary Kathleen ore. This is unlikely; however, assuming it to be possible, cartage costs at 1/- per ton mile would raise the economic cut-off by 0.03%U<sub>3</sub>O<sub>8</sub> for ore of grade 0.20%U<sub>3</sub>O<sub>8</sub>.

The minimum grade which could be won by open-cut methods to 100 ft depth and carted to Mary Kathleen lease, without loss, if it is assumed that the price received at the treatment plant is as per A.A.E.C. schedule, is therefore 0.18%U<sub>3</sub>O<sub>8</sub>.

For open-cutting to 200 ft depth the figure is 0.23%U<sub>3</sub>O<sub>8</sub>.

It is therefore concluded that, on present indications of grade and if all assumptions are valid, no more than 30,000 tons of ore could be profitably mined from the Counter lease under present economic conditions.

LEASE NO. 4234 - Battery

" " 4367 - New Ring.

Examined: 8th July, 1955.

No further workings or comment.

LEASE NO. 4121 - SKAL

Examined: 11th July, 1955

Additional workings: Nil

The deposits were proved by Mount Isa Mines, Ltd., to be of sub-economic grade and the option to purchase was therefore not exercised.

Sampling of costeans and drill cores gave the following rough mean values for the two lodes on the lease:-

Southern Body.	Surface grade	0.9 lb/ton
	100 ft depth grade	3.6 " "
	200 ft " "	1.75 " "
Northern Body	Surface grade	1.3 lb/ton
	100 ft depth grade	4.4 " "
	200 ft " "	1.4 " "

LEASE NO. 4113 - HOPEFUL

Examined: 11th July, 1955  
Additional workings: One costean to the south of the main outcrop.

LEASE NO. 4115 - THE PILE

Examined: 11th July, 1955

Additional workings: Nil

The overall grade of the deposits on the Pile and Hopeful leases is lower than that of the Skal deposits and are therefore not of economic grade.

LEASE NO. 4279 - Queen's Gift

LEASE NO. 4280 - Queen's Gift No. 2.

Examined: 12th July, 1955

Additional workings - Nil

The following assay data have been supplied by J.H. Brooks, of the Geological Survey of Queensland:-

Queen's Gift (Anomaly No. 1 - see Carter (1955) Appendix p.7)  
Chip sample over 16.5ft - 0.14%U<sub>3</sub>O<sub>8</sub>  
(Chemical assay by Queensland Government Analyst)

Queen's Gift No. 2 (Anomaly No.2) - Chip sample over 12 ft,  
50 ft from south-east end of deposit - 0.13%U<sub>3</sub>O<sub>8</sub>  
(Chemical - Qld. Govt Anal.)

Sample, taken by Australasian Oil Exploration Ltd employees, over 9 ft, 27 ft from south-east end of deposit - 0.16% (South Australian Mines Department)

Sample, taken by A.O.F. Ltd., over 12 ft, 40 ft from south east end of the deposit - 0.12%(S.A. Mines Dept.)

LEASE No. 4459 - MARY KATHLEEN

Visited: 14th July, 1955.

Information on development is contained in the body of the report (p. 2). It was not possible to make a detailed examination of the deposit workings, nor were the results of drilling available.

The following observations were made:-

Several fault zones were observed in the adit, the widest of which extended over several feet. The fault zones appear to be barren. The influence of faulting on the present position and shape of the lode may have been underestimated in earlier appraisals. Some, at least, of the faults appear to be post-mineralization in age.

Weathering, with consequent formation of secondary uranium and other minerals, has extended to an unknown depth

along joint planes. The intervening blocks largely consist of primary minerals.

Uranium mineralization is patchy and is not co-extensive with the rare earth minerals.

Pyrrhotite is plentiful near the eastern end of the adit and elsewhere. Chalcopyrite is reported to occur extensively in places. The grade of copper is not known.

#### PELICAN

Examined: 15th July, 1955.

Additional workings: 5 costeans across the lines of mineralization and totalling an estimated 550 ft in length, now extend at irregular intervals over roughly 400 ft. An 8 ft deep pit has been sunk on an area of high counts in the northernmost costean (which had not been dug on the occasion of my previous visit). In addition an estimated 150 ft of costeaning has been done on lease No. 4531 - Pelican No. 1 - the lease to the south.

#### New Observations

With the exception of the radioactivity in the pit in the northernmost costean, the additional work has not revealed any previously unrecorded radioactivity.

Definition of the main radioactivity by means of a beta probe shows that the significant radioactivity in each costean is confined to a zone only a few inches wide. This suggests that the radioactivity is probably due to uranium in an intrusive vein. Weathering has produced some dispersal of radioactivity, but it is concluded that large scale transport of uranium by weathering processes has not taken place. No anomalous radioactivity was detected in the calc-silicate rocks.

The distribution of radioactivity indicates that, unless the size of the mineralized zone increases greatly with depth, there is no possibility of this deposit being of economic interest.

In the pit referred to above, where the highest readings on the lease were obtained a bright green, non-micaceous radioactive mineral, together with a bright yellow mineral (autunite?), can be seen.