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PRELIMINARY GEOPHYSICAL REPORT ON THE CORONATION HILL URANIUM PROSPECT KATHERINE-DARWIN AREA, NORTHERN TERRITORY.

by

J.B. MISZ.

DARWIN. N.T.

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PLANS AND SECTIONS.

SUMMARY.

This report deals with the application of geophysical methods (other than radiometric) to the Coronation Hill Radioactive Deposit. Results of radiometric gridding of the surface and costeans, field sludge assays, and radiometric drill hole logging are not treated as these are included in entirety in R.B. Allen's report "The Coronation Hill Uranium Prospect," Bureau of Mineral Resources Record 1954/17.

Structural indications from magnetic evidence are discussed. These comprise several faults, or zones of weakness, one of which may coincide with the axis of the surface radioactivity. Several interesting magnetic features for which no cause can be proposed are also noted. The highly uncertain nature of the deductions made is emphasised.

The method of approach to geophysical applications at Coronation Hill is detailed, and recommendations are made for possible future work.

INTRODUCTION.

The purpose of this paper is partly to satisfy a need for an immediate assessment of the magnetic work at Coronation Hill and partly to present the writer's views on the results of work completed to date.

It is understood that a report is being prepared in Melbourne by J.A. Barlow, who was in charge of the geophysical programme at the prospect. The following comments should be considered supplementary to Mr. Barlow's report, and written primarily for the benefit of the Senior Geologist, Darwin, who is now considering this year's field plans for Coronation Hill, for which planning it appears Mr. Barlow's report will not be available.

Contouring of the vertical magnetic intensity has been done on the basis of data supplied by J.A. Barlow. Geology is superimposed as accurately as possible, but due to lack of information on the precise location of grid points as related to geological features, slight positioning errors may occur.

Magnetic field readings were made during September-October, 1953, as part of a geophysical programme which also included radiometric gridding, drill hole logging and field sludge assaying. All of the field work was done by Geophysicists J.A. Barlow and L. Hawkins. Mr. Hawkins took most of the magnetometer readings.

Location and access: The Coronation Hill Prospect is located 24 miles on a bearing of 109 degrees from Goodparla Homestead, Northern Territory. Goodparla is 49 miles northeast of the town of Pine Creek, which is 157 miles from Darwin on the Darwin-Alice Springs Highway.

Access can be made to Goodparla by conventional drive vehicles during the dry season, but four-wheel drive is necessary to cover the remaining 29 miles of road to the prospect. The prospect cannot be reached by vehicles during the "wet."

BACKGROUND OF THE GEOPHYSICAL WORK.

A geophysical programme in a new area is proposed, and its probable value assessed, on the basis of known or suspected geological features, and the nature of the information desired.

The salient geological facts known when a geophysical programme for Coronation Hill Prospect was first considered are:

1) The radioactivity occurs in sheared, altered rock on a steep, talus veneered slope beneath a prominent vertical cliff of Mt. Callanan (Buldiva) quartzites and conglomerates. The latter beds dip moderately southwards and form a resistant capping to a 300 foot high hill that is one-half mile north of the edge of an extensive plateau. The plateau is capped by the same quartzite-conglomerate horizon folded into a gentle synclinal basin.

2) 100 feet below the radioactive area a nearly vertical quartz reef striking 100 degrees outcrops prominently.

3) The 2½ times background surface radiometric contour included approximately 40,000 square feet. Several costeans had been dug exposing visible uranium mineralization.

4) A most striking feature was the highly altered and sheared condition of the host rock - so much so, in fact, that great difficulty was experienced in identifying the rock type. R.S. Matheson originally regarded it as a sheared tuffaceous rock. He later suggested it was an acid lava. Other opinions ranged from argillaceous quartz siltstone or sandstone to greywacke, acid porphry, slate and intrusive breccia. Dallwitz summarized the situation in a petrographic report on thin sections: "This rock has been altered, silicified and sheared to such an extent that it is impossible to say what it was originally."

In general, the rock is highly silicious with clots and streaks of sericite, chlorite and limonite plus some granular hematite, black iron ore, fine-grained sphene, leucoxene, etc.

R.S. Matheson, R.B. Allen and B.P. Walpole all remarked verbally and in their reports on the high degree of silicification and hydrothermal alteration suffered by the mineralized rocks. R.B. Allen noted: (File: 84NT/13A - 27/11/5) "Evidence of hydrothermal activity, including sulfide mineraliaation, continues to accumulate... It is indicated that post-mineral alteration occurred possibly resulting in destruction of primary uranium minerals originally present. The alteration is not due to meteoric weathering."

Dallwitz frequently mentions hydrothermal activity as the probable cause of the characteristics of the mineralized rocks. On file 84NT/13A -(30/6/53) he noted: "Heavier silicification seems to be concomitant with the uranium mineralization," and in a petrological report of 21/7/53 he states: "They (isotropic grains) are undoubtedly a by-product of the severe hydrothermal alteration which has taken place.

5) Complex shearing and faulting, possibly on a close scale, occurred in at least three major directions: northeast-southwest, northwest-southeast and east-west. Quartz veins trending in these three directions were noted. A strong northwest (to north — northwest) schistosity was also evident.

6) Sufficient surface indications of sulphides were present to suggest the possibility of important sulphide mineralization at depth. The evidence:

a) See R.B. Allen's comment above.

b) A large boulder buried in the talus of the mineralized area and giving a reading of 14 times background contained pyrite-chalcopyrite with torbernite along fractures.

c) The quartz reef striking 100 degrees contains significant amounts of malachite and chalcocite at the surface. Actually, this reef comprised a currently effective mineral lease.

d) Dallwitz had noted: "Limonite and hematite in these rocks probably owe their origin very largely to hematitic and/or pyritic mineralization.

e) Several vuggy iron stained quartz veinlets in the radioactive zone pointed to the former presence of sulphide.

f) A boulder from the silicified zone contained pyrite.

Additional evidence of sulphide mineralization was later furnished by the drill cores, a mineragraphic examination of which showed the presence of pyrite, (two generations) marcasite, chalcopyrite, bravoite, galena and sphalerite. Although the volume of these minerals present was not spectacular, it was significant. R.B. Allen, in his preliminary report, states; "What is required, therefore, is a continuation of the exploratory programme beyond the limits of the completed work, rather than intensive development within them. As its primary objective, the work should aim at finding and testing possible extensions of the sulphide zone encountered in diamond drill hole No. 1, at a greater depth beneath the present hole and within the area to the northwest of it. An effort should be made to test the unweathered zone beneath the chlorite schist outcrop and beneath the deep pit for the possible presence of sulphide."

7) The geological structure (detail) was almost entirely unknown, and even now after completion of two drill holes, the picture is still not entirely clear. This obscurity extended even to the attitude of bedding. R.S. Matheson states: "The strike and dip of the rocks at Coronation Hill is masked by a strong schistosity and is at present doubtful."

This completes a resume of the pertinent geological information available at the time geophysical investigations were initiated. For a complete description of the geology of the deposit and the surrounding region, the reader is referred to the reports of Allen and Walpole.

The Geologists-in-Charge, R.S. Matheson and R.B. Allen, requested that geophysics be applied to the area with the following primary objectives:

1) To obtain information on the likelihood of occurrence of appreciable sulphide mineralization.

2) To obtain information on the structure of the deposit and the extent of the zone of hydrothermal alteration.

As regards the latter, it was suggested that a magnetometer survey might furnish clues which, combined with other information from costeaning, drilling and geological mapping would assist in forming an accurate picture of conditions present. Features which might (or might not) have caused magnetic anomalies are:-

1) <u>Quartz veins and zones of silicification:</u>

The large reef below the prospect offered an ideal means of locating any faults with a horizontal component striking in other than an east-westerly direction. One such fault was suspected a few hundred feet west of the quartz blow immediately north of the prospect.

It also seemed likely that, wlsewhere in the area of the prospect, quartz veins might occur which were concealed by the talus cover. These could give clues to the genesis of the radioactive deposit or to possible fault patterns.

In New Zealand, with precise measurements, the writer had obtained consistent negative magnetic anomalies of 10 to 30 gammas over quartz veins from three to five feet wide that were injected into basement greywackes and schists.

Similarly negative but less prominent and less consistent anomalies were noted over pegmatite dykes (60 to 90 % quartz) in Rhodesia. These were much wider, being of the order of 5 to 15 feet. The magnetic characteristics of the intruded rocks were apparently much nearer to those of the intrusive than in the previous case.

Fair results were also obtained by Malamphy on auriferous veins in granite in Rio Grande Do Sul, Brazil. Here the veins (ranging from a few inches to occasionally over 3 feet in width) consisted of pegmatite with a high percentage of quartz, negative anomalies resulting. On one vein an anomaly of 50 gammas was recorded, but generally the anomalies were much smaller. In one instance, vein trends were mapped on the basis of 5 to 10 gamma anomalies, the picture produced being tested by trenching and proved to be essentially correct. It was found that in many instances splitting, joining and bending of veins could be predicted from the magnetic data.

It thus seemed reasonable to hope that magnetic work at Coronation Hill might assist in the mapping of quartz reefs and silicified zones. Tracing of known reefs where concealed by overburden seemed likely to be successful, whereas location of unsuspected reefs seemed less probable.

2) The strong hydrothermal alteration:

Such alteration could have been accompanied by introduction of minerals with a higher magnetic susceptibility than the surrounding rock; or it might have destroyed the more paramagnetic minerals already present. In either case a magnetic anomaly would result.

In New Zealand, in connection with the geothermal power project, the writer had done considerable magnetometer work on hydrothermally altered rocks and noted the excellent results. Magnetic surveys are there a standard procedure in locating and delineating areas of hydrothermal alteration.

The possibility of the radioactivity at Coronation Hill being associated with rhyolites or acid tuffs increased the chances of a magnetic anomaly resulting from hydrothermal alteration.

3) Above normal paramagnetic mineral content:

The strong indications of sulphide mineralization suggested that paramagnetic minerals, such as magnetite, pyrrhotite, hematite, pyrite, chalcopyrite etc. might be associated with the deposit.

4) Lithological contrasts:

Matheson had suggested that the radioactivity was localized in a rhyolite flow restricted to a valley in underlying sediments. A reasonable magnetic anomaly could be expected between rhyolite and sediments, in which case a magnetometer survey should either negate or support this hypothesis.

It can be seen from the above, and the summation of geological features presented earlier, that the magnetic stations in the test work would have to be very closely spaced as some of the characteristics of the area considered capable of producing anomalies might be of very small dimensions. Malamphy had employed station intervals of as little as 8 feet, and the writer found intervals of down to 5 feet sometimes necessary.

Also the potentially anomalous features might easily be elongated in several directions, (or non-directional,) and even if elongated in only one direction, that direction could only be guessed. Thus, in addition to closely spaced readings, traverses in two directions at right angles were required, and this grid must cover the entire area of the prospect as the position of possible anomalies could not be predicted.

Differently expressed, in order to test the magnetic method, the conventional procedure of reading two or three traverses over the mineralized area must be replaced by a closely spaced grid, because the former method would not detect the type of anomaly sought even if such an anomaly existed.

A station interval of 12½ feet on traverses 50 feet apart was finally adopted, although the writer preferred a considerably smaller interval and closer spaced traverses, and now feels that appreciably more information would have been obtained if the smaller spacings had been employed.

Finally, the magnetic readings had to be made and corrections applied with a great deal of care and precision, as any anomalies could be expected to be of very small magnitude (of the order of 10 gammas, or even less.) To the writers knowledge, this condition was fulfilled.

To gain information on the presence or absence of sulphides, a self-potential survey was recommended. It was suggested that the self-potential stations coincide with the magnetic stations.

a) to avoid lost time in laying out another grid;

b) because it was not desirable to restrict the traverses to a single direction, as there was absolutely no information available upon which to base a guess as to the direction of possible self-potential anomalies. There was not even evidence to argue against the occurrence of several self-potential anomalies differently orientated:

c) because the taking of self-potential readings at 12½ foot intervals would require very little additional time over that required to take the readings at, say, 25 foot intervals, inasmuch as the full length of traverse must be walked by the observer anyway. The steep, rubbly nature of the surface meant that most of the time required for the self-potential survey would be consumed in moving along the traverses, only a very small percentage being devoted to actual taking of readings.

d) because of the exceptionally poor contact conditions on the slope, 12½ foot station intervals were desirable. A relatively high percentage of doubtful readings was augured, some of which would undoubtedly have to be discarded. Under such circumstances, closely spaced readings are a definite necessity.

No appreciable self-potential was done at the prospect, mainly because of lack of time, but partly because of a conviction on the part of others that self-potential was unlikely to produce results of a useful nature.

Finally, it was suggested th$t resistivity be used to supplement magnetometer work in tracing known quartz veins and in determining the presence or absence of and extent of hydrothermally altered zones.

Gold quartz veins (from stringers to reefs several feet thick) have been successfully traced in the U.S.A. by the resistivity method, and excellent resistivity anomalies were obtained by the writer over hydrothermally altered areas in New Zealand. Resistivity data would prove of immense aid in interpreting the magnetic picture.

At any rate, no resistivity apparatus could be obtained so the method was not tested.

To summarize, it was proposed that magnetic and self-potential geophysical methods be used at Coronation Hill over a grid consisting of stations at intervals of 12½ feet on traverses 50 feet apart in two directions at right angles.

As noted in the writer's "Suggested Considerations for the Geophysical Programme at Coronation Hill," (File B84NT/13 - dated 3rd September, 1953,) The geology is so uncertain and the conditions of mineralization are so indefinite that geophysical work should be done with the assumption that both are unknown, complex and of small dimensions. It must be admitted that the programme as outlined means doing much work which might quite possibly fail to give useful results. However, the chance, even if small, of useful information resulting justifies the necessary efforts because of the extreme difficulty of securring definite information from surface geological mapping. Since the surface does not reveal the situation of the deposit, other methods (geophysics and drilling) must be more heavily relied upon. Under such conditions no effort should be spared or possibility of securring information ignored.

Useful anomalies could not be regarded as "likely" to result, but there was a "reasonable possibility" of such anomalies, and this fully justifies the detailed work under the conditions existing. This viewpoint was emphasises by the writer in his written recommendations.

DISCUSSION OF MAGNETOMETER SURVEY RESULTS.

Plate I is an isogam map of the Coronation Hill Prospect on which positively and negatively anomalous areas are differently hatchered. The interesting features are lettered for ease of reference and discussion, and will be considered separately.

A most striking, but certainly not the most easily explained feature of the map is the plus 10 gamma contour line AA which crosses the area from east to west just south of the prominent quartz reef and divides the area into two sections. South of this contour the relative magnetic intensity is always above plus 10 gammas, a positive anomaly being expressed by the plus 20 gamma contour and a negative anomaly being expressed by plus 10 and 0 gamma "depression" contours.

North of contour AA the general level of the magnetic intensity is between 0 and 10 gammas. Here the plus 10 gamma contour encloses positively anomalous areas, while 0 and -10 gamma contours enclose negatively anomalous areas.

A topographic effect on the magnetometer was the first possibility considered, as AA roughly follows the contour of the hill as far east as the south end of "trough" NN. Against this explanation are 1) the theoretically negligible (as a rule) effect of topography on magnetometers; 2) the apparent transgression of AA across the topographic contours east of trough NN; and 3) the fact that AA is ¼ of the way towards the summit from the base of the hill. If a topographic effect were to exist, one would have expected its expression to be either at the base or summit of the slope.

What prevailing geological condition could be responsible for this very prominent magnetic feature the writer is unable to say. One possibility is that it marks the northern limit of the chlorite schist mapped about the prospect. (See Allen's Preliminary Report.) It is to be hoped that others may be able to contribute towards an ultimate solution.

The magnetic expression of the large quartz reef striking 100 degrees in the centre of the area is unmistakeable. It consists of a negative line BB immediately north of a positive line CC. This condition conforms to what would theoretically result from a vertical east-west tabular body of magnetic susceptibility lower than that of the enclosing rock in low magnetic latitudes. Hence the magnetic expression of the quartz reef is just what one would expect from a diamagnetic mineral such as quartz.

Unfortunately the field party did not extend the magnetic grid as far to the east as the writer originally suggested. This has resulted in an incomplete picture of the structure evidenced at the western end of BB and CC.

From the meagre information available it would appear that the quartz vein is faulted at this point, the western portion having moved southwards relative to the eastern portion. The main evidence lies in the similarity of the two successions.

1) East of the fault: Negative BB, positive CC, positive DD, negative EE.

2) West of the fault: Negative FF, positive GG, positive HH, negative JJ and KK.

Thus the quartz vein west of the fault is represented by negative FF and positive GG, which correspond to the negative BB and positive CC associated with the outcropping quartz vein east of the fault. Corroborating the geophysical evidence of this postulated fault is the fact that no surface expression of the quartz vein is visible west of the fault in line with the outcrop of the vein to the east of the fault. The manner in which the western end of BB seems to broaden and swing northwards as if to indicate southward movement of the eastern block is slightly disturbing, but, pending further magnetometer readings in this area, this evidence is not considered of sufficient weight to alter the interpretation made above. The magnetometer traverses in this area should be extended so as to either increase or erase the evidence for this fault.

If this fault actually exists (and the strength of the geophysical evidence at the moment is only sufficient to make it a "reasonable possibility" - the evidence is anything but conclusive,) an extremely interesting situation results: The axis of the area cut by costeans 1,2,3,4,5 and 6 (the costeans being in the surface radioactivity) coincides exactly with the fault postulated from the magnetic picture.

It will be noticed that the costeans are associated with a narrow positive anomaly PP, whose axis is roughly that of the costeans and hence also the postulated fault. Apparently the hydrothermal alteration associated with the prospect is characterized more by an increase than decrease of magnetic susceptibility, the increase possibly resulting from the injection of small amounts of iron ore or larger amounts of such paramagnetic minerals as hematite, pyrrhotite, pyrite, chalcopyrite etc. Hematite and iron Ore were noted as fairly prominent in thin sections of the mineralized rock. The sulphides occur in minor amounts on the surface with the possibility of stronger concentrations at depth. Considered from the purely theoretical point of view, large sulphide concentrations in sediments of low magnetic susceptibility would be expected to produce magnetic anomalies of the order of 10 gammas, unless pyrrhotite were an important constituent in which case the anomaly would be greater.

There is a general similarity in shape and position of the 2½ times background radiometric contour (surface) line and the slight positive magnetic anomaly.

Anomalies positive DD and negative EE, with their supposed continuations west of the fault positive HH and - JJ are a less definite indication of a tabular structure or body elongated east-west but differing from the quartz reef in having a higher magnetic susceptibility than the adjacent rock. This is suggested by the positive anomaly being north of the negative. Its strength and continuity are not as impressive as in the case of the quartz reef.

The impression is that this feature is genetically related to the quartz reef, but there is insufficient geological evidence to substantiate such a hypothesis. Like the 10 gamma contour AA, it is a feature that cannot be explained at present, but whose existence should be borne in mind. A clue may exist in the fact that its most westerly extension, KK, seems to parallel the east-west Mt. Callanan Group contact, which may well be a faulted contact.

The markedly elongated North-South anomalies positive MM and - LL were first assigned by the writer to the proximity of the Mt. Callanan Group sandstones and conglomerates. However, it seems most unlikely that the susceptibility contrast between the sandstone and the underlying or adjacent rocks would be sufficiently large to give the observed 30 gamma anomaly. Also, similar anomalies do not occur elsewhere along the Mt. Callanan Group contact, and so a narrow linear structure, possibly alteration or injection along a zone of weakness, is favoured as the cause. Support for this hypothesis is given by the following:

a) The adjacent, locally North-South trending Mt. Callanan Group contact might well be a fault expression;

b) A prominent topographic gully, probably marking a local weakness in the rocks, coincides with the anomaly;

c) Negative anomaly KK may be the continuation of negative JJ (additional magnetic readings to the West would assist in deciding) in which case KK would appear to be slightly offset to the south along the anomaly MM.

The cause of the magnetic anomaly probably has a magnetic susceptibility higher than that of the adjacent rocks and is positioned near MM.

Anomalies positive QQ and - RR are suggestive of a North-South structure. Further readings are necessary to the North and Northeast before discussion of this feature is possible.

A relationship seems possible between RR and the negative trough NN. At this time no comments on this trough can be made. As previously noted in connection with AA, it may result from susceptibility contrasts of differing rock types.

It is interesting to note that a broad, strong positive anomaly extends southwards from the South end of trough NN. 100 feet south of the edge of the magnetic grid and on the projected axis of this positive anomaly several high geiger readings were obtained.

The occurrence of the present radioactive prospect in a North-South trending positive anomaly makes this similar, but stronger, anomaly with traces of radioactivity worthy of further consideration.

CONCLUSIONS.

1) The picture produced by the magnetic grid at Coronation Hill canbe classified as highly suggestive, with low intensity anomalies whose origins generally cannot be decisively determined. This is the type of result predicted at the inauguration of the survey.

The value of the work lies in its suggestiveness of possible geological conditions which, it is hoped, may assist the geologist in unravelling a very obscure, and apparently complex, geological setting.

The criticism might well be made that the writer has drawn deductions from evidence of far too ambiguous a nature. The writer himself has emphasised that the evidence is certainly inconclusive, and that the interpretations presented are those considered to most probably approximate actual conditions in his opinion.

For instance, argument could be presented for the placing of the offsetting fault at the western end of BB so as to coincide with LL and MM rather than the axis of the costeans. Evidence also exists for the assumption of a relationship between the large quartz blow and the radioactive anomaly. However, it is not within the scope of this report, nor is it warranted, to present every possibility apparent on such an ambiguous map.

These facts do not eliminate the value of the map in suggesting possible approaches to the hazy geological picture at Coronation Hill. The magnetic map is not offered as the key to this picture - it is presented as another piece of evidence for consideration.

2) Greatly increased clarity of the magnetic indications could have been secured by closer spacing of readings and by continuing the grid further to the west along the quartz reef as originally proposed so as to diagnose the situation tentatively referred to faulting.

3) The East-West quartz reef BB is prominent on the magnetic map and appears to be faulted at its western extremity. It is suggested that this fault may coincide with the axis of the surface radioactivity.

4) The radioactivity is associated with a slight positive magnetic anomaly that could be indicative of mineralization. The occurrence of a similar but stronger positive anomaly with traces of radioactivity is noted.

5) Faults or zones of weakness are indicated parallel to MM and KK-JJ. Silicification may be prominent in the latter.

6) Features for which no explanation is offered at the moment, but which should be borne in mind, are: The East-West 10 gamma contour AA; the linear features QQ and PP; and the trough NN.

RECOMMENDATIONS.

1) The writer agrees with R.B. Allen in that the first objective of further work should be the tracing of the sulphide zone of drill hole No. 1, and the search for other possible sulphide

concentrations. In spite of the fact that surface conditions are far from ideal for the successful operation of self-potential, the writer is still of the strong opinion that it should be attempted.

Admittedly, contacts are bad, but it is not known that this problem is incapable of solution. Thus logic dictates that the method be thoroughly tested, especially in view of the known existence and stressed importance of sulphide mineralization at the prospect. Special procedures for securing contacts may have to be devised, but it seems a far more commendable attitude to say "what methods can we apply to improve contacts?" than to say "the contacts are bad and therefore self-potential cannot be applied.

2) The writer would also recommend several test self-potential traverses over an impressive boxwork gossan which he noticed about ½ mile Southwest of the prospect.

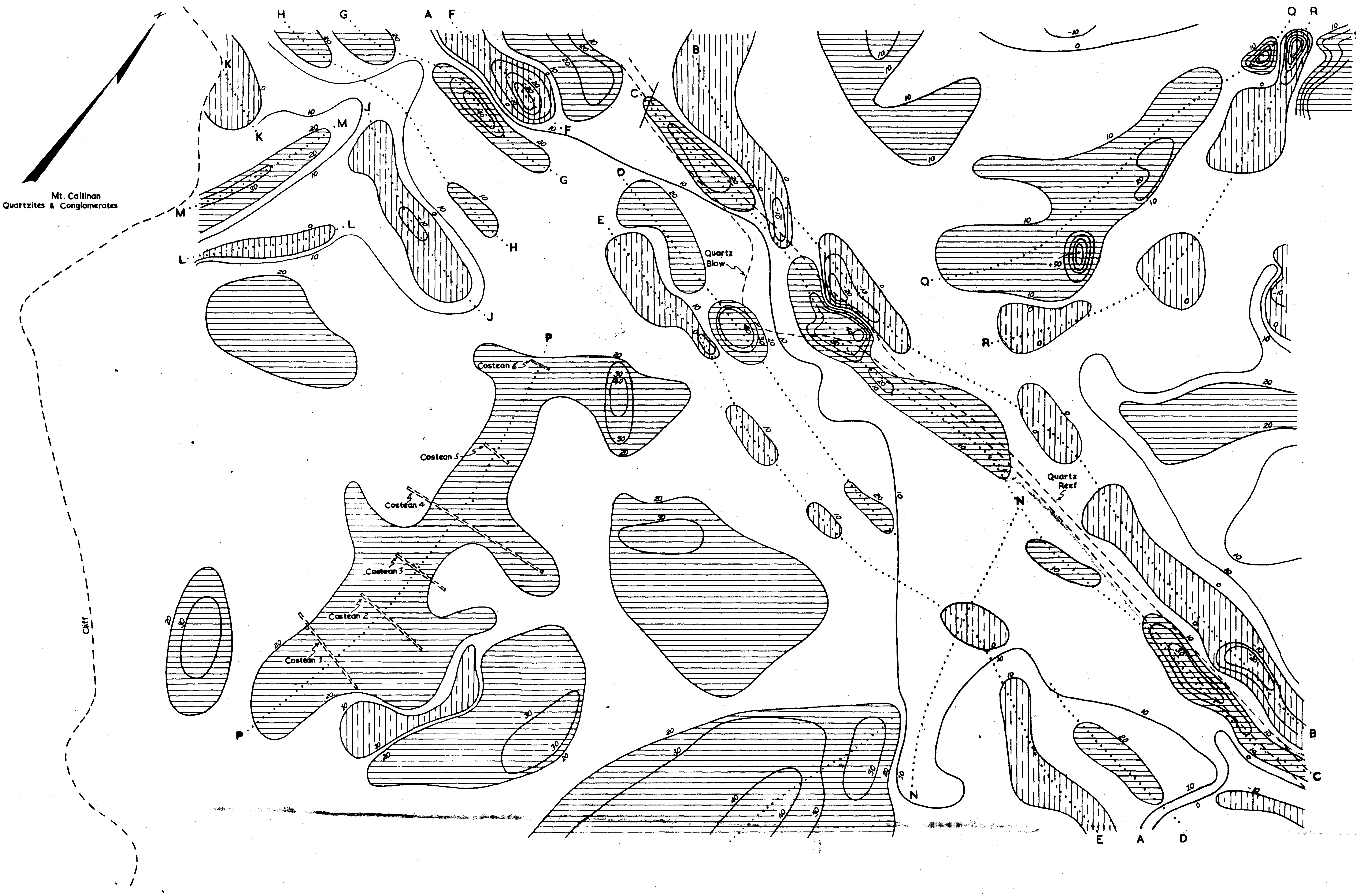
3) Resistivity should be used to reduce the ambiguity of the magnetic picture, especially as regards: a) Faulting of the quartz reef. It's presence and direction need confirmation. Reasonable resistivity anomalies should be given by the quartz vein. b) Location and tracing of sulphide zones. Here again it is a matter of trying the method, even though useful anomalies are far from assured. c) Determination and whether or not the hydrothermally altered zone of the prospect furnishes a resistivity anomaly. If so, resistivity could then be used in seeking other such zones.

4) The magnetic grid should be extended westwards at least as far as originally recommended so as to clarify the situation at the western end of BB. It is further suggested that the magnetic grid be extended southwards of NN, primarily to trace the positive anomaly on whose indicated extension radioactivity occurs. This is desirable to gain evidence for or against the association of radioactivity with small positive anomalies.

All magnetic and self-potential readings should be at intervals of ten feet or less.

5) Production by the Geological Section of a large scale map of the prospect and surrounding area embodying the conclusions of R.B. Allen as stated in his preliminary report is desirable. Such a map would be of immense assistance in interpreting the geophysics.

July 1, 1954 *J B Mig*



SCALE
0' 50' 100' 150' 200'

Positively anomalous areas

Negatively anomalous areas

Magnetic intensity contours – Interval = 10 gammas

Geological contacts

CORONATION HILL URANIUM PROSPECT

VERTICAL MAGNETIC INTENSITY CONTOUR MAP

Bureau of Mineral Resources – Geology & Geophysics
Radioactive Section

Contoured and Drawn by J. B. Misz   June 1954