

TRI-26-30

CORRELATION OF GRANITE AT ABERFOYLE TIN N.L.

By R. G. ROBINSON

The object of this work was to trace the granite derivative found in the Spiers Shaft at Aberfoyle Tin N.L., to the surface equivalent, in order to assist the planning of geophysical prospecting.

Underground

The granite was first located in the Spier's Shaft at 10 level. Since this time it has been intersected by the continuation of Spier's Shaft to 11 and 13 levels. On both 11 and 13 levels, the shaft cross-cuts expose more of the granite. The granite has been well defined within the Spier's Shaft cross-section by cross-cutting and diamond drilling. The mineralisation at Aberfoyle is of the magmatic type and, mainly because of proximity and association, the granite located in the shaft seems to be the source rock of the mineralising solutions. The contact of this granite and the host rocks is generally marked by a contact tin vein which, especially at 10 level, has some commercial shoots. There is much marmatite, and some small barren quartz veins, within the granite.

The granite wherever seen underground is whiteish coloured. Throughout the granite intersected by the mine workings there is a notable absence of the normal black granite minerals (biotite, hornblende), the only blackish mineral in the granite being marmatite. The only visible components of the granite are quartz and plagioclase feldspar. Though there are some varieties of the granite present, the amount of varieties is extremely small and are only either pegmatitic or more quartzose derivatives, still without biotite or hornblende. This granite is more correctly described as an **Alaskite**.

The mineralisation within the shear zone continues downward until level with the approximate crest of the Alaskite cupola, whereupon only barren quartz veins continue lower.

The main controls of mineralisation in the mine are:—

- (1) The Aberfoyle No. 1 fault zone. This is the zone between the western fault (only exposed underground) and the Aberfoyle No. 1 fault.
- (2) The presence of brittle Mathinna quartzites which have been fractured by the folding and faulting.
- (3) The cross-faulting which accentuated the openings produced by (2).

Without the cross-faulting, the mineralisation would not have been as intense and its absence might even have caused the deposit to be sub-economic.

During the underground examination, an attempt was made to appraise the shape of the granite by mapping contact-metamorphic zoning. It was found, however, that four factors militated against this method for mapping the granite shape:—

- (1) The intensity of regional metamorphism. Some of the slates show the production of tourmaline, which the quartzites generally are already showing signs of refusion and recrystallisation.
- (2) The predominance, within the mine workings, of quartzites, whose only response is refusion that is not indicative of the proximity of the granite but rather purity or impurity of the quartzite.
- (3) The addition of silica to the host rocks in the vicinity of the veins (barren or mineralised) masking metamorphic effects.
- (4) The uncertainty as to the exact role of the Aberfoyle fault zone on the possible displacement of metamorphic zones and with the associated time factor as to whether the granite had cooled or not before the faulting.

An attempt at contouring the alaskite contact confirmed the idea that the slope of the alaskite contact is not constant. The contouring produced a dome with a distinct elongation in a direction of about 250 degrees, i.e., south of west. The uncertainty exists whether this elongation is really the true direction of the cupola "ridge". The alaskite underground showed no sign of igneous zoning that could be used to assist the surface search. In the Spier's Shaft east-west cross-section, the granite-sediment contact is shown to be very flat to the west of Spier's Shaft. It is well delineated to the west of the Spier's Shaft but not known at all east of the eastern face of the 10 level shaft cross-cut.

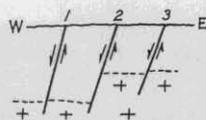
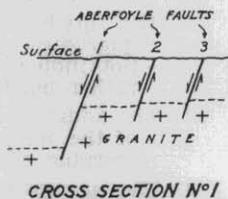
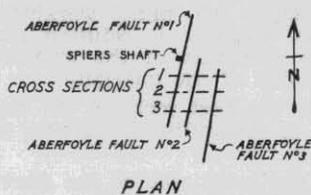
Surface

The Aberfoyle fault No. 1 is the northern extension of the Aberfoyle faults Nos. 2 and 3. These faults all have west side down, but the throw varies according to the position of observation. The indication is that the Aberfoyle fault system impinges upon some resistant mass in depth (apparently the alaskite cupola) and that the movement within the fault system is stepped across the faults 1, 2 and 3 until clear of the obstruction again. (See diagram page 28.)

The cross-faults within the mine are probably originally tension fractures caused by the changing of the throw of the Aberfoyle faults from fault 3 to fault 1. The cross fractures developed as tension fractures, then by acting as releases of stress became faults.

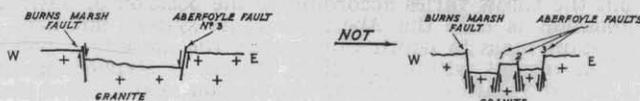
As commented above, the Aberfoyle fault No. 1 is really the footwall of a shear zone whose hanging wall is the western fault. On a broader scale the Aberfoyle fault No. 3 might be regarded as the ultimate footwall of the shear zone. To this end the intersection of the cross-faulting and the Aberfoyle faults 2 and 3 become excellent loci for repetition, but the mineralisation, if present, might not be as extensive as in the Aberfoyle mine since the shearing is probably not so pronounced here. These points, therefore, are possible sites for geophysical prospecting, but the

Permian cover present is likely to hamper prospecting. Short percussion drill holes through the Permian cover might overcome the difficulty. Because of the sulphide content of the Aberfoyle mineralisation, self-potential or equi-potential geophysical methods might be applicable. It might be cheaper and quicker if a series of about four to six 1000-foot declined diamond drill holes were drilled on these sites to test for repetition.



Note: All diagrammatic only—not to scale.

From what is written above it is clear that the Aberfoyle faults 1 and 2, if continuing southward, have an **insignificant** throw (they are **not** detectable south of the South Prospect region) and thus the configuration of the granite in the south gives a cross-section in the vicinity of Archer's Creek as shown below:—



Not to scale.

The graben shown in the left of the two diagrams is still shown physiographically at present. While the scarps have retreated up slope from the faults due to erosion, the scarps really still exist. For the fault scarps to have survived from, say, Devonian, is not likely, hence it is concluded that rejuvenation of the scarps by reworking of the Burns Marsh and Aberfoyle No. 3 faults must have occurred in more recent times, probably coincident with the dolerite intrusion of Mesozoic Age. Actually almost all faults visible underground in the Aberfoyle mine show reworking as evidenced by broken quartz and displaced veins. This is later than the period of mineralisation.

The granite exposed on the surface almost always has either tourmaline, biotite or hornblende, and in only one place is there a variety similar to the alaskite found in the mine workings. This is in the vicinity of the fraying of the Burns Marsh fault and on the western side of the fault. There is no granite visible within the graben similar to the alaskite underground. The uncertainty, therefore, exists as to where it is beneath the Permian cover in the vicinity of the Burns Marsh fault. From the appearance of the granite-Mathinna contact to the north of Tasmania Creek, the contact at surface is very steeply dipping (slightly eastward). On the basis of this and the assumed granite-Mathinna contact position just to the east of the Burns Marsh fault, the movement on the Burns Marsh fault must be nearly all vertical with the horizontal displacement. Thus the position within the graben of granite similar to the alaskite is beneath the Permian cover and a little to the south of the position of the granite on the west side of the Burns Marsh fault.

This gives a south-westerly trend to the alaskite. Along this line there is only the portion round Storey's Creek where there is an absence of Permian cover. This means that again, if geophysical prospecting is done following the alaskite trend, short drill holes through the Permian are needed for the majority of the possible prospecting sites.

On a request from the Bureau of Mineral Resources, the Aberfoyle Mine authorities are preparing a map showing depth of Permian cover to assist the possible geophysical prospecting. The information is gained from surface drilling results. The plotting of such data shows some points in contradiction to the Permian cover as mapped by Henderson in 1946. The explanation is that in parts in the vicinity of the Burns Marsh, there are tertiary gravels unconsolidated and very clayey in character. These seem to be in part of the reworking of the Permian conglomerate together with talus from the erosion of the fault scarp. These gravels have the same hindering features of the Permian cover in regard to geophysical prospecting. These gravels exist too, in the Tasmania Creek and Tiger Creek and Archer Creek flood plains and some have been worked as alluvial tin deposits.

In some previous reports comments have been made with regard to the prospecting of the so-called "embayments" in the granite. From surface examination it seems that there are two ridges possible in the upper surface of the granite, one the alaskite cupola coming from below the Aberfoyle Mine to the surface, the other slight one from where Storeys Creek enters the granite south of the town, north-eastward to the Aberfoyle No. 3 fault east of the Rossarden Post Office. Despite the fact that these ridges seem (?) to exist, the thickness of Mathinna rocks over the granite is so small that only very small, short-lived prospects could be possible. The thickness of the Mathinnas (the tin host rocks) varies from nothing (in places where Permian lies directly on the granite), to a maximum of about 100 feet within the "embayments". There is no real proof that the alaskite found in the Aberfoyle Mine continues to the surface as a ridge. In all, the locating of a prospect in these "embayments" is virtually impossible. To appreciate this state of affairs more fully see the two air photo maps accompanying this report; (1) the actual field map, and (2) the same as if the Permian cover was absent.

There have been many small pits dug on the very numerous small quartz veins in the vicinity of Storeys Creek. Only a few have been worthy of mention in reports, none being the size of the Aberfoyle or Storeys Creek mines. It would seem that the area has been closely examined by prospectors. There is one location still worthy of attention. It lies just north and north-east of the sluicing excavation of Egans in the Burns Marsh locality. The working of the Egans reveal a very altered bedrock which has many quartz veins. The Mathinna rocks under the Egans are in a syncline with an anticline immediately to the north-east with a north-west trend. The trend is coincident with the cross-faulting and the regional trend of all faulting and mining. This is approximately the same distance horizontally from the granite-Mathinna contact as the Storeys Creek and Aberfoyle Mine and in between these two mines. While tertiary gravels interfere here, this region, by virtue of alteration, structure trend and trend of cross-faulting, is a good site for prospecting (geophysical or otherwise).

Conclusions

1. The granite underground at Aberfoyle Mine is unzoned and of one type only, the leucocratic alaskite.

2. The Aberfoyle faults 1, 2 and 3 are caused by the temporary hindrance of the alaskite cupola and are virtually one and the same fault. The Aberfoyle faults 1 and 2 do not continue southward as significant faults.

3. The surface expression of the underground alaskite lies to the south-west of the Aberfoyle Mine, and this is probably part of the alaskite cupola that causes the side-stepping of the Aberfoyle faults in the vicinity of the mine.

4. The points of intersection of the cross-faulting and Aberfoyle faults 2 and 3 are possible prospecting targets.

5. The area immediately north of Egans is a good prospecting target by virtue of anticlinal structure, trend of folds, trend of faulting, rock alteration and position with regard to the granite, Storeys Creek and the Aberfoyle mines.

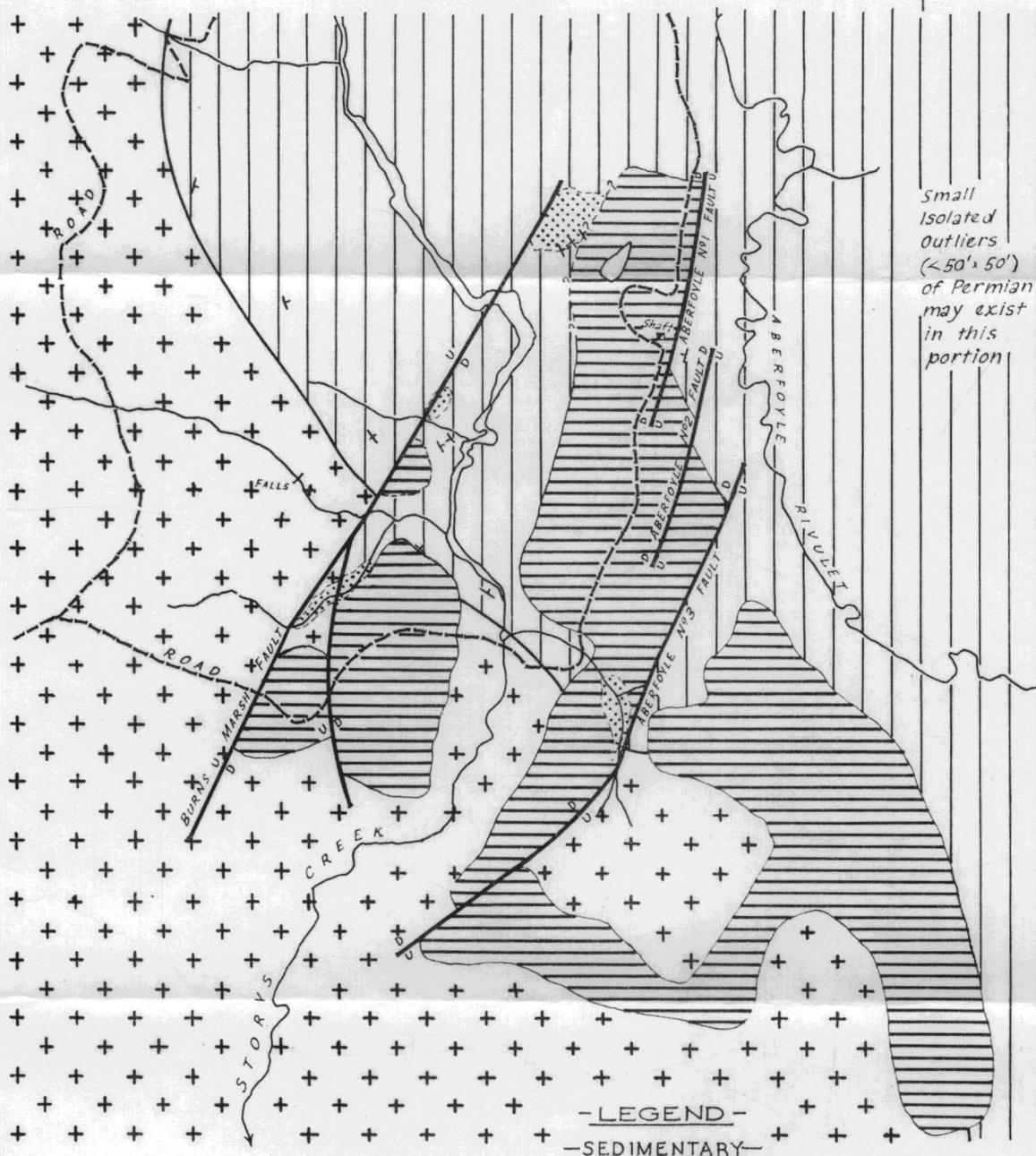
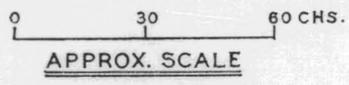
6. The opportunity to prospect along the alaskite cupola is limited by the presence of Permian cover, but short percussion drill holes (60 feet) through the Permian rocks would overcome this difficulty.

7. The so-called "embayments" in the granite mentioned in other reports on the Aberfoyle Mine do not have any real depth being only fluctuations in the roof of the granite and hence are not good targets for prospecting for anything but a very small tin show. The depth to the granite in the Mathinna rocks in these embayments could be from zero (no Mathinna between Permian rocks and granite) to 100 feet.

GEOLOGICAL MAP

OF THE

ROSSARDEN — STORYS CREEK AREA



Small Isolated Outliers (<50' x 50') of Permian may exist in this portion

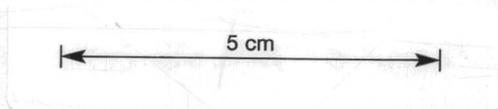
- LEGEND -
- SEDIMENTARY -

- | | | |
|------------------|---|-----|
| SILURIAN | MATHINHA GROUP ROCKS SLATES & QUARTZITES HIGHLY FOLDED. | □ □ |
| TERTIARY GRAVELS | REWORKED PERMIAN MATERIAL POSITIONED IN GRABEN AT BASE OF ORIGINAL FAULT SCARP
SOME TIN BEARING LIMITS NOT PRECISELY KNOWN | ▨ |
| PERMIAN | CONGLOMERATES & SANDSTONES (NO CLEAR FOSSILS) FLAT LYING. | ▨▨ |
| - IGNEOUS - | | |
| DEVONIAN? | GRANITE | + + |

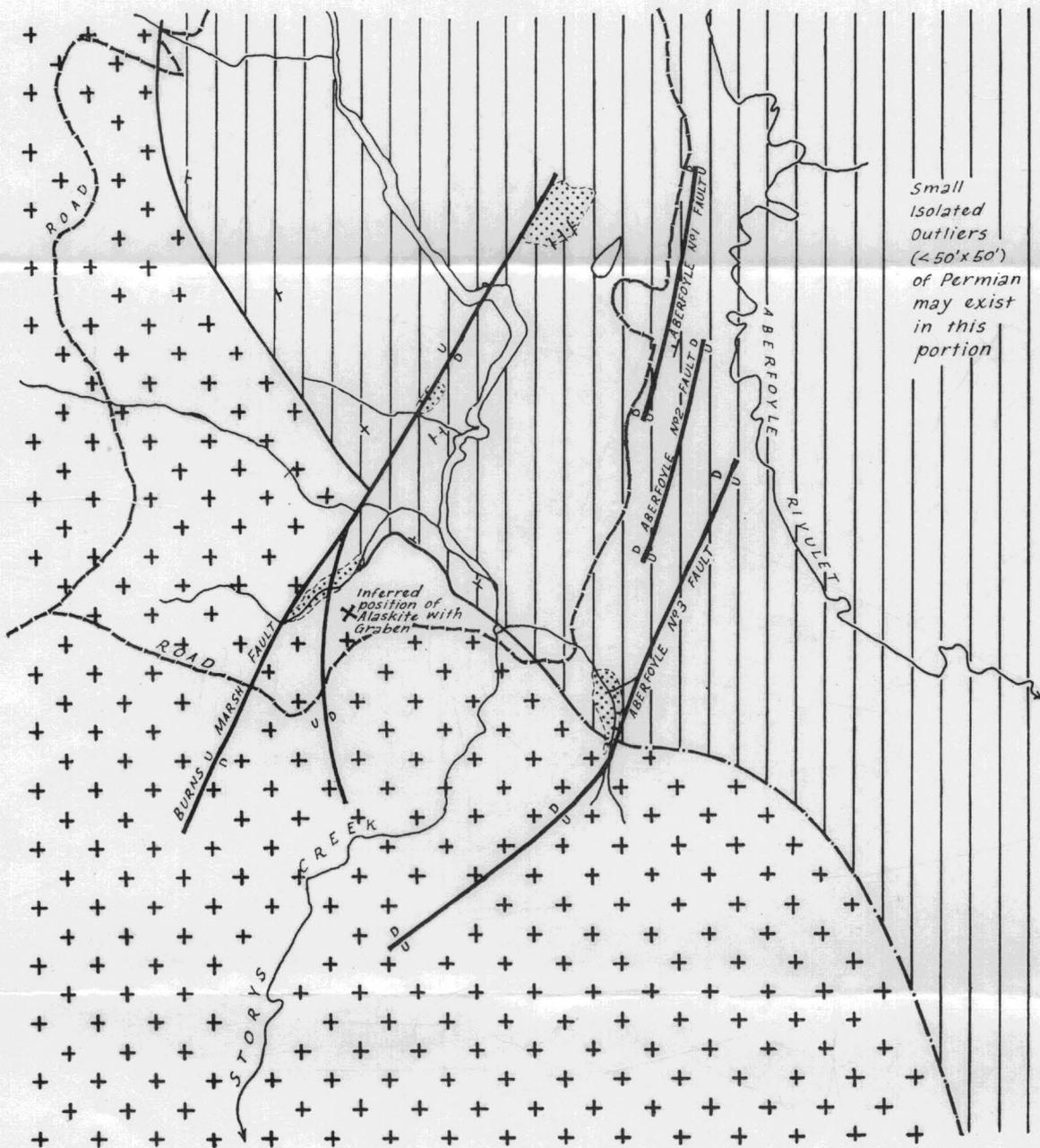
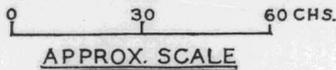
R. G. ROBINSON GEOLOGIST

PLATE 5

TRI-26-30



HYPOTHETICAL MAP SHOWING SHAPE OF THE
MATHINNA/GRANITE CONTACT WITHOUT THE
OBSCURING PERMIAN COVER



Small
Isolated
Outliers
($< 50' \times 50'$)
of Permian
may exist
in this
portion

Note absence of
embayments in
granite.

- LEGEND -

- SEDIMENTARY -

SILURIAN ----- MATHINNA GROUP ROCKS SLATES & QUARTZITES HIGHLY FOLDED -----

TERTIARY GRAVELS ----- REWORKED PERMIAN MATERIAL POSITIONED IN GRABEN AT BASE OF ORIGINAL FAULT SCARP. SOME TIN BEARING LIMITS NOT PRECISELY KNOWN -----

- IGNEOUS -

DEVONIAN? ----- GRANITE -----

R. G. ROBINSON GEOLOGIST

