

THE RAZOR BACK TIN MINE, DUNDASINTRODUCTION:

In the investigation of the Razorback Mine tin deposits, a tacheometric survey of the ridge was made and all the workings that were open for inspection were surveyed and sectioned when necessary. The survey covered portions of lease 27M/43 (40 acres), 3M/40 (20 acres), 2M/40 (20 acres) and Machinery Site 45M/39 of 5 acres.

SITUATION AND ACCESS:

The dismantled Dundas Railway passes just outside the southern limit of the surveyed area, and this railway formation can be used by lorry for  $\frac{1}{2}$  mile, to the old township of Dundas. From here a metalled road connects with the township of Zeehan which is six miles distant.

GENERAL GEOLOGY:

(a) Physiography: The Razorback is a spur running S.S.E. from Lewis Hill which is on the eastern flank of Mount Razorback. This spur runs between the Cander Creek on the east, and an unnamed tributary on the west, both of which flow into the Dundas Rivulet which ends the spur on the south side.

(b) The main rock formations are the Dundas Series of the Sedimentary rocks and the Ultrabasic Dyke which is intrusive into the sedimentary rocks.

1. The Dundas Series consists of black and grey slates, sandstones, grits conglomerates and breccias, with which are interbedded ashes, tuffs, and agglomeratic breccias. These are generally taken to be of Cambro-Ordovician age. This dating can now be established with more precision by the discovery of fossils in these rocks. The following forms belonging to the Hydroids and Dendroids have been determined :-

Archaeolafoea (?) recta  
 Archaeocryptolaria skeatsi  
 Spenoecium filicoides  
 Protohalecium hallianum  
 Cactograptus flexispinosus  
 Mastigograptus (?) circinalis

In a thin sandy bed associated with the shales fragments of trilobites are also present. These, however, are too imperfect for determination.

In Victoria, the above suite of fossils occur with reasonably well preserved trilobite remains (e.g. Amphototon etc.) which fix the age of the beds as being low in the Middle Cambrian Part of the Dundas Series is thus definitely of Middle Cambrian age. Another point of similarity with the Victorian occurrences is the association of these forms with interbedded ashes, tuffs, and agglomerates.

2. The Ultrabasic Intrusives: These form large dyke-like masses belonging to the epi-Devonian epoch and were intruded after the folding of the sedimentary rocks, or perhaps are synchronous with the final phase of this folding. The age relationship cannot be established on the Razorback as the junction of the two rock formations is a faulted one, which is well shown in the largest open cut and in several of the adits. This fault which we have named the Razorback Fault is one of the most important structural feat-

ures of the district as the lode formation is on the eastern side of this fault either parallel to it or else on it.

The alteration of the ultrabasic rocks is very pronounced as they have to various degrees suffered serpentinisation and near the lode formation, the development of talc. This talc may in places reach a thickness of 30'-40' and was probably developed along a line parallel to the Razorback fault. On the western side of the talc there is generally some pistomesite which flanks the gossany lode material. Silicification varying from merely a slight addition to silica, to total replacement with the development of quartz reefs is always associated with the introduction of the tin bearing solutions. As most of the workings are shallow, the oxidised gossany formation is prominent, but in the unoxidised parts, the cassiterite is in intimate relationship with pyrrhotite and arsenopyrite. These sulphides weather into the gossany bodies with a high tin content in the gritty material, often bound together with cellular quartz.

#### The Razorback Fault:

The lode formation in the basic rocks lies on the east side of the fault. The dip of the fault varies considerably as in the northern part it is to the west between 55° and 75°. To the south in the No.1 adit it dips 50°E. and further south assumes a more vertical attitude. The fault also has a marked bend along its strike where it swings from a north-westerly to a more northerly trend. This bend is perhaps significant as it marks a zone of enrichment of the ore bodies.

#### MINING GEOLOGY:

The lode formation is on the eastern side of the Razorback fault and is ideally situated for exploration by means of adits. Several of these adits as well as two open cuts have prospected the lode.

No. 1 adit is driven for 200 feet in a North-westerly direction. It commences in mottled siliceous altered serpentine which passes gradually into more talcy material before reaching the gossanous lode material. The Razorback fault, (which is at 150 feet from portal), dips at 50° to the East, and on the west side are the conglomerates succeeded in turn by the black slates which in this adit are fossiliferous. From cleavage-bedding relationships, these beds are overturned. The lode is not well defined and as no driving or stoping has been attempted the values must have been poor.

Between and just west of the No. 1 adit and the open cut is an underlay shaft joined with a small adit along the Razorback Fault. There has been some stoping on the lode here - but these workings could not be examined in detail (v. section C.C.)

No. 1 Open Cut: This forms the most extensive work on the lode, and measures at the top 120 feet x 80 feet, and has a depth up to 50 feet. The western side of the cut has the Razorback fault as a footwall. Apart from some boulders of sulphidic material, the ore is oxidised and very soft. In the floor of the open cut there are two shafts. One connects with No. 2 adit while the other had water in it at the time of inspection.

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An adit extends northwards, from the open cut. This was driven on in a N.N.W. direction for 80 feet, where the fault was intersected. Just inside the portal there is a crosscut to the east. On the south side there is a cuddy with a shallow winze, while the drive from this point on develops a very sinuous course and becomes inclined heading. At 50 feet from the portal there is another crosscut to the east. At 10 feet on this there is a short drive to the north which in places has connected with the next crosscut to the east. At 16 feet in the crosscut there is a winze chamber, with a winze 30 feet deep to water level. Nearly 50 feet of gossanous lode are exposed in this crosscut before reaching the mottled siliceous material which contains only thin seams of gossan along small faults.

Just north of the above crosscut the drive turns north and then branches, the northerly branch continues for 45 feet, mostly in pyritic material, while the other branch swings further east and has a total distance of 85 feet. The wider part near the beginning of the drive is in gossanous material, but the greater part is in pistomesite.

#### No. 2 Adit:

This is just over 50 feet below the floor of the open cut. It has a general direction a little north of west for 170 feet, where it bifurcates, one branch going to the north west for 23 feet, before turning 24 feet. The other branch goes north for 42 feet and intersects a wall dipping north. The continuation of this drive is mullocked. The crosscut west at a distance of 12 feet is also mullocked, but from this point there is a drive North 30° West for 40 feet. Near the end it is connected with the more northerly shaft in the open cut.

Apparently the driving has been along irregular enrichments of no persistence. It was not found possible to sample the width of the lode in this adit.

#### No. 3 Adit:

136 feet long, lies to the south of the open cut. As is the case with most of the adits it passes from talcose material through the pistomesite into the gossanous lode, which is nearly 40 feet wide with here and there boulders of pyritic ore. The fault is very nearly vertical while on the west side are the conglomerates.

#### No. 4 Adit:

This is very similar in sequence of rock types to No. 3 Adit, and cuts the fault at 193 feet. The gossany lode material is about 20 feet wide, and on its eastern side there is a rise to the surface. According to reports (Bulletin 36) rich ore extended down from the surface for 20 feet - but this could not be examined. The full width of the lode in the adit was sampled, but this did not prove the existence of tin.

#### No. 5 Adit:

This adit was inaccessible at the time of our visit, but according to McIntosh Reid (Bulletin 36 p. 43) there is a width of about 60 feet of decomposed lode material.

#### No. 6 Adit:

Extends from sheared serpentinous rock which passes into talcose material, then into gritty

material and into massive quartz. The gossan is only a few feet wide, and there is a cuddy to the south on this material. The bounding fault is vertical and slates and sandstones are exposed in the face, which is 121 feet from the portal.

#### No. 7 Adits

The only one on the west side of the ridge is not accessible, and the details on the plan are taken from the plan of McIntosh Reid.

North of the No. 1 open cut and on the flank of Lewis Hill, are two more adits, a small open cut and an area apparently has been sluiced but probably is a shallow surface cut.

The open cut lies just North of Hodge's adit, and is 75 feet long with a maximum width of 40 feet. There are two benches and the bottom one forms a narrow opening to the cut.

Hodges' Adit was driven to the south west for 230 feet, the last 130 feet is on the western side of the fault in barren conglomerate. The gossanous lode is about 20 feet wide and the south drive, 70 feet long, is on the western side of the lode formation.

Westerway's Adit: This lies to the South of the above, and as in the case of Hodges' adit, was driven obliquely to the lode, which runs north and south. This adit is 160 feet long and exhibits the usual passage from talcose to siliceous talcose and pistomesitic material into the gossanous lode. The latter has a width of about 40 feet, and on it there has been some underhand stoping for a length of 10 feet and a similar depth. The fault here assumes the nature of a hanging wall, dipping  $75^{\circ}$  W, and is succeeded to the west by conglomerates.

From the above account of the workings, it can be seen that very little driving has been attempted on the lode and that the amount of stoping has been negligible. Some of the prospecting work has been badly directed, as several of the adits are not at right angles to the direction of the lode. In the southern part of the Razorback, the lode is more siliceous and apparently does not carry any tin. Drives along the lode would have been better prospecting than numerous crosscuts, as the gossanous formation is bounded on the west by the Razorback Fault and passes to the east into pistomesitic material. This driving could be placed on the east side of the lode and short crosscuts could be put out west to test the lode. This is the kind of scheme that is in operation in the drive from No. 1 open cut, but there is no need for long east crosscuts through the pistomesitic material.

It is obvious that the tin content is most erratic in its distribution and that taking the lode as a whole it is of low grade. The absence of stoping or driving along the lode in most of the adits is sufficient justification for the above statement.

The official returns are as follows :-

| <u>Year</u> | <u>Metallic Tin (Tons)</u> | <u>Value in £</u> |
|-------------|----------------------------|-------------------|
| 1920        | 0.895                      | 160               |
| 1921        | No records                 |                   |
| 1922        | " "                        |                   |
| 1923        | 5.183                      | 946               |
| 1924        | 6.15                       | 1505              |
| 1925        | 1.36                       | 340               |
| 1926        | 4.00                       | 1239              |
| 1927        | 3.61                       | 1070              |
| 1928        | 0.12                       | 29                |
| 1929 - 1935 | Nil.                       |                   |
| 1936        | 1.55                       | 326               |
| 1937        | 0.25                       | 62                |

Since 1920 - 23.118 tons of metallic tin worth £5683.

Previous to 1920 tin to the approximate value of £360 had been obtained by Kingsley and party. As the records are incomplete, no figure for the average grade of ore can be given. Details are available for 1923 as is shown by the following figures :-

|     |      |     |        |     |
|-----|------|-----|--------|-----|
| 265 | tons | for | 0.51%  | Tin |
| 51  | "    | "   | 1.17%  | "   |
| 125 | "    | "   | 0.60%  | "   |
| 80  | "    | "   | 0.94%  | "   |
| 93  | "    | "   | 1.34%  | "   |
| 136 | "    | "   | 0.88%  | "   |
| 124 | "    | "   | 0.766% | "   |

In 1936 the Dundas (Tas.) Tin Limited recommenced operations and treated 1,877 tons of gossan. Of this, 1,326 tons yielded only 0.08% Tin, and 551 tons from the extreme north of No. 3 open cut, yielded only 0.105% Tin. In both cases, some detrital material was included.

In 1937, the average yield was 0.3% Tin, but as can be seen from the tables, the amount crushed was very small.

The following results of analyses, supplied by the Chief Chemist and Metallurgist, Mr. W.St.C. Manson, Mines Department Laboratory, Launceston, are representative of certain parts of the lode and where possible the samples have been taken across the whole width of the lode. They are representative only of the points sampled. A systematic sampling was not undertaken as it was realised that the workings were in the zone of oxidation, with here and there remnants of pyritic ore. Tin enrichment in the zone of oxidation is primarily a process of residual enrichment due to the removal or reduction in amount of associated minerals. As is usually the case under these circumstances most of the oxidised tin ore is a very porous mass of cassiterite, quartz and limonite. If the pore space was filled with sulphide instead of air or water a much lower grade tin ore would result. The battery returns which have been listed above would be more representative of the oxidised zone than any sampling, but the results tabulated below give some indication of the grade over the full width of the lode.

| <u>Reg. No.</u> | <u>Description</u>                                    | <u>Percentage Tin</u> |
|-----------------|---|-----------------------|
| 527             | No. 4 adit (20' chip sample)                          | Nil                   |
| 528             | Hodges adit (20' chip sample)                         | 0.37                  |
| 529             | Westerways (40' chip sample)                          | 0.69                  |
| 530             | Open cut adit, dump. Grab sample (sulphidic material) | 0.37                  |

SUMMARY AND RECOMMENDATION:

The following is a summary of the main features of this mine area :-

1. Intrusion of the ultrabasic rocks accompanied by the changes normal to this type of intrusion, that is, serpentinisation and the formation of talc.
2. Mineralisation of the western edge of the intrusive along the faults and shears that characterise this junction.

The following sequence of events is evident:

1. Carbonation;
2. Silicification and mineralisation

The latter changes took place along the fault line or parallel to it on the eastern side. Movement along the Razorback Fault continued after the mineralisation which thus does not extend to the west side of the fault.

These successive changes can be utilised in any prospecting scheme. The prospecting drives should be along the lode away from the fault which could cause some mining difficulties. Short prospecting crosscuts from this drive should be extended only as far as the fault on the west, and the belt of carbonate on the east. The adit from the open cut is ideally situated for such a prospecting drive. Until such prospecting work is done, there is no means of estimating the potential value of the lode.

The prospecting work already accomplished shows that the tin content is not evenly distributed. This variation in tenor extends both laterally and vertically and the mineable ore occurs in short shoots of restricted extent. Most of the mining so far has been in oxidised zone with richer concentration than could be expected in the sulphide zone.

No doubt the high cost of transport of the ore to the mill formed a disproportionately costly item in the mining costs of the ore due to the steep grade of the tramline. By regarding this track and either using the shaft in the open cut as an ore shoot to No. 2 adit, or by building a chute from the open cut to the lower tram, transport costs could be reduced. Before consideration can be given to such matters, the quantity and grade of ore that is available has to be determined. It is considered that a prospecting drive with short exploratory crosscuts is the best way of obtaining this necessary information. Such a drive has been started in the No. 1 open cut, and it is recommended that this be continued northwards as far as the adit shown as "Westerway's" on the plan.

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