RIO TINTO AUSTRALIAN EXPLORATION PTY. LIMITED

MELBOURNE, AUSTRALIA

PROJECT:— PRP/7/100

REPORT No.:— Miscellaneous/1958

REPORT ON REGIONAL MAPPING, WESTERN TASMANIA

1957-58 SEASON

by

M. Solomon

06_5283

Report on Regional Mapping, Western Tasmania
1957-58 Season
Rio Tinto Australian Exploration Proprietary Limited*
Solomon, M.

FILE REFERENCE:— 8D/20

MAP REFERENCE:—

DATE:— 4/12/58

REPORT ON REGIONAL MAPPING, WESTERN TASMANIA

1957-58 SEASON

by

M. Solomon

C O N T E N T S

	Page
INTRODUCTION	1
TULLAH-PINNACLES-ROSEBERY AREA	1
TYNDAL-HENTY RIVER-MT. SEDGWICK AREA	4
STICHT RANGE-TULLAH-STERLING RIVER AREA	9
THE ROSEBERY-WILLIAMSFORD AREA	14
THE ZEEHAN AREA	15

P L A T E S

Plan No. T.493 Fossil in Dundas Group, Mt. Sedgwick.

Note: Plans and Sections mentioned in text have been omitted from Progress Report and will be incorporated in later reports.

INTRODUCTION

The field season's work divides conveniently into five sections, viz:-

(a) Reconnaissance of the Tullah-Pinnacles-Rosebery area.

(b) Regional mapping of the Tyndal-Sedgwick-Henty River area.

(c) Regional mapping of the Stieht Range-Tullah-Sterling River area.

(d) Study of the structure of the Rosebery-Williamsford area.

(e) Brief study of some points relating to the geology of the Zeehan area.

The following script provides the most important results of the season's work, particularly local field information and interpretation.

A number of concrete recommendations are made as to future work; suggestions concerning the conduct of the field work have already been made in a memo. to the Exploration Manager.

(a) TULLAH-PINNACLES-ROSEBERY AREA.

Only general reconnaissance work was done in this area, using 1" = 30 chain photographs and confining mapping to areas relatively accessible on foot. The main lines of enquiry were the nature of the "massive pyroclastics"; the massive pyroclastic-bedded series boundary; and the geological setting of the Chester and Pinnacles Mines.

The "Massive Pyroclastics" have already been argued over and discussed at great length; Cottle has pointed out that the term is essentially a local one used at the Rosebery Mine and was not intended to be applied outside the leases. Therefore, the term can be happily ignored and should be left out of discussion, or preferably replaced.

The rocks previously included in the term are exposed along the Farrell-Tullah train-line, the Emu Bay railway line, and the Rosebery-Sterling Valley tramway. They are 90% lava flows with minor slates and pyroclastic beds; they are massive in outcrop and generally featureless except for local flow-banding and pseudo-brecciation.

South of Boko the lavas are 85% of intermediate to basic composition, with only local quartz-rich types. The latter sometimes consist of grey clay studded with coarse quartz crystals (e.g. at Farrell siding), identical to the rock occurring immediately east of the Queenstown Hospital. The majority are andesites, augite basalts, keratophyres, and trachytes and generally appear to be rich in albite. Quartz-albite veining is seen locally and D. McKenna has described an albitised zone striking N.E. and running on the west side of the E.B.R. north of Farrell siding. The predominating colours are blue grey, grey-green, and cream. The percentage of ferromagnesian minerals is generally low.

Carey (1945) emphasises the fragmental nature of the volcanic rocks between Farrell siding and Tullah and concludes that most of them are pyroclastics. However, I think that most of the fragmental appearance is due to auto- and pseudo-brecciation of lava flows. Brecciated lavas with fragmental appearance are common on the Southern Ocean coast south of Point Hibbs.

Many of the fragmental rocks described by the E.Z. geologists are probably lavas.

At, and to the north of Boko, the lavas are almost entirely pale coloured massive quartz porphyries which resemble soda-rich rhyolites of the Queenstown area. For half a mile south of Bulgobac rhyolites are well exposed - the sequence includes beds of red tuff (containing lapilli and lava fragments) and brecciated lavas in which blocks up to 6" diameter of fine rhyolite are distributed irregularly in a coarser grained, darker, streaky base. Carey (1945) described one such occurrence as the pyroclastic phase at the top of the flow but more likely it represents the nuée ardente type of deposit often seen in acid volcanic environments. These acid lavas are characterised by a virtual absence of ferromagnesian minerals.

Nomenclature

The longitudinal strip of lava flows extending from Mt. Read north to, and beyond, Bulgobac represents the infilling of a Cambrian trough (see Campana) and should be given a formal name, both to facilitate description and to resolve the "massive pyroclastic" muddle.

Good cross sections are available in the Sterling Valley tram line and on the Farrell Siding-Tullah Railway and I would suggest Farrell Volcanics (or perhaps Rosebery Volcanics) as a suitable term, thus providing a place name and a description of the rocks.

The Bedded Series - Volcanic boundary was only picked up locally, but information supplied by the E.Z. Company from 1" = 100 feet mapping enabled the contact to be plotted on aerial photographs with reasonable accuracy. Mapping by Cottle at Silver Falls and Pinnacles, both close to the contact, indicate unconformable relationships, for which a number of explanations can be advanced, viz:-

(a) The lavas overlie bedded rocks with unconformity.

(b) The superimposed N.N.W. Devonian folding only shows in the slate bedded rocks and creates a pseudo-unconformity with the lava boundary actually following the folds in detail. The lavas in this case conformably overlie the bedded rocks.

(c) Similar to (b) but further complications produced by assuming the lavas equivalent in age to the bedded rocks, the boundary showing interfingering of the two facies.

This problem will be mentioned later when further evidence from the Rosebery-Williamsford area is discussed.

Cottle's mapping of the slates at the Pinnacles was checked roughly and found correct but it was not possible to check the Silver Falls area.

One and a half miles north of Bulgobac, cuttings on a U-bend of the railway expose shaley siltstones probably belonging to the bedded series. In the river below and to the west, the shales are interbedded with a quartz felspar tuffs. Drag folds indicate a northerly pitch of 40° and suggest the beds face west.

About four miles north of Bulgobac and from thence northwards to the Tertiary basalt cover, the railway line is cut in a variable series of grey and brown shales, sandstones, columnar olivine basalts and coarse siliceous conglomerates. The degree of induration is lower than that of the Dundas Group and would suggest that these beds are younger in age; however, the point is not certain and more field work is required in this area.

Mineralisation

Chester. A brief visit was paid to this mine. It is a pyrite replacement in sheared, sericitised and silicified Dundas lavas which show all stages of alteration from pale grey bleached porphyry to coarse quartz sericite schist. Chert occurs within the pyrite mass and may represent baked lenses of sedimentary material which were caught up in the lava flows. At the base of the haulage chert lenses in porphyry may be seen.

The main directions of schistosity are 20° and 355° magnetic. The deposit has not been tested in depth and warrants diamond drilling to test the possibility of pyrite giving way to economic minerals in depth. There seems to be sufficient evidence from other parts of the world (Park, Econ. Geol. 1957) to suggest the possibility though no such changes have been observed in the pyrite bodies at Mt. Lyell.

The Chester Mine appears to lie on the northern end of a longitudinal zone of weak pyrite mineralisation that could extend to Rosebery. The northern flank of the hill on which the mine occurs is very steep and suggests the possibility of a N.W. or E-W fault; the zone of mineralisation picks up again a quarter of a mile to the west and the apparent displacement may be due to the fault. Alternatively the dying out of the Chester line and the emergence of the line to the west (on which the Pinnacles Mine lies) may be due to an en echelon arrangement of shear zones.

The Pinnacles Mine occurs within the volcanic sequence (though close to bedded rocks), on the western side of a sharp ridge which continues to N. & S. and is marked by intense silicification. This zone of silicification is cut off or disappears a quarter of a mile to the south but continues prominently to the north, gradually swinging in strike to N.E.

Cottle states that the Pinnacles mineralisation is confined to tuff beds within the lava sequence but I could find no evidence to support this. A number of shallow drill holes have been put down to test continuations of surface mineralisation but nothing of interest was found. The E.Z. reports on the Pinnacles state that some geophysical work was done in the area but the equipment used is not stated and the results appear to have been of little value.

The Silver Falls mineralisation has been drilled by the E.Z. Co. and has proved to be very weak.

Conclusions of the Reconnaissance Survey

The area including the bedded-volcanic boundary, the Chester Mine and the zone of silicification extending north and south from the Pinnacles is considered worth mapping on a 20 chain scale and it seems almost certain that as a result of this, geophysical surveys will be recommended at a number of points. Work so far suggests that the zone just east of the Pinnacles workings, on the western side of the silicified strip, would be well worth examining electromagnetically.

No further useful work can be done without track cutters, owing to the density of the vegetation. Four men could be usefully employed for about a month to carry the mapping to the southern limit of the Tertiary cover.

One long section is required west from the Pinnacles Mine to the Silurian-Ordovician beds, and another west from Bulgobac along the Que river bank.

(b) REGIONAL MAPPING OF THE TYNDAL-HENTY RIVER-MT. SEDGWICK AREA.

Mapping in this area was carried out with particular attention being paid to (a) the possibility of mineralisation at the base of the Owen (b) the continuation of the Lyell Shear north of Comstock, along an embayment in the Owen contact (c) the structure in the Comstock area, on which studies had already commenced.

General

Geological Succession

Alluvium and Scree	Recent
Moraines and Scree	Pleistocene
Dolerite	Post-Permian
Tillite, sandstone	Permian
Gordon Limestone	Ordovician
Upper Owen Conglomerate	"
Middle " "	"
Lower " " & Sandstone	"
Jukes Conglomerate	"
Dundas Group-quartz & felspar porphyries, tuffs, slates, shales and quartzites.	Cambrian

Dundas Group

Sedgwick Area.

The structure around Mt. Sedgwick is domal and there is little dissection, so that only a shallow skin of Dundas rocks is exposed. They are largely quartz and felspar porphyries, massive and largely featureless except for local banding (flow banding) and minor slate horizons. On photo L2/776, ½ mile S.W. of Mt. Sedgwick, acidic lavas alternate with thin bands of conglomeratic material and finely banded mudstones. These may represent pyroclastic phases of the sequence; they are lenticular and contorted. One exposure of banded felspathic rock included two cone-shaped "fossils" that closely resemble a comic crinoid stem, with a hollow centre. The feature is either an organism or possibly the result of a "rolling up" of a thin tuff band by currents or wave action. (A sketch accompanies this report).

The bedding indicated by the pyroclastic rocks just described is unconformable with the overlying Owen Conglomerate.

Three quarters of a mile south-east of Mt. Sedgwick is a large mass of pink felsite laced with hematite-magnetite veins. The felsite is a felspar porphyry that closely resembles that on Mt. Darwin, which I have described elsewhere as a potash rhyolite. The iron veins are up to two feet thick, generally lenticular, and of random orientation. They are magnetic and are undoubtedly the cause of the strong airborne magnetic anomaly in this area.

West of the Sedgwick plateau and north west of Comstock, the Dundas rocks are markedly different and consist mainly of hornblende-augite felspar porphyries, siltstones, quartz and felspar porphyries (keratophyres), etc. They have been mapped by Dr. Campana.

Half a mile north-west of Comstock, a medium grained graywacke conglomerate appears interbedded with Dundas rocks; it contains pebbles of porphyries, slate, some Pre-Cambrian quartzites, and hematite and closely resembles both Jukes Conglomerate and Razorback Conglomerate (Elliston 1954). It seems an established fact that such conglomerates form part of the Dundas sequence and presumably represent local upheavals during Cambrian deposition that allowed influx of limited amounts of material from a siliceous source. From now on, I suggest we describe this lithology as Jukes Conglomerate regardless of its stratigraphical position.

The Henty River section is, unfortunately, incomplete but has provided some useful information. An E-W section along the latitude of Howard's tram-line is very roughly as follows:-

Top to bottom = west to east; all thicknesses are very approximate, measured on aerial photos or estimated in field:-

	1000'	Owen quartzites and conglomerates with thin bands shale.
Bedded Series	5000'?	Mainly finely banded dark siltstones with minor tuffaceous sandstones and lavas.
	1500'?	Blue grey augite-andesite (?) with inclusions siltstone.
	2500'?	Incomplete, poor exposure.
	600'?	Grey thinly bedded and locally finely banded quartzites, tightly folded (symmetrically).
	300'?	Variable quartzose tuff, dark slates, purple shales; tightly folded.
Massive Volcanics	700'?	Creamy or grey massive felspar porphyry.
	2000'?	Very variable keratophyres, tuffaceous sandstones, finely banded felspathic rocks, and lavas.
	1500'?	Mainly well banded keratophyres and porphyries. Keratophyres are quartz-albite-chlorite porphyries and include beds of siltstone and bouldery zones.
		Owen Conglomerate of Mt. Tyndal.

Much of the western part of the section probably is equivalent to the eastern section.

Owen-type facies in the Dundas Group

East of Lake Beatrice and in Beatrice Creek are exposed several hundred feet of grits, coarse sandstones, and shaley beds dipping west and directly overlying sheared dark blue-grey shales. These shales are very similar to those exposed in the Anthony River and apparently forming part of the Pre-Cambrian sequence or at least basal Dundas. In this area the Owen like beds are fairly clearly basal members of the Dundas Group and it is thought to be likely that the same applies to the Beatrice area. This would obviate the need for the extensive, strong faulting implied by assuming the Owen-like beds to be Ordovician (see E-W sections through Mt. Sedgwick).

The Jukes Conglomerate is exposed on the western slopes of Lake Beatrice where it is about 1000' thick and thins westward until it disappears a little west of Mt. Sedgwick.

The succession in the crest of the Sedgwick anticline is typical:-

Coarse Owen Conglomerate.

A few feet of dark purplish hematitic shales, grading down to sandy shales. Conformable with Owen.

Graywacke conglomerates, purplish in colour, increasing grain size until bouldering with pebbles 2' diameter at base. Pebbles mainly felspar and quartz porphyries at base, increasing content of quartz and quartzite pebbles towards the top of the conglomerate. Base is obscure and conglomerate appears to merge with underlying porphyry.

Moving south-west along the base of the Owen, the Jukes formation thins until it is represented by no more than 2'-3' of quartzose grit. Once again, this merges down to porphyries of the Dundas Group.

Field work has shown that the Jukes Conglomerate facies occurs in the Cambrian beds and at the base of Owen, and at Lyell rather similar beds occur in the Middle Owen Conglomerate. The facies thus has no significance in time and cannot be assigned a particular age.

Its chief characteristic is that it represents the products of rapid localised erosion with which is generally mixed some Pre-Cambrian material such as rounded quartz and quartzite pebbles. Without the latter one cannot differentiate the material from many Dundas agglomerates.

Owen Conglomerate

The following succession has been used as working basis for field mapping:-

Upper Owen: Grey, pinkish, or purple-coloured sandstones, thin or very thinly bedded; dark hematitic shales, granule conglomerates. Tubercles and vermicular (?) casts frequent.

Middle Owen: Grey or yellowish medium and large pebble conglomerates with thin sandy beds; pink or red sandstones. Generally thickly or very thickly bedded. Fossils locally near top of this division.

Lower Owen: Coarse yellowish or grey siliceous conglomerates with pebbles very large or greater. Coarser and bouldery locally at base. Locally split by sandstones, (Lower Owen sandstone) up to 500' thick. No fossils.

This sub-division was found to be useful in this area except for the eastern limits of the Owen outcrop where the two upper divisions are difficult to distinguish.

The Lower Owen beds are typical of the formation, being fairly well rounded, moderately sorted and grey or yellowish in colour. The Lower Owen sandstone is seen only at the crest of the Mt. Sedgwick anticline and thins fairly rapidly to east and west. It crops out again on the northern slopes of Mt. Tyndal, where it is much thicker.

The embayment in the Owen contact north of Comstock is cut in Lower Owen beds.

The Lower Owen is at a maximum thickness (4,000') along the western side of the Sedgwick plateau but thins rapidly in all directions (see sections). The thinning to the east is the reverse of the Jukes Conglomerate, which thins to the west.

Embayment north of Comstock

Unfortunately there are no outcrops within the embayment and no signs of a marked break in the Owen Cliffs to provide an explanation for the phenomenon. However, there is a suggestion of unconformity or a shallow thrust to be seen when the cliffs at the head of the embayment are observed from Comstock (see sketch). If it is a thrust plane then the Lower Owen succession is repeated and the embayment is due to glacial erosion in the thrust zone. However, it appears more likely to be a local plane of unconformity.

Possibly the embayment is simply an accident of glacial erosion.

The Upper Owen mapped on Mt. Geikie consists of dark purple fine-medium conglomerate-breccia with an abundant matrix, interbedded with red sandstone. Its positioning in the Upper beds is open to question.

Thicknesses

Overall thickness of the formation and thicknesses of subdivisions vary rapidly and are best expressed by isopach diagrams. The lithologies have no time significance as is obvious in the area north east of Mt. Sedgwick, where coarse Lower Owen Conglomerates pass along strike to Middle Owen beds.

A marked thinning of the Owen is seen east of Lake Margaret, where Gordon Limestone rests on only 1000' of conglomerate; this zone of shallow deposition probably represents the embryonic phases of the Sedgwick-Tyndal anticline.

Even more marked is the thinning west and south of the Sedgwick plateau. This must be due to fault movement both on the Lyell Shear or Owen rift walls and also on the E-W Sedgwick fault, causing an area of no deposition across at least part of the Comstock valley.

This valley later became the site of a depression (Comstock graben).

Similar observations on early movements of cross faults and folds have been made at Lyell.

Gordon Limestone

Beds of this formation are exposed on the two eastern islands in Lake Margaret, both of which were visited by means of a collapsible dinghy. The main island exposes the following succession:-

30 ft: Grey cleaved calcareous shale; and alternating grey limestone and cleaved shale.

20 ft: Sandy shaley limestone, shaley limestone, and calcareous sandstone, alternating in 6 inch or 3 inch bands. Near base is a 2 ft. shaley bed with a thin basal band rich in hematite.

Permian

Coarse tillites and fossiliferous sandstones occur over an area ringing the dolerite of Mt. Sedgwick. The beds reach a maximum thickness of 250 feet and rest in clearly defined depressions in Owen and Dundas rocks. The fossiliferous sandstone beds occur near the top of the sequence. Post-Permian folding has produced dips up to 35°.

Structure

Lyell Shear Upturn

The overturning seen at Comstock re-appears on the western flank of the Sedgwick plateau. There are two alternative structural interpretations for this area shown in the sketches. No proven overturned dips were recorded but sharp upturns were seen locally along the synclinal axis and Dundas pebbles were found in the Owen at the foot of the conglomerate scarp, indicating that the western-most beds are the basal ones.

The upturn axis strikes N.N.W. and passes into Dundas rocks north of the Margaret moraine. The upturn axis is almost certainly faulted (see sections) and parallel en echelon faults cut off Owen Conglomerate on the western flank of Mt. Tyndal.

If this is Lyell Shear continuation, then it must be displaced north of Comstock; this is probably brought about by north side west movement on the Sedgwick fault. Evidence for this fault is shown by the sharp cut-off of the Owen along the valley flank; silicification of Owen on the fault plane, and the displacement just described. It is thought to be similar to the North Lyell fault in that it combines vertical (N-side up) movement with wrench (N-side-W) movement (see sections).

Other cross faults occur in the Lake Margaret area but are of lesser significance.

The folding north of Comstock is considerably more gentle than that to the south and axial planes are predominantly N.N.W. The more subdued structures point to weaker mineralisation.

The most prominent fold is the Tyndal-Sedgwick anticline which strikes N.N.W. parallel to the dominant trend in the Sedgwick-Murchison area. Evidence has been given to indicate early stirrings of this fold in the Ordovician.

(c) REGIONAL MAPPING OF THE STICHT RANGE-TULLAH-STERLING RIVER AREA.

Particular importance here was attached to the western margin of the Pre-Cambrian rocks and extensions to the Tullah mineralisation.

A large area east of Mt. Murchison and including portions of the Murchison River gorge were pronounced inaccessible to small ground parties and remain to be examined.

Pre-Cambrian Margin

Anthony River Area

The following succession was established over a few square miles east of Lake Selina, mainly by traversing portions of the Anthony River and its tributaries draining the Sticht Range:-

Dundas Group:

1. Quartz felspar porphyries and felspar-porphyries, fairly fine grained and grey in colour.

2. Lenticular, from zero to c.500' thick, grey crumpled sandstone-quartzites, poorly bedded.

3. Similar porphyries to 1, c.200' thick.

4. Similar quartzites to 2, overlying coarse siliceous conglomerate; the two varying from zero to 6-700' thick, but fairly persistent along west flank of Sticht Range. Conglomerate similar to Owen facies but perhaps more silicified.

Pre-Cambrian:

5. Dark blue-black shales, sheared, quartz veined, including local lenses of white quartzite, typically Pre-Cambrian.

6. White or grey quartz schist and sheared quartzites, extending east across the Central Plateau.
(Individual thicknesses vary considerably and are described in field books and on photos.)

The Owen like facies described in the Dundas Group has been identified as Ordovician (Owen formation) by Dr. Campana working east of Lake Rolleston and this interpretation involves considerable faulting.

Sophia River Area

On the eastern margin of the Sophia Valley, the succession is as follows:-

1. Lenticular (from zero to 200') grey quartzites and sandstones and siliceous conglomerates, probably Owen.

2. Grey and blue quartz and felspar porphyries, cleaved; little or no sedimentary material.

3. Variable zone flanking Pre-Cambrian sheared quartzites in which exposures are generally poor. On photo Pieman/2/319.39 lavas overlay a thin bed of pale grey pebbly sandstone which rests on an irregular surface of Pre-Cambrian quartzite. The sandstone fills hollows in the old surface that have formed as a result of erosion along joint planes. South of the Sophia River, on the same photo, lavas overlay alternating dark shales and sandstones which outcrop poorly; these in turn overlay the massive sheared quartzites that typify the Pre-Cambrian. A quarter of a mile to the north the following succession is found just west of cliffs of Pre-Cambrian quartzites:-

   10'+: pebbly (quartz) beds and impure sandstone.
   10' : massive felspar porphyry, weathering brown
   20'+: alternating quartzite, sandy shale, fine conglomerates.

A section was run along the E-W portion of the Sophia River and revealed the following:-

Dundas Group
   6. Alternating porphyries, tuffs and dark grey shales.
   5. Coarse, massive, quarts felspar porphyry.
   4. Thinly bedded grey quartzites and dark grey shaley beds, contorted.
   3. Poorly outcropping shales and felspar porphyries (?).
   2. Crumpled grey finely banded argillites with thin quartzites, 500' thick.
   1. Typical Pre-Cambrian quartzites.

At the northern limit of the area mapped, east of White Hawk Creek, aphanitic siliceous lavas looking much like fine massive quartzites, are separated from the Pre-Cambrian quartzites by glacial cover.

The basal members of the Dundas Group along the eastern margin of the Pre-Cambrian outcrop are thus a variable assemblage of siliceous rudites and arenites, argillites and volcanics, the siliceous members often appearing very similar to Owen sediments. This accords with the findings of Banks (1954) in the Dora-Rolleston area where he also records impure limestones in the basal Dundas rocks.

The occurrence of boulders of Owen-like conglomerate in Cambrian rocks at Lake Dora confirm the presence of basal Dundas siliceous rudites.

Tullah-Sterling River Area.

This area has been mapped in fair detail by at least four geologists in the last fifty years and Rio Tinto's contribution represents the fifth attempt.

Geological Succession

Silurian (?): Hawk River area sandstones.

Ordovician: Gordon Limestone in the Sophia Valley.

Owen Conglomerate: Upper Owen sandstones.
Lower Owen Conglomerates.
Undifferentiated shales, sandstones, conglomerates.

Jukes Conglomerate.

Cambrian: Dundas Group: (not in stratigraphic order):-

Farrell Volcanics.

Tullah slates.

Sterling volcanics.

Murchison Granite.

Dundas Group

The Farrell volcanics have already been described from sections along the Sterling Valley tram-line and the Farrell railway.

The "Tullah slates" are dark grey siltstones, impure tuffaceous sandstones, sandy tuffs and minor lava flows. Well bedded and dark in colour, they are identical with the Lynch siltstones of the Queenstown area and the slates at Rosebery. They dip consistently to the west but are probably isoclinally folded; no conclusive overturned readings could be found, despite Carey's assertion (Mines Dept. 1945). Individual strike readings are N-S, or N.N.W. while the unit as a whole trends N.N.E.; this is probably due to superimposed folding.

The slates are host rocks to most of the mineralisation in this area; near the orebodies the slates are sheared and gashed by quartz veins and the bedding is destroyed. Mineralisation is confined to the hanging wall of the bedded rocks near Tullah but south of Daly's Farm it is entirely on the footwall side.

A fairly complete section is seen in the Murchison River south of Tullah.

Sterling Volcanics

These outcrop west of the Murchison River gorge and west and south of Little Farrell, extending up to Mt. Murchison.

They are quite different from the Farrell volcanics in that they are entirely acidic, generally showing microscopic free quartz. Individual types can be traced in the field, in particular a pink ferruginous felsite very similar to the felsite of Mt. Sedgwick and Mt. Darwin which I have identified as a potash rhyolite. Other types include white quartz-felspar rocks, sometimes almost granitic (e.g. ½ mile south of Little Farrell), sometimes aphanitic.

A cleavage is poorly developed parallel to the Devonian fold axes i.e. N.N.W.

Age Relationships

Each of the three subdivisions in the Dundas Group mentioned above are probably in some part equivalent to each other in age (see sections). However, it is reasonable to suggest that part of the Farrell volcanics are youngest and the Sterling volcanics oldest.

The distribution of acidic volcanics within the Owen outcrop area flanked by intermediate material is repeated at Mt. Sedgwick and south along the Range to Mt. Darwin.

Ordovician:

Owen Conglomerate

Mt. Farrell is the only area where the Owen fails to split up fairly neatly into the three subdivisions, Upper, Middle and Lower.

At the northern end of Mt. Farrell, Upper Owen sandstones overlay Lower Owen conglomerates, both units thinning to the north where, at the outcrop limit, the succession measures as follows:-

150': red sandstones, well bedded.
200': coarse conglomerate-breccia, poorly sorted.

Half a mile to south, thicknesses, are as follows:-

400': sandstones.
500': conglomerates.

Over the southern half of the mountain a bed of Lower Owen conglomerate is easily discernible but overlying members vary from fairly coarse conglomerate to sandstones and shales and the usual three-fold division breaks down.

Jukes Conglomerate

This formation occurs only on Little Farrell; it is a sheared coarse breccia-conglomerate up to 700 ft. thick lensing to the north. Of particular note are the large pebbles of hematite near the top and the parallelism of the cleavage with that in the Cambrian rocks.

Gordon Limestone.

This is exposed in only a few places in the Sophia River, mainly near the junction with the Mackintosh River.

Silurian

Hawk River Sandstones etc.

These were not mapped owing to inaccessibility; they appear to occupy the core of a north pitching syncline. An old track exists between the old lead workings in these beds and Tullah, and re-opening of the track is essential to continuity of the regional mapping and to a study of the mineral deposits.

Structure

The broad structure of Mt. Farrell and the Sophia Valley is shown in sections. The N-S folds are slightly complicated by shallow cross-folding as shown in the longitudinal section from Farrell to Murchison.

The Owen formation is unconformable upon the Dundas beds, the divergence of strike being particularly obvious north of the Murchison River gorge. This straightway invalidates Mathers H.E.C. Tasmania (1957) suggestion that the structures in the Dundas and the Owen are conformable.

The western margin of the Owen Conglomerage outcrops forms an old straight structural line extending south along the west flank of Mt. Murchison. The line formed the edge of Owen deposition and movement along it was repeated during the Devonian orogeny. The structures in the Dundas Group are less obvious but an interpretation is given in the east-west section.

N.W. faults intersect Mt. Farrell ridge and cut off the Owen Conglomerate at the north end of the mountain. Carey (1948) matches centres of mineralisation in the Tullah slates with these cross faults but the recent mapping has failed to confirm this.

It is noticeable that the pitch of the Owen structures on Mt. Farrell is northerly - for contrast see Campana et alia (1958), where conglomerates here are assumed to have a southerly pitch.

Murchison Granite

The Murchison River gorge exposes the top of a granitic mass, this is largely of syenitic composition but is variable in composition and texture. Some of it is similar to the Darwin granite and it is unlike any of the more acid, porphyritic batholiths such as Heemskirk and Granite Tor.

Its margins are vague and in the gorge section there is a gradual change from syenite to felsites and quartz porphyries of the Dundas Group.

A special search was made in the basal members of the Jukes Conglomerate for pebbles of syenite (c.f. Darwin) but none were found. However, on similarity with the Darwin granite, I would suggest the Murchison mass was of Cambrian age.

Mineralisation

As a result of the field mapping, two areas of some mineral potential have come to light, viz:-

(1) The Sterling Valley from the Murchison River to the Sterling River Mine.

The favourable Tullah slate bed includes the S.R. Mine and two or three minor showings on the footwall side, but the only testing has been done by the E.Z. Co. on the Sterling River Mine leases. The untested zone between the Murchison River and these leases is considered highly favourable for combined electromagnetic and gravity survey. North of the Murchison River the slate beds have been drilled at many points and the favourable zone is considered to be fairly well tested.

South of the S.R. Mine the slate bed probably continues along the west flank of Mt. Murchison; unfortunately the area is densely vegetated and further mapping requires the aid of tracks cut along suitable river beds.

The importance of E-W and N.W. faults that have been mapped south of Little Farrell and of the pitch change shown by the Owen formation between Mts. Murchison and Farrell, are uncertain, but combine to make the area of greater interest. Study of the northerly continuation of the slate horizon is obviously important but on present evidence it is feared that the bed is overlapped by the Owen Conglomerate and then faulted down below the Sophia syncline.

(2) The Murchison River Gorge.

The Cambrian porphyries lying within the Farrell anticline, below the Owen beds, and above the granite are lightly mineralised, are sheared and locally converted to green chloritised rocks. The slopes are extremely steep, to a large extend soil covered and the area is unlikely, therefore, to have been prospected in great detail; these factors, of course, increase its interest.

It is recommended that this zone be examined in greater detail by cutting short tracks above the river and occasionally trenching to expose bedrock.

(d) THE ROSEBERY-WILLIAMSFORD AREA

Field work in this area consisted mainly of filling-in gaps in the mapping done by several previous workers. Most of the work was done in the Rosebery town area, near Williamsford, and south of the Hercules Mine. Some time was spent studying plans and sections of the Rosebery and Hercules Mines, by courtesy of the E.Z. Co.

It is beyond the scope of this report to present the complete geology of this area but it may help to list the chief items of interest that resulted from the recent work:-

(1) The mineralisation at the two operating mines is largely in sericitic schists and slates, the slates being identical with the Tullah slates, Miners Siltstones etc.. The slate beds are lenticular and dip to the east.

(2) The mineralisation and the slate beds occur within half a mile of the bedded-massive boundary and this is obviously a major control over localisation of mineralisation.

The boundary was studied in some detail and it was found that while there was a clear cut division in some areas, elsewhere it was represented by a zone of alternating volcanics and slates (e.g. Rosebery), or it was a confused zone in which lavas appear to merge along strike to pyroclastics and then slates (e.g. Jupiter area).

(3) The Rosebery ore occurrences are probably situated in a local "embayment" in the massive-bedded boundary, the embayment acting as a local trap for ascending solutions. The latter rose to the highest accessible horizon which favoured ore deposition i.e. the Rosebery slate bed.

Similarly the Hercules ore occurrence, though the embayment is less obvious in the Williamsford area.

(4) The distribution of ore lenses within the favourable beds is largely controlled by the superimposed Devonian N.N.W. cleavage or schistosity. At Rosebery, cleavage is roughly parallel to the strike of the slates but dips east at a steeper angle; thus the ore lenses or shoots are arranged en echelon.

As a result of deformation, the rocks along the strike of the favourable beds open up sufficiently to allow extensions of the ore zone beyond the limits of the favourable bed. This appears to be the case at Rosebery, where minor mineralisation occurs S.S.E. of the open cut. I originally attributed this to extension of a shear zone and marked a shear on the map; however, I now think such an interpretation is erroneous, unless the shear parallels the slate horizon.

Extensions of the Hercules mineralisation occur to the south along the rapidly thinning slate horizon and also N.W. along the Devonian cleavage, thus exhibiting the dual control over ore localisation.

(5) The ore appears to be post-cleavage and is unstressed (similarly at Lyell). Therefore it is likely to have been deposited in the closing phases of the Devonian (or at least post-Owen) orogeny.

Summary

If the above notes are correct, then the major mineralisation controls are (a) the bedded series - Rosebery volcanics boundary; (b) the occurrence of slate beds within massive rocks close to this boundary (c) Devonian cleavage or schistosity.

Ore search is localised by point (a) but the whole boundary must be investigated as the occurrence of slates in embayments as in point (b) appears at present to be fortuitous.

(e) THE ZEEHAN AREA

The Owen Conglomerate

The only development of coarse Owen Conglomerate outside the Owen rift valley is in the Mt. Zeehan area.

The succession immediately west of the Oceana Mine is roughly as follows:-

1,200': Upper Owen sandstones, tubicolar horizons, quartzites, pebbly sandstones and granule conglomerates.

800': Lower Owen coarse red or pink subangular conglomerates.

2,000'

For details see photographs.

Half a mile south of the mine, the thicknesses change to:-

2,200': Upper Owen
600': Lower Owen

2,800'

The Lower Owen probably disappears one mile south of Oceana though this has not been checked on the ground. Itcontinues for at least one mile to the north of the mine and then lenses out rapidly.

There is thus a small basin of say, four sq. miles, centred on Mt. Zeehan, in which a coarse basal-type Owen facies was deposited.

The Upper beds are characterised by thick beds of "organ-pipe" tubicolar sandstones, the tubercles occurring perpendicular to the bedding and closely packed together. Rather similar beds may be seen in the Crotty quartzites at Queenstown.

Other occurrences of Owen Conglomerate in the Zeehan area that I have inspected are:-

(a) Mt. Misery just south of the Rosebery-Zeehan Road:-
200'(?): Fine medium rather angular pebble siliceous conglomerate with pink sandstone and grit beds. Pebbles largely quartzite, chert, red slate, jasper. These beds rest conformably on the Mt. Misery conglomerate exposed in the quarry. This is a coarse greywacke conglomerate at base (pebbles up to 9" diameter) fining upwards and including reddish shale and gritty sandstone beds.
Base of Owen conglomerate not exposed but there must be a fairly rapid change from the Mt. Misery formation.

(b) One mile south of Trial Harbour: A prominent hill overlooking the Little Henty River exposes pale grey and white fine quartzites, pebbly quartzites, fine breccia-conglomerate; also some tubicolar sandstone and a greenish sandstone with pellets of grey sandstone.
The beds are unconformable upon the Pre-Cambrian rocks exposed on the sea-shore.

Age of the Zeehan Mineralisation

Brief inspections were made of the Silver Bell, South King, King, Florence and sundry workings near the Oceana Mine.

Dumps of the first three mines showed the host rocks to be sandstones and shales high in the "Florence Sandstones" (Upper Silurian) or in the "Bell Shale" (Devonian?). Fossils were abundant. Reconnaissance mapping west from the Oceana Mine suggested that these mines occur in the same stratigraphic horizon high in the Silurian or even in the Devonian beds.

In the Florence Mine workings, numerous shafts and adits penetrate the Crotty quartzite (basal Silurian) and some mineralised quartzite was noticed on the dumps. The quartzite is faulted against Dundas rocks with small lenses of Gordon Limestone in the fault zone.

Even from these preliminary investigations it seems clear that much of the Zeehan mineralisation is port-Silurian, probably Devonian. If Edwards (1953) is correct in relating the Zeehan field to intrusion of the Heemskirk granite (and it seems a reasonable deduction) then there is a strong suggestion that the Heemskirk granite is of Devonian age.

Similarly the Lyell, Rosebery, Hercules and Tullah ore bodies appear to be Devonian.

However, the occurrence of serpentine pebbles in basal Owen conglomerate at Adamsfield and of chromite in the Upper Owen beds at Lyell suggest that basic intrusions with associated chromite, copper-nickel, etc. ore bodies, took place during the Tyennan orogeny. As far as I know, this is the only direct evidence of Cambrian mineralisation (other than hematite) on the West Coast.

4th December, 1958.

M. Solomon.
Geologist.

5 cm

06_5283

RIO TINTO AUSTRALIAN EXPLORATION PTY. LIMITED

FOSSIL IN DUNDAS GROUP, MT. SEDGWICK

Collected by M. Solomon - 1958

DRAWN TO ACTUAL SIZE

DRAFTSMAN : D. J. LAWFORD	AUTHORITY : PRP 7 100	PLAN Nº T 493