Old Mines on Zeehan Lodes

Manganese Hill

by

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Manganese Hill.

① Location and Access.

Manganese Hill is situated at about the centre of the Zeehan Silver-Lead Field. It is a prominent physical feature of the district, being truncated conical in outline, the peak being 1100 feet above sea-level.

The flanks of the hill can be approached from all sides. The northern flank is reached from Fowler Street via the old Spray Tram to the State Mine and thence westwards on the spray Tram, now a road, eastwards by the road round the eastern slope of the hill to the Comstock Tram near the old Central Balstrup Shaft. The southern flank is entirely controlled by the Comstock Tram, now converted to a road.

The Manganese Hill is entirely clear of timber.

② History.

The original discovery on Manganese Hill was made by Peter M. Balstrup near the entrance of the West Adit. Rich silver assays in the ferruginous outcrop focussed attention on the iron-manganese outcrops at the crest of Manganese Hill and on parts of the slopes. Analogy to Broken Hill was claimed and amid very great optimism Balstrup's Manganese Hill Silver Mining Company was floated in Melbourne. Capitalisation was 100,000 shares of 10/-; 50,000 issued to owners; 50,000 issued to the public; £7,500 placed to the credit of the Company. This was in 1890.

The West Adit and the Eastern Adit were undertaken with confidence that under the iron-manganese outcrop of the crest there must be something similar to Broken Hill. After about 2000 feet of

In subsequent years after the establishment of the Zeetan Smelters the iron-manganese oxides on the south side of Manganese Hill were quarried for flux. This continued with interruptions until the final closing down of the Smelters in 1913.

During the 1930's the area was taken up as a source of iron and manganese, but no work was done.

adit driving with disappointing results the Main Shaft was sunk in an endeavour to get below the 'oxidation' which was so evident in the adits. The Crosscut to the lode from the bottom of the shaft showing no improvement, operations ceased and the mine closed down in November of 1892. Nothing has been done since.

About the same time in 1890 the eastern portion of Manganese Hill was floated as the Balstrup's Central Silver Mining Company. A Main Shaft to 99 feet, a prospecting shaft to 30 feet and four adits from the south-eastern slopes of Manganese Hill were achieved by 1892. Results were somewhat better than those of the Slayer Company, but not sufficient to pay for further development, and the mine closed down. Nothing has been done on it since.

← + + / + ×

③ Output and Profit.

Neither Company obtained much output. About 200 tons of hand-picked galena was obtained from the West Adit, and some cwts of Sylvanite, there was nothing from East Adit.

About 100 tons of galena were obtained from the workings of the Central Balstrup on Johnson's Flat, and a similar amount from the No 4 Tunnel at Brown's Creek.

The total output of galena may thus be said not to have exceeded 400 tons.

Many thousands of tons of iron-manganese flux were quarried and sent to both Tasman Smelters and the North Lyell Smelters at Crotty.

No profit has made by the two Companies but subsequent lease-holders made profits supplying flux to the Smelters. There is no information as to what amount was made, but it would not be great.

④ Geologic Environment

ⓐ Keratophyric Tuffs and Black Slates.

This rock formation constitutes the greater

part of Manganese Hill. The only portion of the Hill itself above the 600ft contour which does not consist of this rock assemblage is the south-eastern portion. As will be seen later this portion of the Hill most probably contains the limestone and some of the overlying Gritty sandstones

The East Adit was driven in the Keratophyric Tuffs and Slates for 1100 feet. Excellent exposures of the weathered faces occur along the Comstock tram from the South Adit westwards towards the Spray turn-off. Splendid fresh specimens of the various rock-types can be gathered from the dump of East Adit.

(b) Ordovician-Silurian

It is in connection with these rock formations that an exasperating but important problem exists. Although the problem cannot be said to have been solved, a series of observations over the last eighteen months has thrown considerable light on it. One of these discoveries, namely that by Mr M.L. Yardley of Ordovician fossils in the iron-manganese of the flux quarries on the south side of the Hill, compelled a drastic readjustment of existing ideas as to the distribution of the Ordovician rocks in this vicinity.

In addition to the indisputable occurrence of Ordovician fossils in the ironstone, there is the observation originally made by Dr Prider and recently confirmed by Mr Webb and myself, of a gritty and even pebbly facies in the decomposed material in the upper portion of the road running from the State Mine to the Central Belstrup shaft. This had been assumed to be decomposed tuff because of its colour, but nowhere do any beds of undoubted keratophyric tuffs show other than a very fine grain-size. In view of the fact that the whole of this eastern side of Manganese Hill shows essentially detrital accumulations, it seems a fair assumption that this pebbly facies indicates Gritty sandstones higher up the slope, i.e. west of the road.

We seem therefore compelled to visualise the

extension of the Ordovician in this south-eastern portion of Margarese Hill to as far west as the western side of No 3 Flux Quarry. The structural picture which is responsible for this will be suggested in the final section of this chapter.

There is no doubt concerning the occurrences on Johnson's Flat, Goodie's Hill (the southern extension of Florence Hill) and the Comstock Tram at the sand quarries. They are clearly Ordovician-Silurian, but are confused by structural displacement. The Black Slates of Johnson's Flat simulate the shale beds of the limestone formation, and their fossil content could possibly be used to confirm or reject this. The sandstones and grits of the sand-quarries on existing evidence would seem to be Crotty. This is the interpretation in Professor Carey's photo-geological map which incidentally puts the sandstones of Goodie's Hill as Crotty. This latter interpretation makes Johnson's Flat look very like the limestone formation.

(c) The Waller Fault.

This major fault continues from the Florence Hill-Argent Flat area. It runs in an approximately meridional direction just east of the entrance to East Adit. Southwards from this it is obscured by the talus accumulations of the eastern slope of Margarese Hill. The suggestion indicated above that the limestone extends to the western edge of No 3 Flux Quarry entails the conclusion that the Waller Fault has been displaced by the Margarese Fault. This, however, is in strict concordance with what has happened northwards as fully described in the Florence Hill-Argent Flat report. It is probable that the meridional line of iron-margarese outcrops in situ below the Comstock Tram south of the Flux Quarries represents the Waller Fault just before it suffers its greatest displacement, namely that brought about by the Balstrup Tear Fault.

The conception, which obtruded into the Zeetan structural picture, that the Waller Fault was rather

an unconformity must uncompromisingly be ruled out and relegated to the long list of misconceptions originating in only partial knowledge of West Coast geology. Waller with his intimate acquaintance with the rock systems of Zeehan recognised it, and the writer after years of study of the West Coast confirmed it as a major structure.

(d) Major Tear Faults.

The Balstrup Tear Fault runs east-west on the southern boundary of the area embraced by this report. Its position on the map produced herewith is that determined by Professor Carey in his photo-geological map, but it seems probable that it should be slightly to the northwards of the position shown.

The Manganese Tear Fault comes into the structural picture as a major factor. Proof of its existence starts at the Keratophyric Tuffs — Nubeena Quartzites contact at the No 2 Argent in the big bend of the Old Spray Tram. This is certainly a faulted contact. It again manifests itself on the south end of Johnson's Flat where the black shales are in faulted contact with Crotty Sandstones of the sand-quarries. The interpolated position between these two manifestations takes into consideration the orientation of structure shadows in the iron-manganese outcrops at the crest of Manganese Hill and the change from gritty talus to clay talus along the State Mine — Central Balstrup road.

(e) Minor Tear Faults.

It appears probable that the West Adit was driven on a fracture which may belong to this group. Balstrup's original discovery was where the adit portal now stands. Waller's description of the Manganese Hill operations is sketchy as it was ancient history by his time. Nevertheless he throws some light on the problem:-

> "The upper level [West Adit] was started on the lode, but soon lost it, and was continued in portwall country. A crosscut was put out east and cut the lode" (1)

(1) G.A. Waller 1904 p 78.

From the shaft which he has sunk a good deal of dolomite and serpentine has been obtained carrying splashes of galena."

In the plan accompanying this report this dear fault has been shown by a broken purple line and named the Central Tear Fault. It is shown not affecting the Wallen Fault where it crosses, but in actual fact it will probably be found to do so if further exploration underground proceeds.

look to "e"

Another major dear fault now comes into the structural picture. Nowhere can it be seen as displacing ~~relative positions of~~ rock formations, but there are pointers which force hypothecation of its existence. These pointers are: the orientation and character of the iron-manganese formation outcropping and penetrated by the Central Balstrup workings; the apparent orientation of the line of the three Flux Quarries; the structure-shadow in the South-West Outcrop; and the dolomite-galena occurrence between the Comstock Team and the north end of No 3 Spray lode.

The latter occurrence is of interest. Waller in 1904 thus describes it on page 82:

"In the north-eastern portion of this section Mr W Moyle has been working on a curious formation on the line of No 3 Spray lode. It is a big formation, and the workings are not yet sufficiently extensive to enable one to form an opinion as to the strike of the lode. The iron outcrop at the surface strikes a little north of east, but this seems to have been cut by another lode formation striking west of north.)

"The main outcrop of ironstone is believed to be the capping of what is known as Balstrup's lode. The strike of this lode is 45° west of north, dipping to the north-east at a high angle." (2)

This is the lode driven on at the levels of West Adit and Low Adit. It is described as having had well defined walls. Its direction suggests that it is in a minor tear-fault. It certainly does not correspond to the Manganese Tear Fault, being well to the north thereof. The question then arises as to what they followed in the Main Drive of the West Adit. There is no information available as to whether they were following a fracture or were just blind stabbing.

The structure shadow in the iron outcrop south of the West Adit portal is probably the Manganese Tear Fault, but that in the next outcrop southwards must be one of the minor tear faults.

(8) Tension Cracks.

Within the area embraced by this report there is, by Zeehan standards, a paucity of the tension type of ore repository fractures. This may be because exploration has been limited. Waller says of the East Adit:-

"Another long adit was driven from the north-eastern portion of the section, and for over a thousand feet, and through a number of gossan formations was cut, none of these has been definitely recognised as Balstrup's lode. There is a formation at about this spot where the lode should pass, but it was of no value when cut, and was not driven on. All the formations cut in this adit are completely oxidised" (3)

Do these 'formations' represent tension cracks?

(9) The Probable Geologic Structure.

The map accompanying this report must be regarded as a sketch map only. It has been prepared with full realisation that data are incomplete and

(2) S.A. Waller 1904 p78.
(3) S.A. Waller 1904 p78.

fixation of certain positions yet to be finalised, but its purpose is to illustrate the present conception of the fundamental structure at Manganese Hill.

The dominant structures are the Balstrup and Manganese Tear Faults and the Waller Fault. The latter has brought the Crotty Sandstones in the northern portion and limestone in the southern portion in faulted contact with the Keratophyric Tuffs and slates. The effect of the Manganese Tear Fault is to place the Waller Fault about 450 feet further east than its position between the Manganese Fault and the Balstrup Tear Fault. The effect of the Balstrup Tear Fault is to bring Keratophyric tuffs abutting on the Ordovician on the latter's south side.

Such an interpretation would result in ~~there~~ there being at least portion of the limestone bed under the south-eastern slope of Manganese Hill. It would have a steep easterly dip. Incidental to this, traces of original bedding are clearly visible in the Flux Quarries dipping steeply eastwards. More will be said of this in the later portion of this report. But all this presupposes that the limestone is hidden either by replacement by the iron-manganese or by being covered with hill talus. However, it is perhaps significant that within the limestone area thus conceived the decomposed material constituting the subsoil has a distinctly sandy facies. Most of Johnson's Flat is covered with silt.

(5) The Lodes.

(a) The Iron-Manganese Occurrences.

(i) Distribution.— A close examination of the surface occurrences of this iron-manganese material indicates that an appreciable amount consists of boulders which are not in situ but are 'floaters'. Waller's map shows a distinct 'line' through the crest of the Hill and indicates that this is 'the line of the Balstrup lode'. But it is at least doubtful whether there is such a continuous 'line' from the Flux Quarries to the crest of the Hill. Rather is there

indicated a distinct break about half-way up the slope.

The occurrences seem rather to consist of irregularly shaped masses with a tendency in places to assume something in the nature of lineal direction. Detrital boulders in the talus tend to give a false impression of lineal extent. It will be best to list the occurrences which are recognisable as in situ. Their spatial relationships must await further elucidation. The occurrences are:-

Quarry Outcrop.- This seems to be the largest individual occurrence. It has been penetrated by three open-cuts and one adit. Dimensions would seem to be 500 ft by 300 ft.

Crest Outcrop.- Prominent at the crest of Manganese Hill this mass is roughly circular in shape with a diameter of approximately 300 ft.

West Outcrop.- This is on the lower portion of the western slope of Manganese Hill. An adit has been driven into it. It shows a lineal extent, being traceable at the surface over a length of 300 ft. Its width is about 20 ft.

South-West Outcrop.- This is similar to the last-named. Its length is some hundreds of feet and the width about 20 ft.

Central Balstrup Outcrop.- This is the outcrop cut through by the Comstock Trams. It seems to emerge from No 1 Flute Quarry, crosses the tramway west of the old Central Balstrup Shaft and continues down the hill until it hits the Balstrup Tear Fault where it ends. It has been penetrated by two adits driven by the Central Balstrup Coy. Its width is about 10 ft and the lineal extent is about 400 ft.

East Outcrop.- At the extreme eastern foot of Manganese Hill and just above Johnson's Flat is an outcrop which appears to be circular in area. The diameter would be about 50 ft.

(ii) Structure.- Even in the undisturbed outcrop there can be seen in most of the occurrences something in the nature of structure. In the western portion of the Crest Outcrop, the West Outcrop, the South-West Outcrop and the Central Balstrup Outcrop, this takes the form of a pseudo-cleavage. In the three former the direction of this

South Outcrop.— South of and below the Comstock Team in vicinity of Flume Quarries. About 20 feet wide with lineal direction roughly meridional of about 100 feet.

pseudo-cleavage is about 290°. In the Central Bolstrup Outcrop it is 315°.

In the Flux Quarry Outcrop the structure is visible in several places as distinct bedding, dipping at a high angle eastwards. The appearance is that of original beds which have been replaced by the iron and manganese oxides.

The outstanding characteristic of the material exposed in the open-cuts is the large-scale mammillary forms; botryoidal, reniform, and stalactitic forms are present in bewildering promiscuity.

(iii) Extent of Depth Testing.— Waller was clearly puzzled by these iron-manganese outcrops, and was well aware of the numerous disappointments which followed several attempts to explore them in depth. This is his summing up of the problem as he saw it:—

> "The presence of manganese in these outcrops, coupled with their great size, led to the belief that the bodies were of the same type as the great deposit at Broken Hill, and the highest expectations were indulged in as to the future of the mine. These expectations have unfortunately not been realised. It has been proved, for one thing, that the size of the gossan outcrops bears little relation to the size of the bodies a short distance below the surface. In other parts the fissure appears to have been enlarged near the surface and filled in with gossanous material. This is the more conceivable when it is remembered that the whole country is in a highly decomposed condition. The gossan is rocky poor, and of no value except as a flux." (4)

Waller, however, was definitely in error in referring to the Manganese Hill occurrences as gossan. Whatever it is, it is certainly not gossan. But, at the same time, Waller

(4) S.A. Waller 1904 p 78.

The former appear for the most part to be surface deposits of the nature of bog iron, and sometimes cut out on a flat floor 30 or 40 feet below the surface.

had differentiated between two types — bog iron and iron-manganese lode material.

The deepest depth testing of any outcrop is that which was accomplished by the East Adit. The Crest Outcrop at that depth was represented by a 'formation completely oxidised'. Apparently it was only a few feet in width. In view of the evidence in the dump of perfectly fresh undecomposed tuff, it is a reasonable assumption that the 'oxidised formation' was the iron-manganese material.

The Central Balstrup's adits penetrated the Central Balstrup Outcrop at 85 ft and 115 ft below the outcrop. Montgomery in 1893 sums up the results as follows:-

> "A great deal of driving and stenching has been done on this property on the lode, but only to find that it is thoroughly oxidised above the water-level" (5)

But Wilberton Tilley in describing the results in the No 2 Adit says:-

> "This is in over 150 ft, passing through lode matter most of the distance — gossan, ironstone and recessional bands of galena — giving small assays, the highest being 2 ozs Ag and 24 percent Pb." (6)

In the open-cuts the vertical exposures reach 30 feet and the same material is seen at the bottom of the cuts as in the upper portion.

(b) The Siderite Lodes.

The lode driven on at the West and Low Adit levels was a normal Zeehan siderite lode. It must be termed, following Waller, Balstrup's lode but at the same time it must be realised that it has a proved length of about 650 feet and not the extended length shown by Waller in his map of Zeehan. Neither are we justified in connecting the lode opened up by the Central Balstrup from the Main Shaft with Balstrup's lode. This was another error due to the 'lure of lode' obsession.

The width of Balstrup's lode was from 6 to 8 feet

(5) A Montgomery 1893 p 20.
(6) Wilberton Tilley "The Wild West of Tasmania, 1891, p 48

with a width of 15 feet at 245 feet east of where first cut. The orientation as far as driven on was 315°.

© The 'Pug'

This heading has been chosen with some hesitation. The occurrences to be described in Johnson's Flat are associated with black material (visible on the dumps) which has the general characteristics of the now well-known 'black pug'.

The only reference to these occurrences of ore is contained in Wilberton Tilleys "Wild West of Tasmania". Neither Montgomery nor Walker refer to it and there is no official record whatever. This is what Tilley says:-

> "A large and promising show of mundic and gossan, carrying carbonate of lead, which assayed 48 ozs Ag and 78 per cent Pb, is situated on the western side of the tramway on what is known as Johnson's Flat. A prospecting shaft has sunk 30 ft, with the object of opening out at this depth, but exceeding water put a temporary stop to operations. Trenches were cut near the shaft, and several very rich veins of sulphide ore discovered, having a tendency to make as sinking advanced; bulk assays gave 250 ozs to 300 ozs Ag and 56 to 85 per cent Pb. About 25 bags of first class ore are ready for shipment, and about 25 tons could be sent away if necessary." (7)

Subsequently Johnson's Flat was flooded for water storage purposes (The Florence Dam) and it is only recently that on the dam being emptied the old workings have become visible. An examination of the dumps shows slugs of galena exactly the same as in dumps of definitely recognisable pug elsewhere.

(7) Wilberton Tilley "Wild West of Tasmania" 1891 p 48.

(6) The Ore

(a) The Iron-Manganese Material.

(i) General Character.— The outcrops are black or reddish black in colour. As exposed in the open-cuts the colours range from black to brick-red and even bright red, with variations of brown to yellow.

The material is similar to that in the Austral Flux Quarries and is probably identical. It is of significance that the latter are demonstrably replacements of limestone.

Where cut in the South Adit the material shows a distinct tendency to silicification and is much harder than that in the open-cuts.

(ii) Constituent Minerals.— The obvious minerals are limonite, pyrolusite, psilomelane and kaolin. Some of the iron oxide is haematitic rather than limonitic. Quartz crystals occur in vughs in the material from the South Adit.

vughs

Waller's remark "the gossan is very poor" gives no indication of actual value although implying that it is not barren of lead or silver. The Zeehan Herald of 9th May 1892 in a report on the Balstrup's Manganese Hill says:-

> "Outcrop of iron stone lode being opened up, and good ironstone coming to hand. Assays from outcrop about usual average 2½ oz Ag per ton."

Nowhere however, is there any mention of Pb values in the ironstone from the quarries. This is in contrast to the output from the Austral Flux Quarries which averaged about 1½ oz Ag and 5 percent Pb. But Wilberton Tilley in describing the work on Balstrup's lode in the Balstrup Central states that No 1 Tunnel driven in the lode gave 'assays of small percentages of silver and lead'. In the drive on the lode from No 2 Tunnel he mentions 'gossan, ironstone and occasional bands of galena'. This probably has significance as the outcrop of the Balstrup lode is typical iron-manganese material.

Another obscure point is as to whether all the iron-manganese outcrops carry silver values.

Apparently no attempt was made in the past to differentiate between the various outcrops — it was all 'ironstone'. Does the outcrop on the top of Manganese Hill carry silver values? Is the silver confined to the 'ironstone' which is a replacement of limestone?

Another question naturally follows — in what form does the silver occur? As a matter of fact the same question applies to the ore obtained in No 1 Bore at the Oceana in regard to lead (galena) and silver. There is no obvious presence of either galena or sphalerite. That question still remains unanswered. Similarly the ore in the Austral Flux Quarries shows no visible galena. How / do the lead & silver occur?

There still remains the absence of understanding of the kinds of galena encountered in the Central Balstrup workings. Actually these workings are the deepest under any iron-manganese outcrop. Does this mean that at that depth the oxide mineralisation is changing to sulphides?

(b) The Siderite Ore.

(i) Character of Lode Material. —

As far as can be seen from an examination of the few specimens in the old dump, the lode material is normal Zectan siderite-galena. The carbonate is mangano-siderite. On the evidence of these specimens there seems no justification for the oft-repeated statement that all lodes in the Manganese Hill workings are 'completely oxidised'; the galena is galena and the siderite still siderite. Have the iron-manganese occurrences confused the judgment of past observers? Apparently they did not recognise the fact that the iron-manganese oxides do not constitute a gossan, for whatever it is, it is certainly not a gossan.

(ii) Constituent Minerals. — Galena and siderite of course with most probably subordinate sphalerite. But silver chloride or silver chlorobromide (embolite) is reported as having been obtained in some quantity

from the West Adit and Low Adit workings. It is uncertain whether this came from the sulphide lode or from the iron-manganese formation. But such silver chloride was not unusual at Zeehan. Thus the Queen, Sylvester & Junction mines produced it in some quantity.

Nevertheless the Balstrup lode carried high silver values as indicated by the following assays quoted by Wilberton Tilley:-

	Pb %	Ag oz/s
Canary Ore	59	838
Gossan	27	830
Galena	76	190
(b) Ironstone & Galena (Bulk)		119

The Z T D Herald of 14th August 1891 gives the following assays of three piles of ore totalling 80 tons

	Pb %	Ag oz/s
Carbonate & Galena	40	113
Galena	70	174
Gossan with Canary Ore	20	39.

The same source on 9th December 1891 gives:-

	Pb %	Ag oz/s
Galena	77	352-455
Carbonate & Oxide of Lead	72	115
Ironstone	31	78

(c) The 'Pug' Material.

There is not much of this material exposed on Johnson's Flat, but what there is shows the general characteristics of the black pug occurrences of the Zeehan district. Slugs of galena can be picked up on the dumps.

(7) Mine Workings.

(a) Shafts.

The Balstrup's Margaret Hill Shaft is down 154 feet, which is 60 feet below the Low Adit. A crosscut was put out westwards to cut the lode. What was encountered there is not recorded, but the Company ceased operations just at that stage. The collar of the shaft is open.

The Balstrup's Central Shaft is 99 feet deep. At 85 ft it connects with No 1 Tunnel. The collar has collapsed.

The Air Shaft put up from West Adit seems to have

disappeared.

(b) Adits.

Although Manganese Hill lends itself 'par excellence' as a proposition for adit exploration, it cannot be said that any approach to thorough testing has been achieved.

East Adit was driven 1100 feet and got as far as under the crest of the Hill. The West Adit was driven 950 feet. Low Adit reached 850 feet from the portal.

Central Balstrup No1 Adit measured 185 feet. The No2 Adit was 900 feet in length.

(16) The length of South Adit is unknown. Another adit high up the north-western slope of Manganese Hill is of unknown length, but is apparently quite short.

(c) Open-Cuts.

The three open-cuts are on the south side of Manganese Hill. They are quarries approached uphill from the Comstock Tram.

No1 Quarry measures about 50 ft by 20 ft. No2 Quarry somewhat higher up the hill is about 30 ft by 20 ft. No3 Quarry adjoins No2 and is four feet higher. It measures about 40 ft by 20 ft.

(8) Discussion of Possibilities

Montgomery in 1893 expressed the following opinion on the prospects of Manganese Hill:-

"Two long tunnels have been driven on the lode above water-level with the effect of showing that it is a well-defined vein up to 12 feet and more feet in width in parts, but consisting almost entirely of oxidised material. In several places rich oxidised lead ores were found carrying chloride of silver, but always going underfoot and not rising above the tunnels, and it became clear that there was no use expecting any quantity of ore until greater depth

The Shaft in Johnson's Flat was sunk to only 30 feet.

disappeared.

(b) Adits.

Although [illegible] excellence as a propos[ition] be said that any ap[preciable] achieved.

East Adit [illegible] under the crest of [the] 950 feet. Low Adi[t]

Central Bolot[ov] No 2 Adit was 900 [feet]

(b) The length of [the] adit high up the [Bolotov] Hill is unknown.

(c) Open-Cuts

The thr[ee] of Margarese Hill [are] uphill from the [Adits]

No 1 Quarry [is] somewhat [less] 20 ft. No 3 Quarry [is] higher. It measu[res]

(8) Discussion of [the] Montgomery [Report] opinion on the pro[perties]

"Tw[o] Me[n] of[fer] def[ine] fe[et] dim[ensions] In s[ome] or[e] sil[ver] not [ex]tra[cted] any[where]

was attained and the lode was struck below the zone of oxidation. But by the time this work was done the shareholders had lost faith in the mine and the Company went into liquidation, with the result that the British Zeehan Coy bought the lease of this section. I still have much faith in the future of this mine, the work done having proved nothing to its detriment, and given many indications of its probably carrying good ore below the gossan." ⑧

When it is pointed out that the British Zeehan Coy did absolutely nothing to add to the work of the original Company, it will be realised that Montgomery's opinion still stands untested.

Waller in 1904 states of the Balstrup Lode:-

"Still, the lode can hardly be said to have had a fair trial below water-level. It is still possible that rich shoots of ore may exist below the gossan"

(17) But, as previously printed out, Waller had confused the iron-manganese material with the gossan.

It seems quite clear that a length of siderite lode of from 600 to 800 feet remains untested below Low Level Adit.

The iron-manganese outcrops present a very interesting problem. Along with the similar material at the Austral these occurrences still remain untested and unexplained. I have no doubt at all that the Austral occurrence is replaced limestone, and the small piece of core plus sludge sample results indicate that underneath is silicified limestone carrying galena and sphalerite. The silver assays of the Manganese Hill Flux Quarries are significant and cannot be ignored. What is underneath?

It must be accepted that the East Adit has disposed of the persistence in depth downwards of the Crest Outcrop. But this immediately raises the question as to

⑧ A Montgomery "Rept on Minerals Field of Montagu" 1893 p. 19.

whether all the outcrops are genetically similar. The undoubted bedding in evidence in the Flux Quarries, taken in conjunction with the interpretation of geologic structure which brings limestone into that section of Manganese Hill, would place these occurrences in a different category from the Crest, West, and South-West Outcrops. These latter lie in fault zones and could possibly be explained by migration of the solutions away from their main ~~most favourable place~~ locus with other sporadic or zonal deposition. Attention, therefore, becomes concentrated on the Quarry, East, and Central Balstrup Outcrops, accentuated by the occurrence of galena in the lower levels of the latter. There must also be added to such a contemplation the realisation that extensions of the outcrops possibly occur under the talus accumulations.

There is in fact an area in this south-eastern section of Manganese Hill, rhomboidal in shape measuring 800 feet in a 330° direction and 600 feet at right angles thereto, which carries possibilities which cannot be ignored. Replacements in limestone are the objectives to be sought. The area demanding attention is bounded on the north by the Manganese Tear Fault, on the south by the Balstrup Tear Fault, on the west by the Waller Fault and on the east by the outcrop line of the base of the Crotty Sandstones.

There is in addition the Johnson's Flat area which is awaiting the attention it ceased to receive nearly 60 years ago. Good results were obtained down to 30 feet when water took charge. The occurrences are most probably in the calcareous shales constituting the upper portion of the limestone formation. The area to be explored is triangular in shape, with the base of 800 feet length along the Waller Fault, and height 1200 ft along the Manganese Tear Fault; the hypotenuse is formed by the western foot of Goode's Hill.

(9) Recommendations.

At this stage a reminder is opportune in regard

to the sketch character of the plan accompanying this report. It is fundamentally based on Dr Blatchford's map which, however, only covers portion of the area. Additions have been based on the 400 ft to the inch enlargement of Professor Carey's photo-geological map. In the absence of surveys, which have been delayed because of urgent demands elsewhere at Zeehan, many points have been placed in their approximate position. It would be best to regard this plan as a nucleus for a more accurate plan to be prepared when surveys have been made. The following call for accurate location:-

1. Positions of Balstrup Central Shaft and No's 1 & 2 Adits.
2. Precise mapping of the Balstrup Tear Fault
3. The position of the Waller Fault south of the Comstock Tram.
4. The exact positions and outlines of the Flux Quarries
5. Precise mapping of the Keratophyre Tuffs — Rubicena Quartzites faulted contact on South side of the No 2 Argent workings
6. Exact position and orientation of the West and South-West Outcrops.

(19) Further work is also needed to check up on the true geological horizon of the Sand Quarry sandstones and the beds on Goodes Hill and Johnsons Flat. Palaeontological study seems to be the modus operandi.

All these things should be done before attempting to test the possibilities. It is unfortunate that the West and East Adits are so far away from the area to be tested. The ends of these adits are 1200 to 1400 feet distant from the Flux Quarries. But the nearest point of the limestone abutting on the Margaret Tear Fault is within 700 feet of the end of East Adit. It may be a possible method of approach to the testing to open-up East Adit. This would involve breaking down the concrete dam at the portal. It is quite possible that the adit is in good condition.

It would be informative and feasible to open up both No 1 Adit & No 2 Adit of the Balstrup Central to see just what the lode structure and composition is as.

The crux of the testing problem is of course penetration ~~of the depth phase~~ of the Flux Quarry bodies. Depressed holes directed northwards from below the Comstock Tram seem feasible. It would be as well to make sure that the collars of such holes were north of the Balstrup Fault. Alternatively, vertical holes could be put down from the Quarries.

In the meantime systematic sampling of all the iron-manganese outcrops and the assaying of the samples for Pb + Ag are needed. This should include a similar attack on the Austral Flux Quarries. A mineragraphic study would surely throw some light on this exasperating mystery. This could be handed as a problem to a University student for concentrated study.

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9th September 1949.