



A literature review relating to groundwater conditions at the Beaconsfield Gold Mine.

by B. D. WELDON

At the request of Beaconsfield Operations Pty Ltd, the Department of Mines has undertaken a review of literature and old mine plans relating to the groundwater conditions of the Tasmania Gold Mine at Beaconsfield.

This review has led to the production of:-

Appendix A, a lever arch file containing photocopies of "definitive" reports concerning the hydro-geological conditions at the mine. This has already been delivered to the project manager Mr J. Luxford.

Appendix B, a lever arch file containing photocopies of "operational" reports concerning the hydro-geological conditions at the mine.

Appendix C, a series of plans at approximately 1:2000 scale depicting year by year mining activity. These have been developed from a water-coloured wall hanging and pencil line drawings of the mine workings. The original colours have deteriorated with time, and several colours were used in close succession. Every care has been taken in interpreting these plans, and where uncertainties could not be resolved by cross-referencing to the Mine Superintendents half-yearly or annual reports, the mined blocks have not been included.

The plans have marked on them the "water bursts" as recorded by Ireland (1981). On the facing page is a summary of the half yearly or annual reports of the Mine Superintendent and comments relating to the groundwater conditions of the mine as reported in the Launceston *Examiner* newspaper. From these descriptions it is seen that some of the "water bursts" are instances where a level was allowed to drain, probably as a result of an increase in water which had to be regulated. This was done by closing the floodgates and regulating the flow of water to the pumps by valves contained within the floodgate structure.

Appendix D, a collection of data relating to mine development and pumping/recharge rates.

In reviewing the literature several themes become apparent.

WET MINE

The Tasmania Gold Mine was a wet mine in which groundwater was a continual problem. Water bursts were expected, and the Mine Superintendent's reports make many references to these and to the fact that a particular level was being left to drain. The water bursts were particularly troublesome in the west end of the mine in what were termed the "wet beds". Above the 1100' level, it was usual to "cut" the water at three successive points as the level was advanced west. At the 1100' and 1250' levels, the water was "cut" in one place. This was attributed to the lode being softer and

containing no hard bars. There was no increase in the total water to be pumped per foot of depth, only a more rapid drainage of the lode channel. Below the 1250' level, the levels apparently were not advanced to the so called "wet beds", and development of these levels was most vigorous in the east. However at the 1500' level, there was a considerable delay to development caused by a heavy inflow of water. This was attributed to the strata taking a flatter dip, thus bringing the "wet beds" into close proximity with Grubb shaft much sooner than was expected.

MINE DEVELOPMENT

The mine was developed by sinking shafts successively located to the south-east. These were located to place the shaft in close proximity to the reef at the new levels to be developed. At the required depth, cross-cuts to the lode were commenced and within these a floodgate would be constructed. These were substantial constructions of timber and brickwork well cemented in, with iron doors to shut up the chief body of water from the shaft when required to do so. Valves apparently were an integral part of this construction and were used to regulate the flow of water to the capacity of the pumps. Pump chambers were also excavated, and when the pumps were connected the cross-cut would be driven to the lode until the water was "cut". The floodgates would then be closed and the level allowed to drain. Several levels were prepared ahead of the current mining activities in this manner. There are several reports that when the water was "cut" in a deeper level, the water would be taken off higher levels where it had previously been troublesome.

HYDROLOGICAL CONNECTIVITY

The fractured nature of the ground was recognised early in the development of the Beaconsfield goldfield.

Thureau in 1883 wrote:-

"Taking the Tasmania Gold Mining Company's lode, ... it was found afterwards that the upper portion of that lode, down to about the 200' level, were of an abnormally disordered and fragmentary character ... the veinstone occurs embedded between the walls in a black carbonaceous substance in a partly disjointed state evidencing much local disturbance since the lode had first been formed.

... at the lower levels the lode appears to become more regular ...

In No 2 adit level the reef was found to occur in a peculiar form ... because, owing to the occurrence of a "fault", the reef is not only displaced from south to north, but there has also been a "downthrow" to the north at the same time,

and a "folding back" by means of which the acute angle with which the eastern stone meets the "fault" is reversed hitherto by the mining oblique one. In all these cases of "faults" numbering, as far as observed hitherto by the mining manager, considerable over 20, the displacements from east to west have been to the north, so that, as each block was displaced, its footwall became the hanging wall of the next block, and so on, except one—the "Main Cross-course"—which throws or faults the lode to the south. To be more explicit as to the great irregularities occurring on this line of the reef, and which repeat themselves from level to level, it may be stated that to the east of that cross-course, which throws the lode out of its course for a distance exceeding 250', the country is soft, whilst to the west it is composed of hard, dense, black, contorted rock, with cuperiferous stains on the joints, thus proving the downthrow. The cross-course itself is of but very inconsiderable width; its western wall is smooth and striated, indicating the direction of the displacement; the eastern wall is soft, brittle and short-jointed, evidently the result of frictional heat."

Inference:

- (i) the upper 200' is more conductive of water (i.e. higher transmissivity) than the ground below that level.
- (ii) The ground to the east of the cross-course is soft. Hard bars which could act as barriers to water movement are not mentioned but if present could cause a build up of hydrostatic head and thus water bursts.

Robertson (1887), in a report to the Manager of the Tasmania Quartz Crushing and Gold Mining Company, wrote:—

"The pitch of the slates or country rocks is southeast (the inclination of the beds being about equal to the eastern slope of Cabbage Tree Range), the reef where it follows its normal course (that at which it is richest), is transverse to the bedding of the country. It then follows that, in opening up or following the course of the reef, every foot of ground driven in exposes new beds and opens up new country, and increases the drainage area. This is somewhat unusual and unfortunate. To this circumstance the open character of the bedding places - the fissures, vughs cavities - that exist in the strata, the very large amount of water raised by the united mines referred to, may be referred. The upturned edges of the strata running in the line of the top and sides of the range, and overlaid with open, pebbly conglomerate, or porous debris, offers a catchment for water, and permits it to percolate from the surface into the open beds, and thence into the mines.

The lenticular or irregular deposits of limestone occurring in broken and open strata have become corroded and worn away by the evolution of carbonic acid gas, and these, covered by a thin coating of surface, may be regarded as so many reservoirs of unknown capacity or extent, kept full by the freedom and rapidity with which surface water passes or into the open joints and fissures in the shales. When these, or the fissures or open beds that communicates into these, are tapped by your workings, the pent-up waters are suddenly relieved, and a burst of water is the result. In cases where a fissure is tapped that communicates with a distant supply, the rush of water is maintained for a considerable period. The enormous feeder that you have tapped in the lower level (No 5) of the Tasmania Mine at a point 285 ft west of the shaft and east of the "cross course", or "slip", or "heave", may probably be referred to the last named cause. The stratification of the country being so open causes the growth of water to follow the progress of the sinking operations, descending to deeper levels as they are

opened up. When mining operations first followed the reef westwards, the strata gave off water from the sides. For some time, however, the growth of water from the north side of your drives had diminished, and has now altogether ceased. Shafts sunk fully a mile to the north and northwest, and formerly abandoned on account of the influx of water, are now dry, proving that the reef and the open strata in that direction have sufficiently acted as conductors - that your pumps have drained and now drain, the whole of the strata in that direction. The strata to the west of the great "heave", or "cross-course", is much tighter, and passes less water than that to the east of that disturbance.

A long the base of Cabbage Tree Range, and to the south, there is a perceptible surface depression that probably marks the course of the ancient channel referred to. This depression increases to the south. South of the Lefroy shaft the surface waters are collected into a little rivulet (following the course of the ground) that flows in that direction. This stream represents the drainage from the eastern slopes of Cabbage Tree Range, as well as from the area between that range and the low ridge on which the new road to Launceston has been formed. In its course are a few water-holes, which I think have been artificially formed, and appear to be shallow. About 1 mile south of the Lefroy shaft the surface depression widens into a valley or flat and across this Blyth's Creek flows, following a somewhat circuitous course. In the centre of this flat or valley is a large water-hole about 35 feet deep and about 50 yards across. About 100 yards or so nearer to Blyth's Creek is a similar hole of smaller area. Across the creek (south) are a number of depressions of limited length, the first two represent the sites where deposits of limestone have been worked for a period of 35 years. These quarries have been disused, and up to 2 1/2 years ago they remained continually full of water.

At some remote period a canal has been cut from Blyth's Creek to No. 1, or the largest quarry hole, and in the opposite side an outlet or bye wash has been cut. The small rivulet that carries the drainage from the valley flows into this canal, and from thence into No. 1 hole. For the period of 35 years the surface drainage kept this hole full, and the surplus flowed out by the bye-wash and found its way into the creek at a lower level. No. 2 hole has no connection with the creek, and in former times the soakage into this lime quarry was removed by "force pumps" about 7 inches diameter. It would appear that when pumping operations were commenced in the Lefroy shaft, and the upper mines had began to sink to lower levels, that the water suddenly disappeared from these large holes. After heavy rainfalls the creek rises and a large stream of water passes through the canal, and from thence into the large or No. 1 hole, and fills it. The streamlet at all times pours itself into the cavity. Within the past year or so, since attention has been directed to the disappearance of these reservoirs of water, it has been found that the outflow of water was less than the supply. At the date of my visit a strong stream of water was running into this hole from the rivulet. No water was passing away, and yet the level of water of the reservoir was being steadily lowered fully 4 inches per day. At the date of my visit No. 2 hole was all but dry, although it was full only a day or so previously.

To the south of the creek are a few depressions where smaller lodes of limestone has been worked, or where the surface has fallen in, revealing cavities of some extent. Into these depressions the surface drainage and storm waters flow, and we are informed that, although a large stream during a recent storm flowed into these, it instantly disappeared. A lime quarry (No. 3) contiguous to the

creek was full of water, but it is probably that as yet no connection has been found here to permit of the water disappearing or finding its way into the strata.

The amount of water raised from the mines bears a direct relation to the rainfall. It is probable that the through drainage of the "gutter" or ancient channel by the Lefroy shaft has tapped the surface water referred to. By far the heaviest feeder of water issues from the lowest drive of the Tasmania Mine from a large crevice in the south wall, where the bedding planes are open. At a point 285 feet west of the shaft, there is a steady rush of water, and evidently represents an extensive drainage area. The water is fresh, and has no smell - it has all the appearance of passing directly from the surface to the point of the mine from whence it issues.

The manager, who naturally is much concerned at the ever-increasing water supply and the serious difficulty connected with future operations for unwatering your mines, is suspicious that this burst of water emanates from, or is derived from, Blyth's Creek, the water finding access along some open bed or joint. This may be so, but there is nothing improbable in its having a more distant origin."

Inference:

- (i) Shafts sunk a mile to the north and northwest which were once troubled by a water influx became dry after concerted pumping by the mines. The northern boundary of previous groundwater models would appear to be invalidated by this information.
- (ii) Country to the west of the cross-course is tighter and passes less water than the country east of the cross-course.
- (iii) There is a direct connection from the old lime workings to the groundwater regime.
- (iv) Blyth's Creek is a leakage path.
- (v) Water at the No 5 level in the Tasmania was issuing from the south wall, i.e. from the country rock.

Montgomery in 1891 wrote:-

"The strata are very loose and open, and water gets through them freely. This was shown by the diamond drill bores both of the Phoenix and East Tasmania Companies; in neither case could the bore be kept full of water, even when tubed to the bottom with iron tubes; this, too, when the bottom of the bores was 200 and even 400' below the level of the water in the Tasmania mine. Another proof of the porous nature of the country is seen in the fact that there is rarely any water in the bottoms of the Moonlight, West Tasmania, and Little Wonder shafts, though these are all a long way below sea level. During the recent flooding of the Tasmania mine, however, water rose in the Moonlight shaft and remained until the former was unwatered, when it drained out of the latter also. If water can communicate so easily through the rocks with points so distant from the Tasmania mine as the East Tasmania bore and the Moonlight shaft, it seems incredible that it would not get from the Tasmania into the Phoenix mine, on the same reef and closely contiguous."

Inference:

- (i) The ground through which the Phoenix Companies bore was passing was obviously not saturated but open fractures must have been present to cause the water losses.

- (ii) Hydrological connectivity exists between the Tasmania Mine and the Moonlight, West Tasmania and Little Wonder shafts.

Twelvetrees (1903a) wrote concerning the prospects of the East Tasmania Company:-

"A consideration of the state of things in the eastern workings of the Tasmania mine will help us ...

The 700' level is the one which has been driven furthest east.

At 66' behind the face the level entered limestone, which continues to the end ... Behind the limestone, conformable with it and underlying it, the level passed through a bed of dense, tenacious clay, about 36.25' thick in the drive, equal to a true thickness of 32.5' (about). This clay band is known as "the dyke". Westwards it merges gradually into a zone of what can best be described by the term "broken formation", or "broken country". This consists of sandy material showing lines of false deposition, and containing angular fragments of sandstone, giving place to the west to more solid remnants of rock, and conveying the impression of shattering and disintegration in situ. Hard blocks of sandstone are met with, having the sandy material between them, for a length of about 60'. It is noteworthy that the reef in this section of the level became irregular, splitting and jumping up and down. The reef tails out just where the broken formation begins; its track goes into the broken for a little way and then disappears.

In the level above the 600', the reef behaves in the same way when the broken country is entered. The end in that level does not go far enough east to reach the clay "dyke". It has been driven parallel with the country in the sandy broken formation to provide filling for the stopes, and consequently does not enter the limestone.

The alluvial gutter, which was entered in the upper levels of the mine, does not descend to this depth; the broken formation is in situ, and not alluvial."

Inference:

- (i) The eastern end of the Tasmania mine contains broken ground which probably has a relatively high transmissivity.
- (ii) The broken country passes into a clay "dyke" which could act locally as a barrier to water movement between the limestone and the broken country.

Twelvetrees (1903b) writes:-

"Much of the country driven through is open and fissured, affording numerous channels for the passage of water, which flows into the levels by tricklings, or even strong gushes, as driving on the reef proceeds. As the reef traverses the strata, it naturally collects the water along its walls, and often receives it into friable or fissured portions of its own substance. The tighter parts of the reef and strata hold back the water till it is suddenly released by driving, and sometimes with inconvenient results. A good deal of the water may have found its way thither from the main cross-course, which in its turn received it from the limestone beds at each end of the mine.

... The Tasmania water-logged strata may be regarded as a channel of rather open country, running north-west and south-east, flanked by a highly permeable broken

sandstone and limestone belt on the east, and less pervious slates on the west."

Inference:

- (i) The reef is not always water tight and in places is a good conduit of water.
- (ii) The country contains tighter (? harder) strata which may act as a barrier to the flow of water, causing locally high hydrostatic heads which may be relieved by water bursts.

The mine superintendent, in his report to the fourth Ordinary General Meeting of the Tasmania Gold Mining Company Limited, states in relationship to the flooding in June 1906:-

"Nearly all the flow of water to the mine from the quarries comes in by the sandstone beds in the west end (the beds that are always wettest). To the south of the lode there must be an open fault channel connecting the limestone with these beds."

Inference:

There is very good hydrological connectivity between the limestone country in the east and the "wet beds" in the western part of the mine, as the water made its presence felt within 24 hours of Blyth's Creek overflowing its banks.

Cundy and Fawcett (1914) wrote:-

"The beds of sandstones and grits cut through by the reef vary in composition in that some are fairly hard and impervious while others are comparatively soft and porous, forming channels for the underground waters.

These latter are the so-called "wet strata" through which most of the water comes into the mine workings.

The reef itself in this mine is not the water channel (a fact which we desire to emphasize) though where the roof is a bit more open and fissured than usual there would be some flow of water into the advancing level, before the wet stratum was cut.

As these [wet] strata are cut when driving along the reef, heavy bursts of water occur, to control which it has been found necessary to fix concrete dams in the main cross-cuts near the shafts at each level, so that the flow of water to the pumps can be regulated to the capacity of the pumps until that particular wet stratum has been drained and driving can be proceeded with. Apart from the coming water or daily flow, there is a reservoir of stored water in the country which has to be pumped. The west end, i.e., west of the main cross-cuts from Grubb and Hart shafts, is the wet part of the mine in which most of the wet strata are met."

Inference:

- (i) The "wet beds" west of the Hart and Grubb shafts are a problem source of water.

VOLUME OF WATER AVAILABLE

The mined out areas can be conceptualized as a gravel deposit which is saturated below the water table. As such the transmissivity in these materials will be infinite. Some idea of the quantity of water stored in the mined out areas and taken back into storage of the country rock can be gained from examining the pumping rates at the end of the mine and the

observation on water levels in the shaft and the limestone pits adjacent the town.

At the end of the mine, the pumps were raising about 90 l/s of water. The pump rate was gradually declining and flattening off. Very little development had been undertaken for several years so that this figure can be taken as a conservative value for the mid-term recharge.

Hudson (1923) reports that on the 2nd April 1923 the water in Hart shaft was at a level of 215 m (a recovery of 212 m). Applying the mid-term recharge rate of 90 L/s to the period from when the pumps ceased on 25th November 1914 (3050 days), the quantity of water which could have flowed into the mine and surrounding country is calculated at 23 717 Million litres.

A local resident reported that the limestone pits again held water in 1938. These pits are about 30 m below the level of Hart shaft collar and using the mid-term recharge rate of 90 L/s the quantity of water which could have flowed into the mine and surrounding country is given in Table 1. Also shown in the Table are figures for discounting the final pump rate by 25%.

Table 1. RECOVERY AT HART SHAFT

Date	Water depth Hart shaft (m)	Recovery (m)	Days Elapsed	Quantity of water at 100% 75%	
				of final pump rate	
25-Nov-1914	426	0	0	0	0
02-Apr-1923	215	212	3050	23 717	17 788
03-Jan-1938	30	396	8440	65 629	49 222
02-Jun-1938	30	396	8590	66 796	50 597
19-Dec-1938	30	396	8790	68 351	51 263

The final pump figure of about 90 L/s is low in relation to observations made by Frecheville (1905) who states:-

"...about 3 Mg/day [157 L/s] were being pumped, and ... water in the mine was only being very slightly lowered below the 900' [274 m] level, this quantity ... may therefore be regarded as approximately the amount of "coming water" ... as distinguished from accumulations which may be lying in the cavities of the rocks, and in the porous strata.

When all development work was stopped the quantity of water fell off to about 2.75 Mg/day [144 L/s], but as soon as driving in the bottom levels was resumed there was an immediate increase."

It could be speculated that the recharge rate reported by Frecheville indicates a higher transmissivity zone, but it is more likely that the recharge rate reported is a very short-term one and as such should be discounted.

The figure of 90 L/s is conservative in relation to the recharge rate established by the current work at the mine (70 L/s).

CONCLUSIONS

It is considered that the volume of water readily available to the mine system is in the order of 65,000,000,000 litres. As previously mentioned, the mined out areas are conceptualized as a gravel deposit through which the water may readily flow. Water has already been withdrawn from the country rock once and has since been replaced. Any hard bars which may cause a build up of hydrostatic head have been cut through by the mine workings and these are no longer impediments to drainage.

The rate at which the mine is dewatered is a commercial decision. On top of the quantity of water readily available from the mined out areas and the adjacent country rocks, it would appear that 70 L/s of recharge water must also be pumped. Of course, a too high a rate of dewatering may cause

compaction of the stope infill with subsequent subsidence at the surface.

[22 December 1988]

APPENDIX A

Photocopies of 'definitive' reports concerning the Tasmania Gold Mine at Beaconsfield, presented to Beaconsfield Gold Mine in a lever arch file 5th December 1988. The reports are arranged in the file in descending date order as listed here.

AUSTRALIAN GROUNDWATER CONSULTANTS PTY. LTD., 1982. *Hart Shaft Dewatering Review, Beaconsfield* [for AMAX Australia Ltd.]

IRELAND, S. D., 1981. *Tasmania Gold Mine - Water*. Precis of extracts from the Launceston 'Examiner' dealing with water inflow control at the Tasmania Gold Mine.

AUSTRALIAN GROUNDWATER CONSULTANTS PTY. LTD. 1980. *Tasmania Gold Mine Dewatering, Beaconsfield, Tasmania. Geophysical Programme Results* [for AMAX Minerals Exploration (Australia) Inc.].

AUSTRALIAN GROUNDWATER CONSULTANTS PTY LTD, 1980. *Tasmania Gold Mine Dewatering, Beaconsfield, Tasmania. Report on detailed literature and data search relevant to water inflow.* [for AMAX Minerals Exploration (Australia) Inc.].

AUSTRALIAN GROUNDWATER CONSULTANTS PTY LTD, 1979. *Hydrogeological appraisal in relation to reopening the Tasmania Gold Mine, Beaconsfield Tasmania.* [for Allstates Exploration N.L.]

NOLDART, A. J. 1967. Exploratory diamond drilling, Tasmania Gold Mine, Beaconsfield Goldfield. *Tech. Rep. Dep. Mines Tasm.* 12:27-36

NOLDART, A. J. 1963. Notes on auriferous deposits, Beaconsfield Goldfield. *Tech. Rep. Dep. Mines Tasm.* 8: 11-22.

HUDSON, J. O. 1923. Tasmania Gold Mine, Beaconsfield. *Rep. geol. Surv. Tasm.* 107-115.

CUNDY, W. H.; FAWCETT, L. 1914. Tasmania Gold Mine, Beaconsfield. *Rep. geol. Surv. Tasm.* 152-176.

LEWELLYN, A. 1914. *Report to John Taylor & Sons, Managing and Consulting Engineers to the Tasmania Gold Mine Ltd.*

FRECHEVILLE, Wm. 1905. *Report to the Directors of the Tasmania Gold Mining Company Ltd.*

TWELVETREES, W. H. 1903. Report upon the present position of the Tasmania Mine, Beaconsfield. *Rep. Dep. Mines Tasm.* Old Series 205

TWELVETREES, W. H. 1903. Report on the mineral resources of the Districts of Beaconsfield and Salisbury. *Rep. Dep. Mines Tasm.* Old Series 204

TWELVETREES, W. H. 1902. Report on deep-sinking at the Moonlight-Cum-Wonder gold mine, Beaconsfield. *Rep. Dep. Mines Tasm.* Old Series 191

HARCOURT-SMITH, J. 1896. The Mineral Industry of Tasmania. *Rep. Dep. Mines Tasm.* Old Series 125

MONTGOMERY, A. 1894. The Mineral Resources of Tasmania. *Rep. Dep. Mines Tasm.* Old Series 178B

MONTGOMERY, A. 1891. Report on the Geological Structure of the Beaconsfield Goldfield. *Rep. Dep. Mines Tasm.* Old Series 85

ROBERTSON, J. 1887. *Report to the Manager of the Tasmania Quartz Crushing and Gold Mining Company Registered.*

THUREAU, G. 1883. Report on the Future Prospects as Regards Productiveness and Permanency of the Beaconsfield and Salisbury Mining Districts. *Rep. Dep. Mines Tasm.* Old Series 40

GOULD, C. 1866. Geological Surveyors Report of the Country near Ilfracombe, in the West Tamar District. *Rep. Dep. Mines Tasm.* Old Series 16

APPENDIX B

Photocopies of 'operational' reports concerning the Tasmania Gold Mine at Beaconsfield. The reports are presented in a lever arch file in descending date order as listed here.

Secretary of Mines Report Tasmania 1915 [for year ended 31st Dec. 1915].

Secretary of Mines Report Tasmania 1914 [for year ended 31st Dec. 1914].

Secretary of Mines Report Tasmania 1913 [for year ended 31st Dec. 1913].

Third Ordinary General Meeting of the Tasmania Gold Mine, March 1914 [for year ended 30th September, 1913].

Secretary of Mines Report Tasmania 1912 [for year ended 31st Dec. 1912].

Secretary of Mines Report Tasmania 1911 [for year ended 31st Dec. 1911].

Secretary of Mines Report Tasmania 1910 [for year ended 31st Dec. 1910].

Secretary of Mines Report Tasmania 1909 [for year ended 31st Dec. 1909].

Seventh Ordinary General Meeting of the Tasmania Gold Mining Company Limited, February 1910 [for period ended 30th September, 1909].

Secretary of Mines Report Tasmania 1908 [for year ended 31st Dec. 1908].

Secretary of Mines Report Tasmania 1907 [for year ended 31st Dec. 1907].

Fifth Ordinary General Meeting of the Tasmania Gold Mining Company Limited, January 1908 [for year ending 30th September 1907].

Secretary of Mines Report Tasmania 1906 [for year ended 31st Dec. 1906].

Fourth Ordinary General Meeting of the Tasmania Gold Mining Company Limited, January 1906 [for year ending 30th September 1906].

Secretary of Mines Report Tasmania 1905 [for year ended 31st Dec. 1905].

Third Ordinary General Meeting of the Tasmania Gold Mining Company Limited, February 1906 [for year ending 30th September 1905].

Secretary of Mines Report Tasmania 1904 [for year ended 31st Dec. 1904].

Second Ordinary General Meeting of the Tasmania Gold Mining Company Limited, February 1905 [for period 4th June, 1903, to 30th September 1904].

Secretary of Mines Report Tasmania 1902-03

Secretary of Mines Report Tasmania 1899-1900.

Secretary of Mines Report Tasmania 1898-9.

Secretary of Mines Report Tasmania 1897-8.

Secretary of Mines Report Tasmania 1896-7.

Secretary of Mines Report Tasmania 1895-6.

Secretary of Mines Report Tasmania 1894-5.

Secretary of Mines Report Tasmania 1893-4.

Secretary of Mines Report Tasmania 1892-3.

Secretary of Mines Report Tasmania 1891-2.

Secretary of Mines Report Tasmania 1890-91.

Secretary of Mines Report Tasmania 1889-90.

Secretary of Mines Report Tasmania 1888-89.

Secretary of Mines Report Tasmania 1887-8.

Secretary of Mines Report Tasmania 1886-7.

Secretary of Mines Report Tasmania 1885.

Secretary of Mines Report Tasmania 1884.

Secretary of Mines Report Tasmania 1883.

APPENDIX D

Various miscellaneous data relating to mine development and pumping rates

Twelvetreets 1903

Average pumping rate	3 million gallons/day	13.64 million litres/day
Pumping period	9 years	9 years
Volume pumped	9834.75 million gallons total	44 708.77 million litres total
Drawdown achieved	225 feet	68.58 m
Drawdown rate	43.71 million gallons/ft drawdown	651.92 million litres/m drawdown

Frecheville 1905

		Million gallons/day	Million litres/day	L/s
6 month pumping period ending	27 December 1902	3.500	15.91	184.16
	30 June 1903	3.072	13.97	161.64
	26 December 1903	3.266	14.85	171.84
	25 June 1904	2.721	12.37	143.17

... about 3 million gallons/day [13.64 million litres/day or 158 L/s] were being pumped, and ... water in the mine was only being very slightly lowered below the 900' [274.32 m] level, this quantity ... may therefore be regarded as approximately the amount of "coming water" ... as distinguished from accumulations which may be lying in the cavities of the rocks, and in the porous strata.

When all development work was stopped the quantity of water fell off to about 2.75 million gallons/day [12.50 million litres/day or 145 L/s], but as soon as driving in the bottom levels was resumed there was an immediate increase.

On one occasion an apparent loss of 165,000 gallons [750,000 litres] per 24 hours, and on another occasion of about 250,000 gallons [1.14 million litres], out of the creek [Blyth's] in a distance of about one mile ... the loss being spread pretty evenly along the whole distance.

Comparative Shaft Depths

HART SHAFT			GRUBB SHAFT		
Date	Depth		Date	Depth	
	(ft)	(m)		(ft)	(m)
18 February 1910	1274.0	388.32	18 February 1910	1380.5	420.78
23 May 1910	1286.0	391.97	20 June 1910	1408.0	429.16
06 June 1910	1296.0	395.02	18 July 1910	1427.0	434.95
20 June 1910	1306.0	398.07	15 August 1910	1439.5	438.76
18 July 1910	1326.5	404.32	29 August 1910	1451.0	442.26
15 August 1910	1338.0	407.82	01 September 1910	1479.0	450.80
12 September 1910	1344.5	409.80	15 September 1910	1490.0	454.15
26 September 1910	1355.5	413.16	30 September 1910	1497.0	456.29
09 January 1911	1390.0	423.67	09 January 1911	1523.0	464.21
23 January 1911	1398.0	426.11	23 January 1911	1530.5	466.50

Pumping Rates, 1911-1914

Pumping Rates—1911

DATE	WEEKLY (gallons)	WEEKLY (ML)	DAILY (ML)	DAILY (L/s)
09 Jan 1911	22 634 040	102.89	14.70	170.13
16 Jan 1911	22 157 460	100.73	14.39	166.55
23 Jan 1911	21 527 740	97.87	13.98	161.81
30 Jan 1911	21 325 460	96.95	13.85	160.29
06 Feb 1911	21 320 780	96.92	13.85	160.26
13 Feb 1911	21 681 400	98.56	14.08	162.97
20 Feb 1911	21 185 060	96.31	13.76	159.24
27 Feb 1911	19 890 260	90.42	12.92	149.51
06 Mar 1911	19 598 280	89.09	12.73	147.31
13 Mar 1911	19 639 880	89.28	12.75	147.62
20 Mar 1911	19 466 200	88.49	12.64	146.32
27 Mar 1911	18 944 640	86.12	12.30	142.40
03 Apr 1911	18 986 500	86.31	12.33	142.71
10 Apr 1911	18 709 080	85.05	12.15	140.63
17 Apr 1911	18 345 600	83.40	11.91	137.90
24 Apr 1911	18 623 280	84.66	12.09	139.98
01 May 1911	18 271 240	83.06	11.87	137.34
08 May 1911	18 307 380	83.23	11.89	137.61
15 May 1911	17 979 780	81.74	11.68	135.15
22 May 1911	17 789 720	80.87	11.55	133.72
29 May 1911	17 882 280	81.29	11.61	134.41
05 Jun 1911	17 632 680	80.16	11.45	132.54
12 Jun 1911	17 519 320	79.64	11.38	131.68
19 Jun 1911	17 501 120	79.56	11.37	131.55
26 Jun 1911	17 197 180	78.18	11.17	129.26
03 Jul 1911	16 893 240	76.80	10.97	126.98
10 Jul 1911	16 875 040	76.71	10.96	126.84
17 Jul 1911	16 803 280	76.39	10.91	126.30
24 Jul 1911	16 643 900	75.66	10.81	125.10
31 Jul 1911	16 460 340	74.83	10.69	123.72
07 Aug 1911	21 108 360	95.96	13.71	158.66
14 Aug 1911	47 090 160	214.07	30.58	353.95
21 Aug 1911	43 766 880	198.96	28.42	328.98
28 Aug 1911	37 471 200	170.34	24.33	281.65
04 Sep 1911	33 424 040	151.95	21.71	251.23
11 Sep 1911	31 075 200	141.27	20.18	233.58
18 Sep 1911	28 539 160	129.74	18.53	214.52
25 Sep 1911	26 586 560	120.86	17.27	199.84
02 Oct 1911	25 364 560	115.31	16.47	190.65
09 Oct 1911	24 620 740	111.93	15.99	185.06
16 Oct 1911	24 047 140	109.32	15.62	180.75
23 Oct 1911	23 726 040	107.86	15.41	178.34
30 Oct 1911	23 024 300	104.67	14.95	173.06
06 Nov 1911	22 594 260	102.71	14.67	169.83
13 Nov 1911	23 886 460	108.59	15.51	179.54
20 Nov 1911	27 092 260	123.16	17.59	203.64
27 Nov 1911	25 756 900	117.09	16.73	193.60
04 Dec 1911	25 328 420	115.14	16.45	190.38
11 Dec 1911	23 678 720	107.64	15.38	177.98
18 Dec 1911	22 732 580	103.34	14.76	170.87
25 Dec 1911	19 753 760	89.80	12.83	148.48

Pumping Rates—1912

DATE	WEEKLY (gallons)	WEEKLY (ML)	DAILY (ML)	DAILY (L/s)
01 Jan 1912	23 423 140	106.48	15.21	176.06
08 Jan 1912	22 086 220	100.40	14.34	166.01
15 Jan 1912	23 704 720	107.76	15.39	178.18
22 Jan 1912	23 891 400	108.61	15.52	179.58
29 Jan 1912	22 991 540	104.52	14.93	172.82
05 Feb 1912	22 230 780	101.06	14.44	167.10
12 Feb 1912	21 464 300	97.58	13.94	161.34
19 Feb 1912	19 705 920	89.58	12.80	148.12
26 Feb 1912	21 854 560	99.35	14.19	164.27
04 Mar 1912	20 789 600	94.51	13.50	156.27
11 Mar 1912	17 522 180	79.66	11.38	131.71
18 Mar 1912	20 724 600	94.21	13.46	155.78
25 Mar 1912	21 008 780	95.51	13.64	157.91
01 Apr 1912	20 243 600	92.03	13.15	152.16
08 Apr 1912	16 095 560	73.17	10.45	120.98
15 Apr 1912	21 064 940	95.76	13.68	158.34
22 Apr 1912	20 102 420	91.39	13.06	151.10
29 Apr 1912	19 486 220	88.58	12.65	146.47
06 May 1912	15 614 820	70.98	10.14	117.37
13 May 1912	19 894 420	90.44	12.92	149.54
20 May 1912	19 739 460	89.74	12.82	148.37
27 May 1912	18 723 380	85.12	12.16	140.73
03 Jun 1912	18 601 440	84.56	12.08	139.82
10 Jun 1912	14 410 500	65.51	9.36	108.32
17 Jun 1912	16 824 080	76.48	10.93	126.46
24 Jun 1912	21 611 460	98.25	14.04	162.44
01 Jul 1912	21 263 320	96.66	13.81	159.83
08 Jul 1912	20 857 460	94.82	13.55	156.78
15 Jul 1912	20 161 180	91.65	13.09	151.54
22 Jul 1912	19 402 500	88.20	12.60	145.84
29 Jul 1912	19 174 220	87.17	12.45	144.12
05 Aug 1912	18 801 900	85.47	12.21	141.33
12 Aug 1912	17 900 480	81.38	11.63	134.55
19 Aug 1912	17 614 480	80.08	11.44	132.40
26 Aug 1912	17 598 880	80.00	11.43	132.28
02 Sep 1912	17 588 740	79.96	11.42	132.21
09 Sep 1912	17 481 620	79.47	11.35	131.40
16 Sep 1912	17 435 340	79.26	11.32	131.05
23 Sep 1912	17 334 720	78.80	11.26	130.30
30 Sep 1912	17 304 180	78.66	11.24	130.07
07 Oct 1912	17 421 820	79.20	11.31	130.95
14 Oct 1912	17 530 500	79.69	11.38	131.77
21 Oct 1912	17 262 440	78.48	11.21	129.75
28 Oct 1912	17 121 000	77.83	11.12	128.69
04 Nov 1912	17 207 060	78.22	11.17	129.34
11 Nov 1912	17 087 460	77.68	11.10	128.44
18 Nov 1912	17 223 700	78.30	11.19	129.46
25 Nov 1912	17 316 520	78.72	11.25	130.16
02 Dec 1912	17 372 940	78.98	11.28	130.58
09 Dec 1912	17 363 320	78.93	11.28	130.51
16 Dec 1912	17 149 860	77.96	11.14	128.91
23 Dec 1912	16 869 060	76.69	10.96	126.80
30 Dec 1912	16 663 920	75.75	10.82	125.25

Pumping Rates—1913

DATE	WEEKLY (gallons)	WEEKLY (ML)	DAILY (ML)	DAILY (L/s)
06 Jan 1913	16 766 360	76.22	10.89	126.02
13 Jan 1913	16 939 780	77.01	11.00	127.33
20 Jan 1913	16 990 220	77.24	11.03	127.71
27 Jan 1913	17 225 520	78.31	11.19	129.48
03 Feb 1913	16 964 480	77.12	11.02	127.51
10 Feb 1913	17 062 760	77.57	11.08	128.25
17 Feb 1913	16 569 956	75.33	10.76	124.55
24 Feb 1913	16 336 060	74.26	10.61	122.79
03 Mar 1913	16 305 640	74.13	10.59	122.56
10 Mar 1913	16 545 100	75.21	10.74	124.36
17 Mar 1913	16 248 180	73.86	10.55	122.13
24 Mar 1913	15 149 160	68.87	9.84	113.87
31 Mar 1913	15 050 620	68.42	9.77	113.13
07 Apr 1913	14 369 680	65.32	9.33	108.01
14 Apr 1913	14 417 260	65.54	9.36	108.37
21 Apr 1913	14 368 380	65.32	9.33	108.00
28 Apr 1913	14 499 680	65.92	9.42	108.99
05 May 1913	14 450 020	65.69	9.38	108.61
12 May 1913	14 275 040	64.89	9.27	107.30
19 May 1913	14 168 180	64.41	9.20	106.50
26 May 1913	14 139 580	64.28	9.18	106.28
02 Jun 1913	14 277 120	64.90	9.27	107.31
09 Jun 1913	14 556 360	66.17	9.45	109.41
16 Jun 1913	14 443 520	65.66	9.38	108.57
23 Jun 1913	13 839 280	62.91	8.99	104.02
30 Jun 1913	13 679 380	62.19	8.88	102.82
07 Jul 1913	13 933 400	63.34	9.05	104.73
14 Jul 1913	13 847 080	62.95	8.99	104.08
21 Jul 1913	13 592 020	61.79	8.83	102.16
28 Jul 1913	13 623 480	61.93	8.85	102.40
04 Aug 1913	13 515 320	61.44	8.78	101.59
11 Aug 1913	13 420 420	61.01	8.72	100.88
18 Aug 1913	13 429 000	61.05	8.72	100.94
25 Aug 1913	13 252 460	60.25	8.61	99.61
01 Sep 1913	13 111 540	59.61	8.52	98.55
08 Sep 1913	13 224 120	60.12	8.59	99.40
15 Sep 1913	13 295 880	60.44	8.63	99.94
22 Sep 1913	13 015 860	59.17	8.45	97.83
29 Sep 1913	12 914 720	58.71	8.39	97.07
06 Oct 1913	12 952 940	58.88	8.41	97.36
13 Oct 1913	13 019 760	59.19	8.46	97.86
20 Oct 1913	13 264 840	60.30	8.61	99.71
27 Oct 1913	13 034 320	59.25	8.46	97.97
03 Nov 1913	13 057 720	59.36	8.48	98.15
10 Nov 1913	12 948 780	58.87	8.41	97.33
17 Nov 1913	12 949 040	58.87	8.41	97.33
24 Nov 1913	13 138 840	59.73	8.53	98.76
01 Dec 1913	12 787 840	58.13	8.30	96.12
08 Dec 1913	12 634 440	57.44	8.21	94.97
15 Dec 1913	12 744 680	57.94	8.28	95.80
22 Dec 1913	12 623 780	57.39	8.20	94.89
29 Dec 1913	12 991 420	59.06	8.44	97.65

Pumping Rates—1914

DATE	WEEKLY (gallons)	WEEKLY (ML)	DAILY (ML)	DAILY (L/s)
05 Jan 1914	12 840 620	58.37	8.34	96.52
12 Jan 1914	12 912 640	58.70	8.39	97.06
19 Jan 1914	12 650 820	57.51	8.22	95.09
26 Jan 1914	12 687 740	57.68	8.24	95.37
02 Feb 1914	13 031 460	59.24	8.46	97.95
09 Feb 1914	13 174 720	59.89	8.56	99.03
16 Feb 1914	12 927 720	58.77	8.40	97.17
23 Feb 1914	13 166 660	59.86	8.55	98.97
02 Mar 1914	13 328 640	60.59	8.66	100.19
09 Mar 1914	13 449 020	61.14	8.73	101.09
16 Mar 1914	13 359 320	60.73	8.68	100.42
23 Mar 1914	13 380 120	60.83	8.69	100.57
30 Mar 1914	13 053 040	59.34	8.48	98.11
06 Apr 1914	13 046 540	59.31	8.47	98.06
13 Apr 1914	12 910 820	58.69	8.38	97.04
20 Apr 1914	12 527 580	56.95	8.14	94.16
27 Apr 1914	12 788 100	58.13	8.30	96.12
04 May 1914	12 606 360	57.31	8.19	94.76
11 May 1914	12 361 180	56.19	8.03	92.91
18 May 1914	9 543 820	43.39	7.89	91.30 (5.5 days)