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RECORDS.

1955/59

ORE RESERVES AT MT. ISA, QUEENSLAND

by

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SUMMARY.

In requesting some taxation concessions, Mt. Isa Mines have emphasized the value of low grade ores of lead and copper in the Mt. Isa Mine which, under present conditions, are sub-commercial.

The situation as regards ore reserves, both payable and sub-commercial has been examined at the mine with the full co-operation of the mine staff.

Established reserves of silver-lead-zinc ore, payable under present conditions, total 15 million tons and promise a life of 23 years for the mine at the current rate of production. The two main lead orebodies have not been fully explored and additional reserves are in sight.

Sub-commercial lead ore occurring in these two main lodes totals 30 million tons but only 6 million tons of this total has much chance of being mined unless costs could be drastically reduced or metal reserves significantly increased. There is promise of further ore, probably largely of low grade, in the Northern Leases, but exploration is not sufficiently far advanced to delineate tonnage and grade reliably.

However, expected metal recoveries from an improved vertical furnace (I.V.F.) would allow the entire 30 millions to be mined thus providing about $1\frac{1}{2}$ million tons of lead of which about 1 million tons would otherwise be lost.

Low grade ore must be mined with the higher grade sheets and will be lost if mining remains restricted to the higher grade ore. Mine development to include the mining of low-grade ore must be planned now, otherwise about $1\frac{1}{2}$ million tons of low-grade ore is likely to be abandoned each year.

Reserves of copper ore total nearly 5,800,000 tons and promise a life of 9 years for the copper section at the current rate of production. However, the prospect for additional reserves of payable grade ore are very good in the known copper lodes and a life of many more than 9 years seems assured.

Sub-commercial copper ore accompanying the higher grade ore in the main lodes totals, to date, 50,000 tons of copper, but costs would have to be decreased by between 40-50/- per ton before it could repay mining, on the basis of cut-off grades on a copper price of £A280. The price of copper would need to rise to about £A470 before this ore could repay mining.

Low-grade ore seems unlikely to be mined but low-grade lead-ore is likely to be mined if I.V.F. were installed and would greatly add to the nations supplies of lead and zinc.

Taxation concessions requested have no obvious link with the mining of low-grade ore but would facilitate the raising of finance (about 4,000,000) for I.V.F. by making the Company more attractive to shareholders.

INTRODUCTION.

Mount Isa Mines Limited has approached the Commonwealth Treasury for taxation concessions to remove an alleged anomaly and to encourage future development of the mine.

Their submission refers mainly to Section 23A of the Income Tax and Social Services Contribution Assessment Act 1936-1954.

Under this Section, mines producing a number of specified metals and minerals are allowed 20% total profits tax-free. Copper is included, but not silver-lead-zinc. Mt. Isa Mines, therefore, are allowed 20% of profits tax-free on copper, but not on the other metals produced.

Their request is, briefly, that this Section be amended so that a mine producing copper, which is one of the metals listed in the Section to the extent of 40% of total production, should receive 20% of its total profits tax-free.

As the value of the copper production at Mt. Isa exceeds 40% of the value of the total production, such an amendment would extend the 20% of profits tax-free to the total profits of the Mt. Isa Mines Ltd. The company refers to the precedent established under section 23 (a) of the Income Tax act whereby if a company is producing copper and gold and the value of the gold produced exceeds 40% of the total value of the output, then the whole production is tax-free.

One of the matters raised in their submission was the existence, in the Mt. Isa Mine, of large tonnages of ores of both silver-lead-zinc and copper which are too low-grade to be mined and treated under present conditions. Large tonnages of low-grade ore could provide reserves of metal of national importance, if by one means or another they could be mined, and to clarify this position, the present investigation of ore reserves at Mt. Isa was carried out with the full co-operation, and at the desire, of the Company.

The investigation was carried out at Mt. Isa from the 8th to the 18th May with the assistance of the company staff. All relevant plans and documents were made available and the several orebodies were inspected underground. A review of the ore position at Mt. Isa is provided by the accompanied ore reserve tables. Details are given in the following notes.

EXPLANATION OF ORE RESERVE TABLES.

The tonnages and grades of ore shown in these tables have been compiled from data provided by the Geological Department Mt. Isa Mines. The checking carried out consisted mainly of examining the evidence for the calculations of ore reserves and the factors used therein. The main basis for the figures were ore reserve calculations at June 1954 together with subsequent calculations of more recent developments, and of low-grade reserves, carried out by the Geological Department in the last 6 months.

In these tables total reserves to date have been divided into "reserves" which are the quantities of payable ore available under present conditions and "sub-commercial ore" which are unpayable under present costs and methods of treatment.

RESERVES

The figures for "reserves" do not take into account the tonnage of ore mined since June 1954 and therefore are likely to be about $\frac{1}{2}$ million tons too high in both lead and copper sections but this does not significantly affect the overall picture.

In mine documents, reserves are divided into the following 5 categories:

<u>Developed Ore</u>		<u>Prospective Ore</u>	<u>Irreclaim-</u>
<u>Prepared for</u>	<u>Other</u>	<u>Undeveloped Ore Pillars</u>	<u>able</u>
<u>Stopping</u>			

For the purpose of this investigation categories of reserves have been simplified into "positive" and "probable". Both categories of "developed ore" are "positive" i.e. blocked out; and both categories of "prospective ore" are "probable" - limits and grade established by mine development or drill hole intersections but not blocked out. Ore contained in pillars is classified as "probable" ("prospective ore" in mine records)

because, although they have been blocked out, there is some uncertainty about recovery.

All of the reserves, and in fact, the tonnages of sub-commercial ore as well, are sufficiently well defined to rate "positive" or "probable"; no calculations have been made of "possible" ore in extensions of ledes beyond the present limits of exploration.

Reserves have been calculated on the basis of the "cut-off" or "break even" grade mentioned below and the procedure followed by the Geological Department, Mt. Isa Mines, in estimating ore reserves is very sound and conservative. Tonnage factors of 15 cu. ft. per ton for carbonate lead ore, 11 cu. ft. per ton for silver-lead ore, and 12 cu. ft. per ton for sulphide copper ore are based on stope extractions. The grade of ore established by drill core assays is reduced by 5% in known ground and by 10% in unknown or undeveloped ground, based on the comparison of original core assays with subsequent chip samples when development exposed the drill hole.

SUB-COMMERCIAL ORE

Ore is defined as sub-commercial when the average grade is below the cut-off grade. The cut-off grade for both lead and copper ore has recently been revised by Mt. Isa Mines on the basis of the present cost per ton of ore and on the following specific metal prices - silver 7.14/- per oz., lead £A130 per ton, zinc £A107.5 per ton, copper £A280 per ton. Except for copper these prices are close to those ruling in May 1955.

The valuation of sub-commercial ore requires a "value index" to relate its present value to current costs and to indicate the degree to which the ore is at present sub-commercial. Such an index was obtained by using the data and calculations on which the current cut-off grade is based. This index, used in the tables, is the difference between the recoverable value of the ore per ton in shillings and the total production costs in shillings (excluding amortization and compensation of share holders. The index is therefore nett profit or loss in shillings per ton under the specified conditions.

The formula for silver-lead-zinc ore is:

$$\left(\frac{\text{Ag(oz.per ton)}}{2.3} + \text{Pb.(\%)} + \frac{\text{Zn(\%)}}{5.8} \right) \times 13.09 - 100.83 = \text{Profit and loss per ton}$$

Present recoveries are silver 82.5%, lead 80% and zinc 51%.

The installation of an improved vertical furnace (I.V.F.) would, it is believed, increase recovery, particularly of zinc, and tentative figures for recovery with I.V.F. are: silver 85%, lead 86.5%, zinc 72.2%. A new cut-off grade has been worked out on these probable recoveries and the reserves of sub-commercial ore have been calculated on the basis of this I.V.F. cut-off grade. The index of profit or loss on the I.V.F. basis is given by:

$$\left(\frac{\text{Ag(oz.per ton)}}{2.3} + \text{Pb(\%)} + \frac{\text{Zn(\%)}}{1.5} \right) \times 13.8 - 100.83 = \text{Profit or less per ton.}$$

The cut-off grade and the profit index for copper ore is much simpler, as only one metal is involved, and the index is given by:

$$(\text{Cu(\%)} \times 36.23) - 91.53 = \text{Profit and loss per ton.}$$

The present cut-off or break even grade for sulphide copper ore is 2.5% copper.

SILVER-LEAD-ZINC ORE

RESERVES.

Current reserves of payable ore of about 15,000,000 tons promise a life of about 23 years for the lead section of the mine, dependent upon costs and prices, at the production rate of the last financial year, viz. about 640,000 tons per annum. These reserves are higher than those quoted in the last financial report of the mine, mainly because they include reserves, proved by development this financial year, but because the Company adopts a conservative policy in quoting reserves, it is likely that those quoted in this year's report will be lower than those given in the tables accompanying this report.

The Mt. Isa Mine contains a number of orebodies, most of which are grouped under Black Star, Black Rock (including Race course) and Rio Grande Sections. The lodes are replacements of bedding and follow faithfully the course of beds of finely laminated shale which dip steeply to the west. Lodes in the Black Rock and Rio Grande Section are comparatively small; have pinched out in depth and are not likely to provide significant quantities of ore other than that shown in present ore reserves.

The Black Star lodes, particularly the No. 2 and No.5 lodes, provide the bulk of the reserves and show promise of some additional reserves beyond the present limits of development. These two main lodes pinch out in depth against a body of dolomite which lies on the hangwall side and which dips west with the bedding, but at a higher angle, so as to transgress the beds in depth. The No.2 lode below the 10 level (1400 feet below the surface) is pinching and falling off in grade and is regarded as "closed" in depth as regards ore reserves. However the lode plunges to the north and promise of additional tonnage lies in this direction above the 10 level, and down the plunge. The northernmost drill holes, above the 10 level, record horizontal widths of between 200 and 300 feet although most of the orebody is below present commercial grade.

The No. 5 lode provides 67% of mine production of lead ore and shows better promise of additional reserves of payable ore than does No. 2 lode. No. 5 lode also plunges northward and, near the present northern limits of development, both payable and sub-commercial portions of the orebody continue beyond the limits of both northward and in depth. Towards the northern limits of development, mainly below the 10 level, true lode widths range from 85 to 174 ft. (horizontal widths from 85 to 200 ft) of which, on an average, 60 to 70 ft. in true width constitutes a persistent commercial lode.

Taken together then, these two main lodes promise additional reserves of both commercial and sub-commercial ore.

The tonnage of commercial ore classified in the reserves as irreclaimable (8,000,000 tons) needs some explanation. Most of this ore is in pillars but some remains in unstable ground in the upper levels of the mine where collapse in recent years has further increase the cost and hazard of extraction.

Some of this ore, at present classified as irreclaimable, may yet be mined. However the present tonnage shown as "irreclaimable" is not excessive when viewed as the percentage of the total tonnage of commercial ore developed in the mine. Relevant figures are:

Total ore mined (to June 1954	11,750,000 tons
Total ore reserves	15,400,000 tons
Irreclaimable ore	<u>8,230,000 tons</u>
Total ore developed	35,380,000 tons

* Further reserves will of course be disclosed as development proceeds and it is not intended to suggest that the life of Mt. Isa Mines might be limited to 23 years.

Irreclaimable ore has not been allowed for in 7,000,000 tons of the reserves and, allowing 25% loss there, the total irreclaimable ore reaches 10,000,000 tons. This is about 28% of the total ore developed and is not excessive particularly in view of the difficulties encountered in the higher levels of the mine, the number of separate lodes involved, and the large-scale mining methods used.

SUB-COMMERCIAL ORE

Important bodies of sub-commercial ore are restricted to the Black Star lodes No.2 and No.5 where low-grade ore forms an envelope around payable ore, or in places a selvedge on hangingwall or footwall side.

Mine staff have investigated the possibilities of mining the several lodes in the Black Rock and Racecourse sections together as one low-grade orebody in which the payable lodes would be mined with the intervening low-grade ore and country rock. The results are shown on table 1 and indicate that the grade of about 70% of this block is so low as to rule out the proposition, even if higher recoveries are realised with the installation of I.V.F.

Low-grade ore in Nos. 2 and 5 lodes at or above the I.V.F. cut-off grade lies toward the northern limit of development of the orebody, and some notes on these sections have been given under reserves. In both cases exploration has been done mainly by drill holes. Sub-commercial ore in the No.2 lode (which includes some payable ore) extends from the 4 level to the 12 level, over a total vertical depth of 1,600 ft. and on the 8 level extends northwards, roughly along the strike, for nearly 1,200 ft. As already mentioned, the lode above the 10 level continues strongly northward beyond the present limit of development.

The body of mineable sub-commercial ore in the No. 5 lode has a total vertical depth of about 1,500 ft. and extends along the strike for about 1,400 ft. on the 12 level. In general, No. 5 lode is narrower than No.2 but contains a greater percentage of payable ore. The ore continues beyond the limits of development both in depth and to the north.

The total tonnage of ore available in these sections of the No.2 and No. 5 lodes is 38,320,000 tons. This includes 8,000,000 tons known payable ore. Full details of the break-down to commercial and sub-commercial ore are shown in table 1.

The importance of such reserves needs no emphasis. The 38,000,000 tons contains 1,460,000 tons of recoverable metallic lead of which nearly a million will be lost to the Nation if the sub-commercial ore is not mined. Moreover total mine reserves would be increased by about 23,000,000 tons (allowing 20% irreclaimable in low grade ore) giving total reserves of the order of 38,000,000 with consequent long life for the mine and the community.

If metal content were evenly distributed throughout these orebodies, the entire section of No. 5 lode (12 million tons) could be profitably mined (see table 1) but unfortunately this 12 million tons is made up of 7 million tons of high-grade ore + 5 million tons of low-grade ore which at present would be mined at a loss of 12/- per ton. On the results of current development, No. 2 lode, although providing twice the tonnage available in No. 5 lode, consists very largely of sub-commercial ore and the low-grade section could be mined only at a loss of 29/- per ton.

This division into payable and unpayable ore in these orebodies is not an arbitrary segregation of the highest grade ore but is based on the "break-even" grade i.e.

the boundary is drawn at the zone where mineable widths of ore no longer repay extraction. In most places these boundaries are fairly easy to determine and basically, are dependent on the level of costs and of metal prices.

In theory the limits of the ore to be mined extend with rising metal prices or with greater efficiency, but in practice, large scale mining can only respond effectively to those changes which can be foreseen. Stopes are prepared well ahead of actual mining on ore limits determined 6 to 12 months before extraction commences. Moreover, once the payable ore has been extracted from a section of a lode, the remaining sub-commercial ore is, in most cases, lost. Its value may appreciate but seldom to the extent of repaying the cost and hazard of return and extraction.

The 30,000,000 tons of low-grade ore in the Black Star lodes could well be lost, under present conditions, at the rate of about $1\frac{1}{2}$ million tons per year as the payable ore is extracted. Since there seems no present justification for expecting a significant rise in metal prices, the chances of mining this ore lie in decreased costs or in more efficient metallurgy. Costs would have to be decreased by 12/- per ton for No.5 lode and 29/- per ton for No.2 lode before the average grade would even equal the present cut-off grade.

Mining, milling, general and administrative costs in the lead section of the mine are at present as follows:

	<u>Shillings per ton ore</u>
Mining	46.05
Milling	18.05
Administrative and General	5.91
Lead Bonus	25.00 *
Community	5.82
	<hr/>
Total	100.83
	<hr/>

The cost of smelting is 556.5/- per ton, of lead bullion which, very approximately, gives 33/- per ton of sulphide ore.

A decrease of the order of 30/- in these costs appears impossible but a decrease of 12/- per ton may be possible if the output of ore could be stepped up and the tonnage per man shift could be increased, although this would entail further capital expenditure to provide, at least, an additional haulage shaft. Present conditions, therefore, can offer only a promise of mining about 6 million tons of the 30 million tons of low-grade ore.

There remains the chance of increased metallurgical efficiency and the importance of I.V.F. is apparent. If it raises metal recoveries as assumed, the limits of payable ore can be extended to the I.V.F. 'break-even' grade and 30 million tons of low-grade ore profitably extracted.

However it is not yet certain whether I.V.F. can do what is expected of it; a shipment of Mt. Isa concentrate has arrived in the U.K. for testing and I.V.F. is being tried at Port Pirie ~~W.A.~~. The installation at Mt. Isa would cost about 4 million pounds but if the process is successful this outlay will greatly add to the Nations reserves of lead and zinc.

* The high cost of the lead bonus, $\frac{1}{4}$ of total mine charges is noteworthy. It is virtually the price the mine has to pay to retain labour in this remote locality.

xx I.V.F. will provide some problems of its own. Zinc recoveries will be greatly increased and as more lead producers use this process the disposal of zinc could become increasingly difficult.

THE NORTHERN LEASES

Prospecting by Mt. Isa Mines Ltd. in the Mt. Isa district led to the discovery of oxidised lead ore in the Northern Leases, about 14 miles north of the mine. Shaft sinking, underground development and drill holes have proved about 200,000 tons of 'probable' carbonate ore which no doubt will be mined and hauled to the present mine for treatment.

A major diamond drilling campaign has disclosed larger tonnages of low-grade ore containing narrow uncorrelated streaks of higher grade material. The ore occurs in the Mt. Isa shales in approximately the same stratigraphic position as the Mt. Isa lodes, but current investigations have not reached the stage where a reliable evaluation of these prospects can be made. Very preliminary calculations from uncorrelated drill hole intersections, suggest a 'possible' tonnage of 26,400,000 and a grade of 2.1 oz per ton silver, 3.9% lead and 7.9% zinc.

Ore of this grade would be profitable under I.V.F. if working costs were of the order of those in the present mine, but development, to date, can only be regarded as a promise of at least additional low-grade ore.

The Company has spent more than £400,000 on the prospect to date and development will continue. There is a promise of further reserves of low-grade ore which could be of prime importance to the Company and the Nation, but it seems obvious at this stage, that the Company should be encouraged to decrease costs and increase metal recovery to the utmost as therein lies the chance of profitably mining the 'possible' ore in the Northern Leases.

COPPER ORE

RESERVES

Three copper orebodies, the 500, 650 and 750 lodes, occur in the Black Star section of the mine. They do not outcrop but occur in the dolomite on the hangingwall side of the Nos. 1 and 2 and No. 5 lead lodes. The 500 copper lode is close to the hangingwall of the number 5 lead lode and the 650 and 750 copper lodes are close to the Nos. 1 and 2 lead lodes. The copper lodes are thus en echelon as are the lead lodes and all plunge to the north.

The lodes consist mainly of chalcopyrite in blebs and patches within the dolomite and each lode contains a core or shoot of payable ore surrounded by an envelope of varying width of low-grade ore. The 650 and 750 lodes which are worked together in most places were developed first and have provided most of the ore extracted to date - 1,576,812 tons to 30th June 1954. To the same date, 14,600 tons of oxidised copper ore have been mined from 3 small lodes in the Black Rock section. Reserves in this section, taking in the lodes and the country between them, are estimated at 100,000 tons of ore averaging 3.7% copper.

The 650 and 750 lodes "make" between the 6 and 7 levels and have been investigated down to the 10 and 11 levels - the 750 for about 600 ft. vertically and 1,500 ft horizontally and the 650 for about approximately 800 ft. vertically and 1,800 ft. horizontally. On development to date, figures for tons per vertical ft. for these two lodes show a maximum of 13,500 on the 8 and 9 levels but the orebodies continue below the 11 level at a figure of about 8,000 tons per vertical ft. The 650 lode provides the bulk of the tonnage, and payable ore on the 11 level, the lowest level at present developed, is approximately 1100 ft. long 70 to 80 ft. in horizontal width and has a grade of 4.5 to 5% copper.

The 750 lode is approximately 300 ft long below the 10

level but is 120 to 140 ft. in horizontal width with a grade of about 2.8% copper.

Additional reserves can be confidently expected below the present level of development.

Table 2 shows 828,000 tons of ore as irreclaimable. As in the lead section of the mine, this is contained mainly in pillars and in ore left above the grizzly levels. However this figure is only about 12% of the total payable ore-body as developed to date.

The 500 copper lode "makes" slightly above the 10 level and development by drill holes to the 12 level shows fairly consistent increases in length to about 2,200 ft. over a vertical interval of 300 ft. Horizontal widths of ore near the 12 level range from 35 to 170 ft, on drill hole data, but further investigation is needed to delineate the limits of payable ore on the 2.5% copper cut-off grade. The heading of a drive in the 500 lode, inspected in May showed a visual grade of about 20 to 25% chalcopryite or about 6 to 8% copper. Preliminary calculations show a total tonnage in No. 5 lode to date of 5,500,000 at an average grade of 2.2% copper.

The present cut-off grade of 2.5% copper is based on a price of £A280 for copper. The current price is approximately £A435 but this is an abnormally high price which is expected to fall and it is evident that stope preparation for future extraction cannot be based on this figure. The future price of copper can only be estimated and in basing their cut-off grade on £A280 the company may seem too conservative, but considering the large and immediate potential of African mines (present labour troubles in these mines are probably the main reason for the abnormally high current price of copper), the growing substitution of aluminium for copper, the more hopeful international situation and the high cost of refining where this is done in Australia, this figure seems not unreasonable. It should also be noted that most of the copper ore must be hauled from at least 1,400 ft. below the surface and that this depth will increase. Also the dolomite gangue is tough and difficult to crush.

In brief the present reserves of copper ore - about 4½ million tons at an average grade of 3.6% copper - give an assured life for the copper section of about 9 years if annual production continues at about 530,000 tons of ore. However the prospect for additional ore is very good in the 650 lode and excellent in the 500 lode and on present showing a life of many more than 9 years can be expected.

SUB-COMMERCIAL ORE

Sub-commercial copper ore developed to date is restricted to the 650 and 750 lodes where an envelope of low-grade ore surrounds the higher-grade material. The main development of low-grade ore lies above the 10 level where the envelope ranges up to 200 ft. in horizontal width. Between the 10 and 11 levels the envelope is thinner and only reaches a total of 40 ft. in width in a few places. Portion of the low-grade ore above the 10 level is now shown in reserves of low-grade ore because it is already lost. Extraction of payable ore and subsequent filling is well advanced in this section.

The cut-off grade for the calculations of low-grade ore is 1% Cu. The data in table 2 are arranged in the same way as that for low-grade lead ore and some of the general remarks on lead ore apply also to copper.

However, low-grade copper ore does not show the potentialities apparent in the lead section for two reasons. The value of the low-grade copper ore developed, and still mineable to date is between 40 and 50/- below cost and this would not be payable

even at current prices for copper. Secondly there does not seem to be any imminent metallurgical improvement - the counterpart of I.V.F. in the lead section - which could significantly lower the cut-off grade.

It should be noted that the orebody between 10 and 11 levels with an average grade of 2.8% copper appears payable but half of this tonnage could only be mined at a loss (see table 2). The possibility of significantly increasing reserves by lowering the cut-off grade was briefly examined but additional tonnages at a cut-off grade, say, 2% copper would probably not be great. The grade of ore falls noticeably from the ore-shoots into the low-grade envelope, as can be inferred from the actual grade of the sub-commercial ore - large tonnages averaging 1.2 and 1.3% copper - when the cut-off grade is taken as 1%.

The current costs in the copper section of the mine are as follows:

	<u>Shillings per ton</u>
Mining	43.32
Milling	13.32
Administration and general	4.07
Lead Bonus	25.00
Community	5.82
	<hr/>
Total	91.53
	<hr/>

Smelting cost is 526.9/- per ton of blister copper or approximately 19.6/- per ton of ore.

As in the lead section, it may be possible to decrease these costs by a total of a few shillings but it is obvious that, on the basis of £A280 per ton for copper, these low-grade ores are not likely to be mined. The "break even" grade for a copper price of £A435 would be, on present costs, 1.4% copper but even if this price were a reasonable basis on which to plan mining these low-grade ores would still be mined at a loss of 7/- or 14/- per ton according to their respective grades, and the price of copper would have to rise to £A465 or £A470 per ton before they would repay the cost of production.

Further investigation is required on the 500 lode before the tonnages and grades are known. The quoted 5½ million tons is for the whole orebody as known, and further investigation is expected to break down this figure, into payable ore (on the 2.5% cut-off) and sub-commercial ore (on 1% cut-off) as has been done in the other lodes.

Sub-commercial copper already delineated in the mine therefore represents about 5,000 tons of copper but because the ore is too low-grade, relative to production costs, the loss of this copper seems inevitable.

TAXATION AND LOW-GRADE ORE.

There is no obvious connection between the taxation concession the Company requests and the winning of low-grade ore. Taxation is levied on profits only and is therefore not an item of the production costs on which the cut-off grade is based. Moreover, the financial value of the concession to the Company is comparatively small. Company profits are at present taxed at the rate of 7/- in the pound - 35% on the whole profit from lead and 35% on 80% of the profit on copper, making an overall tax of 31½% on total mine profit, as profits from the two sections are approximately equal. If, under the concession sought, only 80% of the profit on lead were taxed, the rate of taxation on total mine profits would fall by 3½% to 28%, and, in the last

financial year, this would have increased the Company's nett profit by £87,000.

However, this additional profit remains tax-free in the shareholders hands, and therein lies an indirect connection between this tax concession and the mining of low-grade ore.

The mining of low-grade ore is largely dependent on I.V.F. which would cost about £4,000,000 to instal, and any concession which makes the Company more attractive to shareholders will assist in raising the finance necessary for this purpose.

From a national view point, the 30 million tons of lead ore, containing nearly $1\frac{1}{2}$ million tons of lead, must be mined, if at all possible, and the Government will be very short-sighted to refuse any small concession which will assist in extending lead reserves; particularly when total taxation from Mt. Isa Mines will be greatly increased by longer working life.

The concession requested appears particularly modest when related to trends overseas, where producers have sought and received subsidies, in the form of guaranteed prices, from Governments to make possible the mining of low-grade lead ores. Furthermore, the amendment to Regulation 23A, suggested by the Company, will affect only Mt. Isa Mines Ltd. as no other mining company, including those at Broken Hill, could qualify on present operations.

It may also be pointed out that there are two main ways of countering our depleting metal reserves - finding additional orebodies and mining the low-grade ore we already have. New orebodies, not yet found or developed, do not diminish with time, but minable low-grade lead ore at Mt. Isa will diminish at the rate of approximately $1\frac{1}{4}$ million tons per year if only the higher-grade ore is mined.

From another view point, $1\frac{1}{2}$ million tons of lead from 30 million tons of low-grade ore in an established mine would, I believe, cost much less to produce than the same quantity of metal from 10 million tons of higher-grade ore which might be found in a new deposit situated in any of the remote areas in Australia which show potentialities.

Both types of deposit are needed to ensure future production but low-grade lead ore at Mt. Isa is a reality - to be wasted or worked - and the decision should be made now.

ORE RESERVES-MT ISA MINE

(Compiled from data provided by Mt. Isa Mines Ltd)

SILVER-LEAD-ZINC
Reserves
(Currently payable).

	Positive Ore.				Probable Ore.				Irrecoverable Ore				Remarks
	Tons	ozs Ag	% Pb	% Zn	Tons	ozs Ag	% Pb	% Zn	Tons	ozs Ag	% Pb	% Zn	
Carbonate Ore	94,000	3.7	7.8		156,000	1.9	9.6		663,000	4.6	7.6		
Sulphide Ore													
Black Star	1,632,000	7.2	8.9	6.8	9,431,000	5.8	8.0	7.2	6,250,000	5.8	7.8	8.2	Reserves mainly in the No.2 and No.5 lodes where additional reserves seem assured. Lode explored - No significant additional reserve likely. -ditto-
Black Rock	45,000	9.7	13.9	6.8	3,929,000	6.2	8.9	5.7	1,275,000	6.5	9.1	5.6	
Rio Grande	32,000	18.5	15.8	4.8	81,000	12.6	13.5	6.4	42,000	14.9	14.3	5.9	
Total Sulphide Ore	1,709,000	7.4	9.1	6.7	13,441,000	5.9	8.3	6.8	7,567,000	5.9	8.0	7.7	
Total Reserves	1,803,000	7.2	9.0		13,597,000	5.9	8.3		8,230,000	5.8	8.0		
Total Reserves													
Positive + Probable	15,400,000	6.0	8.4										

SUB-COMMERCIAL
Probable Ore

	(1) Total Orebody (I.V.F. Cut-off)								(2) Reserve of Payable Ore included in (1) (Present Cut-off)							
	Tons	oz Ag	% Pb	% Zn	Present Conditions Profit or Loss Sgs. per ton	I.V.F. Assumed Profit or Loss Sgs. per ton	Met.Pb in tons		Tons	oz Ag	% Pb	% Zn	Present Conditions Profit or Loss Sgs. per ton	I.V.F. Assumed Profit or Loss Sgs. per ton	Met.Pb in tons	
Black Star Orebodies																
No.2 lode	25,512,000	2.1	4.0	5.7	-26	+19	815,000		980,000	4.8	10.0	7.7	+72	+136	78,000	
No.5 lode	12,810,000	4.7	6.3	6.9	21	+78	645,000		7,000,000	5.9	7.9	7.4	+50	+110	442,000	
TOTAL	38,322,000	3.0	4.8	6.1	-9	+39	1,460		7,980,000	5.8	8.2	7.4	54	114		
Black Rock Racecourse Orebodies	21,400,000	3.2	4.2	3.3	-22	+6	7.7		7,000,000	7.2	10.0	6.8	+87	+146	700	

Estimates

- * At May 1955 but including ore extracted since June 30th 1954 (about 530,000 tons)
- x On current production costs (excluding amortization and compensation to shareholders) and on following metal prices - Pb. \$1130 per ton, Zn \$107.5 per ton, Ag. 7.14/- per oz.
- δ Improved vertical Furnace which may provide higher recovery, particularly of Zn. Figures on same basis as above .(x)
- 1 Recalculation of these high grade reserves for selective mining of coarse individual lodes reduced this figure to:
- | | | | | |
|-----------|-----|-----|-----|---------------|
| 3,974,000 | 6.2 | 9.0 | 5.7 | Recoverable |
| 1,275,000 | | | | Irrecoverable |
- Included in 'positive' and 'probable' reserves above.

	(3) Low Grade ore lost if only (2) is mined (I.V.F. Cut-off)								Remarks
	Tons	oz Ag	% Pb	% Zn	Present Conditions Profit or Loss Sgs. per ton	I.V.F. Assumed Profit or Loss Sgs. per ton	Met.Pb in tons		
24,532,000	2.0	3.8	5.6	-29	+15	757,000			Not likely to be mined without I.V.F.
5,812,000	3.3	4.4	6.3	-12	+38	105,000			Might be mined without I.V.F. if cost lower and metal prices increased.
30,344,000	2.2	3.9	5.7	-27	+19				
14,400,000	1.3	1.4	1.6	-72	-59	161			

TABLE 2

COPPER ORE

Ore Reserves

Currently Payable

	Tons	Positive Ore			Profit Margin p	Tons	Probable Ore			Profit Margin p	Irrecoverable		Remarks
		Cu per cent	Recoverable value ton	per /-			Cu per cent	Recoverable Value ton	per /-		Tons	Cu per cent	
Oxidized Ore	51,000	8.6	312		220	100,000?	3.7	134		43			
Sulphide Ore	1,623,000	3.4	123		32	2,981,000	3.6	130		39	828,000	3.8	Very good prospects for additional reserves.
	1,674,000	3.6	130		38	3,081,000	3.6	130		38	828,000	3.8	

Positive + Probable

Total Current Reserves

4,755,000 3.6 130 38

Low Grade (Sub-Commercial) Copper Ore

	(1) (Total Orebody on 1 percent Cu Cut-off Grade)				(2) (Probable Ore Included in (1))				(3) (Ore lost if only payable reserve mined)					Remarks
	Tons	Cu per cent	Profit Loss per ton /- p	Tons of Metallic Cu	Tons	Cu per cent	Profit per ton /- p	Tons of Metallic Cu. Invd.	Tons	Cu percent Cut-off 1 percent	Loss per ton /-	App.Pr. Met.Cu to make payable pA	Tons of Metallio Cu.	
Black Star Orebodies 650-750 Lodes														
Above 10 Level	4,540,000	2.0	-19 p	90,000	1,280,000	4.0	+53	51,000	3,260,000	1.3	-44 p	465	42,000	Not likely to be mined
Between 10 - 11 Levels	1,280,000	2.8	+10	35,000	650,000	4.3	+44	27,000	630,000	1.2	-49 p	470	7,500	Not likely to be mined
500 Lode	5,500,000	2.2	-12 p	121,000	Further development in hand to delineate tonnage and grade of payable and sub-commercial ore.									

SUMMARY.

	Tons	Met.Cu		
Ore Reserves	4,755,000	171,000	3.6	Profitable
Submarginal ore to date	3,890,000	50,000	1.3	Not likely to be mined
Developing	5,500,000	121,000	2.2	Tonnages and grades of payable and submarginal ore to be determined.

-a- Included in 'positive' and 'probable' ore above.

* On current production costs excluding amortization and compensation to shareholders.
Cu £A280 Ag 7.14/-

:: Cu £A280 Ag 7.14/-

p Based on cost of 91.53/- per ton of ore excluding amortization and compensation to shareholders

p Shows reduction in production costs necessary before ore becomes marginal under present conditions