DEPARTMENT OF MINES
SOUTH AUSTRALIA

Rept.Bk.No. 19/151
D.M. 98/1943

EXPANSION AND POST-WAR DEVELOPMENT IN THE MINING INDUSTRY

Having given careful consideration to the request of the Hon. Premier for a schedule of projects for post-war development in the mining industry I have to report as follows:-

The chief avenues leading to permanent employment are connected with the major mining and metallurgical industries already established but capable of material expansion. The development of these branches can be visualized definitely today. On the other hand, it is extremely hard to foretell future developments concerned with the numerous small scale mining operations that have been carried on in the past or are being carried on today. In some cases the domestic supplies of raw material suffer either in quantity or quality or even in both when compared with deposits elsewhere in Australia.

Again, it is difficult to see how any reasonably permanent employment can result from even a large expenditure on some mining fields that gave work to large numbers of men in the past, before the exhaustion of the workable ore. This latter difficulty is especially noticeable in regard to the copper fields of the State. Future developments must depend upon entirely new discoveries yet to be made. Such discoveries are not judged to be impossible of achievement.

The conditions imposed by the present war have not greatly influenced mineral production in the case of most minerals, although they have been responsible for a serious diminution in the output of gypsum, on account of building construction restrictions. The search for mineral deposits other than those already known has not been greatly affected by the withdrawal of men to the munition plants, since there were few prospectors afield in South Australia at the time of the outbreak of hostilities. With the advent of peace very few of the men now in the military forces or engaged in

wartime production can be expected to enter upon mining and prospecting with the advantage of previous experience of this work.

METALS AND METALLIC ORES

Iron

Much the most important possible developments are, in my judgment, those connected with the expansion of the iron ore smelting at Whyalla. Under existing circumstances it is practically impossible to foretell any notable expansion such that will result in a demand for increased labour, unless the Broken Hill Proprietary Coy. enters into steel production at Whyalla. The installation of a steel-making plant would probably result in the establishment of coke ovens, to produce coke locally from imported coal and utilize in the steel furnaces the gases given off from the coal during its conversion into coke. The manufacture of steel in South Australia would probably lead to the installation of rolling mills; and, if this step is taken, the establishment of the tin-plate industry would be brought appreciably nearer.

These operations may be expected to be carried out by the Broken Hill Proprietary Coy., if the initial decision to authorize the expansion is reached. If the Government can accelerate the favourable consideration of the question, such action is likely to be by far the most important that can be taken to provide permanent employment in the post-war period. For this reason I consider that the greatest possible effort should be made to obtain an early decision from the Broken Hill Proprietary Company.

Copper

It is impossible, at the present time, to forecast the absorption of men in copper mining on any field. Much exploratory work by drilling remains to be done before a scheme of development

can be outlined for Moonta, Kadina, or Kapunda. So far as can be judged today, the other copper-bearing districts in the State offer less promise.

The principal requirement of the moment, to prepare for post-war possible development, is skilled diamond drillers. The Department is accelerating the exploratory work at Moonta by putting another drill on the field, but has had the greatest difficulty in obtaining the services of a driller to run the plant now available. There are several holes to be drilled in this field to test the indications given by a geophysical survey.

It is hoped that a geophysical survey of the northern end of the Burra field can be carried out, to examine the possibility of a northern extension of the mineralized zone. Drilling will be required there also, if any favourable indications are given by geophysics.

Zinc

In the very large tonnage of zinc-bearing slag at the B.H.A. Smelters at Port Pirie there is an immense quantity of zinc, to which additions are being made continually by current smelting operations. The slag dump is known to contain already 4,580,000 tons of slag, having an average content of a little over 17 per cent of metallic zinc. The total quantity of zinc present is estimated to be 778,635 tons.

If slag-fuming operations are adopted the number of operatives required daily will be 43. If the vertical retort process is adopted also for the treatment of fume to the stage of final refined zinc, an additional 110 operatives daily will be required. The scale of operations, taken into account in respect of this measure of employment, involves the treatment of 600 tons of molten slag daily, of which about 320 tons would come from the dump and the remaining 280 from the current production of the furnaces.

The recovery of zinc from the slag has long been considered by the B.H.A. Smelters directorate, and it may be possible to

induce them to enter upon this work prior to the cessation of hostilities, since supplies of zinc are short today, and the use of the metal for galvanizing is severely rationed as a consequence of the demand for zinc in minition manufacture. If the process of slag treatment is once established it may be expected to be carried on in the post-war period.

Should this suggestion receive approval, I think that the discussion of the matter should be taken up with Sir Colin Fraser, of Collins House, Collins Street, Melbourne, since he is known to be keenly interested in this particular phase of the smelting operations at Port Pirie and to have expressed the hope that it can be brought into operation in the near future. In my judgment this proposal should be put forward at the earliest possible date.

Manganese

This is mined at a number of places, but the deposits that have been located are relatively small, and consequently cannot be expected to provide continuous employment to a considerable number of men, although they may be worked by small parties. Hitherto attempts at beneficiation have not been successful in developing a method treatment that will lead to the use of the use of the manganese ore in secondary industry. There is a ready market at Whyalla for all the saleable ore that can be produced today.

Gold

Gold mining is now being carried on at very few places. Although there will doubtless be some more prospecting on all the known fields after the war, it cannot be expected that there will ben any material increase in the production of this metal, with which South Australia is not so well provided as the other States of the Commonwealth. The State maintains 5 batteries at Mount

Torrens, Mongolata, Peterborough, Glenloth and Tarcoola and no other localities can be suggested for additional plants of this character.

Titanium

Titanium occurs in the form of rutile, the oxide, sparsely disseminated through the china clay of the Williamstown district and in veins in other localities. The purest rutile is that occurring in the china clay and its recovery may be part of a general process designed to wash and improve the quality of the clay. It is essentially a by-product and its recovery is unlikely to lead to any material increase in the labour employed.

Magnesium

Magnesium may be obtained from magnestie or dolomite but is not being produced today from these South Australian ray minerals. The present Australian requirements are being met by the treatment of very high-grade magnesite mined and smelted by the Broken Hill Proprietary Coy. in N.S.W. It appears to be improbable that South Australia can be the site of smelting operations for the production of this metal, unless the new method of recovery from dolomite shows material advantage, over the use of magnesite.

NON-METALLIC MINERALS

PHOSPHATE ROCK

Phosphate rock occurs in greater abundance in South Australia than inother parts of the Commonwealth. It is being worked today on account of the occupation of Nauru and Ocean Islands by the enemy, but cannot compete with the raw materials from these islands either in chemical composition or in physical characters. On the cessation of the war, or perhaps even before its final

phases, traffic with the Pacific Islands will be resumed, and then it is improbable that local production will be maintained. Much of the South Australian raw material is low-grade and requires special treatment, the details of which have yet to be worked out, to enable the grade to be raised to the minimum required for the manufacture of superphosphate. The alternative use of finely-ground raw phosphate rock in regions with over 20 inches of annual rainfall is to be encouraged, but it seems to be impossible that a new plant for grinding the rock will be built, in view of its abandonment when the existing conditions are changed. The possibility of turning to full account the grinding facilities now available is being examined.

BARYTES

Barytes is abundant in South Australia, and is produced in greater quantity here than in the other States. Hitherto only the highest grade has been marketed from most of the deposits, but a little work has been done on beneficiation at Port Adelaide with good results. This treatment of lower-grade material is certain to increase in the future, as the difficulty of obtaining first-class barytes by selective mining andhand picking increases. There are very large deposits of the second or even lower grade material in South Australia which can be treated successfully when the supplies of better barytes are exhausted, and when the demand for large tonnages exists. The proposal to manufacture the white pigment known as lithopone in South Australia failed to prove attractive on account of the salinity of the water available, and this industry cannot be established on a sound andpermanent basis.

SULPHUR

Sulphur in the elemental form can be recovered from some of the gases given off in teh course of smelting operations at B.H.A. Smelters at Port Pirie. A considerable quantity of elemental sulphur has been consumed annually in South Australia,

its source being, for the most part, Texas, U.S.A. The B.H.A. Smelters use 216 tons of sulphur per annum in removing copper from smelter bullion. The fertilizer companies generating sulphuric acid by the contact process use a much larger amount; the Adelaide Chemical andFertilizer Coy. Ltd. requiring 5,200 tons per annum, andthe Cresco Fertilizers Ltd. at Port Linclon requiring 2,680 tons, when operations are conducted on a full scale. Large quantities of sulphur are required in Australia, which imported 72,818 tons in 1941, over 80% of which was consumed in the manufacture of chemical fertilizers.

In the roasting of Broken Hill zinc concentrates at Port Pirie only a fraction of the gases is used in the generation of sulphuric acid, the remainder passing into the atmosphere, as shown in the following table:-

Zinc Concentrates

	Percentage of gases converted to acid.	Percentage of gases passing to atmosphere	Tone of Concentrate roasted.
1941	50.5	49.5	58.510
1942	31.2	68.8	62.552
Year to 7/4/43	20.8	79.2	47.909

(Note: the year begins on 2st July)

The calculated tonnage of sulphur passing into the atmosphere in gases from the B.H.A. Smelters is given in the following table:-

	From Lead concentrates roasting & smelting	From Zinc concentrates roasting	Total
30th June, 1941	41,114	7,314	48,428
" " 1942	46,075	10,923	56,998
1/7/42 - 7/4/43	32,172	9,642	41,814

The blast furnace gases are not amenable to treatment for the recovery of sulphur. The remaining gases, however, from the Dwight-Lloyd plant carry approximately 120 tons of sulphur per day.

It will be seen from the figures quoted that there are ample supplies of sulphur available, as possible by-products of existing operations, to satisfy the State's requirements and to provide a surplus for export, if full advantage is taken of the sulphur-charged gases now escaping from the smelters.

If a plant were installed to recover 100 tons of elemental sulphur a day, and assuming that gas concentration and reduction to sulphur were undertaken, it is estimated that about 51 additional operatives per day would be required.

I think that it would be well to urge that the recovery of sulphur from waste gases be undertaken at the B. H. A. Smelters at Port Pirie and that the approach to the proposal should be made through Sir Colin Fraser of Collins House, Collins Street, Melbourne.

CLAY AND CERAMIC MATERIALS

South Australia is particularly well-endowed with the raw materials for the ceramic industry, if the preparation of a wide range of products is considered. Many enquiries have been made with regard to these raw materials with a view to the expansion of the industry beyond the comparatively narrow limits observed by existing potters. The range of clays available in considerable quantities is large, but some of them require the treatment by washing that is found necessary throughou the world to render the clays suitable for the better grades of pottery. There is excellent china clay to be obtained from the Mt. Crawford district, and a good ball clay from Woocalla on the East-West railway at a distance of 71 miles from Port Augusta. High-grade silica, suitable for pottery, is obtainable from Longwood, and flint is abundant on the coast west of Port MacDonnell. Felspar of good quality is mined at Boolcoomata and Gumeracha and is already in use in the manufacture of ceramic ware. Cornish stone is available also from the felspar-producing

localities. Calcite of exceptional purity is obtainable from the Angaston district and from Mt. Gambier. The only mineral used in pottery that it would be necessary to import is fluorspar, since the domestic supplies are practically non-existent.

The establishment of pottery works to produce a wide range of products should be based upon extensive experimental work carried out by a specialist who has had the scientific training necessary to enablehim to make the best possible use of the raw materials and also lengthy practical experience in the blending of clays and the burning of these mixtures in pottery kilns. A laboratory examination of the clays is not by any means enough. The clays must be treated, and experimental work in a kiln is wanted to afford proof of the capabilities of the clays. I have tried more than once to interest others in the development of the South Australian ceramic industry, but so far without success. Possibly one of the obstacles to expansion in South Australia has been the comparatively small population as contrasted with that of the Eastern States, which also are well-endowed with raw materials. If ceramic ware is produced in large amounts in South Australia, a market for much of it beyond the State must be obtained.

The most important first requirement for the development of the ceramic industry appears to me to be the obtaining of the services of a properly-qualified specialist to advise on the experimental work. If and when such a man is engaged there will be a considerable expenditure to be met in establishing a laboratory equipped with a kiln and engaging the working staff. Whether a specialist can be obtained from England seems doubtful at the present time, but the services of a suitable man might be got after the war. I have already in hand the full plans of the ceramic laboratory that was installed recently in Canada, but doubt whether such an elaborate equipment would be required in South Australia.

GYPSUM

Gypsum is available in very large amounts, the chief reserves being situated near Lake MacDonnell on western Eyre Peninsula. Production has fallen off recently as a result of the diminished demand for plaster caused by restrictions on building but there will be much plaster required when hostilities cease and men are available to engage in the building trade. The following table shows the details of recent total production, and of the amounts produced by Waratah Gypsum Pty. Ltd.:-

Year	Production by Waratah Gypsum Pty Ltd. Tons	Total State Production Tons
1934	70,229	75,241
1935	88,726	102,268
136	97,742	107,151
1937	106,699	116,121
1938	134,440	145,666
1939	129,288	144,940
1940	142,169	153,438
1941	102,363	113,501
1942	44,728	57,206

This table shows clearly the predominance of Waratah Gypsum Pty. Ltd. in this industry. Plaster has been made also by Austral Plaster Coy. Ltd and by R.G. Howard & Coy., by the Dry Creek Plaster Coy., and by W. Hall and Son. Some negotiations have taken place between Waratah Gypsum and Austral Plaster, but no amalgamation of interests resulted. It is understood that proposals were made for building an entirely new factory at Port Adelaide at a site which would permit deep-sea vessels to berth close to the works. The gypsum deposit at Marion Bay is becoming exhausted and it will be necessary to draw the raw material for the plaster from the Lake MacDonnell deposit via Kowulka and Thevenard. It has been proposed to erect handling plant and bins

at Thevenard to deal with large tonnages.

Even ifplaster manufacture at Thevenard cannot be resumed, for economic reasons, it is greatly to be desired that gypsum be converted into plaster at Port Adelaide instead of being shipped to the eastern States.

The manufacture of plaster boards appears to be deserving of encouragement also. There are other manufactured building materials which backing; but plaster products appear to be deserving of support.

Although it hardly seems possible to arrange for the construction of handling appliances at Thevenard at the present time, and for shipping large tonnages from that port, it would be well, in my opinion, to try and get all plans completed to carry these proposals into effect as soon as peace comes, and to again approach the directors ofWaratah Gypsum Pty Ltd. with this end in view.

GRAPHITE

Graphite is being produced on a small scale at the present time and arrangements are being considered for increasing production from the principal deposit to satisfy the deamnds of the munition plants which are calling for it as a lubricant. There is an additional demand from industry generally. Competition with imported graphite has been an obstacle to development in the past, and the reopening of trade with Madagascar, following upon recent agreements made by the Allied Powers to absorb the mineral products of that country, is making itself felt already. Nevertheless there appears to be no reason why the South Australian graphite should not hold its own at current prices. Yet it does not appear probable that there will be many more men engaged upon any work connected with such expansion of the industry as can be visualized at the present time.

SALT

Salt is one of the chief non-metallic products of South Australia, and is not expected to be in greatly increased demand, save perhaps for the expansion of the alkali industry that can be effected by the extension of the evaporating basins in the St. Kilda district. After the initial expenditure on the creation of salt-fields the amount of labour required is small and the harvesting of the salt from the crystallizers is mechanized fully. South Australia can produce now more salt than can find a market. Shipping difficulties have brought in competition from the northwestern portion of Victoria whence salt is being carried by road to Melbourne.

MAGNESITE

Magnesite occurs in large quantities in South Australia but is not so pure as that obtained in the eastern States or in Western Australia. There is consequently no reasonable prospect of obtaining an export market in the face of competition with the purer deposits elsewhere in Australia. After the war the European sources will be again available, and no Australian magnesite will be wanted to take their place. It seems probable that those working the deposits situated in South Australia will find that the only markets available lie within the state. Expansion is therefore improbable.

TALC

Talc is in great demand at the present time, but the quantities required in Australia are relatively small, and South Australia can satisfy these demands with ease. Expansion on a scale that will call for much more labour seems to be improbable, although the output seems likely to increase beyond that of the present time.

ASBESTOS

Asbestos also can be marketed with ease, but the prospects of large scale developments from South Australia sources are not regarded as promising.

FUEL

No outstanding developments in the use of domestic fuel are expected other than those connected with the Leigh Creek field. The prospects of obtaining supplies of petroleum are certainly far from promising, and it seems improbable that the lignite deposits can be exploited in the near future. The State is already taking the measures necessary to turn the Leigh Creek sub-bituminous coal to account.

L.K. WARD

DIRECTOR OF MINES

19/6/43

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SOUTH AUSTRALIA

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RECOVERY OF ZINC FROM SLAG AT PORT PIRIE

- Sir Colin Fraser, Collins House, Collins Street, Melbourne. C 1 VICTORIA -

I am writing to ask you whether it is possible for the Broken Hill Associated Smelters Pty. to undertake the recovery of zinc from the large tonnage of slag that has accumulated at Port Pirie and which is receiving continual accretions from the smelting of the Broken Hill concentrates.

You are probably as well aware as I am of the existing deficiency of zinc for industrial use in Australia, and of the need for severe rationing of the amount of zinc available. We hear continually of the impossibility of obtaining sufficient supplies of galvanized iron, piping, etc. to meet the needs of the community, and I shall be very glad if the B.H.A. Smelters can take the necessary steps immediately to undertake the recovery of zinc from the slag.

From the enquiries I have made it appears that the amount of slag available from past and current operations is ample for the establishment of permanent smelting operations under the direction of the able metallurgical staff at Port Pirie, and trust that no hesitation will be felt about undertaking this work without delay.

I quite realize that the establishment of this branch of the metallurgical industry calls for careful consideration and that several matters must be weighed carefully before a decision can be reached; but at the same time I feel that I am giving expression to the needs of Australia generally in proposing a method by which South Australia can make a material and useful contribution to the national progress.

Quite naturally we expect that, once the recovery of zinc from the slag is undertaken, the operations will be continuous even when wartime conditions no longer exist; and that this additional smelting will provide permanent employment for the men who are engaged for the purpose.

I shall be very glad to hear your views regarding the proposal, which is one that I feel sure has not excaped your notice during your long connexion with the B.H.A. Smelters although steps have not been taken to carry it into effect. The present time would appear to be specially favourable for starting the work and I trust that it can be authorized.

19th June, 1943

L.K. WARD,
DIRECTOR OF MINES

DEPARTMENT OF MINES
SOUTH AUSTRALIA

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RECOVERY OF SULPHUR FROM SMELTER GASES AT PORT PIRIE
- Sir Colin Fraser, Collins House, Collins Street,
Melbourne. C. 1 VIC. -

You may have noticed a recent statement by the Minister for Commerce and Agricultre, Mr. Scully, to the effect that arrangements had been made for the importation into Australia of additional supplies of sulphur, presumably from the Gulf Region of the United States, whence supplies have been drawn for some years to meet the demands of the fertilizer manufacturers.

Although a large amount of sulphuric acid is made from the roasting of Broken Hill concentrates at Port Pirie and elsewhere there is still a considerable demade for elemental sulphur to meet the requirements of those plants which are designed to make their acid from this material. Even if there has been recently a limitation of the amount of raw phosphate rock available for manufacture into superphsophate, and a tendency for pyrite to be substituted for sulphur in the manufacture of sulphuric acid, the demand for elemental sulphur is still such that efforts are being made to obtain shipping space for importation.

It is possible to meet this demand by undertaking the recovery of elemental sulphur from the gases that are passing into the atmosphere at Port Pirie? The South Australian requirements are not negligible, since the normal requirements of the Adelaide Chemical and Fertilizer Coy. are 5,200 tons of elemental sulphur per annum, and those of Cresco Fertilizers Ltd. at Port Lincoln are 2,680 tons per annum, when operations are conducted on a full scale. I have been informed that the anticipated imports for the year ending 30th June, 1944, amount to 41,400 tons.

It seems to me therefore that the smelting industry at Port Pirie can make a useful contribution towards satisfying Australian requirements if provision is made for producing the by-product sulphur that is now going to waste, and that the economic position of Australia

will be improved materially by the adoption of such methods.

You are doubtless in a position to ascertain what quantities of elemental sulphur are recoverable from the smelter gases at Port Pirie, and what are the additional plant requirements to make this product. Possibly you have investigated this problem, and have already before you the details regarding the measures necessary to carry out such a suggestion as is made in this letter.

I shall be glad to have your comments and still more happy to hear that you have decided to take action along the lines mentioned.

19.6.1943

L.K. WARD
DIRECTOR OF MINES