

1945/60
c.1

COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT
BUREAU OF MINERAL RESOURCES
GEOLOGY AND GEOPHYSICS

RECORDS:

1945/60

Notes on Arsenic Production at Wiluna

by

N.H. Fisher

The information contained in this report has been obtained by the Department of National Development, as part of the policy of the Commonwealth Government, to assist in the exploration and development of mineral resources. It may not be published in any form or used in a company prospectus without the permission in writing of the Director, Bureau of Mineral Resources, Geology and Geophysics.

DEPARTMENT OF SUPPLY AND SHIPPING.

Mineral Resources Survey Branch

NOTES ON ARSENIC PRODUCTION AT WILUNA.

Report No. 1245/60.

A visit was paid to Wiluna on July 28th and 29th, and an inspection made of the underground workings and of the plant. The reserve ore above the bottom (2000') level, which was stated in January to be 300,000 tons, was being mined out at an average rate of 32,000 tons per month. Reserves at July 15th, in the Wiluna mine were stated by the management to be 109,000 tons. This would allow the full rate of extraction to be maintained until the end of September, by which time 78,000 tons would have been raised. The full production rate could not be kept up during the process of cleaning up the last of the ore in the mine.

Arsenic is being produced by A. Victor Leggo and Company from the current flue gases and from crude arsenic stored in dam at Wiluna. The rate of production was stated by Leggo's in February to be approximately 40 tons per week, of which current condenser crude contributed 65 per cent. and crude from dam 35 per cent. The proportion derived from each source depends on the amount becoming available from the mine production. The dam was stated, at the time of inspection, to contain about 3,000 tons of crude arsenic from which at least 60 per cent. (probably up to 2,000 tons) of refined arsenic can be obtained. It has been pointed out by Leggo's that as the arsenic in the dam contains some antimony, the refined arsenic from this source is suitable only for about 50 per cent. of Australian requirements. It would, therefore, be preferable to absorb this as far as possible by mixing in such proportion with current condenser crude that the deleterious effect of the contained impurities is kept below the allowable maximum. This apparently has been done when refinery capacity has been available, but a substantial tonnage will still remain when full-scale mine production ceases.

If arsenic from the dam alone were being used, the output of the plant would be only about 80 per cent. of the full capacity on current condenser crude, due to the physical condition of the arsenic from the dam and its higher antimony content. Cost of production from dam crude is estimated at about £5 per ton higher than from condenser crude, approximately \$19 per ton against about \$14. The costs using a proportion of dam crude vary between these two limits according to the percentage used.

It was stated by the manager of Wiluna Gold Mines Ltd., that by the end of September, 1945, the production of arsenic at Wiluna since March 31st, 1944, will be 3,750 tons of arsenic, with a probable 400 or more tons of arsenic in flues and other parts of the plant, which will eventually be recovered. The Wiluna Company is anxious to apply the total subsidy approved, viz. \$123,000, to this period of production, resulting in an average subsidy of \$32 to \$33 per ton of arsenic produced, including arsenic from dam crude. Selling price of refined arsenic in Australia during this period was \$28 to \$29 per ton, and the total cost per ton, therefore, \$60 to \$62. During the same period, the London price was \$59 stg. per ton, and the New York price 4 cents per lb., but it is stated by Leggo's that in any case it was impossible to obtain refined arsenic either in England or the United States of America, at least until the end of the European war. Prior to the payment of subsidy, arsenic was produced at Wiluna during the war years at a price only one-half to one-third the cost of importing arsenic from Great Britain, if any had been obtainable. (See A. V. Leggo's letter of 9/2/45 to Division of Import Procurement).

Further supplies of arsenic at Wiluna after the end of September will be available from the following sources.

1. Crude arsenic referred to above, stored in dam, containing probably about 1,800 tons of refined arsenic. If Leggo's refining plant

at Wiluna were devoted exclusively to the treatment of this material, it would be put through in 12 months or a little more.

2. Arsenic obtained from ore extracted from the main Wiluna mine after September 30th, in the process of cleaning up. From the figures given above, this will be 31,000 tons or possibly more, containing up to 150 tons of arsenic.
3. Arsenic production from outside lodes. At present, the Company is doing its utmost to bring into production a recently explored orebody in the Happy Jack mine, which is situated a mile or so to the north of the main mine. This orebody contains possibly 120,000 tons of ore, carrying higher gold values than the Wiluna ore. The arsenic content of this ore was not ascertained.

Ore treatment at Wiluna consists of floating off, after the necessary grinding, an arsenopyrite concentrate which is filtered and then fed into roasters. Oxides of arsenic and sulphur are driven off in the flue gases, the latter escaping to air and the arsenious oxide being collected as crude arsenic by precipitation, after which it is refined in furnaces, especially designed for the process by A. Victor Leggo and Company.

The calcined product from the roasters is then cyanided to extract the gold and the tailings from this process are stored in a dump. These tailings contain about 6 dwt. gold per ton and it is estimated that some 450,000 tons have accumulated. The company has developed a process for the retreatment of these tailings to extract the gold, which, it is understood, involves recalcining them with either 3 per cent. of Wiluna sulphide (arsenopyrite) concentrate or 2 per cent. of pyrite from the Iron King Mine at Norseman, and then again cyaniding. As the company have continued to use their current concentrate for arsenic production, it is assumed that they will depend entirely upon Norseman pyrite for the tailings retreatment process. It is, however, possible that they will also use in this process the concentrate mentioned above which will be produced from clean-up ore and from the Happy Jack Mine. In any case, the arsenic content should eventually become available for refining.

The only ore remaining in the Wiluna mine after the present ore extraction programme has been completed is a triangular area on the East lode below the 2000' level, containing probably about 200,000 tons of low grade ore. It was this ore which the company proposed early in 1944 to develop by means of a new level, but this plan was abandoned on account of manpower shortage. This ore could not now be brought into production before the ore above the level is mined out, even if the arsenic content were required so urgently that mining costs need not be considered.

CANBERRA, A.C.T.
25th August, 1945.

N.H. Fisher
N.H. FISHER,
Chief Geologist.