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COMMONWEALTH OF AUSTRALIA.

DEPARTMENT OF SUPPLY AND SHIPPING.

MINERAL RESOURCES SURVEY.

REPORT No. 1944/2 .

NOTES ON

THE UPPER YARRAMAN BENTONITE DEPOSIT, QUEENSLAND.

- By -

N. H. FISHER.
D.Sc.

Geologist.

CANBERRA. 11th February, 1944.

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I. INTRODUCTION.

This deposit was examined in company with Mr. L. C. Ball, Chief Government Geologist of the Queensland Geological Survey on Wednesday, January 5th, 1944. It has previously been described in some detail by H. G. S. Cribb of the Geological Survey (Queensland Government Mining Journal, August, 1943, P12-15) and information contained in that report will not be repeated here. Since Mr. Cribb's examination was made, the workings southwesterly from the shaft have been extended somewhat, but the owners, Messrs. Elver Bros., at the time of our visit were proposing to abandon that shaft on account of water and the fact that the drives were too long for economic working. The mining method used is expensive, slow and inefficient. Drives are put out from the working shaft, with shorter drives at right angles. These are close timbered overhead and the sides robbed to an extra width of 1 or 2 feet. The broken ground is carried to the shaft and hauled to the surface by windlass and then spread out to dry before shipment. Less than 50%, probably only about 30% of the bentonite is recovered by this procedure.

Origin of the Deposit.

There can be little doubt that the bentonite is derived from the alteration in situ of a volcanic agglomerate, as it still retains the agglomeratic texture. The original rock fragments are sparsely distributed through the mass and are decomposed to a white kaolin. They are subangular and usually less than 1 inch in diameter, but may in places be as much as 2 or 3 inches. The interstitial matter, which comprises easily the main bulk of the deposit, has been altered to bentonitic material with characteristic waxy appearance. The base of the deposit in the workings is practically flat, and it is underlain by white clay which is also bentonitic in character. A sample of this clay from just underneath the bentonite in a cross-cut off the southwest drive, showed bentonitic qualities by Sadlers test equal to that of the bentonite itself, but it is not known whether this is representative of the whole of the clay band. The thickness of this clay is not generally known, as the workings are confined to the bentonite, but it is considered by Messrs. Elver Bros., to be probably about 8 feet. In the most northwesterly shaft, ironstained clay was found underneath this white clay.

White clay up to 8 feet in thickness overlies the bentonite and this grades upwards into blue or grey clay. This in turn passes into reddish rubbly material and finally to surface soil. The upper boundary of the bentonite is less regular than the base and rises and falls locally forming "peaks". Fractures showing slickensiding are common and it is probable that the slickensiding and the irregular upper surface are due to the bentonite swelling when wet and expanding upwards at points of least overlying pressure. The top of the bentonite is often marked by a greenish-red line and is overlain by 3 to 6 inches of slightly bentonitic laminated white clay. Both the upper and lower clays are probably the result of decomposition of fine volcanic ash. Both clays when washed give a very small residue of tiny quartz crystals.

The base of the bentonite coincides with the bottom of the shaft at 24 feet depth, and as it is practically flat in the workings, it would be expected to extend underneath the whole of the small plateau shown in the accompanying plan, but it will be terminated by the slope of the ground on all sides away from this central area. It is quite possible that other deposits may exist in the district.

Method of Testing.

The bentonite has been so consistent over the area exposed in the mining that it is considered that bore holes at 300 feet intervals would be sufficient for preliminary testing of the deposit, though if anomalies should occur further holes may be necessary. Bores could be put down by hand auger or extended "post-hole digger", two men being sufficient to operate either of these tools. Depth of each hole would be about 30 feet or a little less and a grid of fifteen holes at 300 foot intervals, based on the shaft would cover the principal area in which the bentonite might be expected to occur. If five additional holes be allowed for any further testing that may be necessary, a total of 600 feet of boring will be required. Information is not yet to hand as to the probable rate of boring in this type of ground, but it is possible that two holes could be put down per day. Even at one hole per day, the cost of boring should not exceed £50, with a possible additional £10 for the purchase of a "post-hole digger" and extension rods, and their transport to Yarraman.

All holes should be sunk to the bottom of the lower white clay. The owners already have a market for some of the clay above and below the bentonite. This is sold as a lower grade mixed product and it is probable that the whole of the white clay could be sold if the mining costs were low enough. At an average thickness of 6 feet for the upper white clay, 4 feet for the bentonite and 6 feet for the lower white clay, the total clay thickness would be 16 feet under an overburden of equal or slightly lesser thickness, so that open cut mining methods should be applicable to the whole deposit, and the loss in mining which is a feature of the present operations would be avoided.

The scheme of testing proposed is shown in the accompanying plan. If an average thickness of 3 feet were proved, and assuming one ton of air-dried bentonite per 20 cubic feet in situ, the tonnage contained in the area covered by the drill holes would be approximately 60,000 tons, which is far in excess of the amount needed to establish an adequate reserve for Australian requirements.

By Sadler's test the bentonite has given results from 32 to 56 per cent. However, measurements by the Standard Chemical Company have shown it to have high compressive strength, both green and dry, comparing quite favourably with imported bentonite, so that it is suitable for use in bonding moulding sands for foundry purposes which is the principal Australian requirement.

Information collected by Mr. F. Canavan from bentonite users indicates that the Yarraman bentonite is almost, if not quite, the equal of imported bentonite for this purpose, and superior to any other Australian bentonite. In particular, it is vastly superior to the Trida bentonite, which is being marketed in Sydney at a high price as "Australian bentonite." The consumption for foundry purposes per year would be, at present, about 800-1000 tons, with possible future expansion.

Following is a comparison of the properties of the Yarraman bentonite, imported bentonite from Wyoming, bentonite from Marchagee, Western Australia and from Trida, Western New South Wales.

Property	Yarraman	Wyoming	Marchagee	Trida
Sadler's Test	32-56%	100%	85%, 47%	27.5%
Green compressive strength	7.3	4.8	5	2.4
Dry compressive strength	60	79	38	9.0
Permeability	210	240	210	-

II.RECOMMENDATIONS.

It is recommended:-

1. That arrangements be made for some reliable foundry company to make comparative trials of the bentonites from Yarraman, Wyoming, Marchagee and Trida.

2. That testing of the bentonite on the lines laid out above be proceeded with as soon as practicable, the boring to be supervised by a geologist of the Queensland Mines Department or of this Branch. Samples from each hole should be submitted for Sadler's tests and for measurements of permeability and green and dry compressive strengths

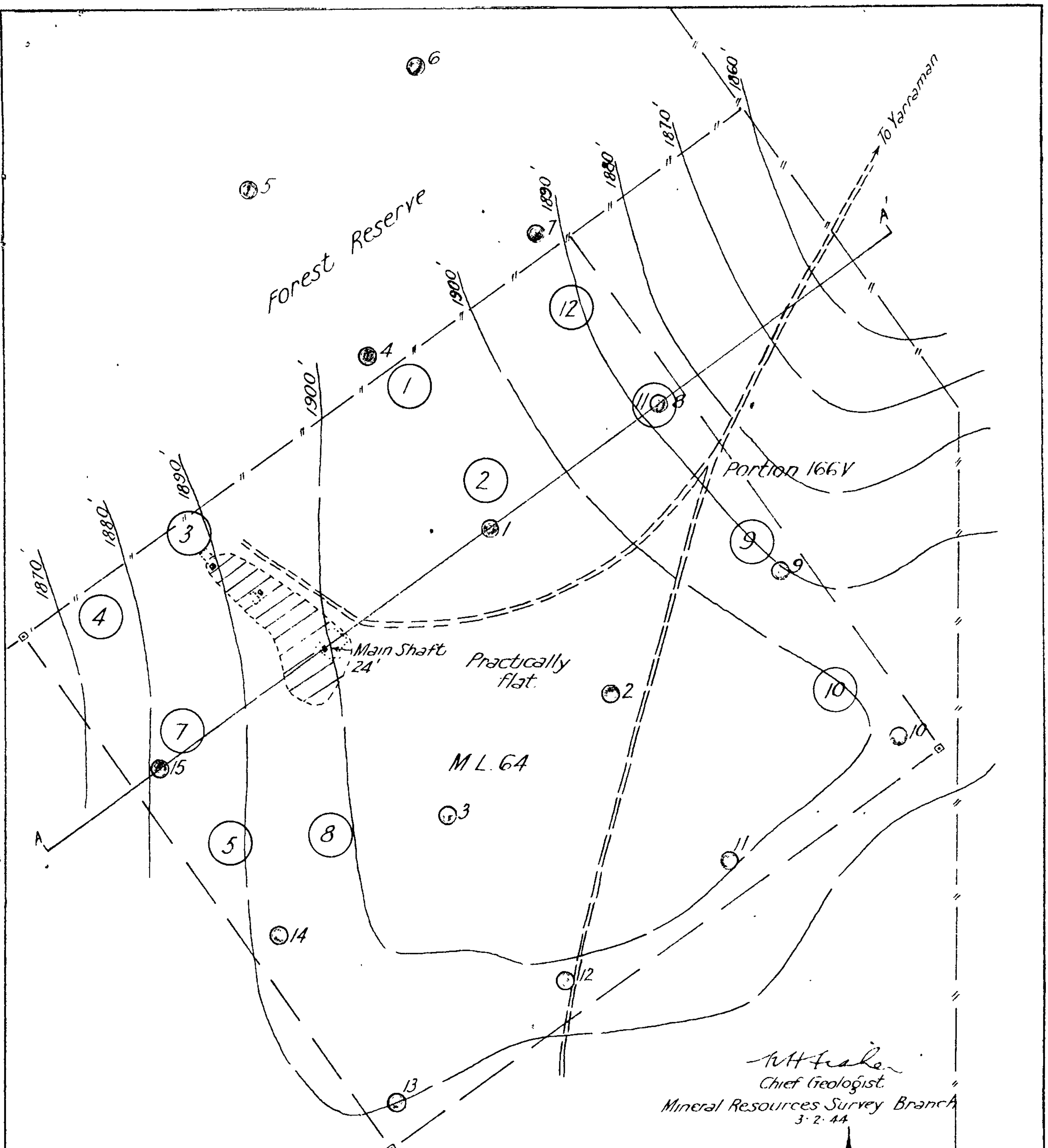
3. That, while the boring is in progress, the geologist survey the whole area in detail and establish the exact elevations of the proposed boreholes, as well as those of previous bores.

4. That some attention be paid by the geologist to the possibility of locating other deposits in the district.

5. If the practical trials confirm the suitability of the Yarraman bentonite for foundry purposes and the boring proves adequate reserves, the question of increasing the production, preferably by the initiation of open cut methods of mining, should be considered.

CANBERRA, A.C.T.
11th February, 1944.

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

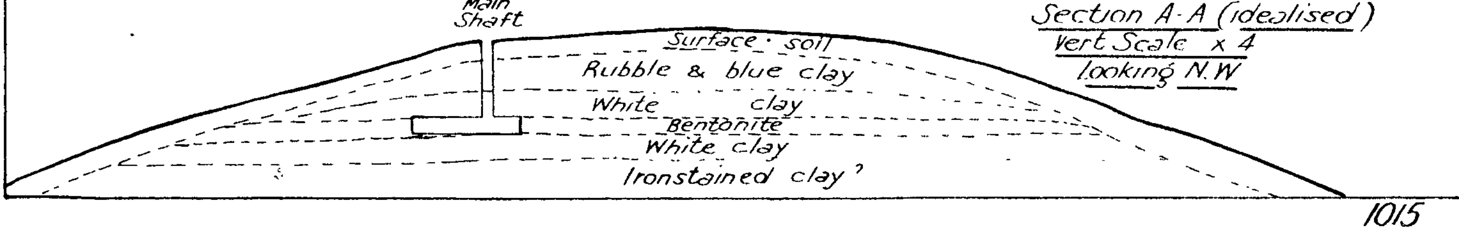


Sketch Plan of M L 64
Upper Yarraman
Portion 166V
Ph Cooyar Co. Cavendish, Qld.

Scale 1" = 200ft

Reference

- Bentonite proved by underground workings
- Shaft
- Drying Shed
- Fence
- Lorry track
- (5) Approximate position of hand bore holes (to upper surface of clay only)
- 7 Position of proposed bores
- Contours at 10 foot intervals drawn by L.C Ball from aneroid readings. Heights above sea-level only very approximate.



Section A·A' (idealised)
Vert Scale x 4
looking N.W