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(Geol. Ser. 5).

GEOLOGICAL NOTES ON THE SUPPLY OF RAW MATERIALS FOR CEMENT MANUFACTURE AT PORT MORESBY, PAPUA.

by

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I. INTRODUCTION.

The Provisional Administration of the Territories of Papua and New Guinea is investigating the possibility of manufacturing portland cement in the vicinity of Moresby and the question of supply of raw materials in that area has been referred to the Bureau of Mineral Resources, Geology & Geophysics.

No field investigations into the supply and distribution of these materials has yet been undertaken, but sufficient geological data are available from previous geological reports* and from observations made by Dr. N.H. Fisher to allow the compilation of the following preliminary notes. Unfortunately, no detailed geological map of the area is available.

It is intended that a geologist from the Bureau, who is at present in New Guinea, should carry out some field investigations within the next few weeks.

The raw materials from which portland cement is produced are limestone (to give the necessary lime) clay or shale (to provide the necessary silica and alumina) and a small quantity of iron oxide.

Limestone for cement manufacture may vary widely in hardness, texture and composition, but magnesia, free particles of silica and sulphur are undesirable constituents. The shale or clay may be impure, but should not contain grit or any free solid particles.

The limestone, shale and iron oxide are finely ground and mixed in proportions calculated from the chemical analyses of the three constituents. The mixture is fired in a kiln in which finely ground coal or coal gas is used as fuel. The rock mixture is fed into the kiln in one end and the coal dust is injected and ignited at the other end. Hydro-electric power could replace coal or gas in the process, although a different type of kiln would be necessary. Electrically heated kilns have not been developed in the Australian cement industry, but it is understood that they are used in some parts of Europe.

II. GENERAL GEOLOGY OF THE PORT MORESBY AREA.

The oldest rocks in the area - The Lower Port Moresby Beds of Cretaceous age - consist of folded marl, chert and limestones. Stratigraphically above these beds lie the Upper Port Moresby Beds which range from Eocene to Lower Miocene and consist mainly of marl, argillite (claystone), chert, tuff, grit and a wide variety of limestones. All of these beds show degrees of folding on axes trending northwest-southeast and in many places the dips are steep with minor folds and buckles. The Port Moresby - Rouna Road crosses the strike of these beds for about 13 miles north-east of Port Moresby and outcrops show repetition of beds due to folding. The limestones show varying degrees of silification, in some places, due to small bodies of serpentine, gabbro and granophyre which intrude the sediments.

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* Montgomery, J.N. 1930 - "Contribution to the Tertiary Geology of Papua." Oil Exploration work in Papua and New Guinea, 1920-1929, vol. 4.

Carne, J.E. 1913 - "Astrolabe Copper field Central Division Papua". Bulletin of the Territory of Papua - No. 1.

III. ROCK MATERIALS FOR CEMENT MANUFACTURE.

Rock materials suitable for cement manufacture will undoubtedly be found in the Moresby area. Suitable clay or shale will be provided by some of the beds of marl and argillite and many of the limestones in the area should be satisfactory. The small quantities of iron oxide required could be provided by outcrops of ironstone, at least one of which has been exploited in the past.

Since suitable rock materials are likely to be available in several places within the area, investigations should first be directed to localities where the plant could be erected and operated at least cost. Assuming that a site close to port facilities would be desirable, the area in the vicinity of Bogoro Inlet, which forms part of Bootless Inlet, appears to be the most suitable.

Argillite occurs on the eastern side of Bogoro Inlet and several varieties of limestone have been observed in the area. Limestone outcropping on both sides of the Inlet may be satisfactory, although some of it at least has been referred to as limestone-grit. Limestone observed along the old mule track from Bogoro Inlet to the Dubuna Mine, about 1¼ miles west of the old Inlet Road and about 1 miles north-east of the Inlet, will almost certainly prove satisfactory and may be more suitable than those bordering the Inlet itself.

J.F. Carne collected samples from the mule track about 1½ miles east of the old Inlet Road and the analysis showed the rock to be fairly pure.

Limestone, one quarter mile from Bogoro Creek, on track from Bootless Inlet to Dubuna Mines.

	Per cent.
Water	0.48
Calcium carbonate	81.93
Magnesium carbonate	1.27
Manganese	1.29
Ferrous	0.87
Silica	10.66
Alumina	3.62
Phosphoric anhydride	0.14
	100.26

Samples and chemical analyses of the argillites and limestones at Bogoro Inlet and of limestones along the mule track will be necessary before the materials can be regarded as definitely satisfactory. Quarry sites should also be investigated as the beds are folded - closely in some places - and it will be necessary to work out the geological structure at any prospective sites to ensure that the material is available in sufficient quantities and can be economically quarried.

If hydro-electric power were used instead of coal the plant could be located along the Moresby - Rouna Road near the Laloki River, west of Rouna Falls. Raw materials could be supplied from argillite or marl and from limestone which outcrop in the vicinity of the lode. Many of the limestones in this locality have been metamorphosed and strongly silicified. J.F. Carne gives one analysis of limestone from Iriama Scrub in this area which contains only 61.18 per cent calcium carbonate, but 29.22 per cent silica.

Limestone of this grade may be satisfactory, but this would be dependant on the mineral composition of the limestone and the chemical constitution of available marl and argillites. The presence of silicate minerals, such as wollastonite, garnet, tremolite and diopside is undesirable in limestone for cement manufacture and such secondary silicate minerals are likely to

be found in some of the metamorphic limestones in the Port Moresby area.

Prominent beds of limestone and marl or argillite in the vicinity of the Rouna Road would need to be sampled to assess their value as raw materials. Iron oxide has been quarried in the past from outcrops along the Port Moresby - Rouna Road about 3 miles west of Sapphire Creek.

IV. OTHER MATERIALS.

The lignites, or brown coals, known in Papua and New Guinea are too low in grade to be used as fuel and coal would have to be imported from Australia.

Adequate supplies of water may present a problem at Bootless Inlet, but the record of water bores put down by the Army in the Moresby area may help in assessing the possibilities of underground water in the vicinity of the Inlet. Supplies of water will present no difficulties if the plant were located near the Laloki River, west of Sapphire Creek.

V. CONCLUSIONS.

(1) The available geological information on the Port Moresby area indicates that there should be little difficulty in locating satisfactory rock material for the manufacture of cement.

(2) The most suitable area appears to be at Bootless Inlet, although if hydro-electric power could be used in the kilns, an alternative position for the plant would lie along the Port Moresby - Rouna Road, where it follows the Laloki River west of Sapphire Creek.

(3) If coal is the only practical fuel, it will have to be imported from Australia.

(4) The possibilities of obtaining supplies of underground water in the vicinity of Bootless Inlet may need to be investigated.

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