

other known outcrops on its property. Over the adjoining country, towards the coast, thick seams are known in many places, and are mined at Kaituna, Kaibrook, and Kaidale mines; and the first coal worked in the district in 1858 was in a seam in this formation in the sea-cliff at Coal Point. Thick seams are being mined at Benhar, Lovell's Flat, Crichton Hill, Waronui, and Akatore, and many other thick outcrops are known in less accessible places. The mines at present working could supply a much larger market, and these and others yet to be opened in this formation will be producing coal for many years to come. It is probable that thick seams could be found in these strata close to the railway-line by boring near Crichton Hill.

In the adjoining Tuapeka Subdivision rocks corresponding with the Kaitangata and the Taratu conglomerates are worked for gold; but, although they probably contain gold in this district also, no payable areas are known. At Benhar, close to the thick coal-seams near the base of the Taratu conglomerate, occur thick extensive beds of high-grade white clay, from which acid-resisting bricks, pipes, basins, and sanitary ware are being manufactured. Pottery-works are being built according to the latest Staffordshire designs, and, it is expected, will shortly be producing sanitary ware, &c., in quantity sufficient to meet all local requirements. Similar beds of clay as well as layers of fine white sand occur in many places in the Taratu conglomerate, and will supply a large amount of raw material. The Taratu conglomerate, moreover, consisting of 1 in. subangular pieces of quartz, is used extensively for roadmaking.

The Milburn greensand and limestone cover 1 square mile of the surface and underlie some 3 square miles of lava. At present about a hundred men are employed in the quarrying of the limestone, and in the pulverizing and calcining plants of the Milburn and Dominion companies. The bulk of the limestone is being used for agriculture; some, however, for cement-making. There is a local prejudice against limestone containing any greensand. Since the greenish colour is due to the presence of glauconite, which in many parts of the world is used as a potash fertilizer, the greenish limestone is of more value than the white limestone, and the prejudice against its use is unreasonable.

In pockets on the surface of the limestone occur concentrations of phosphate rock, which has been used in the preparation of fertilizers; but, as the Nauru phosphate now supplies the market, the Clarendon phosphate is not being quarried. It could well be ground with the limestone to increase the value of the product. There is no necessity to apply phosphate as manufactured superphosphate, for it has been shown that finely ground raw phosphates are equally valuable. The following extract from Waggener and Wagner on the agricultural availability of raw ground phosphates is quoted from Bulletin No. 7 of the Geological Survey of Nigeria, 1924:—

“Out of the thirty-seven tests [extending over a period of five years or more] twenty-two were carried on with a view to comparing the relative merits of raw rock and acid phosphates [*i.e.*, super-phosphates]. The conditions under which such a comparison was attempted varied greatly, but it may be said that in a general way thirteen of these experiments, or 59·1 per cent., gave crop yields as favourable to raw rock as to the more soluble form of phosphoric acid. Of the nine experiments in which raw rock did not compare favourably with acid phosphate, two were conducted on fields unresponsive to phosphate treatment, and two gave results which could be classed as either favourable or unfavourable, depending on the method of interpretation employed. Of the fifteen experiments in which no comparison between raw ground rock and acid phosphate was attempted, eleven, or 73·3 per cent., gave results strongly indicating beneficial effects from the application of the former material, and two of the remaining four experiments were conducted on fields showing little or no response to phosphate treatment. In twenty-one experiments the applications of raw rock were relatively light (250 lb. or less per acre), yet fifteen of these experiments, or 71·4 per cent., showed distinctly favourable increases in yields on the fields treated with this material. In sixteen experiments where the raw-rock applications were more liberal, thirteen, or 81·3 per cent., resulted favourably to raw rock phosphate, and the remaining three experiments were conducted on soils showing little or no response to phosphate treatment.”

Other experiments are quoted in support; and it is pointed out that the raw phosphate is more effective if finely ground and if decomposing organic matter is present in the soil.

Above the limestone is an unjointed homogeneous sandstone, which has been used locally as a building-stone, and is of first-class quality. On the south-west of Waiholo Hill it is more than 30 ft. thick, and, as no rocks could be seen in contact with it, its boundaries are unknown. It would not be difficult to trench the hillside above the limestone and below the volcanic cap and find out how much sandstone is there. Probably it encircles the hill above the limestone and could supply a great quantity of first-class building-material. Basalt has been found covering in all about 4½ square miles, and is in common use for roadmaking; much stone, however, is still imported from Dunedin.

The residual surface clay on the greywacke in many places is thick, and east of Milton is being used to manufacture bricks and pipes. The amount of this material in the district surveyed last season is very great.

4. LAKE TAKAPUNA WATER-SUPPLY. (Summary of Report by P. G. MORGAN.)

From the 25th to the 27th September last, at the request of the Lake Takapuna Board of Control, I made an investigation of Lake Takapuna and surroundings. This lake is at present the only source of water-supply (apart from rain-water caught on roofs) for the 18,400 inhabitants or more of Devonport, Takapuna, Northcote, and Birkenhead boroughs.

The lake is a nearly circular basin, with a shallow bay at the north-east corner. Its area is 270 acres, and its maximum depth, when at its highest level, about 200 ft. No stream runs into it, but it receives the surface drainage of about 200 acres of land, and is evidently fed to some extent by springs. As well known, it occupies an explosion crater, formed during a comparatively late period of volcanic activity. The surrounding rocks are loosely compacted tuff and scoria, underlain in many places by a flow of basalt, the whole resting on the tuffaceous claystones of the Waitemata Series.

Since 1895, when water was first pumped from Lake Takapuna, the population of the district has greatly increased, and is still rapidly growing. Since 1911 the lake has not been able to supply all the