

SITUATION AND TOPOGRAPHY OF DISTRICT.

Sandy Bay is an inlet situated on the western side of Tasman Bay a few miles north of the mouth of the Motueka River. Immediately to the north are Astrolabe Roadstead and Adele Island. Inland is the Pikikiruna Range, spurs of which separate the valleys of the various streams draining into Tasman Bay, and reach the coast-line, there forming bold cliffs. The principal streams entering Sandy Bay are the Marahau and Otuwhero, each of which has a shallow estuary almost dry at low water, except for narrow channels. Into the Otuwhero estuary there also flows Holyoake Creek, which, before the moderate depression of the land that evidently took place in not very remote geological times, was a tributary of the Otuwhero Stream. The marble-deposits presently to be considered are wholly in the valley of Holyoake Creek.

Sandy Bay itself may be reached either by sea or by a road that branches from the main road over the Pikikiruna Range immediately north of the Riwaka River. The upper part of Holyoake valley is most conveniently reached by following the main road as it climbs the range until the marble-outcrops near Mr. A. J. Henderson's house are seen.

GENERAL GEOLOGY.

The chief sources of information concerning the geology of the Sandy Bay district are the reports by Messrs. S. H. Cox, James Park, and Alexander McKay, in the old Geological Survey publications. A list of these, together with other references, is given at the end of this report.

The section seen on the road over the Pikikiruna Range between Motueka and Takaka is an excellent one, but requires some detailed study before it can be fully elucidated. The rocks observable consist of highly folded mica-schist, quartzite, and marble, intruded by granite, amphibolite, and other igneous rocks. The chief rock of economic interest, the marble, occurs partly in narrow bands interbedded with calcareous schistose rocks, but mainly as a very thick bed which outcrops over an area of many square miles. There is some disagreement among geologists as to the age of the marble and the other sedimentary rocks, but for the present they may be regarded as belonging to the Aorere Series, which in part at least is of Ordovician age.

MARBLE.

The Sandy Bay marble is a banded grey or greyish-blue to white coarsely crystalline rock, which, although not adapted for important statuary work, is of attractive appearance, and without doubt well suited for ordinary building purposes. In most places the bedding-planes, usually disposed at high angles, are easily perceived, being indicated both by parting-planes and by alternating darker and lighter bands. In some localities, however, these indications of bedding, owing to the thorough recrystallization and metamorphism of the original rock, are almost obliterated. Regular jointing both parallel to the bedding and in other directions nearly at right angles is well pronounced, but not uncommonly the joints are somewhat close-set, and in addition more or less irregular fractures, making an acute angle with the main jointing-planes, are developed. These grade into the small almost imperceptible cracks or flaws known as "shakes" or "dries," many of which cannot be detected until the stone is dressed or sawn. In places small quartz veins traverse the marble in various directions, and thus impair its value as a building-material. Pyrite in small amount is present almost everywhere, and in some bands is abundant. There need be no difficulty, however, in selecting stone free from this objectionable mineral. Other very minor constituents of the marble are quartz, muscovite, sphene, magnetite, graphite, and probably hornblende or other amphibole. As shown by the analyses quoted later, the Sandy Bay marble is on the whole a rock of great purity, especially in upper Holyoake valley, where it carries on an average fully 98 per cent. of lime and magnesia carbonates. The specific gravity of four samples taken in March last varies from 2.68 to 2.715, with an average of 2.704, corresponding to a weight of approximately 168 lb. per cubic foot, and a volume of $13\frac{1}{2}$ cubic feet to a ton of rock.

Sandy Bay Marble-quarry.

The Sandy Bay Marble-quarry, which has been opened by the New Zealand Marble and Cement Company, is situated at a height of nearly 600 ft. above sea-level, in the steep-sided valley of Marble Creek, a branch of Holyoake Creek, at a point almost two miles from high-water mark in the Otuwhero estuary, and over three miles from the company's wharf. A tram-line with a gauge of 3 ft. 6 in. has been constructed from the wharf to the foot of a self-acting incline, which is badly laid out, and has an unnecessarily steep grade near its head. From the top of the incline a few hundred yards of nearly flat tramway leads to the quarry. Here the main equipment consists of a large crane, but channelling-machines and the other accessories of a modern quarry are conspicuous by their absence. A considerable quantity of rock has been excavated, most of which has been dumped into the creek-bed below the quarry. No great depth has yet been reached, as is clearly shown by a glance at the surface contours and by the iron-stained joints and bedding-planes of the exposed rock-face. The quarry itself is awkwardly situated on a steep slope, has been poorly opened, and is not convenient nor yet very safe to work, largely owing to the marble dipping steeply away from the direction of working. In places the rock is badly broken, whilst in others it is traversed by aplite dykes. On the other hand, some of the stone is conveniently jointed, and apparently would furnish solid blocks weighing 5 or 6 tons. So far, however, all the larger stones have been spoiled by flaws or cracks making acute angles with the bedding and main joint planes. These flaws, as a rule, do not extend right through the larger blocks, and there is hope that if the quarry were properly opened and depth from the surface attained they would largely disappear.