

The waste from the stripped area covers the hillside to the beach, where the hanging-wall "head" was readily picked up, though here it carries no quartz. The schist on the foreshore between the "heads" contains a few stringers of quartz. At the point on the shore where the vertical head should outcrop, debris from above completely concealed the solid rock. Some weeks after the writer's visit this was cleared away, but only a narrow "track" was found.

All the quartz seen was stained brown to nearly black by oxides of iron and manganese, and no gold was seen. Mr. Soanes took two samples across the formation where exposed in the stripped area at points about 8 ft. apart, vertically. The higher contained 7 grains of gold, and the lower 22 grains of gold and 7 grains of silver per ton. Other samples from this locality, no doubt picked, have been found to contain up to several ounces of gold per ton.

A bedded quartz-vein striking a little east of north and dipping west at 45° outcrops prominently for 20 chains at a height of about 1,800 ft. along the steep hillside to the west of the stream draining through Havelock from Takorika Hill. Prospect cuts across the vein at several points show it to consist of iron-stained quartz and very siliceous, perhaps silicified, schist, to range in thickness from 2 ft. to 4 ft., and to contain iron pyrites near the foot-wall. Samples from two prospect cuts were found on assay each to contain but 7 grains of gold per ton.

A fracture-zone occurs on the east bank of Kaituna Stream at a point about two miles south-east of Havelock. The formation, which strikes a little east of north, and dips west at 70° , is about 4 ft. wide, and contains branching veinlets of quartz.

10. WAIKARI AND MOUNT SOMERS DISTRICTS, CANTERBURY.

(By J. MARWICK.)

In April an examination of the Waikari district, North Canterbury, was made in order to find out the amount and quality of limestone suitable for agricultural purposes. Numerous samples were taken for analysis, the results of which, however, are not yet to hand. As the report cannot be finished until these analyses are available, only an indication of the probable result can be given here.

The railway and the road from Waipara northward to Waikari ascend in a grade through Weka Pass, where limestone cliffs tower conspicuously on either hand. The section exposed here has been perhaps more studied and debated by geologists than any other in New Zealand, the question being what is the significance of the contact between the lower part (the Amuri limestone) and the upper part (the Weka Pass stone). In the small area under review this question is not likely to have a direct bearing on the problem of the location of lime-crushing works, and so need not be discussed.

On the whole, the limestones of the district are not of high grade, and analyses published by Park (1905), Speight and Wild (1918), and Morgan (1919) indicate that only the upper 50 ft. to 60 ft. of the Amuri limestone is sufficiently high in CaCO_3 (over 80 per cent.) to be worth considering as a fertilizer. To this may perhaps be added a few feet at the base of the Weka Pass stone, which contains some phosphate and much glauconite.

If the analyses now being made agree with those already known, as in all probability they will, the problem is where the upper part of the Amuri limestone can be most conveniently quarried with respect to railway access.

In Weka Pass itself the railway is cut through the limestone, but a difficulty here is that sidings on a grade are not favoured by the Railway Department.

From the head of the pass the railway bends to the west and skirts the north side of the high east-west ridge lying south of the Waikari Township. The eastern end of this ridge is formed by Monument Hill, rising some 250 ft. above the railway, which intersects the toe of the slope. The ridge extends westward about a mile and a half, diverging from the railway and rising to 500 ft. above it.

Weka Pass stone overlying Amuri limestone caps most of this ridge, dipping south and forming the north side of a small physiographic and structural basin that is open on the east side. Monument Hill lies outside this basin. It is formed mostly of Amuri limestone, dipping north-west, but an outlier of Weka Pass stone outcrops on the north slope.

Immediately west of Monument Hill, on the north-east edge of the basin, the Weka Pass stone has been stripped back by weathering, leaving a platform of Amuri limestone several chains wide at about 300 ft. above the railway. Westwards this platform narrows, and where the ridge bends to the south round the head of the basin it disappears, the Amuri limestone outcropping only in the face of the hill.

The upper part of the Amuri limestone can therefore be quarried most conveniently along the face of the ridge from Monument Hill westward for about half a mile. This locality is easily accessible to the railway, and a siding could be run back from Waikari Station.

A short visit was also paid to Mount Somers, where limestone-quarries have been worked intermittently for many years. The Government railway-line is about four miles from the quarries but a full-gauge line now being laid by a private company to a coal property passes within a few chains of them. Two large quarry-faces have been opened on the limestone, each about 60 ft. high. The stone on the eastern quarry is mostly hard and strong, and will probably show a high percentage of CaCO_3 . The stone in the western quarry is stratigraphically at a somewhat lower horizon, is much softer, and contains a considerable amount of volcanic tuff scattered through it. The total thickness of the limestone is over 200 ft., so that the amount of stone available is very large. The lime-kiln, not working at the time of visit, is situated about half-way between the quarries and Mount Somers Railway-station.