

reach in this Pahaoa area, as compared to the low position occupied by the beds of the same formation, is due to the strong representation of the lower beds, which consist of a fossiliferous conglomerate, with but a small admixture of arenaceous material. These rocks are abundant at the base of the formation on the hills to the north of Wainuioru, and on the high slopes to the south of the East Coast Road. Elsewhere in this area the rock is not so prominent, and its absence is signalled by feeble resistance to denudation and a consequent low elevation. In the north, a little to the eastward of Wainuioru, they are overlying blue micaceous rocks of the Cretaceous age, which soon give way in the westward to the Secondary rocks, and in the eastward and southward to the underlying and older beds of the same series. The rocks of the uppermost are soft clay and sandstones, with harder bands at places interstratified with them. As a rule these are lying at low angles, while the beds below on the slopes of the coast range are tilted at considerable angles.

The second, or Kaiwhata area: This, both in point of size and importance, is in the valley of the Kaiwhata, about six miles from the mouth of the river. It is triangular in shape, and is about three miles in length, while its width is about two. Its physical boundaries are the foot-hills of the high ranges, completely surrounding it—viz., the Brocken on north and north-west, and the main range of the Maungaraki on the east and its western development on the south. It occupies about two miles of the lower portion of the Bismarck Creek, flowing into the Kaiwhata, and along the main river it extends to within a mile of the Te Maire's junction with it, and about half a mile south of the Bismarck Creek. Differing from the Pahaoa area of the same rocks, this exposure nowhere rises to any heights, occupying in all cases the low-lying parts of the valley, not rising above 500 ft. to 600 ft. This want of elevation is due to the absence of the fossiliferous conglomerates at the base of the series, the presence of which answers for the comparatively high elevation of parts of the Pahaoa area. In this locality the formation consists of soft shales and sandstones, interstratified with conglomerates and mudstones, the whole overlain by a heavy bed of mudstones, unassociated with sandstones or conglomerates, and possessing no fossils. These last beds are very conspicuous on the northern boundary, near Te Maire Creek. The strike of the beds are very regular, being 30° east of north, while the dip varies from 45° to almost flat. In all cases the high angles are confined to the lower beds, while the beds lying nearer the horizontal are the uppermost. The conglomerates, as aforementioned, at the base of the formation are absent, but their detritus is found in the creek beds as alluvial.

In section this area does not present much, its relation with the surrounding and underlying beds being simple. In the east and south it lies directly on the Cretaceous rocks, containing coal and pierced with volcanic intrusions. On the north the Cretaceous rocks give way to the Secondary rocks of the Brocken, which are in juxtaposition with all the beds of this area.

Third area, Kuamahanga: Directly west, and at a distance of about two miles, is a third, and the smallest area, of these Miocene beds. It is here called the smallest, for the reason that its western development carries it into the valley of the Wainuioru, and beyond the boundary of the present survey, leaving the area to be described of very limited dimensions. Its area is about two miles in length, trending direct north, with a width of no more than a half to three-quarters of a mile. It covers an area exclusively made up of the lowest beds of the Miocene formation, consisting of a highly fossiliferous sandstone. The whole series, differing from the same beds on the west slope of the Maungaraki, is characterised by the beds lying almost horizontal. From the thickness or quantity of fossils in these beds they would almost constitute a limestone. But the shells themselves have altered very little since their deposition; the matrix is still arenaceous, while the fossils can be separated from it with careful dressing. The beds do not rise to any height—no more than 400 ft., 200 ft. of which is in perfectly vertical walls in the Kuamahanga River. In this area it lies directly in contact with micaceous rocks of the Cretaceous age.

The fourth area of these Miocene beds, stretching from the Kaiwhata river-bed to Flat Point, is of importance, being the trough of the syncline occupying the East Coast. At the Kaiwhata they are about one mile in width, and consist of soft sandstone and shales, with interstratified beds of conglomerate. On both their east and west boundaries they rest directly on the Cretaceous rocks. The beds themselves form a syncline, dipping west on the coast side and east on their inland side, while the central beds are almost flat. They lie upon the coal-rocks of the coast at an angle of 45° , while the strike is 40° west of north; while on the west they incline to the east at 40° , with a strike of 20° east of north. At their junction with the underlying coal-rocks on the east the formation consists of heavy beds of shales, mudstones, and soft sandstones. The latter are thin-bedded, but the shales and mudstones are 10 ft. thick in places. The strike is as indicated above. After undergoing some local changes in the dips and strikes, and in the thickness of their bedding, they assume a level course, and, while resting thus, they give support to a series of consolidated sands and sandstones. Their colour is grey, and the thickness is some 20 ft., while the upper part only is stratified (the sandstone, the strike of which is 30° west of north, and the dip, east at 40°).

The western portions of these Miocene beds are found resting upon the western portion of the syncline of coal-rocks, the actual member of which is the gritty coal-rock of the coast, which is here dipping east. The Miocene beds, consisting of conglomerate, interstratified with sandstones and shales, conform with them in their easterly dip, and pass under the horizontal beds at the axis of the syncline. They are not, however, represented on the west side, for on the coal-rocks of the coast are superimposed the thick-bedded shales and sandstone, without the conglomerates.

The conglomerates are in six or seven distinct and parallel beds, from 6 in. to 24 in. in thickness, and are composed of angular and subangular pieces of the adjacent formation, chiefly of limestone and glauconitic sandstone of the Cretaceous formation, and of coal-rocks and conglomerates of the same age.