In this mile it also crosses the main gully, and would require an embankment of 60ft. in height for about 4 chains. At this point the main road (Brunswick line) would have to be deviated for a distance of about 30 chains, and its level raised on the siding to give convenient height for a through bridge.

The tunnel piercing the Brunswick hill occurs at 4 miles 16 chains, and is 28 chains in length. There are several small bridges crossing creeks, but none of any magnitude.

The total length of this deviation is by traverse 7 miles 50 chains, including easing to 1-in-70 grade of about 30 chains of existing line near Aramoho. The distance by the present line between the same points is 5 miles 18 chains, the deviation thus giving an excess mileage of 2 miles 32 chains.

I surveyed a 1-in-50 grade for this deviation, the mileage of which is only about 50 chains in excess of the existing line, but, finding that the tunnelling and earthworks would be as heavy as for the 1-in-70 grade, I discarded consideration of it for this report. This line was pegged, and complete survey of it is contained in the field-books.

The estimated cost of the Brunswick deviation is £64,980, at the rate of £8,664 per mile.

For a distance of about 15 chains after crossing the bridge, Goat Valley Stream, the present gradient is 1 in 44. The bridge, however, has lately been raised 3ft., and this additional height would, in conjunction with a small amount of filling, reduce this gradient to below 1 in 50.

Kai-Iwi–Okehu Section.

When recalled from the field to prepare this report I was engaged upon the survey of this section, and had got as far with it as to decide upon the direction of a route and to obtain approximately the gradient and length of deviation necessary. No levels were run over this section, but the approximate heights were obtained from reconnaissance observations, and I am enabled from the data obtained to give an approximate idea of the length, gradients, and cost of construction between Kai-Iwi and Okehu.

The length of this deviation would be about 4¾ miles, and the distance by the present line is practically the same. The general direction is inland of the present line. The existing line after leaving Kai-Iwi strikes seaward and rises to the summit of the ridge dividing the Okehu and Kai-Iwi Valley with a gradient of 1 in 40 for 71 chains, and then falls away at the rate of 1 in 38 for 67 chains; from this point it again rises to the Okehu Station with an inclination of 1 in 46½ for 1 mile 20 chains.

The proposed deviation, instead of mounting the summit, would, after leaving Kai-Iwi with an ascending gradient of 1 in 70, pierce the ridge by a tunnel of 30 chains in length, and fall away to the Okehu Valley at the rate of 1 in 75, and rise again to the Okehu Station with an inclination of 1 in 70.

In order to obtain a 1-in-70 grade from Kai-Iwi it would be necessary to take off from the present line some 40 chains before reaching Kai-Iwi, and keep further up the Kai-Iwi Valley than at present. This would necessitate the removal of the Kai-Iwi Station for a distance of about 30 chains inland from its present site, and also from the traffic road, but access to the station would be very easy.

The removal of the station for the distance quoted would place it on a higher level, from 10ft. to 15ft. above the present site, and the extra chainage gained would permit of a 1-in-70 grade up to and piercing the ridge.

With a 1-in-50 gradient the deviation could start from the present station, but the length of tunnel would be the same as that required for the easier grade. There would, however, be a saving in construction up to the tunnel of about £7,000, as the present line could be utilised as far as the bridge crossing the Kai-Iwi Stream, whereas the line for 1-in-70 grade would diverge, as above stated, some 40 chains before reaching Kai-Iwi Station.

The cost of this deviation, with a maximum gradient of 1 in 70, approximately estimated from reconnaissance survey, would be about £50,000, at the rate of £10,526 per mile.

Nukumaru–Waitotara Section.

With regard to this section I have very little data to go upon, as I was only able to make a cursory examination of the locality.

The length of this deviation would probably be about three miles and a half, being an excess mileage of about 40 chains over the existing line.

I should judge that the best point for deviating from the existing line would be in the vicinity of Nukumaru Lake, and, after holding to the low ground to the left for about half a mile, the route should strike off to the right, cutting under the present line, and enter a bushed gully which falls away towards Waitotara Flat. It should keep on the right sidling of the gully, and, upon reaching the mouth, make a detour up the Waitotara Valley, still keeping to the sidling for about half a mile. From this point it could pass on to a long low ridge or hill which runs far out into the Waitotara Flat, terminating about three quarters of a mile inland of the present Waitotara Station; thence its location to the present station would be easy.

It would be necessary either to move the present bridge crossing the Waitotara River about half a mile up stream, or to construct a new one at this point. It is very probable that the present station would require extensive alterations, or removal for a few chains, to meet the requirements of the deviation.

I conclude that the cost of this deviation would be about £28,000, at the rate of £8,000 per mile. This estimate is based upon a 1-in-60 gradient, as I am doubtful if an easier grade could be obtained without necessitating much heavier construction.