

The extra length puts this route out of the question for any line going through the Road Saddle. For the Tauherenikau route a good grade could be got from the Upper Hutt to the Summit Tunnel. There would be about two miles and a half of very rough heavy work required in the Hutt and Pakuratahi Gorges, and a high viaduct over the Pakuratahi River; the line would run at a considerable distance from the trial line run from the Pakuratahi to the Tauherenikau River, and pass through the range by a tunnel most likely at some distance from the tunnel-site as surveyed. The only advantage offered by this route is a uniform grade from the Upper Hutt to the Summit; but the cost to get a safe line up the Hutt Gorge would be so great that it would be better to get whatever improvements in grades that may be deemed necessary by lengthening the tunnel through the saddle opposite Kaitoke.

The working gradients stated in each case make sufficient allowance for lengths of level required for passing-places. In the case of the up-grade on the Tauherenikau route—Woodside to the tunnel—two passing-places are allowed for. These will very considerably increase the traffic-capacity of the line; they will hardly ever be likely to be required as stations, as the settlement in the valley must always be small or nil under existing conditions. The passing-places cause a considerable steepening of the ruling working grade, which will spoil the line if ever a double line is required to be made, as a double line would probably be made with continuous grades from Woodside to the Summit Tunnel. A continuous working grade of 1 in 73 from Woodside to the tunnel would be sufficient for a much greater traffic than the present; and it is a question to be settled whether it would not be the better course to omit these passing-places if the line is made by this route. The passing-places are shown at approximately equal distances apart between Woodside and Kaitoke, and making the Mungaroa Station equidistant between Upper Hutt and Kaitoke put it on perhaps a bad site. Two passing-places are shown on the Road Saddle—Woodside route; one would serve as a station for the Featherston traffic, the other would be merely a passing-station.

It would be necessary, in order to avoid, if possible, any necessity to use assistant engines, to get sufficiently flat grades from the Upper Hutt to the Summit Tunnel on the deviation line adopted. For the ratio of up- to down-country traffic given in the General Manager's memorandum (attached) the grades required for the Tauherenikau route would be 1 in 64 on the straight; for the Road Saddle—Woodside route, 1 in 74 on the straight; and for the route ending at Fernside Station, 1 in 60 on the straight. Purely passenger traffic would require equal grades both ways, so would heavy excursion traffic to the Wairarapa. There will be some difficulty experienced in getting the 1-in-64 grade from the Upper Hutt to the Kaitoke Tunnel, and still more in getting the 1-in-74 grade without unduly lengthening the line or lengthening the Kaitoke Tunnel.

I think the choice of routes for the deviation will be found to lie between (1) a line from the Upper Hutt through Kaitoke Saddle, following somewhat closely the first two miles of No. 3 line and the last seven miles of No. 1 line so as to get a uniform working grade, combined with the Tauherenikau route, with 1-in-70 grades on the straight; and (2) a line with suitable grades between the Upper Hutt and Kaitoke Saddle, combined with the Road Saddle—Woodside route, with 1-in-82 grades on the straight. The only objection to this latter route is its much greater probable cost.

It would be possible to adopt either of these alternatives, and for the present, if it is thought advisable, only construct a section of the permanent deviation from about the Pakuratahi River crossing to Woodside, and form a temporary connection to the existing line between Kaitoke and the Pakuratahi, leaving the Upper Hutt—Pakuratahi section of the deviation to be done at some future time. This would involve the loss of some £8,000 or £9,000 required to form the temporary connection.

The advantages to be expected to be got from the construction of the deviation with 1-in-70 grades or 1-in-82 grades on the straight against the down-country traffic, with properly balanced grades against the up-country traffic, would be: A much quicker service between Wellington and Woodside; a saving of seven miles in length of journey, and of over 1,100 ft. of rise and fall to be surmounted by each train; a greatly diminished number of goods-trains required to haul a given amount of traffic; a considerable saving in rolling-stock maintenance by the cutting-out of the 5 miles 8 chains of curves of 5-chains radius, and 1 mile 46 chains of curves of $5\frac{1}{2}$ - to 7-chains radius, on the existing line between the Upper Hutt and Cross Creek Stations (the limits of curvature on the new line being, say, 10-chains radius Upper Hutt to the Summit, and $7\frac{1}{2}$ or 8 chains Summit to Woodside); the saving of the expenditure required to keep up the Cross Creek Station; the saving of the useless haulage of Fell brake-vans, weighing 12 to 18 tons, for each train up or down the Fell Incline; the saving of expense of running assistant engines between the Upper Hutt and the Summit, and between Cross Creek and Pigeon Bush, and some saving in maintaining the permanent-way on the Fell Incline. The grade of 1 in 70 on the straight will enable fully loaded engines to be run through from Woodville to Wellington (this grade offering about the same resistance to traction as the 1 in 76, with curves of 15-chains radius, between Woodville and Woodside), or the grade of 1 in 82 on the straight would enable an engine to take up some additional loading between Eketahuna and Woodside, in addition to its full load from Woodville to Eketahuna, and take this additional load through to Wellington without assistance.

The probable saving in working-expenses on the present annual traffic should be at least £12,000 to £13,000, but against this there would be, in the case of the Tauherenikau route, the cost of working a branch line to Featherston or Pigeon Bush; with the Road Saddle—Woodside route, this, perhaps, might be avoided, though it must be admitted that the station on the hills about 370 ft. or so above Featherston would be somewhat inconvenient. There would also, for some time at least, be an increased cost in earthwork maintenance. With increasing traffic, such as may reasonably be expected, there would be correspondingly greater saving in working-expenses.

The deviation *via* the Tauherenikau will reduce the distance from Woodville to Wellington to about $107\frac{1}{2}$ miles, as against 105 miles by the Manawatu line; but in view of the slower speeds