

rapidly, and at its junction with the river the grade-line is about 180 ft. above the river-bed. Along this last section the creek is cutting into its banks, and there are a number of slips, one or two of some size: in one case what appears to be an old slip, overgrown with small scrub, reaches above the grade-line; in all the other cases the upper edges of the creek-banks where cut away and fallen in are well below the grade-line. Judging from the slopes of the hillsides, the works required along the tributary to form a railway-line would not be very heavy for the first mile, but would be somewhat heavy for the last three-quarters of a mile or so. Cuttings, banks, and culverts, with perhaps one or two small bridges, would be the works required.

After leaving the tributary creek the line would follow the right bank of the Tauherenikau for about four miles and a half. There will be some heavy work on this section, especially on the first three miles. The cuttings will be heavy; some short tunnels at bluffs and bridges over tributary creeks will be required. The works would be lighter on the last mile and a half as the gorge opens out more, and generally the slopes of the hillsides seem not to be so steep. About three miles from Woodside Station the line would cross the Tauherenikau River either on a bridge or on a viaduct, according to the grade adopted, and would then run on the terraces or on the hillsides, as the grade may require.

The continuous grade obtainable from Woodside to the tunnel will vary from 1 in 60 to about 1 in 81, according as the grade begins near the crossing of the river or near Woodside Station. When the grades are suitably flattened on the curves in proportion to their radius, I think it is probable that a ruling grade not worse than 1 in 70 on the straight can be got from Woodside to the tunnel. The corresponding ruling grade for the proposed 1-in-60 line would be about 1 in 56. The volume of the present traffic fully justifies the adoption of the 1-in-70 grade, and if a new line is worth making the best obtainable grade should be adopted. The 1-in-70 grade would, of course, be a little more costly, owing to the line having to run for some distance on the hillsides after crossing the river instead of on the flats; the viaduct across the river should not cost much more, if anything more, than the tunnel, cuttings, and bridge that would be required for the line with the steeper grade. Against this extra cost it will be a distinct advantage to have the grade-line as high above the river as it can be got in the lower length of the tributary creek and the upper two miles or so of the gorge. The additional height gained by the 1-in-70 grade on these sections will be from 30 ft. to 70 ft., and will give a safer if not a cheaper line.

The hills are of slate along the tributary creek and the Tauherenikau, and where it is exposed to the atmosphere it does not seem to be of a very stable character. I only saw some small slips on the banks of the Tauherenikau, along which the proposed line would run. These at present are not of any great moment. The line will avoid the large slip just above Buck's house, which I take to be the one Mr. Rochfort refers to in his report. The occurrence of a slip as large as this on the line after it was made would necessitate a heavy expenditure in making a tunnel to avoid it. The cuttings in this slate rock will, I think, weather considerably, and all tunnels will have to be lined throughout. Until, however, the grade-line is defined along the hillside, and the character of the works approximately determined, it will not be possible to make any very definite statements as to the probable stability of the works that will be required to form a railway-line down the Tauherenikau for the first three miles, or as to their probable extent and cost.

Woodside, being the highest point on the existing line between the Waiohine and Tauherenikau Rivers, is the proper ending-point for the deviation. Better grades than the 1 in 70 on the straight could only be got by keeping the line on the hillsides and crossing the Waiohine at a higher level than at present. The Tauherenikau Valley does not afford facilities for doing this except at great cost.

The above-described deviations do not cut out the steep gradients and numerous curves of only 5-chains radius between the Upper Hutt and Kaitoke. This will best be accomplished, I think, by a combination of No. 1 and No. 3 trial lines, described below.

No. 1 trial line starts from the Upper Hutt Station, and runs for about a mile over the flats; then it rises for about six miles on a 1-in-60 gradient, broken by a short length of 1-in-550 grade. The Mungaroa Stream and Valley would be crossed by a long viaduct, from 50 ft. to 140 ft. high. The line is on steep sideling ground for a short distance south of the Mungaroa Stream, and also on steep sideling ground from Mungaroa to a point opposite Kaitoke, seven miles from the Upper Hutt, where it passes over a low saddle requiring a tunnel at least 20 chains long. From the saddle the line runs through easy country to join the Kaitoke-Featherston trial line near the Pakuratahi, the length from the Upper Hutt to the Pakuratahi crossing being about nine miles. The estimated cost of this line is, say, £111,000, in round figures, for the nine miles. No. 2 line is an alternative to the lower portion of No. 1 line, but it increases the length by a mile and a quarter, while it is estimated that the cost of construction would only be lessened by £5,000 to £6,000; this is too small a saving to justify the increased length, except the extra length were required for the purpose of getting a flatter ruling grade to meet possible traffic requirements.

No. 1 trial line is quite independent of the existing line; but No. 3 line was run to determine how much of the existing line between the Upper Hutt to Kaitoke could be made use of. This line begins to rise on the hillside immediately after leaving the Upper Hutt Station, and joins the existing line just south of the Mungaroa Railway-station. A short length of the line and the station would be utilised. The line leaves the existing railway about 15 chains beyond the Mungaroa Station, and joins it again about a quarter of a mile south of the Kaitoke Station. The length of new line required is eight miles and a quarter, the estimated cost of which is £105,000. No. 4 line is an alternative of part of No. 3 line; it uses a portion of No. 2 line; it lengthens No. 3 line by about one mile, at an estimated saving in cost of £5,000, which is too little to justify the additional length.

The levels taken and the examination made show that the Hutt Gorge below the junction of the Pakuratahi is very rough, and it is only possible to take a railway-line up the gorge at great cost.