heavy—say, £60,000—even if some of the plant and buildings used in construction were utilised afterwards for working. It would probably be necessary to use steam-power for the generation of electricity to minimise the risk of stoppage of traffic due to break downs. It does not appear, from the information at present available, that any single stream in the Otira or Bealey watersheds would supply water enough to drive an electric-traction plant if the plant is located in the watershed of supply, as a sufficient pressure is not thus obtainable, unless it were possible to store large quantities of water in a suitable reservoir. There would be serious risk of failure of the water-supply at certain seasons, and the cost of collecting water from several streams and the risk of damage to the works would be great. The only scheme that is likely to give a safe water-supply, and one but little liable to damage by floods, &c., is to construct a suitable reservoir in the Bealey Valley, near the 3-mile peg, and take the water through the tunnel in a steel pipe to a power-station near Dyer's. A head of about 900 ft. would be obtained. The drainage area available for supply would be about thirteen square miles, which should be enough to insure a supply under all conditions, with properly designed works.

Water-power would reduce the cost of working very materially, and, besides, possess the very important advantage of enabling the electric plant to be used at any time it might be wanted. With a steam plant, on the other hand, there would be considerable loss in keeping up steam between trains and in getting up steam at odd times, as with only two or three trains a day each way the plant would not be fully employed, and it would not likely be possible to work all the trains closely one after another each day.

Electric traction would introduce more or less of a break, though not a serious one, in the system of working; but it would not interfere with the transfer of locomotives from Canterbury to Westland, or *vice versâ*, in the way that the Fell system would do. The rail wastage in the long tunnel would be much less than if coal-burning locomotives were employed.

If it were decided to employ electricity for traction, then the buildings and electric plant required for construction could be made use of for working the line afterwards if suitably designed in the first instance. A permanent power-station would be located at Dyer's.

The electric plant could be designed to take full trains through without the steam locomotive, or, if it was deemed advisable, it could be designed to take the whole trains with the steam locomotives ready to continue the through journey from the Bealey Station. About £10,000 extra would provide the more powerful plant required for taking the locomotives with the trains.

The numerous tunnels required on the Fell line up the Otira Gorge, even when broken up into shorter lengths, as we formerly recommended, would still, in some cases, be of sufficient length to cause trouble, owing to the large quantities of smoke and steam emitted by the Fell engines. Liquid fuel, if used, should give considerable relief if it is the success it is alleged to be in numerous other cases. If, however, ventilation had to be provided for the worst tunnels on the Fell line, it would compare less favourably with the 1-in-37 line than we have stated in the table attached. It would be justifiable to spend £675,000 on the 1-in-37 line to avoid the Fell line. The time taken by a Fell service over the pass would be at least one hour longer between the Otira and the Bealey Stations than the time required on the 1-in-37 line.

After a very full consideration of the merits of the various alternative routes, we beg to recommend the adoption of the shortest route between the Otira and Bealey, 8·3 miles long, with 1-in-37 grade, approximately; that the tunnel be about 2 ft. higher and 2 ft. wider in section than the standard tunnel on New Zealand Railways, and that an efficient system of artificial ventilation be provided.

If, however, it is desired to avoid any chance whatever of discomfort to passengers and those employed in working the traffic, then electric traction can be adopted for the same line with a smaller section of tunnel. The probable cost of the scheme would likely be very little greater than that of the one recommended, and the difference may be neglected in arriving at a decision. There is no doubt but that electric traction would give the greatest satisfaction to the travelling public.

If the above recommendation is adopted, then a survey of the line should be at once made; and the construction of the section up to the Otira end of the tunnel completed as quickly as can be, in order that all the plant and materials required in the construction of the tunnel could be railed up to the tunnel-mouth at as early a date as possible after work on the tunnel is begun.

Should it be desired to compare more closely the 1-in-37-grade line with any of the other lines given in the attached table with 1-in-40 or 1-in-44 grades, then a survey of the line selected for comparison would be required to enable quantities to be computed and a more reliable comparison made. We do not think, however, that the results would be such as to cause us to modify in any way the recommendation given.

The accompanying plan shows by a black dotted line the probable location of the 1-in-44-grade line, and by a full black line the approximate location of the 1-in-37-grade line.

As about £100,000 has been saved by the construction of the line up the bottom of the valley to Goat Creek, the cost of the line completed to the Bealey, on the location recommended above, will not be any greater than the estimated cost of the original line on the 1-in-50 grade surveyed in 1883, while much treacherous country will be avoided.

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