

and character of the sea-bed of the Waitemata Harbour, and whose estimates, therefore, were purely conjectural. Advocates of a tunnel in preference to a bridge stressed several obvious advantages, among the principal of which were—

- (i) Non-interference with aircraft.
- (ii) Lesser vulnerability in wartime.
- (iii) Better relationship to existing traffic centres on both sides of the harbour.
- (iv) Less imported materials.

However, apart from other disadvantages, cost alone, in our opinion, is sufficient to decide that a tunnel is a much less favourable proposition than a bridge. We have, however, taken cognizance of the possibility that, with continued improvements in the technique of tunnelling, largely made possible by the use of more efficient construction plant, costs may decrease; and at some future date, when it becomes necessary to provide augmented trans-harbour traffic facilities, the construction of a tunnel on the route we have suggested may become a practicable alternative to duplication of the bridge. In this connection we draw attention to the suitability, as a common approach to both bridge and tunnel, of the route we have recommended for the second stage of the northern approach to the bridge—that is, from the head of Shoal Bay via Bayswater to Devonport.

Advocates of a bridge cited examples such as Sydney, San Francisco, and Vancouver, none of which we regard as strictly comparable with Auckland, in support of their contention that a bridge was economically justifiable, and several witnesses had obviously gone to considerable trouble to collate information. The majority of the interests represented preferred a bridge to a tunnel.

(3) DISCUSSION OF BRIDGING PROBLEM

In an endeavour to find the best and cheapest solution of the problem, we have thoroughly examined all the schemes placed before us and have kept to the forefront the need for long-term planning in a work of this magnitude. Floating bridges, either of the arch type adopted at Hobart, or of the heavy continuous pontoon type adopted at Lake Washington, near Seattle, U.S.A., with opening or lifting spans, were considered; but in our opinion they are not suitable for Waitemata Harbour because of its tidal range, high current velocities, and occasional rough water, and because the provision of any form of opening or lifting span would involve intolerable delay to both shipping and road traffic, and the use of the waterway would also be greatly impeded for yachting.

We early reached the conclusion that long spans on high piers were unavoidable, and that the most favourable location for the northern abutment was Stokes Point, Northcote.

The 1929 Commission also selected Stokes Point for the site of the northern abutment. The alignment it proposed for the bridge was partly straight and partly curved, extending across Waitemata Harbour, intersecting St. Mary's Bay breakwater about its mid-length, and then continuing in a curve to connect with a long approach leading to Fanshawe Street. The route proposed practically bisected the boat harbour, and in order to meet the objections of the Harbour Board the length of the bridge structure was increased from 4,740 ft. to 5,340 ft.

In other designs subsequently proposed on the same alignment, the length of the bridge structure ranged from 5,340 ft. to 6,400 ft. On the route we propose, the length need not exceed 4,100 ft., representing a very considerable saving in capital cost and maintenance. Apart from the question of length, however, there are other objections to the route adopted in former schemes. We mention the following:—

- (i) The axis of the bridge is not normal to the line of the strongest tidal currents in the navigation channel.
- (ii) The southern terminal is not favourably placed for distributing traffic to the higher levels of the city.