(9) Limits have been set to the amount of organic matter and to the biochemical oxygen demand in the sewage effluent being discharged into the harbour waters. The permissible reduction of dissolved oxygen in the harbour waters at defined distances from the sewer outfall has been defined.

(10) Thus it will be seen that for any location of sewer outfall discharging into a body of water optimum conditions for natural purification can be obtained and the health of the public using the harbour waters can be adequately protected by setting suitable limiting standards for the sewage and for the harbour waters.

Sewage-treatment Methods

34. (1) It would appear to be beyond dispute that the complete purification of sewage by treatment processes is now practicable. Great advances have been made in these processes during recent years, and it has been demonstrated by their successful operations in many parts of the world that, provided sewage is given adequate treatment by processes which have been proved to be satisfactory, purity is achieved and the possibility of injury to public health eliminated.

We consider that this fact cannot be emphasized too strongly, as it is plain from the evidence that a great deal of the opposition to the Brown's Island scheme has arisen from ignorance of the efficacy of modern sewage-treatment methods.

It will be appreciated, of course, that the treatment of sewage involves extra cost and therefore that the nature and extent of the treatment will depend on the strength of the sewage and the capacity of the receiving water to complete the purification process, and also on the practicability of the utilization of sewage by-products.

(2) Treatment processes are usually classified as primary and secondary. The former includes the removal of gross solids (excreta, timber, paper, rags, and other substances) at comparatively small expense by the use of screens (which is the method at Orakei) or some other similar process. Another primary process is the removal by the use of sedimentation tanks of portion of suspended solids comprising grease, scum, and other solids which are capable of floating or settling in quiescent waters. The Board's proposals for treatment-works at Brown's Island include primary works of the kinds mentioned, and it is suggested that, depending on the quality and volume of the sewage, primary treatment may prove to be sufficient for several years.

Secondary or oxidation processes which involve higher costs will be required if they are found to be necessary in order to maintain the standards of purity which have been prescribed to ensure the prevention of pollution in the receiving waters. It is proposed that any secondary treatment required would be done by the activated-sludge process.

(3) It is important in considering methods of sewage treatment that regard be paid to the practicability of the utilization of the sewage and the economic and other benefits to be derived from the production of gas and fertilizers.

(4) As will be shown, there are many factors to be taken into account. The disposal of sludge by depositing it in the open sea, which is the method adopted in many instances, is too expensive for use at Auckland, even if the loss of the benefit of utilization of the by-products which is involved were considered to be justified. It is necessary, also, to take into account that the treatment of sewage can be carried out more efficiently and more economically when it is fresh, particularly when the sewage includes strong trade wastes. It is advisable, therefore, that the sewage should reach the treatment-works as soon as possible, and this has an influence, of course, on the selection of a site for treatment and also on the advisability of having more than one works. Again, as has been previously mentioned, whereas sewers cannot be altered without considerable expense, treatment-works can be more economically extended from time to time as may be found necessary, and this consideration must influence the decision as to the number of treatment-works that should be installed.