

MANGAHAO.

Manguore Section.—The Manguore Stream now carries all the tail-water from the power-house of this scheme, and as a consequence a certain amount of erosion has taken place, due to the additional quantity of water added to the normal flow. At the same time, it must be pointed out that the normal flow under present conditions is very much less than the previous flood flows, which were responsible for considerable erosion long before the power-station was erected. It is considered that a reasonable balance will shortly be obtained, and that after that no excessive erosion should occur, except that due to flood flow. In the meantime the Department has agreed to construct protection works where needed, and in accordance with that policy a considerable number of gabion and stone groynes have been constructed. Three additional bridges have been erected to give internal access to various settlers, and a weir 150 ft. long has been built to improve a ford in the lower part of the river. In the lower portion of the tail-race, the additional water tended to interfere with the drainage of several properties, and to overcome this the Department has hired a floating dredge from the Makerua Drainage Board to improve the outlet for a distance of 60 ch. from its junction with the Manawatu River.

Arapeti Section.—The balance of construction material was removed, and the permanent electrical installation, with outdoor transformer for the gate-shaft control at No. 2 tunnel, was completed. The sawmill was kept steadily in operation throughout the period, the output being mainly used for housing and construction purposes at the No. 3 dam; but portion of the timber is being supplied to the Palmerston North Railway deviation.

Mangahao Section.—No. 1 dam: The automatic spillway gates have been kept under close supervision, and where necessary adjustments have been made.

No. 3 dam: This work, of course, represented the main development work on the scheme for the period under review. A very great deal of preliminary work had to be carried out before a start could be made with the construction work proper. The site of the dam itself is in a comparatively narrow gorge, with a very limited area of suitable ground surrounding it on which to provide housing and construction facilities. Where possible, hutments, &c., were shifted from the lower dam, but in addition to this it was necessary to considerably increase the present accommodation.

The main crushing and screening plant, which stands on the side of the gorge, was completed early in the period; it is 173 ft. above the river-level, and is equipped with bins of 600 cub. yd. capacity, and duplicate crushing, screening, and sandmaking machines, all driven by electric motors. The aggregate itself is obtained from deposits in the stream, both at the head of the existing No. 1 dam and by the construction of shingle-traps above the new dam. These deposits were connected with the screening plant and metal-dumps by tramway, 6,800 ft. of track being laid and ballasted during the year, independently of that laid in the river to the various shingle deposits. The rolling-stock using the tramway consisted of light metal-wagons hauled by small oil-locomotives. A large reserve dump was established to enable work to be carried on continuously during periods when the river was unworkable. These dumps are connected with the screening and mixing plant by means of an inclined tramway 1,070 ft. long, operated by motor-driven hauling-winchies. An auxiliary aggregate supply was obtained by opening up a quarry near the crusher. A supplementary screening and crushing plant was also erected at the head of the No. 1 dam, and additional bins, with a capacity of 220 cub. yd. were erected adjacent to the dam core-wall section. Two mixers were established adjacent to the main screening plant, and duplicate chute-lines were carried to the limits of the main dam section. A second mixing plant, with associated hauler and feeder lines, was established on the opposite side of the gorge.

By-pass tunnel: This was completed and the river diverted in August last, the following work having been carried out since the end of last period: Concrete invert, 39 ft.; enlarged inlet portal, 34 ft.; outlet, 23 ft.; 8-ft.-diameter tunnel barrel-lining, 200 ft.

Main diversion dam: This temporary dam, 95 ft. long, 32 ft. wide, and 13 ft. high, was constructed across the gorge near the entrance to the by-pass tunnel. It was constructed with heavy transverse and longitudinal logs, with a consolidating filling of 1,500 cub. yd. of boulders from the core-wall excavation, all placed from the upper terrace by a motor-operated flying-fox line.

Coffer-dam: In order to enable the foundation for the dam and core-wall to be constructed in the bed of the river, a coffer-dam was built across the gorge below the diversion dam. This consisted of two parallel rows of interlocking steel-sheet piling above the coffer dam and a similar double row below the toe of the dam, with concrete filling poured between the rows to tighten and consolidate the work. Two 10 in. centrifugal pumps mounted on skids were used for pumping out this coffer-dam. After unwatering, it was necessary to excavate 2,000 cub. yd. of material, the bottom of the dam as finally exposed consisting of hard waterworn rock. During the period that work was being carried out on these foundations severe and constant flooding was experienced throughout, and it was only by constant work night and day whenever conditions were at all possible that the difficulties were eventually overcome.

No. 3 dam excavation: This involved the completion of the core-wall trench, the base of the main gravity section adjoining the foundation of the main dam in the gorge, the extension of the cut-off trenches, additional rock-excavation on the sides of the gorge, the lateral and longitudinal extension of the toe of the dam, and the excavation of the lower sections of the spillways. The core-wall trench was everywhere carried at least 5 ft. into solid rock. During the period 25,583 cub. yd. of concrete were placed in the core wall and main dam. Concreting operations in the core wall were much retarded by an exceptionally wet season, also the presence of springs and excessive water made concrete progress very slow until the drier summer months. Three shift operation was maintained throughout the year, and this enabled good progress to be made in spite of floods and excessive rain, the latter being indicated by the fact that the rainfall for the year was 145 in. Maintenance and improvements in connection with