

only. This plant is now used exclusively for municipal pumping. In 1901, plant No. 2 was built, and a 250-kw. unit installed. In 1908 it was found necessary to add a 300-kw. unit. In 1909, the growing demand for power led to the building of No. 3 plant at Wilson's Falls. This site is now developed to full capacity, 600 kw. being installed. At the present time, the town has over 2,000 h.p. of wheel capacity installed, and a continuous market demand of 1,500 to 1,800 h.p. Under the low water conditions which have obtained during recent years, about 25 per cent. only of this installed capacity has been capable of use, and for weeks at a time the town has been obliged to carry a commercial load of 1,800 h.p. with a maximum plant output of about 550 h.p.

It is quite evident that the continued occurrence of these periods of power shortage would ultimately ruin the municipal system, as manufacturers would be forced to install a more dependable type of motive power.

In view of the above, it is unnecessary to emphasize the urgent need of improving the flow characteristics of the north branch of the Muskoka River. The obvious means of effecting such improvement is by the storage of surplus run-off in the navigable lakes, or in the smaller lakes of the upper watershed.

Storage Possibilities.—The choice of initial storage development lies between the group of four navigable lakes above Port Sydney, and a larger number of very much smaller lakes on the upper watershed above Lake Vernon.

As regards the latter, the complete development of the larger lakes would provide approximately 60,000 acre-ft. of storage. To obtain this, it would be necessary to repair and maintain seven to ten timber dams. Owing to the small storage capacity of the individual basins, more or less constant attention would be necessary for proper operation, and the inaccessible location of most of these basins would be detrimental to operation, both as regards cost and efficiency.

Another disadvantage consists in the fact that stored water from the upper system of lakes must pass through and be partially absorbed by the large lakes above Port Sydney. The influence of wind and temperature on these lakes will make it impossible to foretell with any degree of accuracy what effect the flushing out of a basin would have on the regimen of the lower river, or in what time the effect would become noticeable.

The obvious solution of this latter difficulty is, of course, to use the navigable lakes as auxiliary storage basins. This has actually been done through the agency of the government dam at Port Sydney.

Having established the fact that the navigable lakes must in any case be used to some extent in connection with any storage scheme that may be devised, the question arises as to whether the storage of these lakes could be developed sufficiently to dispense altogether, or in part, with the necessity of developing the upper system.

The combined area of the four lakes involved is such that about 10,000 acre-ft. of storage is available for each foot in rise. The importance of obtaining the maximum possible range of variation in level is therefore evident, and the whole point at issue is to determine a range of variation which will, on the one hand, cause no extensive damage by flooding, and, on the other, permit minimum navigable levels to be permanently maintained.

Results of Surveys.—The investigations of this problem necessitated the making of surveys covering a

new site for a dam at Port Sydney; flood contours around Mary Lake; surveys, with soundings, of various channels. These surveys were of service in reaching certain conclusions which may be summarized as follows:—

(1) That the maximum regulated level of Mary Lake could be held 3 ft. above the ice level which obtained at the time of the survey, without causing undue damage.

(2) That the maximum regulated level above the lock should be held at, or slightly below, high-water level, corresponding to about 8.5 ft. on the upper sill of the present lock.

(3) That a 3-ft. variation of level above the lock, during the navigation season, will not injuriously affect navigation or riparian owners.

(4) That a 4-ft. variation of level below the lock during the navigation season will not injuriously affect navigation, and will not cause serious injury to riparian owners.

New Construction and Improvements.—The existing dam at Port Sydney is a wooden structure built by the Provincial Government for maintaining navigation between Port Sydney and the lock. This dam now requires to be replaced, and, in the interests of economy and efficiency, a permanent structure should be built. The lock between Mary and Fairy lakes is in a dilapidated condition, as is also the dam. The useful life of the dam might be prolonged by extensive repairs, but the lock requires to be entirely rebuilt. All new construction at this point, whether lock or dam, or both, should be permanent.

In the narrow channels between the lakes, the backwash of the boats cuts away the banks, and the consequent silting up of the navigable channels necessitates frequent dredging. This silting action could be effectively stopped by pile sheeting the exposed sections. The whole length of the channel between Fairy and Peninsula lakes should be treated in this way, and also certain portions of the channel between the lock and Mary Lake.

All of the above new construction is required in the interests of navigation, and any additional features of design in connection with these structures, which might be necessary in order to adapt them for storage regulation, would be insignificant from a cost standpoint. The surveys also indicated that the storage capacity of the lakes above Port Sydney could be economically increased by deepening some of the connecting channels between the lakes.

Details of General Scheme.—The dam at Port Sydney is to be designed so as to enable the levels of Mary Lake to be held between El. 23 and El. 27 during the navigation season, and to allow for an additional drop of two feet during the fall and winter. The bottom of the navigable channel between Mary Lake and the lock has been set at El. 16. A small amount of excavation may be necessary through the sandbar at the mouth of the river. Some soft dredging will also be required just below the lock.

At the lock, it is proposed to drop the lower guard sill to El. 15, and the mitre sill to El. 14. The upper guard sill is dropped to El. 23, and the mitre sill to El. 22. There will thus be 8 ft. of water on the lock sills under the minimum projected summer level.

With a tight permanent dam at Port Sydney, a permanent dam at the lock is not absolutely necessary, and present requirements will be met if the latter is repaired and alterations made which will enable it to hold the level above the lock within the extreme limits of variation, El. 34 max., and El. 29 min.