

about 25 years after its completion, and the 25,000,000-gallon pipe line would supply by gravity the quantity of water required for two or three years; but, as already stated, the capacity of the pipe line can be increased by pumping.

Quantity of Water Available from Shoal Lake.—

Shoal Lake has a drainage area of about 360 square miles and a water surface of 107 square miles, and is at the same level as the Lake of the Woods, with which it connects at Ash Rapids. No direct measurements of the quantity of water which this lake will furnish have been made, but the probable quantity of water may be inferred from the amount of rainfall in this vicinity and the size of the drainage area and of the lake surface.

Shoal Lake, if separated from the Lake of the Woods, would derive its supply from the rainfall upon the surface of the lake and upon the land included in its drainage area. The rain which falls upon the surface of Shoal Lake is offset in part by the evaporation from the lake, but under all ordinary conditions there is probably a considerable supply to the lake from the excess of the rain over the evaporation. A part of the rain which falls upon the land surrounding the lake is lost by evaporation from the surface of the ground, but such evaporation is not as great as from the lake surface, so that there is a larger yield of water per square mile from the land surfaces.

Shoal Lake is so large that in case the supply to it in any year were unusually small, water stored in it in previous years could be used to make up the deficiency. For example, the quantity of water in a single foot of Shoal Lake is equivalent to about 8.5 months' supply for 850,000 people, at the per capita rate of water consumption before stated.

Quality of Water in Shoal Lake.—Physical and chemical examinations of water taken from Shoal Lake show that it is practically free from contamination, that it is clear and practically without color and that it is free from odor and has an agreeable taste. It is very soft in comparison with the water at present supplied to Winnipeg, and was, at the time we examined the water, of excellent quality for a domestic water supply. The chemical analyses show that it is well suited for boiler and general manufacturing purposes.

Microscopic examinations of the water show, as is the case with the water of all lakes and reservoirs, that the water contains a variety of minute animal and vegetable organisms which can be discerned with the microscope and some of them with the naked eye. The total number of organisms per cubic centimeter has ranged from 249 to 1,776, and averaged 833, which is no more than the amount usually found in small lakes and the better class of reservoirs used for water supplies.

So far as the examinations have been carried, the water has had no disagreeable taste or odor at any time, but it is sometimes the case that these minute organisms increase greatly in numbers and give the water a pindy or even a disagreeable taste. This is not as likely to be the case in large lakes as in small ponds and artificial reservoirs. Many cities take water from the Great Lakes, from Lake Superior to Lake Ontario, and there has been no complaint from bad taste or odors from such waters, although they are not free from microscopic organisms.

There are many other reservoir supplies which contain a much larger number of organisms than has been shown by the recent examinations of Shoal Lake water, and which are nevertheless used without serious complaint on the part of the water takers.

We cannot, in the absence of definite knowledge as to the history of Shoal Lake water, affirm that growths will not occur to cause at times unpleasant tastes and odors, but the results of recent observations and all of the conditions indicate that troubles from bad tastes and odors should be infrequent, and not very serious, if they occur at all.

Having made such an extended reference to these organisms, we wish to state positively that they have no relation whatever to disease germs and there is no evidence that they render the water unwholesome.

Should it ever become desirable to filter the water, either completely, or to the more limited extent required to remove the microscopic and larger organisms, this can be provided for at the site of the proposed reservoir east of Transcona, where an opportunity is also presented for the aeration of the water should this be found advantageous.

Description of Proposed Works.—The main features of the work for immediate construction are:

1. A dyke and channel for the diversion of the Falcon River into Snowshoe Bay.

2. A concrete masonry aqueduct, having a continuous down grade for 84.73 miles from an intake at Indian Bay to a point just south of the Grand Trunk Pacific Railroad, about one mile east of Transcona, the aqueduct having a capacity of 85,000,000 gallons of water daily.

3. A pipe 5 feet in diameter, extending from the end of the masonry of the concrete aqueduct, most of the way through streets to Victoria Park on the west side of the Red River in Winnipeg, this pipe to be of steel except under the Red River, where cast-iron pipe laid in a tunnel is recommended.

4. A 48-inch cast-iron pipe through the streets of Winnipeg from Victoria Park to the McPhillips Street reservoirs. The pipe line will, as stated, have a capacity of 25,000,000 gallons daily.

Estimates of Cost.—Detailed estimates of the probable cost of construction, excluding land acquisition, installations of branch pipes to adjoining communities along the line, water damages, interest charges, etc., are summarized in the report as follows:

85 miles of construction railway	\$1,020,000
Clearing	55,000
Ditching	90,000
Telephone line	25,000
12,000 lin. ft. 4-foot cast iron pipe from McPhillips Street reservoirs to Victoria Park at \$23.17....	278,000
900 lin. ft. tunnel under Red River, including the shafts and the 5-foot cast-iron pipe laid in shafts and tunnel, at \$144.44	130,000
43,200 lin. ft. 5-foot steel pipe, extending from the easterly shaft of the Red River tunnel to the junction with the concrete aqueduct about one mile east of Transcona, at \$20.74	896,000
447,300 lin. ft. concrete aqueduct, extending from the end of the steel pipe to Indian Bay, with all appurtenances, at \$19.51	8,729,000
Falcon River diversion	121,000
	\$11,344,000
Add for administration, engineering and contingencies, 15 per cent.	1,701,600
Total estimated cost	
	\$13,045,600

The annual cost of maintenance of the aqueduct and the expense connected with its operation is estimated at \$40,000.

Conclusions.—“Briefly summarized the conclusions and recommendations are as follows:

“1. Shoal Lake, without help from the main Lake of the Woods, can be depended upon to furnish, even in the driest years, a large part, if not all, of the water needed