

der local conditions from \$8 to \$14 per head. Using the 1911 Dominion census as a base, in those portions of the townships of York, Scarboro, Markham, Uxbridge, Pickering, Whitby and Reach affected by the proposed lines, and in the towns of Stouffville, Markham, Uxbridge, Port Perry and Whitby, there is an estimated tributary population of 18,219, with an average population per square mile of territory affected in the country districts of 63. Taking into consideration the local conditions and average width of territory served, it has been estimated that the per capita return would be \$12, which for the 18,219 tributary population, would give a passenger return of \$219,000. To this must be added the suburban receipts, which for an estimated number of 900,000 at 4 cts., would give \$36,000, bringing the passenger total to \$255,000. As these figures are based on the present population, it is a safe assumption that the passenger revenue on the completion of the line would be as estimated.

The estimated freight traffic of the steam lines was obtained from reliable sources. From this, and from data obtained in other towns surrounding the city, it was ascertained that more than one half the freight revenue within a radius of 50 miles of Toronto, results from traffic to and from the city. An average freight rate between Toronto and the Markham-Stouffville district would be 17 cts. per 100 lbs., so that the estimated average rate of 11 cts. per 100 lbs. should be conservative. It is assumed that a subsidiary cartage company would be formed in Toronto to handle the city deliveries, and considering the frequency and rapidity of an electric service specializing in local business, it is believed that the proposed line could secure at least one half the present freight business, as well as developing new business.

In checking up the milk business, the inadequacy of the steam lines in being able to pick up milk at frequent points, makes it appear certain that an electric line, with collection points at almost every cross road would be able to get a lot of new business as well as much of the present.

The big difference between the estimated express revenues of the present steam and proposed electric lines, is accounted for by the consideration given to the fact that a large amount of the steam railway express traffic is for service rendered outside the Toronto district, for which the electric line could not compete. Consideration is also given to the fact that the fast schedule possible on electric lines tends to reduce the express traffic, the latter going as freight, which has nearly as quick a schedule as observations on other lines have shown.

In estimating the operating expenses, the number of car crews necessary to give the service desired, was estimated from train sheets prepared on the schedule planned. The number of station and repair men was determined from the requirements of other steam and electric lines. The cost of maintenance and repairs of track and rolling stock is more or less standard. All operating expenses were deduced from comparisons with roads operating under similar conditions. To cover annual charges of interest and sinking fund on the cost of the line, 6.3% of the capital investment has been added to the other operating expenses.

In order to examine the project with regard to the effect of adding to or reducing the length of the line, five separate estimates have been made, considering primarily the complete line, and this line with certain sections omitted.

Scheme 1. This is the main estimate, including the following lines: Toronto to Markham, 16 miles; Markham to Uxbridge,

20 miles; Markham to Brooklin, 16 miles; and Port Perry to Whitby, 19 miles; total, 71 miles.

Scheme 2. This considers the same line as scheme 1, with the exception of the line between Brooklin and Whitby. Total, 64 miles.

Scheme 3. This considers the line from Toronto through Markham to Uxbridge, without connection to Brooklin, Whitby or Port Perry. Total, 36 miles.

Scheme 4. This considers a line from Toronto through Markham to Stouffville only. Total, 24 miles.

Scheme 5. This considers a line from Toronto to Markham only. Total, 16 miles.

Provision has been made in the shorter schemes for extending the system at some future date to the full 71 miles, and where possible, portions of the ultimate equipment are figured upon, but this has not always been possible. In scheme 5, the 16 miles is planned to be operated at least partially by long distance equipment, necessarily giving a proportionately higher overhead operating cost than would result if the equipment were selected for the shorter line only.

In estimating the effect of each section of the road on the operating revenue, credit was given to each for the travel between sections that each would induce, recognition being given to the fact that the further a person resides from the city, the less frequent will it be used by him. The following gives the division of the 600,000 passengers among the various sections:

	Passengers.
Toronto-Markham	218,000
Markham-Stouffville	109,500
Stouffville-Uxbridge	88,500
Markham-Port Perry	157,800
Brooklin-Whitby	26,200
Total	600,000

In the table below are shown the net results of the detailed estimates on the five schemes, for capital cost, operating revenue and operating expenses:

Scheme	1	2	3	4	5
Mileage	71	64	36	24	16
Capital cost, total	\$2,470,776	\$2,291,200	\$1,274,807	\$995,991	\$693,003
Per mile	34,800	35,800	34,800	41,400	43,300
Operating revenue	450,500	446,200	300,800	203,100	137,500
Operating expenses*	396,660	372,430	232,780	194,260	152,600
Surplus	53,840	73,770	68,020	8,840	
Deficit					15,100

* Including interest and sinking fund.

In order to compete with a service which the steam lines might feel forced to give under competition, it was necessary to figure on the quadruple 100 to 125 h. p. motor equipment. With these motors, it would be possible to travel between Toronto and Uxbridge in 1½ hour, and to Port Perry, some 8 miles further, in from 10 to 15 minutes more time because of the fewer stops. The present analysis does not make provision for limited cars, as the estimated traffic between centres would not warrant their use, but the same equipment might be used for this service if it should be found advisable to inaugurate such a service.

A study of the accompanying map will show that the section east and north of Brougham and Greenwood is served by the main lines of three steam railways and one electric railway, and on this account the municipalities within this district may not see the necessity of the enterprise. This will not affect the scheme greatly, as an examination of the estimated revenue from the section between Brougham, Brooklin, Myrtle and Whitby has purposely been made small, as the traffic developed must be divided between five other lines that are in a position to give direct and fast service to the city. The bulk of the electric traffic would be local, with small fares. The town-

ship of Whitchurch, to the northwest of the district outlined, has requested a report on lines through there which might change the proposition should the district mentioned above not desire the service.

If all the municipalities that requested the report desire to have the line constructed through their districts, the line as laid down in the accompanying map is recommended as the preferable one, but in the event of any changes being desired by reason of the section to the east and south of Brougham not desiring to be served, there are two alternative plans of connecting the Uxbridge and Port Perry districts: First. Toronto to Unionville, Unionville to the vicinity of Cashel and Almira, north west from Cashel to Newmarket, eastward from Cashel through Stouffville and Altoona to Glen Major, Glen Major to Uxbridge, Glen Major to Port Perry, and Unionville to Locust Hill. Second. Toronto to Markham, Markham to Stouffville to Newmarket, Markham to Glen Major via Locust Hill and Greenwood, Glen Major to Uxbridge, and Glen Major to Port Perry.

To build a line as set forth in the report, with the omission of the Brooklin-Whitby section, would mean a line 64 miles long, whereas either of the lines just outlined would only be from 55 to 60 miles long. The new routes would also pass through a greater section of unserved territory, and probably cross the height of land to Uxbridge and Port Perry at a lower elevation.

The report concludes by stating that schemes 1, 2 or 3 would be the only ones that could be profitably built, as the revenue estimated for the shorter schemes 4 and 5 appears too small to warrant the outlay.

The lines as outlined are estimated on a Toronto terminal in the northeastern section of the city, but it is desired that at some time, a terminal be secured in the heart of the city, and with that object in view, it is the intention to approach the city authorities. It has been suggested

that the proposed line use a street to the north of and parallel to Danforth Road to the Don ravine, crossing the latter on the lower deck of the new bridge projected at that point, reaching the centre of the city by way of Ontario, Gerrard, Jarvis and Mutual Sts., giving a route close to the business and financial districts, also providing access to the market districts at the lower end of Jarvis St.

The report is followed by complete detailed estimates of the five schemes, which have of necessity been omitted from this summary for lack of space.

The report was prepared by W. G. Hewson, Assistant Engineer to the Commission, under the direction of F. A. Gaby, Chief Engineer, to whom we are indebted for the data on which this article is based.

The Municipal Railway Tax Association is the name of an organization consisting of a union of counties and townships in Ontario, which interviewed the Provincial Government recently with a view to effecting a change in the matter of taxation of railways within the province. It is suggested that the assessment act be amended to provide for the assessment at a specific value per mile of the structures, substructures, rails, ties, poles and other property.