CIHM
Microfiche
Series
(Monographs)

ICMH
Collection de
microfiches
(monographies)

Canadian Institute for Historical Microreproductions / Institut canadien de microreproductions historiques

Technical and Bibliographic Notes/Notes techniques et bibliographiques

The Institute has attempted to obtain the best original copy available for filming. Features of this copy which may be bibliographically unique, which may alter any of the images in the reproduction, or which may significantly change the usual method of filming, are checked below.

L'Institut a microfilmé le meilleur exemplaire qu'il lui a été possible de se procurer. Les détails de cet exemplaire qui sont peut-être uniques du point de vue bibliographique, qui peuvent modifier une image reproduite, ou qui peuvent exiger une modification dans la méthode normale de filmage sont indiqués ci-dessous.

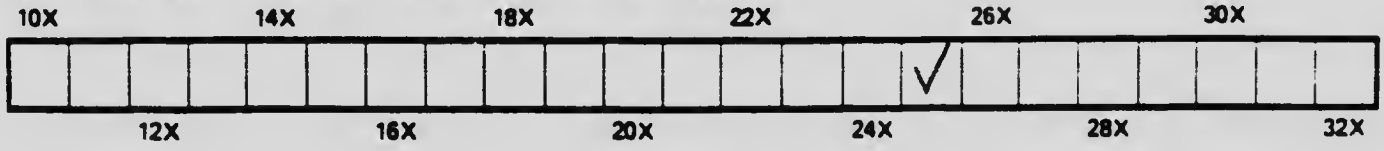
- ☐ Coloured covers/ Couverture de couleur
- ☐ Covers damaged/ Couverture endommagée
- ☐ Covers restored and/or laminated/ Couverture restaurée et/ou pelliculée
- ☐ Cover title missing/ Le titre de couverture manque
- ☐ Coloured maps/ Cartes géographiques en couleur
- ☐ Coloured ink (i.e. other than blue or black)/ Encre de couleur (i.e. autre que bleue ou noire)
- ☐ Coloured plates and/or illustrations/ Planches et/ou illustrations en couleur
- ☐ Bound with other material/ Relié avec d'autres documents
- ☐ Tight binding may cause shadows or distortion along interior margin/ La reliure serrée peut causer de l'ombre ou de la distorsion le long de la marge intérieure
- ☐ Blank leaves added during restoration may appear within the text. Whenever possible, these have been omitted from filming/ Il se peut que certaines pages blanches ajoutées lors d'une restauration apparaissent dans le texte, mais, lorsque cela était possible, ces pages n'ont pas été filmées.

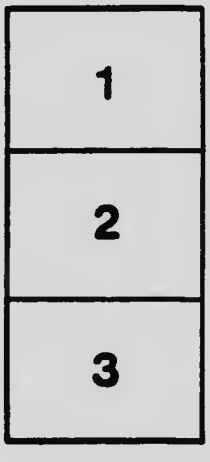
- ☐ Coloured pages/ Pages de couleur
- ☑ Pages damaged/ Pages endommagées
- ☐ Pages restored and/or laminated/ Pages restaurées et/ou pelliculées
- ☑ Pages discoloured, stained or foxed Pages décolorées, tachetées ou piquées
- ☑ Pages detached/ Pages détachées
- ☑ Showthrough/ Transparence
- ☑ Quality of print varies/ Qualité inégale de l'impression
- ☐ Includes supplementary material/ Comprend du matériel supplémentaire
- ☐ Only edition available/ Seule édition disponible
- ☐ Pages wholly or partially obscured by errata slips, tissues, etc., have been refilmed to ensure the best possible image/ Les pages totalement ou partiellement obscurcies par un feuillet d'errata, une pelure, etc., ont été filmées à nouveau de façon à obtenir la meilleure image possible.

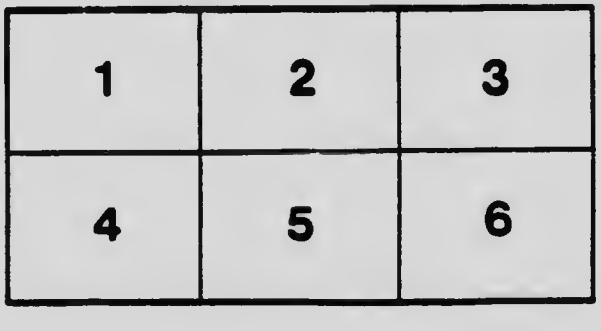
☑ Additional comments:/ Commentaires supplémentaires:

Title page is a photoreproduction.
La page titre est une photoreproduction.
Copy has manuscript annotations.
Cette copie a des annotations manuscrites.

This item is filmed at the reduction ratio checked below/
Ce document est filmé au taux de réduction indiqué ci-dessous.







REPORT

ON THE

TRACTION IMPROVEMENT

AND

DEVELOPMENT

OF THE

TORONTO METROPOLITAN DISTRICT

SUBMITTED TO

G. R. GEARY, K.C.
CORPORATION COUNSEL
OF THE
CITY OF TORONTO

BY
BION J. ARNOLD
CONSULTING ENGINEER

TORONTO, CANADA
OCTOBER, 1912

CONTENTS

PHOTOGRAPHS AND DRAWINGS

The following illustrations accompany this report:—

Figure 1. Map showing density of population and present City and suburban railway lines.
Figure 2. Map showing the present tracks of the Toronto Railway Company.
Figure 3. Cross section showing arrangement for tracks of different gauge in the centre of the same street.
Figure 4. Map showing proposed system of tracks for Greater Toronto District.
Figure 5. Map showing proposed new tracks for Greater Toronto District.
Figure 6. Map showing proposed track system confined to City limits.
Figure 7. Cross section showing grooved rail track construction.
Figure 8. Cross section showing "T"-rail track construction.
Figure 9. Cross section showing conduit construction.
Figure 10. Plan and sections showing manhole construction for conduit system.
Figure 11. Plan showing Grand Union Special-work layout.
Figure 12. Plan of modern P-A-Y-E car.
Figure 13. Plan showing seating arrangement for rebuilding narrow car.
Figure 14. Plan showing arrangement of tracks for modern car house.
Figure 15. Cross section and street elevation of modern car house.
Figure 16. Plate showing car congestion at Richmond and Victoria Streets.
Figure 17. Plate showing car congestion at College and Yonge Streets.
Figure 18. Map showing proposed subway terminal and surface tracks for civic lines.
Figure 19. Plan showing single track subway station.
Figure 20. Plan showing double track subway station.
Figure 21. Cross section showing proposed double track subway.
Figure 22. Plan showing proposed single track subway loop.
Figure 23. Cross section showing proposed single track subway.
Figure 24. Cross section showing concrete elevated structure for use on private right-of-way.
Figure 25. Cross section showing proposed tracks on River and Valley Bridges connecting Bloor Street and Danforth Avenue.
Figure 26. Cross section showing proposed roadway for tracks in Rosedale Valley.

LETTER OF TRANSMITTAL

BION J. ARNOLD
105 SOUTH LA SALLE STREET, CHICAGO

October 28th, 1913.

G. R. Geary, K.C., Corporation Counsel, City of Toronto

SIR,—I have the honor to present herewith such conclusions and recommendations as can be reached at this time in connection with the local passenger transportation problem of the Toronto District. The increasing demands and the opportunities for further traction development have been shown, and the necessity of a comprehensive plan for rehabilitation, betterments, extensions, re-routing and publicity has been, in my opinion, fully demonstrated. The report has been prepared in sections in order to permit of a convenient sub-division of the entire subject, and the numerous topics of these sub-divisions discussed. Preceding the body of the report will be found a summary of recommendations for the benefit of those who desire a comprehensive view of the subject without being required to study it in detail. In this study my entire effort has been to investigate the traction situation as it exists, make recommendations for its improvement, and give some idea of the magnitude of the problem of the future.

Two plans are submitted, one contemplating the operation of all lines in the Toronto District under one management, and the other providing an independent system with an entrance to the heart of the business district for many of the present and proposed civic lines, with the system so planned that it can eventually be co-ordinated with the lines of the present traction system when the franchises under which they are now being operated expire.

The Toronto Railway Company is at present returning to the City a larger percentage of its receipts than is being received by any other American municipality from its street railway system. At the same time it is paying to its owners a liberal return, and building up a large reserve

fund. The crux of the situation, so far as the present service is concerned, is that instead of this reserve fund being spent on the property to maintain it in condition to give adequate service, it has been distributed in the form of extra dividends, or is being allowed to accumulate, presumably for the purpose of protecting the securities outstanding against the property at the time of the expiration of the present franchise. Whether the company should be criticized for endeavoring to protect itself depends on the attitude the community takes toward it now regarding the protection of its investment at the expiration, in 1921, of its rights to operate, but the company, under the terms of its franchise, seems to have no right to accumulate a reserve fund at the expense of good service. On the other hand the City may find that in order to get the necessary extensions to the present system, or a sufficiently comprehensive municipal system properly to serve and develop the City's interests, it will have to forego some of the profits it is now receiving from the street railway business.

In the preparation of this report I had the benefit of the experience and advice of Mr. John W. Moyes, C.E., whose services as a consultant the City placed at my disposal, and he informs me that he fully concurs with the conclusions contained therein.

I wish to acknowledge the assistance and courtesy of the municipal officials of the City of Toronto, who have spared no effort to furnish necessary information and facilities for the preparation of this report, and I trust that the information has been put in such a form that it will contribute to a more complete understanding of the transportation problem of the Toronto District.

Respectfully submitted,

Bion J. Arnold

Consulting Engineer.

SUMMARY OF RECOMMENDATIONS.

More tracks, more cars, more speed.
Re-routing in down-town loading district.
Increased rate of track extension.
Improved car house facilities.
Prepayment cars with part cross seats.
Development of nearest suburbs.
Merger of all Radials within what is known as the Toronto District with all City lines.
Operation of all these lines under one management on the One-City-One-Fare-Plan.
Subways—as an alternative—for the terminal of civic lines.
Department of Supervision.
Electric feeder and return cables to go underground.

Re-routing of:

Broadview Avenue.
Queen Street.
Winchester Street.
College Street.
Harbord Street.
Dundas Street.

New cross-town lines north and south in:

Greenwood Avenue.
Pape Avenue.
Christie and Clinton Street.
Dufferin Street.

New cross-town lines east and west in:

St. Patrick Street and Wilton Avenue.
Bloor Street and Danforth Avenue.
St. Clair Avenue.
Dupont Street.

Extensions to present lines:

Church Street line north in Glen Avenue.
Broadview line north in Don Mills Road.
Parliament line east in Gerrard Street.
Dovercourt Road north to Vaughan Road.
Bloor west to Jane Street.
Teraulay north to Bloor.

Development lines in:

Windermere Avenue.
Vaughan Road.
Bathurst Street.
Mount Pleasant Road.
Forest Hill Road.
Avenue Road.
East York Avenue.
Don Mills Road.
Mortimer Avenue.
Prospect Avenue.
Eglinton Avenue.

SECTION I.

TORONTO CONDITIONS.

Immediate relief necessary—Few difficulties to overcome—Co-operation—Alternative plan available—Favorable location of Toronto—Present transportation — More lines necessary — Subways — Population—Earnings of Toronto Railway Company — Operation cost — Slow schedules—Modern equipment required—City control—Re-routing —Greater Toronto.

While it is quite apparent that Toronto has outgrown its transportation facilities, and is in need of immediate relief, if the City hopes to keep up with the requirements of its present remarkable development, the general thought which it is desired to convey in this report is one of congratulation that so few difficulties stand in the way of that larger transportation expansion so necessary to the future welfare of the City. If it were possible to face these difficulties through genuine co-operation on the part of the different interests involved, relief could be acquired quickly, the needs of the City to-day and of the greater metropolis of to-morrow would be properly cared for, and the annoying "traction question" disposed of. The fact that the present highly profitable, compact, traction system is under one control eliminates one of the greatest difficulties experienced elsewhere in undertakings of this character, and offers an opportunity for an adjustment which could furnish a firm foundation for the future transportation structure. Failing in this, a solution of many of the difficulties is at hand ready for the using, and while more expensive, and requiring more time in its accomplishment, the much-needed relief could be brought about, finally giving to the Toronto District the One-City-One-Fare Plan under unified management.

Favorable Location.

In many respects the conditions governing the traction situation in Toronto are better than in other cities, particularly because of the favorable location of its business centre, and its geographical surroundings, and especially so because the earning capacity of its transportation system has been so developed that any reasonable improvements desired may be put into effect without any general disturbance of either the

financial or operating conditions of the company, provided the net earnings of the system over and above a fair return on the investment be devoted to service, and the expansion of the system, and provision made for the protection of the true investment in the property performing the service.

Present Service.

Observations upon which this report is based were made during the months of July and August, and it is recognized that the cars during the winter months, and especially during the holiday season, would naturally be more crowded, and the service less satisfactory than during the summer.

In some respects the service in Toronto is better than in many other cities, and the present deficiencies may be largely overcome by proper co-operative measures on the part of the City and the Company, if the policy is such as to make this possible. Car congestion may be remedied by the re-routing of a few lines in the congested district, and overcrowding at certain rush-hour periods could be largely eliminated by the addition of a few cars on the trunk lines. Revised time-schedules based upon faster operation would greatly improve the service without the addition of a car to the present equipment. This may be greatly aided by a more careful training tending to produce alertness on the part of the conductors and motormen, and thereby inducing more activity on the part of the public when boarding cars and alighting from them.

More Lines Needed.

Cross-town lines in certain sections are needed for the proper transportation of passengers to and from their homes, and extensions to existing lines should be built into outlying territory, not only for the accommodation of those who are already there, but for the purpose of developing the unsettled districts not far from the business centre. The transportation problem of Toronto has grown beyond the City boundaries, and should be studied with a view to the greater City of the future. The proposed extensions of lines herein suggested, beyond the present City limits, cover this probability of development.

Subways.

Subways have been advocated as a means of relief for present congestion. With the transportation affairs of the City under unified man-

agement, subways would not be warranted at present. Yonge Street, the present point of congestion, is not now carrying all the cars it could, and other streets, such as Church, Victoria, and Bay, could accommodate several times the number now using them. Subways should be looked upon in the nature of a last resort, a necessity forced by conditions for which there is no other remedy. Toronto does not at present need subways nearly so much as it needs more surface tracks, and more and better and faster surface cars, preferably under unified management.

Population and Transportation.

Since 1907 the population of the City has increased over 45 per cent., according to official police records, or an average of 9 per cent. per year. During that period car track mileage was increased from 101 miles to 113 miles, about 12 per cent., or 2.1 per cent. per year. Car miles operated were 12,036 per day in July, 1909, and 13,878 per day in July, 1911, an increase of but 1.5 per cent. in two years, or 2.25 per cent. per year, plainly demonstrating that the track mileage and service have not kept pace with the increase of the population. During the period 1907-1911, inclusive, the gross income increased 38.2 per cent., or an average of 9.6 per cent. per year, thus a large and constant increase in receipts without a corresponding increase in service rendered by the Company, is another verification of this conclusion.

Earnings.

The Toronto system earned $1,661,017.50 in 1901, and $1,851,511.12 in 1911. Assuming this rate to be continuous an increase of business of 192 per cent. must be provided for in 1921, with estimated total gross earnings of approximately $11,000,000 per annum at that time. These figures may seem to be excessive, but at the present time over $12 per capita per annum is being used for street car transportation by the people of Toronto, and the City is growing quite rapidly. A general rule used frequently in estimating probable increases in City transportation earnings is that * " within reasonable limits the annual transportation income of any large centre of population increases approximately as the square of the increase of population." Applying this rule to the City of Toronto on the basis of 390,000 estimated population in 1911, with an annual increase to 1921 of 6 per cent. and the expenditure in 1911 of $12.10 per capita for transportation, the estimate for earnings in 1921

* See Report on Pittsburgh Transportation Problem, by Bion J. Arnold.

does not appear to be too large. During the past decade the actual rate of increase of earnings has fallen below this law of the square of increase in population in spite of the growth of the City, the actual relation being 1.89th power, instead of the 2.0nd power, or the square. This furnishes additional evidence of the curtailment of the system elsewhere noted, and shows that the Company's earnings should have actually been higher than those recorded had the system been properly expanded to meet the growth.

Low Operating Costs.

The just proportioning of service to income will generally result in adequate service. Ordinarily for a system covering an entire City, under conditions similar to those herein outlined for Toronto, about 70 per cent. of the income is required to operate and provide for taxes and depreciation. From the Toronto Railway Company's annual reports of 1911 these items, exclusive of renewals, consumed but 57.46 per cent. of the gross income, demonstrating an ability on the part of the Company to increase its service materially without sacrificing a fair return from the business, even if a liberal allowance is set aside for renewals. Earnings of $2,198,000 on a gross income of $4,851,000 in 1911, or $42,900 per mile of single track, would be justified only if the patrons of the road were given a proper return for their fares.

From the annual report for 1911 made by the Company to the Ontario Railway Board the *total* expenditure of the Company for *maintenance only*, is found to be 8.58 per cent. of the gross receipts, a figure which compares favorably with that of the average of all the Chicago companies for 1910, *i.e.*, 8.6 per cent., but the comparison is not so favorable when the amount spent on *maintenance of track and roadway alone* are compared, *i.e.*, 926 of 1 per cent. for Toronto and 2.27 per cent. for Chicago. This, in addition to the fact as developed from inspection, indicates that the track is not being properly maintained, and this, together with the absence in the statement of any expenditures for *renewals*, which alone should be from 8 to 10 per cent. of the gross receipts, accounts for the low operating costs and the large surplus shown. An examination of the property shows that about 35 per cent. of the tracks should be rebuilt and other improvements, hereinafter outlined, made. *After the entire property is put in good physical condition there should be expended annually upon maintenance and renewals, in order to keep it in first-class operating condition, from 15 to 18 per cent. of the gross receipts, depending upon the growth in earning capacity of the property.*

Slow Schedules.

One of the most important improvements in service needed, and the most readily obtained, is an increase in schedule speed, which at present is entirely too low on City streets so well adapted for speed as those of Toronto. The elimination of the present trailers, more alertness on the part of the trainmen and the public, and the operating of only one class of equipment on any one line, would aid materially. Faster cars should be procured, and improved track turnouts and curves installed.

Modern Cars Needed.

The rolling stock consists of a mixture of large and small motor cars and trailers. The trailers should be retired as soon as new equipment can be procured, the single-truck cars provided with truck-guards and placed on cross-town lines, or on streets where the travel is light or routes short, and the large double-truck cars rebuilt to meet present requirements. Modern practice unmistakably points to the acceptance of the pre-payment type of car for City service. In this type of car the platforms are of ample dimensions, and so arranged as to separate incoming and outgoing passengers, thus facilitating the loading and the unloading of passengers, the conductor collecting fare as they enter. Cross seats are provided, which are quite an improvement over the present long side benches to which there is so much objection. While quite as comfortable as open bench cars in summer, the suggested type will largely reduce accidents and avoid an unnecessary duplication of investment in rolling stock.

Recent track and roadbed construction in Toronto is along modern lines, except for the use of the local wide gauge. This should be standardized under any general reconstruction of the system, and about 35 per cent. of present track rebuilt in the next five years. Car stations should be of fireproof construction, and divided into sections, so that no more than twenty-five to thirty cars would be subject to fire loss at one time. The power supply is adequate at the present time, when not interfered with in transmission. Reserve capacity or duplicate service should be available in emergencies of such a character.

City Control.

It should be understood that recommendations contained in any report for increased facilities must necessarily be based on present con-

ditions and estimates made in regard to future requirements. As conditions change, requirements become different, so that it is quite necessary that to some recognized authority be delegated the duty of keeping informed regarding such changes. The riding habit is subject to such unaccountable variations as to require continuous study, in order that the service shall be at all times reasonably adequate. It is also necessary that the property be kept in first-class physical condition in order to insure adequate service to the public. The power for the supervision of the maintenance of the physical property, as well as its operation, should be vested in a Provincial or Municipal Board, clear of political bias, and of unquestioned integrity and professional skill, and this Board should be empowered by such legislation as is necessary to fully enforce its mandates.

Re-Routing.

Re-routing should also be a matter of constant study. This report directs attention to improvements most needed. In general, cars should be routed as directly through the business district as possible. Should the City elect to bring the radial lines into the City on the surface, long haul radials should be looped back just outside the centre of the City, in order to save delay, a walk of one or two blocks being considered reasonably convenient service to any shopping district.

Greater Toronto.

While this report concerns only the City of Toronto, it should be remembered that boundary lines are easily extended, and that the Greater Toronto of 1921 will occupy much more room than the City does at present. Already the home-builder is busy to the north, north-east and north-west, and large sections of available land are only waiting for transportation to be rapidly and thickly settled. Recognizing this condition, an outline for a present and future transportation system for outlying territory is here presented along with that of the City proper.

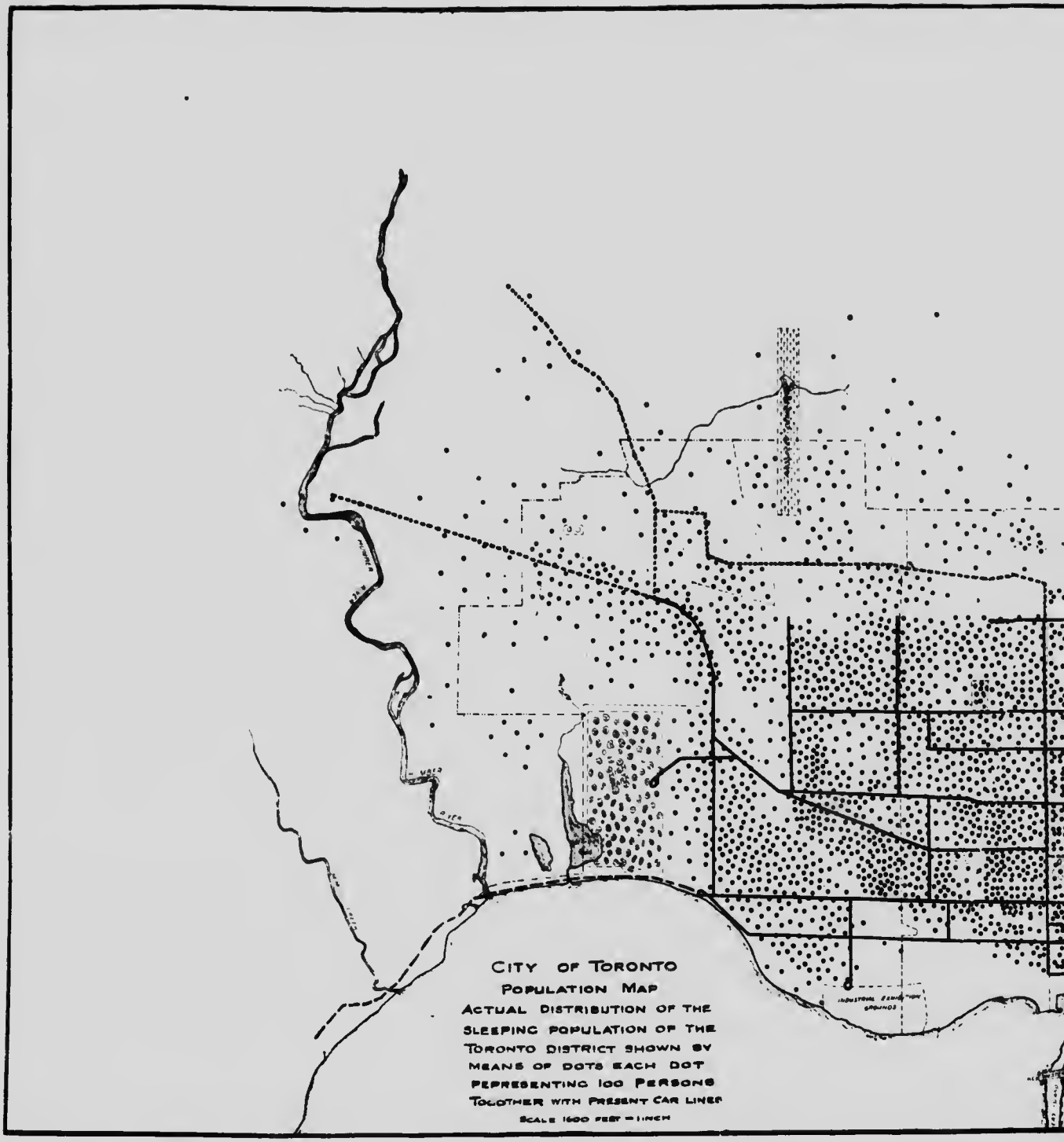

CITY OF TORONTO
POPULATION MAP
ACTUAL DISTRIBUTION OF THE
SLEEPING POPULATION OF THE
TORONTO DISTRICT SHOWN BY
MEANS OF DOTS EACH DOT
REPRESENTING 100 PERSONS
TOGETHER WITH PRESENT CAR LINES
SCALE 1600 FEET = 1 INCH

Figure No. 1


TORONTO
HARBOUR
TORONTO RADIAL LINES
TORONTO STREET RAILWAY

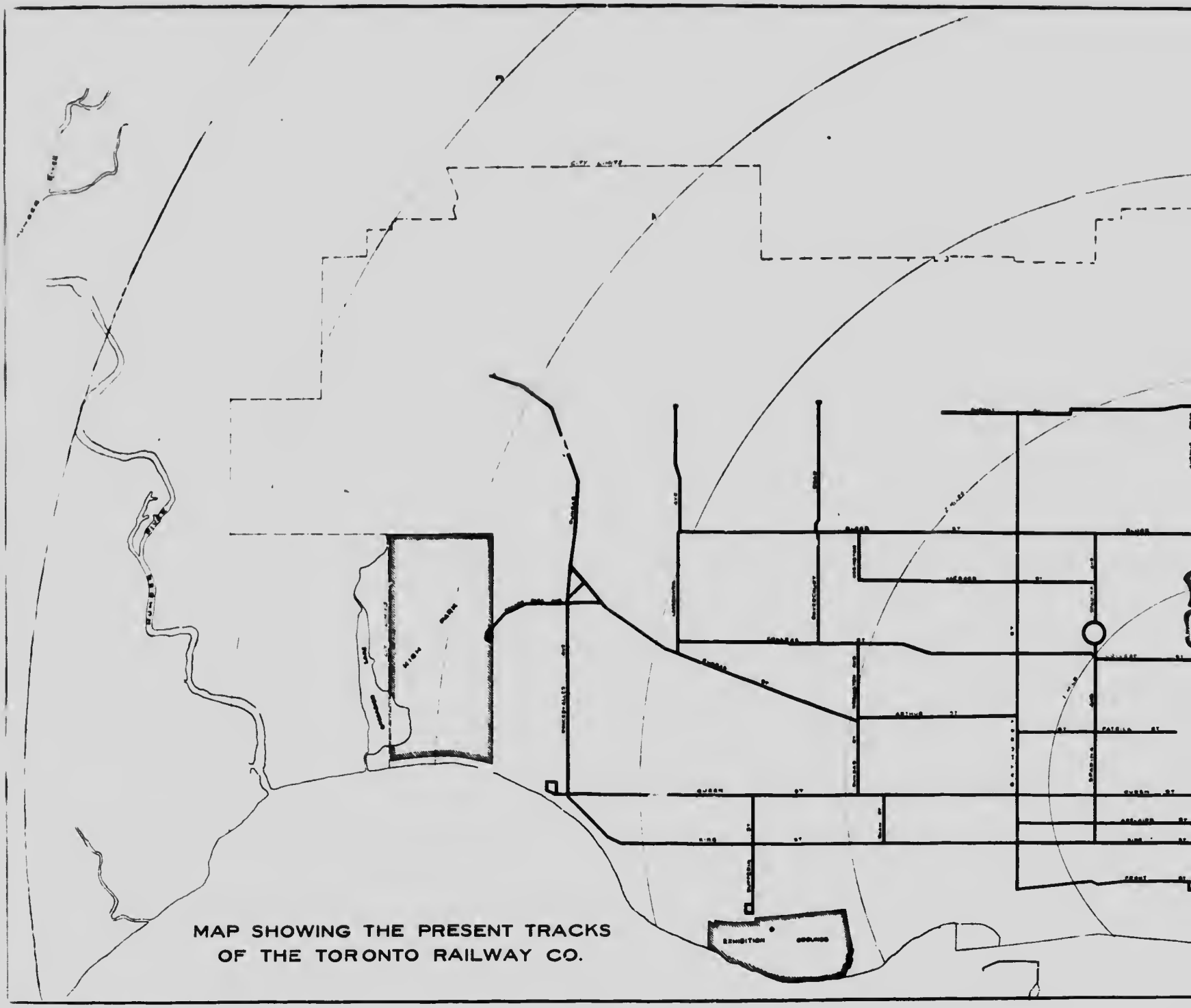
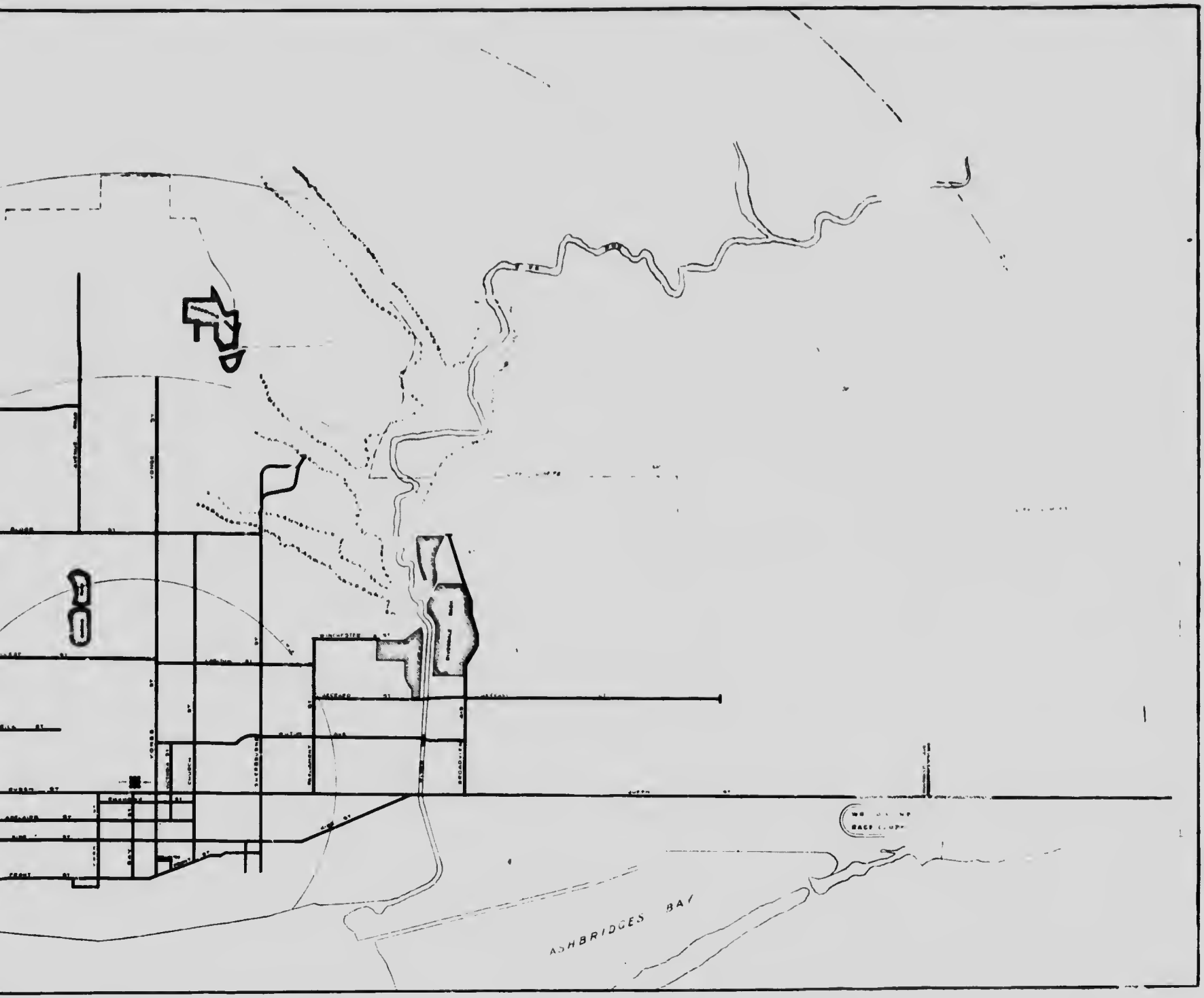


Figure No. 2


ASHBRIDGES BAY

SECTION II.

PRESENT TRAFFIC CONDITIONS.

Shortage of cars and tracks—Future population—Present service, compared with other cities—Combined service of Toronto District.

The demand for this report is the result of numerous complaints regarding the shortage of cars and car tracks that were necessary properly to care for the rapidly growing needs of Toronto, both of which the local traction company seems unable or unwilling to provide, owing probably to the expiration of its franchise rights within a few years. Much-needed cross-town lines and extensions of existing lines into outlying territory have not been constructed, old equipment has been retained in service, and slow moving cars have been allowed to interfere with better ones by routing them over the same streets. In many sections of the City, transportation to the business centre consists of a long walk and a ride the rest of the distance. While the City has been growing rapidly, its transportation facilities have been almost at a standstill for some time.

Future Population.

The recent growth of the population of Toronto has been rapid. There has been an increase during the last four years of 125,000, giving an estimated population at the present time of 425,000. The territory tributary to the Toronto District is of such a character as to warrant the belief that the population will continue to increase rapidly and indefinitely, provided the City is prepared to care for such growth. The more optimistic are already looking forward to the metropolitan mark of over a million before 1925, and that total will probably not be far out of the way before 1930. A study of the growth of cities in territory no less favored, strengthens this belief. Distribution of population in the Toronto District is shown in Figure 1.

Present Service.

For the purpose of caring for the present transportation requirements, the Toronto Railway Company is operating 113 miles

of single track (Figure 2) 4 feet and 11 inches gauge, over an area of City territory approximately $10\frac{1}{4}$ miles in length east and west, by $3\frac{3}{4}$ miles in extreme width north and south. For the year 1911 the Company carried 121,000,000 cash and 19,000,000 transfer passengers, the latter being 19.5 per cent. of the former. The gross receipts were $1,851,511.12, operating and maintenance expenses $2,653,361.86, and net earnings $2,198,179.56. The percentage of charges to earnings was 55.2, as against 51.6 in 1910, which indicates a somewhat better return in service to the passenger last year than the year before. After payment of all charges and dividends there was carried to surplus $506,233.68. Such results can only be accomplished by operating cars in thickly settled districts with a large amount of short-haul travel—particularly when it is remembered that the fares paid are quite favorable to the travelling public, *i.e.*, six tickets for 25 cents; 25 for $1, and tickets for rush hours at eight for 25 cents, making the average revenue fare four (4) cents per passenger. This business is conducted with 642 cars consisting of 569 double-truck and single-truck motor cars, and 73 trailers. This equipment has been operated so that the revenue has been over 28 cents per car mile, notwithstanding the low rate of fare, while the expenses were about 13 cents per car mile; which would be a most favorable showing for a surface line in any city. Dividends on capital stock issued have been paid for many years, the rate last year being $7\frac{1}{2}$ per cent. These figures do not include the business of the radial lines controlled by the Company, and which do some City business. Car miles run on the City lines for the year ending June 30th, 1911, were 16,354,871.

Below the Average.

In order to handle the same amount of business other cities are provided with more cars and more tracks, the average for nine American Cities* being about one car for each 500 of population and one mile of track for each 1,800 of population, or one mile of track for about $23,055 of receipts. Selecting several cities suitable for traction comparisons with Toronto, track mileage, population and receipts and their ratios are found to be as follows:

* Data from Electric Railway Manual, 1911. McGraw Publishing Co.

City.	Miles of track.	Population U. S. Census 1910.	Receipts.
Washington	217	331,000	$6,349,000
New Orleans	200	339,000	4,206,000
Baltimore	100	559,000	7,687,000
Cincinnati	222	364,000	5,005,000
Cleveland	215	560,000	6,123,000
Toledo	116	168,000	2,000,000
Seattle	188	237,000	3,660,000
Milwaukee	115	374,000	3,787,000
Toronto, 1911	113	390,000	1,851,000
Nine cities	1,846	3,322,000	13,568,000

Ratios.

	Miles track per 1,000 persons.	Receipts per capita	Receipts per mile of track.	Population per mile of track.
Washington	.656	$19.18	$29,258	1,525
New Orleans	.590	12.41	21,030	1,695
Baltimore	.716	13.75	19,220	1,397
Cincinnati	.610	13.72	22,540	1,640
Cleveland	.437	10.93	24,990	2,286
Toledo	.690	11.90	17,241	1,448
Seattle	.790	15.44	19,470	1,261
Milwaukee	.388	10.13	26,444	3,579
Toronto	.289	12.44	12,929	3,451

From the above table it will be seen that Toronto is by far the highest in receipts and population per mile of track, lowest in trackage for each 1,000 inhabitants, and slightly below the average in receipts per capita.

According to these figures Toronto could have supported a transportation system consisting of over 200 miles of track with the last year's population of 390,000, and earnings of $1,851,541.

SECTION III.

CAR LINES RECOMMENDED.

Connecting lines—Extension lines—Cross-town lines—Development lines—Radial lines.

The combined trackage of all lines available for transportation purposes in the City limits, if united into one system, including radials and civic lines now under construction, would be about 60 miles of double track and 10 miles of single track. Taking into consideration the undesirability of duplicating lines too closely in City service, and having in view the ultimate, if not immediate, operation of the system as a whole, recommendations are herewith made with a view to giving adequate service without unnecessary expenditure.

The following additions to the car track mileage of the Toronto District are recommended, subject to the City's discretion as to the date of their construction.

Connecting Lines.

Terauley Street—From Queen to Bloor. This track should be built this autumn as far north as College Street for the purpose of removing the College Street line from Yonge Street before winter congestion begins. The extension to Bloor should care for the Avenue Road line by the time the St. Clair line is ready to use Yonge Street.

Patrick Street, Anderson and Agnes. New tracks have been pla St. Patrick, f Bathurst to McCaul, and arrangements made for opening the street east of that point. Wilton Avenue and St. Patrick Street should be connected in 1913, and a cross-town line operated as part of the Dundas Street line to the west, and in Wilton Avenue to Broadview Avenue to the east.

Extension Lines.

Broadview Avenue and Don Mills Road.—The present Broadview Avenue line should be extended with double-track construction north

and north-east in Don Mills Road to the City limits at once, and to the intersection of Don Mills Road and Pape Avenue with double tracks; next year, if necessary, arrangements can be made with outlying territory. This section of the City is within less than three miles of the City Hall, is being quite rapidly populated, and is in need of transportation. This extension should be made in 1913. Later, as required, the tracks should be extended east in Don Mills Road and Globe Avenue to Woodbine Avenue, using single track until double tracks are needed.

Broadview Avenue and Danforth Avenue.—Civic car line transportation is at present being arranged for on Danforth Avenue, by the construction of tracks from Broadview east to the City limits. When completed this line should be operated as part of the Broadview Avenue line, until the proposed bridge over the Don River is completed, when it would be available as a cross-town line in connection with Bloor Street. The territory to be served is being rapidly settled, is close to the business centre, and is entitled to transportation as soon as it can be furnished. If given a proper outlet for traffic to the down-town district the country tributary to this avenue should grow rapidly and the line become self-sustaining in one or two years after completion. With an outlet provided, the work should be completed and cars in operation by September, 1913, as far as Coxwell Avenue at least.

Gerrard Street.—The civic line now being built in Gerrard Street, from Greenwood Avenue east to Main Street, is a logical extension of the Parliament line and should be so operated. The line is needed as soon as a down-town terminal can be procured for the business now at hand and immediately prospective. This is the most available street for transportation purposes between Danforth Avenue and Kingston Road in this part of the City, and the country is of such a character as to invite prompt settlement. The line should be extended east to the City limits in 1914.

Dupont Street.—The present Dupont Street line terminating at Dupont and Bathurst, should continue west in Hallam, Lappin and Antler Streets, and Humberside Avenue to Quebec Avenue. The use of Royce Avenue would be objectionable on account of track elevations proposed at Dundas Street, Royce and Weston Road, which will locate the crossing at Antler Street. This extension is needed for the accommodation of a thickly settled neighborhood west of Dundas Street, and south of the Canadian Pacific Railroad yards and tracks, the nearest cross-lines being Davenport Road to the north of the tracks, and Bloor Street one-half mile to the south. This extension is recommended for 1915.

Dovercourt Road. Should be extended north from its present terminal at Van Horne Avenue north in Dovercourt Road and Oakwood Avenue to St. Clair Avenue, and in Lake View Avenue to Eglinton Avenue. A north and south line is needed in this section, and the extension of Dovercourt would best meet the requirements at the least expense. This extension should go to Eglinton Avenue by 1917, street improvements permitting.

Church Street. The rapid settlement of the north and of the Rosedale District, along with the location of the new Government House in that neighborhood, requires the extension of the Church Street line north in Glen Road to Summerhill Ave, and west to St. Andrew's College; returning over the same route, as soon as the bridge over the Glen Road ravine can be made safe for cars, at least by 1914.

Bloor Street West.—For the purpose of caring for the thickly populated section of the City north of High Park and south of Dundas Street, and from Roncesvalles Avenue to the Humber River, the Bloor Street line should be extended west in Bloor to Jane Street, and north in Jane Street to St. Clair. The extension to Quebec Avenue should be built in 1913, and the rest of the work done at the rate of at least one-half mile per annum until completed, street improvements permitting. Two ravines will need filling before the track work can be done west of Quebec Avenue. A large territory tributary to this extension is at present without transportation facilities within a reasonable distance in any direction.

Cross-town Lines.

Greenwood Avenue.—A cross-town line is needed on Greenwood Avenue, from Queen to Danforth, at the present time residents of that part of Toronto being compelled to walk to Queen or Gerrard for street car accommodations. As the territory becomes more thickly populated to the north of Danforth Avenue, the line should extend north to Mortimer Avenue and thence west as required. This part of the City is capable of rapid settlement, but has been neglected by the transportation interests. The line from Queen to Danforth should be constructed and placed in operation in 1915, the extension into new territory being made as rapidly as demanded by settlement.

Pape Avenue.—Within less than two and one-half miles from the City Hall, the district east of Broadview Avenue has become thickly populated and is in need of better transportation. Pape Avenue traverses this district north and south and should be the location of a cross-

town line starting at Queen Street and running north to Danforth Avenue in 1914. North of Danforth settlements are now being made, and the line should be extended north to Gowan, east to Leslie, and north to Don Mills Road by 1916.

Christie and Clinton.—A cross-town line is recommended south from St. Clair Avenue to Niagara and Bathurst, via Christie, Clinton, Claremont and Niagara. This densely populated section of the City should have more convenient accommodations than the present lines on Bathurst and Dovercourt. The inconveniences of travel are not so great as in the outlying territory, but the line should be built as soon as possible, at least in 1916.

Dufferin Street.—Starting at the Exhibition Grounds at the south end and intersecting all east and west streets, a cross-town means of transportation is needed on Dufferin Street, as far as St. Clair Avenue, for the proper accommodation of street car patrons in the large territory between Ossington and Lansdowne. This line should be in operation by the autumn of 1915. North of St. Clair Avenue, the country through which this street passes is becoming quite thickly settled, and by 1917 the line should be extended north of St. Clair Avenue to Eversfield and Waverley Roads and west to Prospect Avenue, going north to Eglinton Avenue, with single track in Prospect Avenue, as rapidly as street improvements will permit and settlements justify. At the south end the Queen Street subway should be used by diverting the line via Peel and Gladstone Avenue to connect with Queen. South of Queen tracks are already laid and used occasionally.

St. Clair Avenue.—The Civic Car line at present being constructed in St. Clair Avenue will furnish a much-needed east and west line in the north part of the City. The present plan provides for double tracks from Yonge Street west to Prospect Avenue. This should be extended as soon as practicable east to Alice Street and west to Jane Street. When completed an outlet will be provided for branch lines to the north, for the purpose of developing some of the most desirable and easily accessible residence districts around Toronto. As part of a general system of transportation the St. Clair Avenue line should all be completed in 1914, if not before.

Development Lines.

Mount Pleasant Road.—For the proper development of North Toronto additional transportation should be provided for the territory

north of Mount Pleasant Cemetery and east of Yonge Street. This may be furnished the most economically by constructing a line in Davisville Avenue from Yonge Street east to Mount Pleasant Road, thence north to Eglinton Avenue, and east to East York Avenue. This work should be completed to Eglinton Avenue with a double track by 1915, and to East York Avenue, with a single track, when warranted by settlements made in that territory, double tracking to follow when needed.

East York Avenue.—Extending the St. Clair Avenue tracks east of Yonge Street to Alice Street will furnish an outlet for a line into the eastern part of North Toronto by using Alice and McClintock Streets to Moore Avenue, and Moore Avenue to East York Avenue, thence north to Eglinton Avenue. This extension should be built when the street improvements are in place, a new ravine bridge being necessary in Moore Avenue. Up to this bridge the line should be of double track, and in place by 1916, beyond that point of single track construction, to be followed later by double tracking as rapidly as required. Lines of this character will be necessary if Toronto wishes to provide homes instead of tenements for its future citizens. Two years' notice of intention to build, before actual construction, should cause a rapid populating of this territory. From present indications, transportation will be needed in this part of the City by 1917.

Avenue Road.—Development of the western part of North Toronto will require a north and south line west of Yonge Street. Avenue Road is proposed as the most available street in that territory, and should be provided with street car transportation as soon as settlements warrant the expenditure, probably by 1917. The line should start at St. Clair Avenue, go north as a double track road in Dunvegan Avenue to the intersection of Forest Hill Road, thence east to Avenue Road north of the Upper Canada College grounds. The Dunvegan Avenue part of this route should be built in 1911. Should a through route become desirable later from the north, the present Avenue Road cars could readily be operated west on St. Clair and north into this new territory. The north terminus should depend on the density of the population to be served.

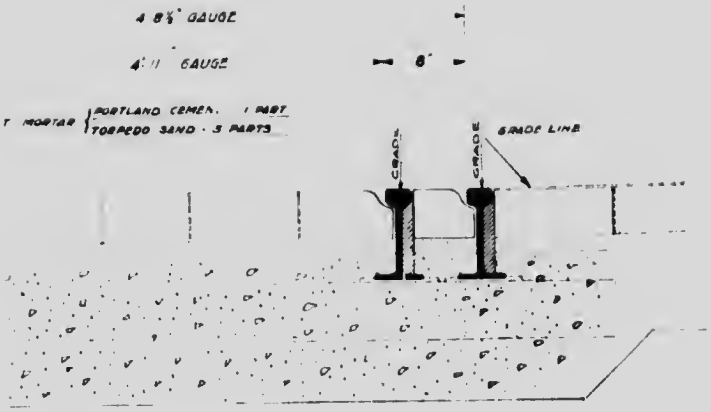
Forest Hill Road.—Branching off at Dunvegan Road and the proposed diversion of Avenue Road, there should be a single-track line placed in Forest Hill Road to Eglinton Avenue for the purpose of opening a large tract of desirable land to settlement. The intersection of Eglinton Avenue and Forest Hill Road is within the four-mile circle from the City

Hall, and should be quickly populated after transportation is furnished to the business centre. The first one-half mile of construction is recommended for 1916, to be followed by the remainder as needed, adding the second track to the street when the service requirements have outgrown the single-track construction recommended, or when the street is paved.

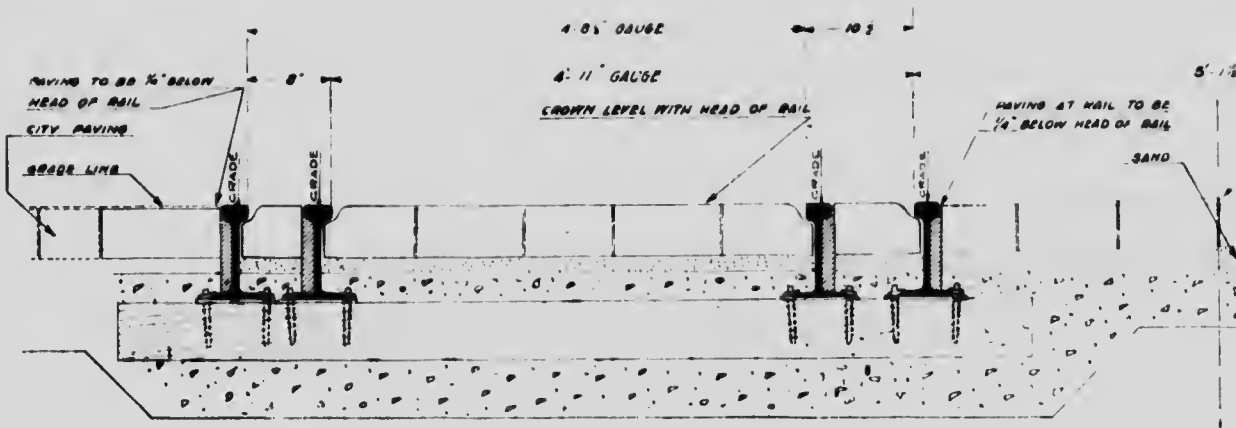
Vaughan Road. Transportation is already needed in the neighborhood of Vaughan Road in the north-west part of the district, and this street is recommended for development purposes. The line should be a feeder to St. Clair Avenue for the present, but is capable of extension into the business centre if future necessity should require. Double tracks should be built in Bathurst Street north from Davenport Road to Alice Street, thence west to Vaughan Road and north-west to the intersection of Wychwood Avenue not later than 1916. Beyond that point single-track construction should be used until street improvements are in. It is estimated that this line will be needed to Eglinton Avenue before 1915.

Bathurst Street.—Between Forest Hill Road and Vaughan Road there is a large territory ready for use for home-building purposes, which would most properly be served by a line of cars on Bathurst Street running north and south through the District. While a line is recommended on this street for the future, it is suggested that its construction await further development, as the territory is quite rough. The probability of its use for transportation purposes should be kept in view.

Windermere Avenue.—For the purpose of developing the territory west and north-west of High Park and east of the Humber River, the use of Windermere Avenue is recommended. This street should be the first to receive attention to the west, as quite a number of residents are in need of transportation at the present time. As rapidly as the streets can be put in condition to receive a single or double track, the work should be done. As the proposed Bloor Street extension west of Quebec Avenue may be delayed several years on account of street improvements, it is recommended that the Windermere Avenue line be built north from the Lake Shore to Bloor, and in Bloor, Elizabeth, Annette and Jane Streets, forming a single-track loop in this district. Later when the Bloor Street line extends west, this loop could be double-tracked and the Windermere Avenue cars operated east in Bloor, north in Elizabeth, and west in Annette to Jane, or the Humber River if desired, the Bloor line going west to Jane and north to St. Clair. With a terminal furnished for Windermere Avenue, via Lake Shore Radial to Sunnyside, it is recommended that the work be done in 1914 and 1915, street improvements



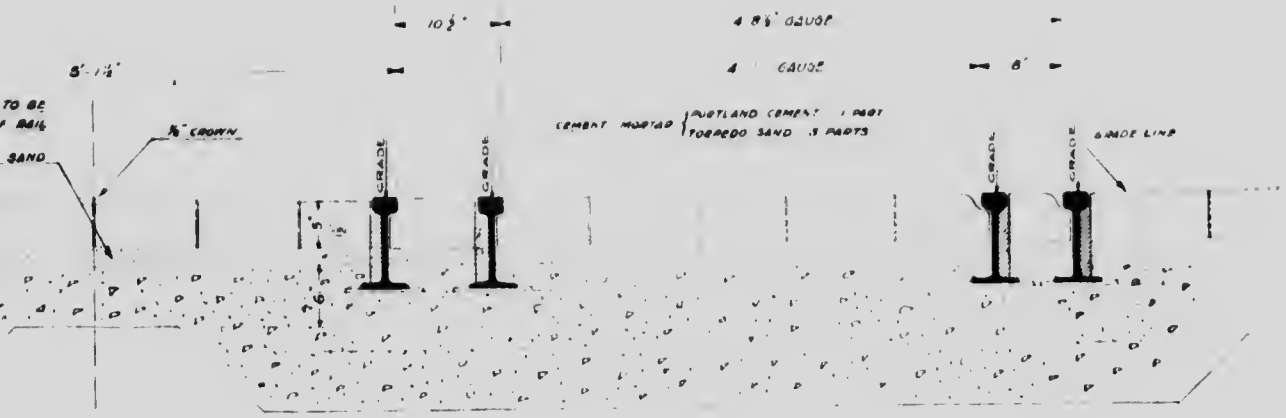
SS SECTION SHOWING ARRANGE-
T FOR TRACKS OF DIFFERENT
AUGE IN THE CENTRE OF THE
SAME STREET



CROSS

SCALE

Figure No. 3



ROSS SECTION

SCALE 1½ IN = 1 FOOT.

CROSS SECTION SHOWING ARRANGEMENT FOR TRACKS OF DIFFERENT GAUGE IN THE CENTRE OF THE SAME STREET

permitting, unless the Bloor Street line is built through to Jane before that time.

Eglinton Avenue. The crossing of Eglinton Avenue by different development lines in the next five years would probably result in a demand for a cross-line on that thoroughfare from East York Avenue to Vaughan Road. It is the most available for that purpose in that territory, and its use for street-car purposes eventually should be kept in mind when street improvements are being made. A line on that street is recommended when conditions warrant its construction. Although inside the four-and-one-half-mile circle from the City hall, such transportation may or may not be required before 1921.

Radial Lines.

Yonge Street. City service should be extended on Yonge Street north from the present terminal at Cottingham Street to the north end of North Toronto, as soon as arrangements for such operation can be perfected. Temporary accommodations could be provided by an exchange of transfers at Cottingham Street with the Metropolitan Radial cars. Double tracks will be necessary for the accommodation of traffic in this neighborhood as far north as Eglinton Avenue at least, as soon as possible. Owing to the differences in gauge between the tracks of the City and Radial Lines, double rails (Figure 34) will be required along this street, until such time as both companies adopt the same gauge. With a uniform gauge the City cars should go through to the north end and Radial cars to the down-town centre, the Radial cars conforming in general to City specifications and forming a part of the Yonge Street line service when in the City limits. The hauling of freight by the Metropolitan Line into the City and over the City streets, to Cottingham Street, if continued, should be confined to night operation. Double-tracking north of Eglinton Avenue should be done as the street is paved. As Yonge Street is the main artery of the City to the north, this work should be completed in 1913.

Davenport Road.—The Radial line in Davenport Road from St. Clair Avenue and Keele Street to Dupont and Bathurst should be double-tracked the entire distance by 1916, and operated as an extension of the Bathurst Street line.

Dundas Street.—Operating in a thickly populated section of the City, to the north-west the Radial line now occupying Dundas Street,

from Keele Street to Lambton, should be operated as an extension of the present Dundas Street line. Double-tracks should be placed in this street in 1914.

Weston Road.—From Dundas Street north to Mount Dennis (Eglinton Avenue) the Weston Road Radial should exchange transfer passengers with St. Clair Avenue, Davenport Road and Dundas Street lines, for the present using the Dundas Street terminal. This territory is developing rapidly and should be incorporated in the single-fare district. Double-tracks will probably be needed as far north as the City limits by 1916, if not before.

Lake Shore Road.—As a terminal and outlet for transportation lines west of Sunnyside Avenue, the Lake Shore Radial to the Humber River should be operated under a suitable agreement as an extension of the King Street line, as soon as track gauges are equalized. Through routes from the down-town district along the west shore, and also up the Humber River valley and on Windermere Avenue, will depend on the disposal of this question. The line should be included in the City's system of transportation.

Kingston Road.—From Queen Street north-east and east to the City Limits, the Kingston Road Radial should be double-tracked by 1916, and made part of the regular City's service. The present terminal should be continued until such time as the country becomes more thickly populated, when through route operation could be inaugurated to the down-town district, or across the City to the Humber River.

SECTION IV.

SCHEDULE OF CONSTRUCTION.

Mileage for each year. Five years for completion.

It is estimated that the construction of the track work, recommended in Section III., part of which is already finished, could be completed years according to the following schedule:

1913.	Street Distance feet
Teraulay—Queen to Bloor	6,650
St. Patrick to Wilton Avenue (Via Anderson and Agnes)	3,135
St. Clair—Yonge to Prospect Avenue	16,720
Danforth Avenue—Coxwell to Broadview	9,400
Yonge Street—Cottingham to North limits of North Toronto	19,150
Don Mills Road—Danforth to Pape	7,600
Bloor—Lansdowne to Quebec	6,680
1914.	
St. Clair—Yonge East to Alice and Prospect West to Jane	14,370
Mount Pleasant Road, from Yonge Street to Eglinton Avenue (Via Davisville Avenue)	5,800
Danforth Avenue—Coxwell to City Limits	8,250
Pape Avenue—Queen to Danforth	6,600
Dunvegan Road—St. Clair to Forest Hill Road	2,950
Church Street—South Drive to St. Andrew's College (Via Elm Road and Summerhill Avenue)	1,500
Gerrard Street—Main Street to City Limits	3,725
Windermere—Lake Shore to Bloor	6,300
Dundas Street—Keele to Lambton	11,100
1915.	
Pape Avenue—Don Mills Road to Danforth (Via Leslie Ave.)	7,200
Greenwood Avenue—Queen to Danforth	6,600
Dupont—Christie to Quebec (Via Hallam, Lappen and Humberside)	14,[illegible]

	Street Distance feet
Dufferin Street—Queen to St. Clair	13,700
Eglinton Avenue—Mount Pleasant Road to East York Avenue	3,650
Davenport Road Line, Bathurst to St. Clair	14,650
Moore Avenue Branch, St. Clair Avenue to Moore Avenue Bridge (Via Alice Street)	1,450

1916.

Bloor and Jane—Quebec to St. Clair and Jane	11,350
Christie—Clinton and Niagara—St. Clair to Bathurst	16,250
Dufferin—St. Clair to Prospect Avenue (Via Waverly)	5,650
Forest Hill Road—Dunvegan Avenue to Eglinton	5,000
Vaughan Road—Bathurst and Alice Avenue to Eglinton	9,000
Bathurst—Davenport Road to Alice Avenue	3,500
Kingston Road—Queen to City Limits	8,500
Weston Road Line—Dundas to City Limits	6,100

1917.

Elizabeth and Annette—Bloor to Jane	5,525
Avenue Road—Dunvegan to Eglinton	4,600
Dovercourt and Lake View Avenue—Van Horne to Eglinton	10,025
Greenwood Avenue—Danforth to Mortimer	3,000
Don Mills and Globe Roads, Pape to Woodbine Avenue	9,250
Weston Road—City Limits to Eglinton Avenue	4,650
Mortimer Avenue—Greenwood to Woodbine	5,100
Prospect Avenue—Waverly Road to Eglinton	2,700
Bathurst—Alice Avenue to Eglinton	5,300
Moore Avenue, Ravine Bridge to East York Avenue	2,300
East York Avenue—Moore Avenue to Eglinton	5,300

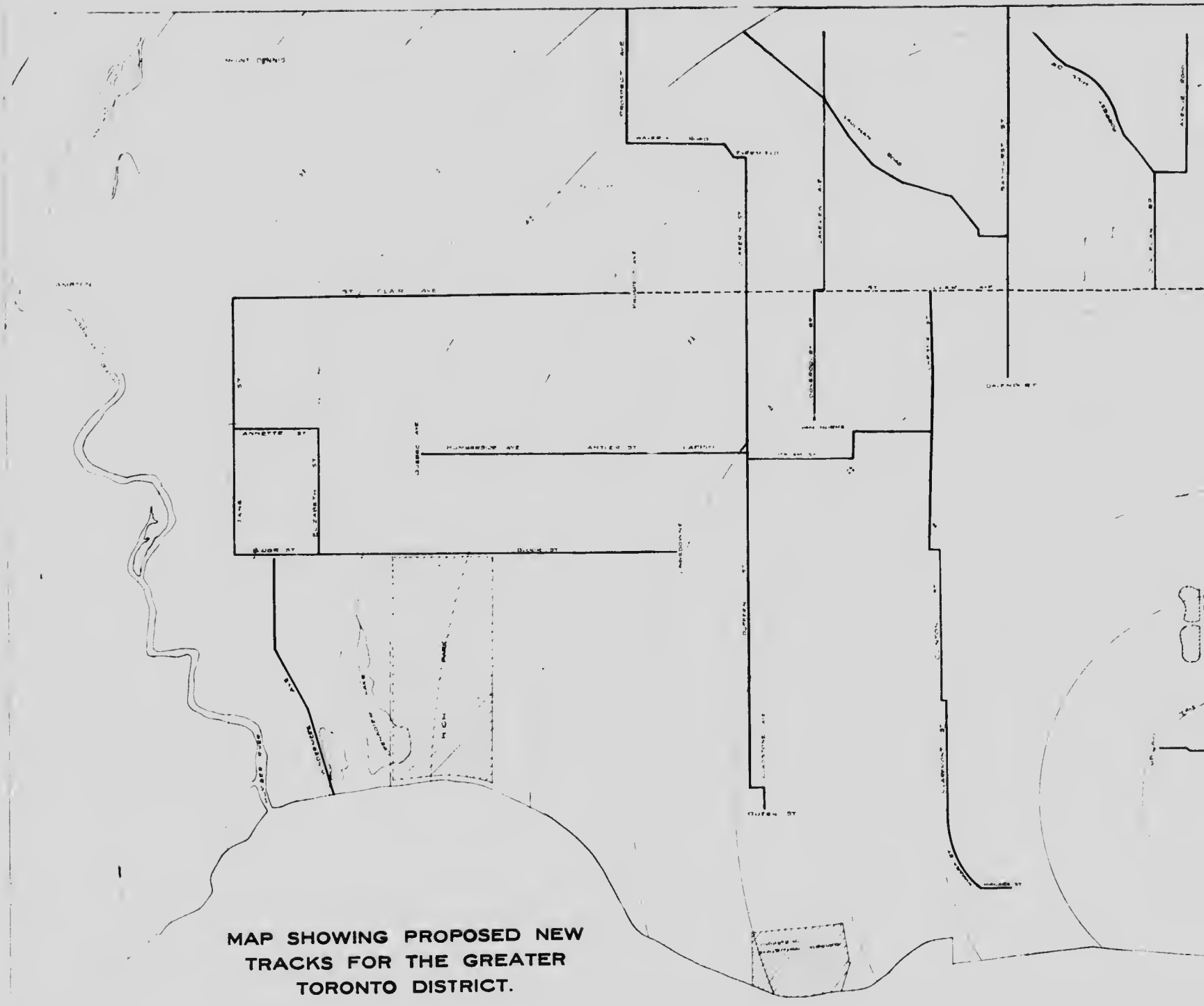
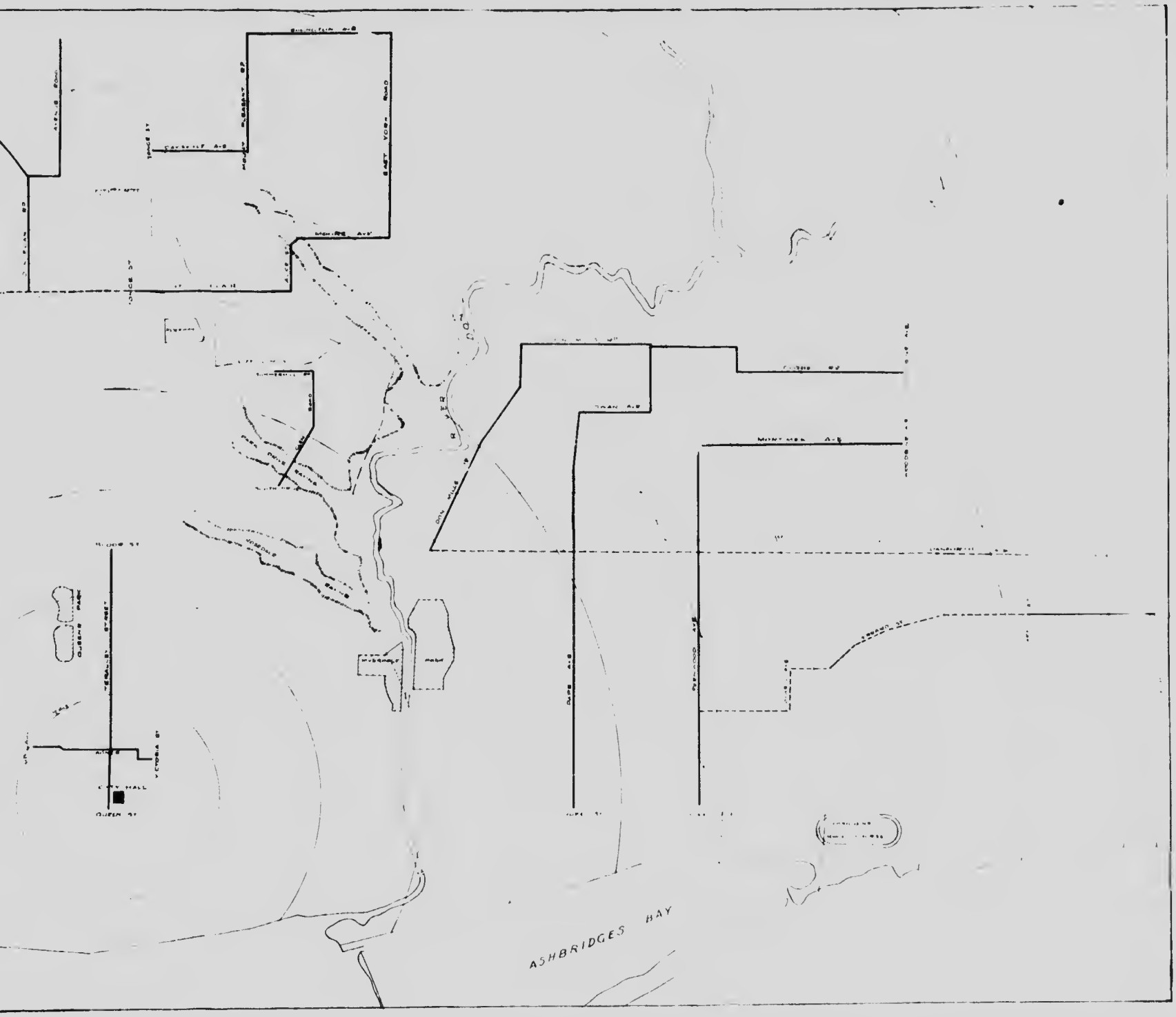

MAP SHOWING PROPOSED NEW
TRACKS FOR THE GREATER
TORONTO DISTRICT.

Figure No. 5


ASHBRIDGES BAY

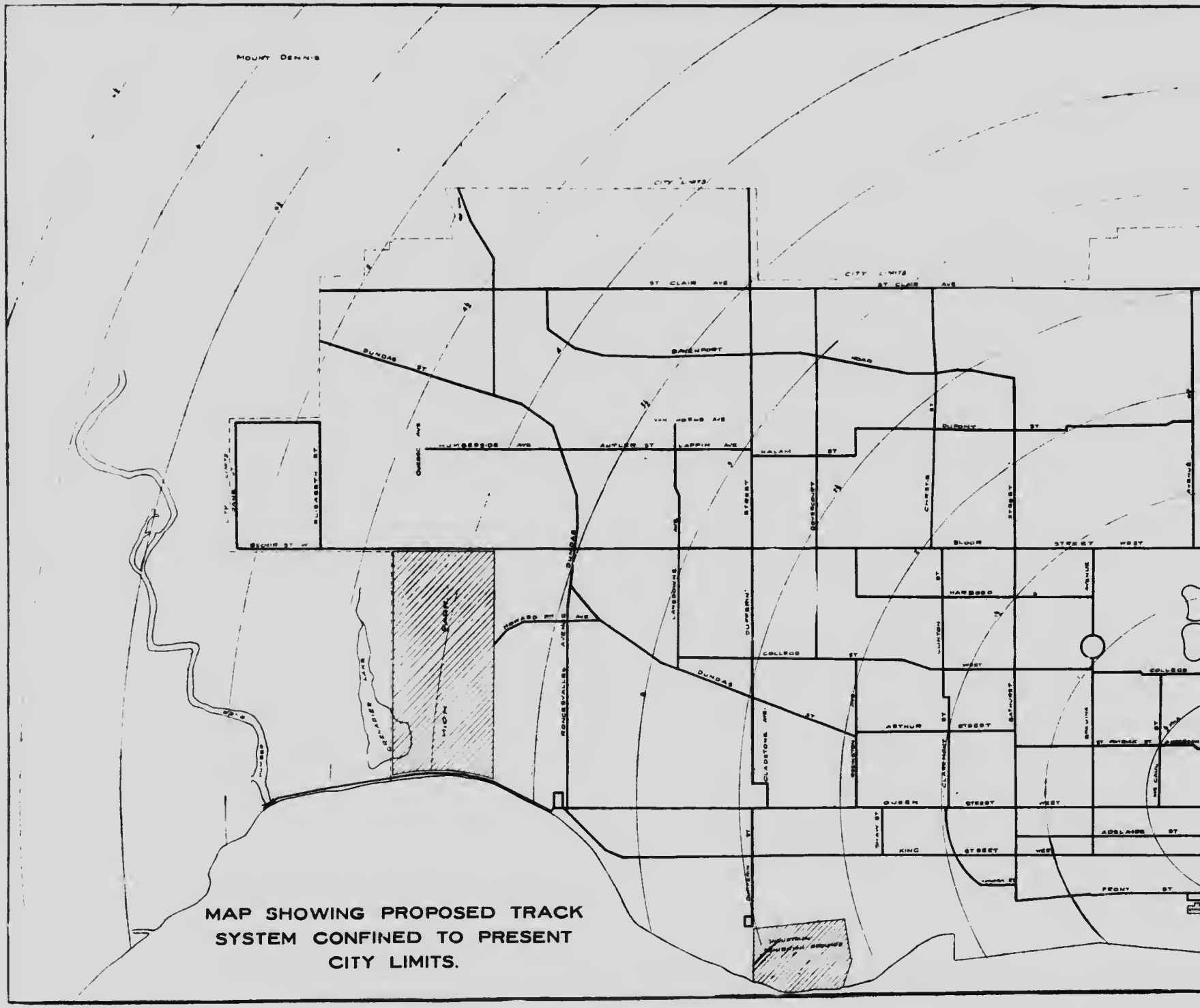
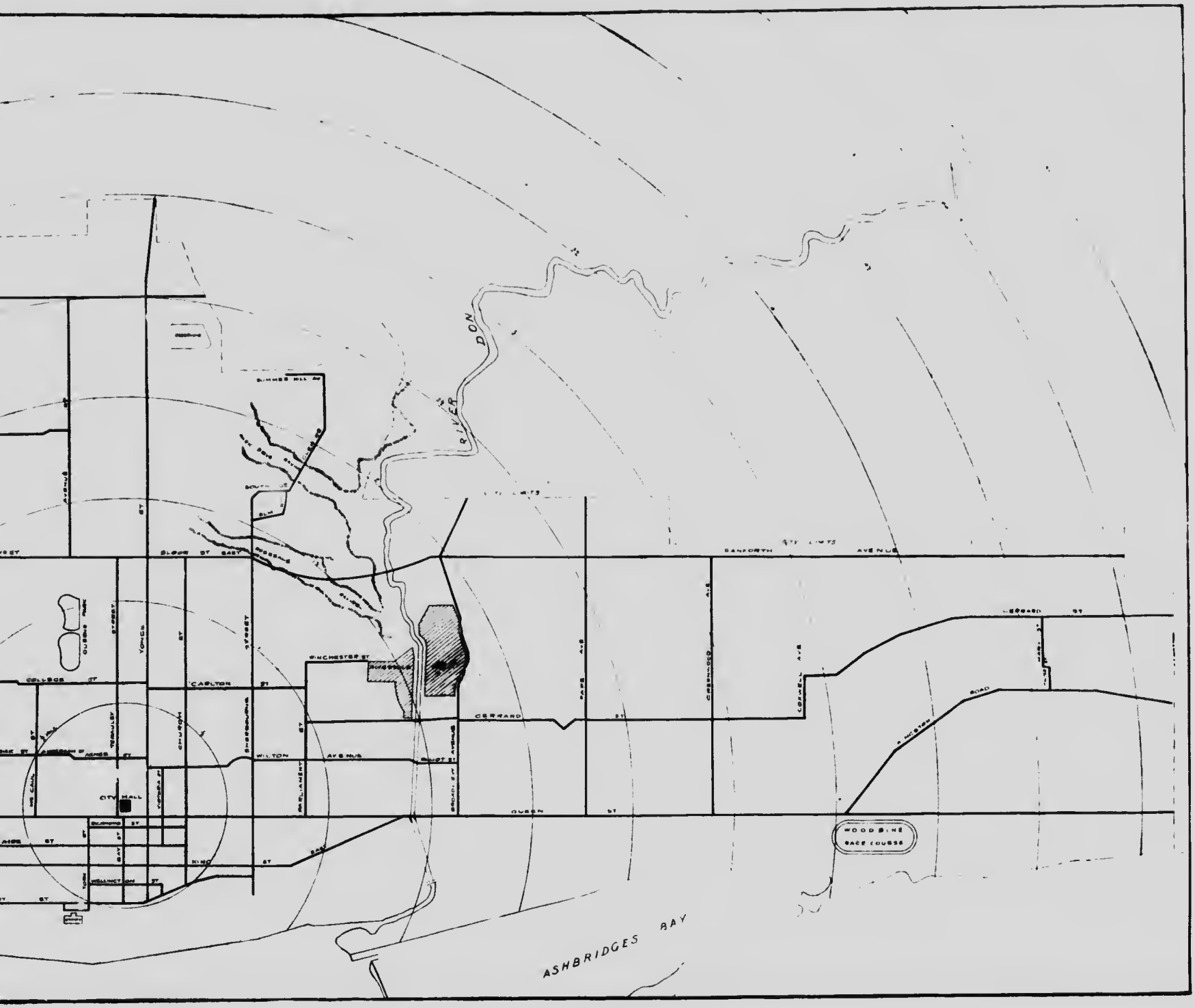

MOUNT DENNIS
CITY LIMITS
ST CLAIR AVE
DUNDAS ST
DAVENPORT ROAD
HUMBERSIDE AVE
ANTLER ST
LAPPIN AVE
HALAM ST
DUNDAS
BLOOR STREET WEST
HARBORD
COLLEGE ST WEST
ARTHUR STREET
QUEEN STREET WEST
KING STREET WEST
ADELAIDE ST
FRONT ST
PARK
HIGH
MAP SHOWING PROPOSED TRACK SYSTEM CONFINED TO PRESENT CITY LIMITS.

Figure No. 6


DON
RIVER
BLOOR ST EAST
WINCHESTER ST
CARLTON ST
GERRARD ST
QUEEN ST
KING ST
WILTON AVENUE
CITY HALL
WOODBINE RACE COURSE
ASHBRIDGES BAY

SECTION V.

TRACKS AND TRACK CONSTRUCTION.

Increase of 127 miles of single track—Grooved rails for business centre—"T" Rails—Temporary track—Conduits—Curves and turnouts.

The foregoing outline of service trackage required for the present needs and proper future development of the Toronto district, including Gerrard Street and Lake Shore Road, would increase the mileage to be operated from 113 miles now, to a total of 240 miles at the end of five years (Figure 1). As all recommendations of this character must necessarily be based only on estimates of future requirements, it is recommended that those tracks be built which are required at this time, and the future be provided for by arranging for a certain mileage of construction each year in streets to be designated at the time. This would provide for the development of new territory as the changing conditions would warrant, and would allow for the unexplainable shifts in population which so frequently occur.

The total of 127 miles hereby proposed as additions to the present Toronto system is divided approximately into 32 miles of single track in the old City limits of 1891, and Ward No. 7; 10 miles in the territory annexed since 1891, except Ward No. 7; 28 miles of Radial lines to be added to the City system; 10 miles in the territory outside the present City limits; and 17 miles now being built by the City (Figures 5 and 6). It is estimated that the construction will cost approximately $2,617,127, all of which would be used before 1918. This includes new lines to be built, civic lines now being constructed but not in operation, improvements to Radials outlined, crossings and other special work, electrical overhead trolley wire and feeder cable with necessary poles according to present methods, the City furnishing the roadbed and pavement, which is not included in the estimated costs.

Track Construction.

The track construction now being installed by the Toronto Railway Company conforms in general respects to modern practice, and, if continued, should be acceptable for the outlying districts of the City, where heavy vehicle traffic is not encountered.

This construction consists of 7-in. T-rail, laid on ties embedded in a concrete substructure and paved with granite block, scoria block, brick or asphalt.

For the purpose of this report it has been assumed that extensions of the system would be made either with the above described track of the Railway Company, or with one or more of the following types of construction. The estimates in this report, however, are based upon the following types:—*

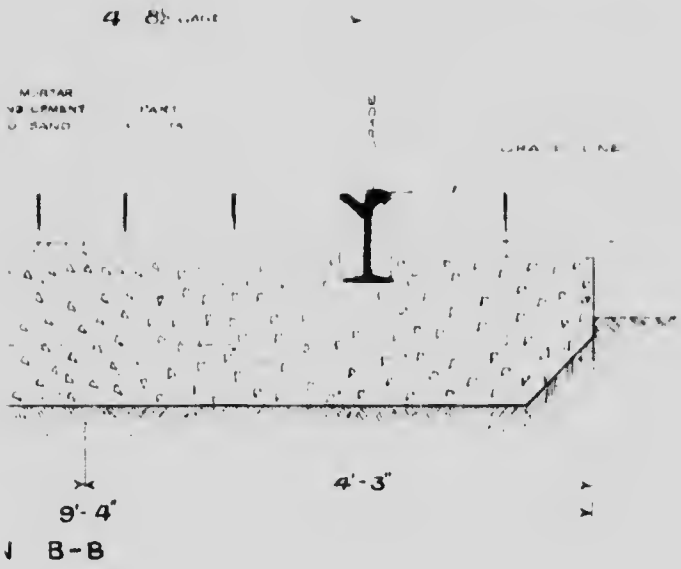
Type No. 1. (Figure 7) consisting of 9-in. grooved girder rail, with concrete foundation and granite pavement, for use on streets within one mile of the City Hall, and on such trunk lines as Yonge Street south of Cottingham Street and King and Queen Streets from Broadview Avenue to Dufferin Street.

Type No. 2. (Figure 8) The same construction as Type No. 1 except using 9-in. T-rail. Designed for outlying paved streets only.

Type No. 3.—The same as Type No. 2 except that a bolted joint with bonding is used instead of a welded joint, and instead of using a concrete base the ties are spaced on 2-ft. centres and laid on crushed stone foundation eight inches deep under the ties. This type of construction is proposed for use in unpaved streets on which the underground service improvements, such as sewers, gas and water mains, etc., have not been made, and which, when installed, would necessitate tearing up the tracks.

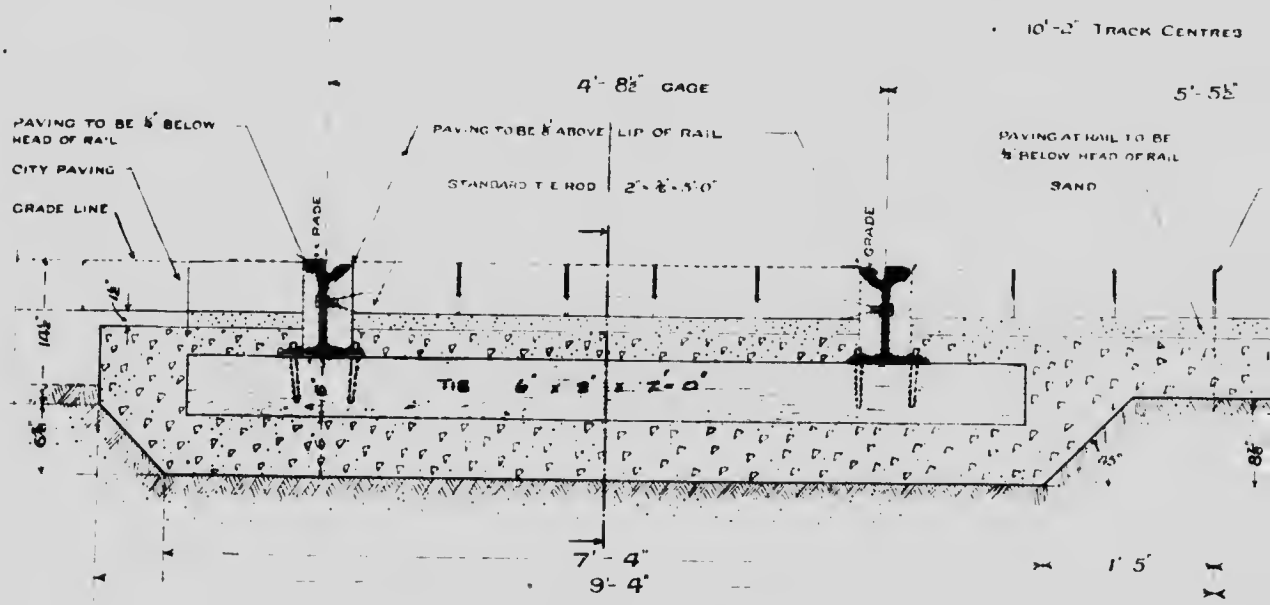
For any but the streets of heaviest traffic the use of T-rail for City service has generally proved satisfactory, and is therefore recommended for all such parts of the Toronto District. For the heavy traffic district,

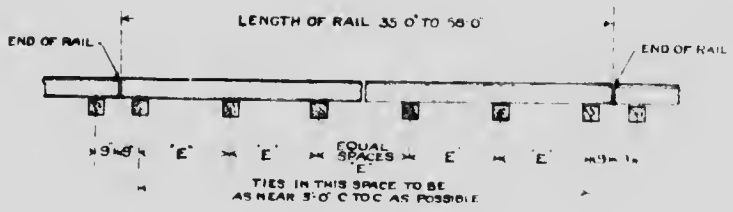
* Transportation conditions in Toronto are quite similar to those which confronted the people of Chicago in 1907, when thorough rehabilitation of the large traction systems was effected by co-operation between the city and the street railway companies. Since that time over $70,000,000 has been expended in the construction of new tracks, cars, car houses, power stations, tunnels, and other improvements considered necessary to furnish the people of Chicago with proper surface transportation. This large amount of capital has been expended under the active direction of a Board of Supervising Engineers representing the City and the different companies. The latest standard types of construction originated and adopted by this Board, which it was thought would be of assistance to the citizens of Toronto at this time, have been freely drawn upon for use in this report. The courtesies of the members of the Board are hereby acknowledged.

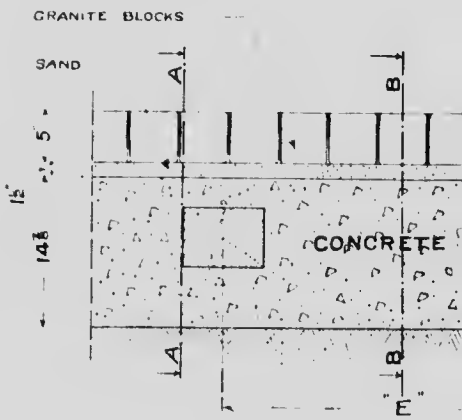


LENGTH OF RAIL IN FT.	C TO C OF TIES SPACED	NUMBER OF TIES PER RAIL	LENGTH OF RAIL IN FT.	C TO C OF TIES SPACED	NUMBER OF TIES PER RAIL
35	36⅝"	12	47	36⅝"	16
36	34⅝"	13	48	35"	17
37	35⅝"	13	49	35⅝"	17
38	36⅝"	13	50	36⅝"	17
39	34⅝"	14	51	35"	18
40	35⅝"	14	52	35⅝"	18
41	36⅝"	14	53	36⅝"	18
42	34⅝"	15	54	35"	19
43	35⅝"	15	55	35⅝"	19
44	36⅝"	15	56	36⅝"	19
45	34⅝"	16	57	35"	20
46	35⅝"	16	58	35⅝"	20

TYPE 1 (Fig. 7). Specifications: Grooved Girder Rail, 9 inch, 129 lb., 60 ft. length. Ties creosoted if soft wood, untreated if hard wood. Concrete foundations, tie plates, screw spikes, flat tie road set on edge, with six foot facing. Welded rail joints. Brow paving set in cement mortar.

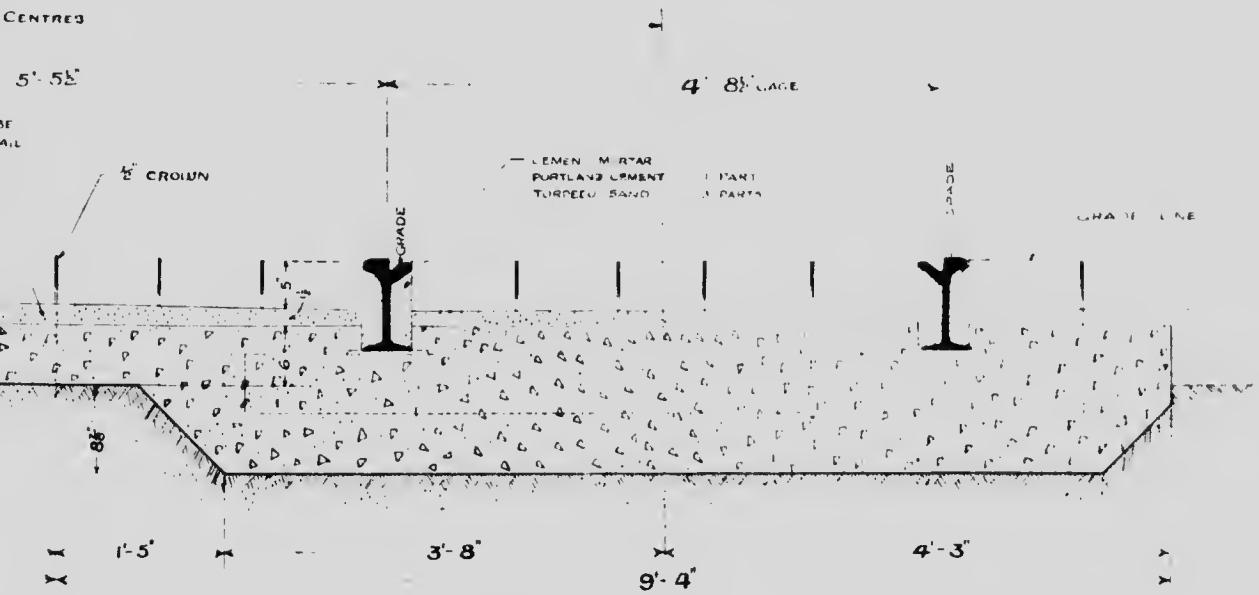






CROSS SECTION SHOWING MODERN GROOVED RAIL AND TRACK CONSTRUCTION.

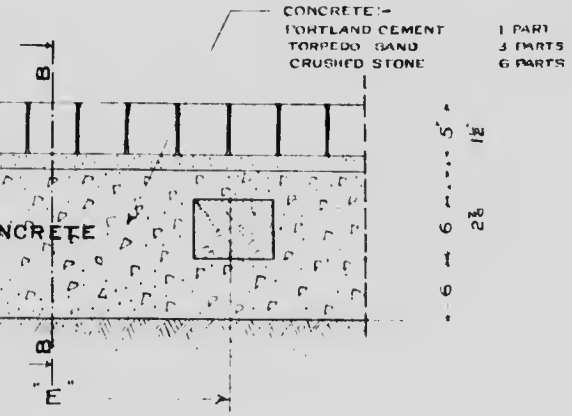
Figure No. 7



SECTION B-B

SECTION

E 1½ IN = 1 FOOT.



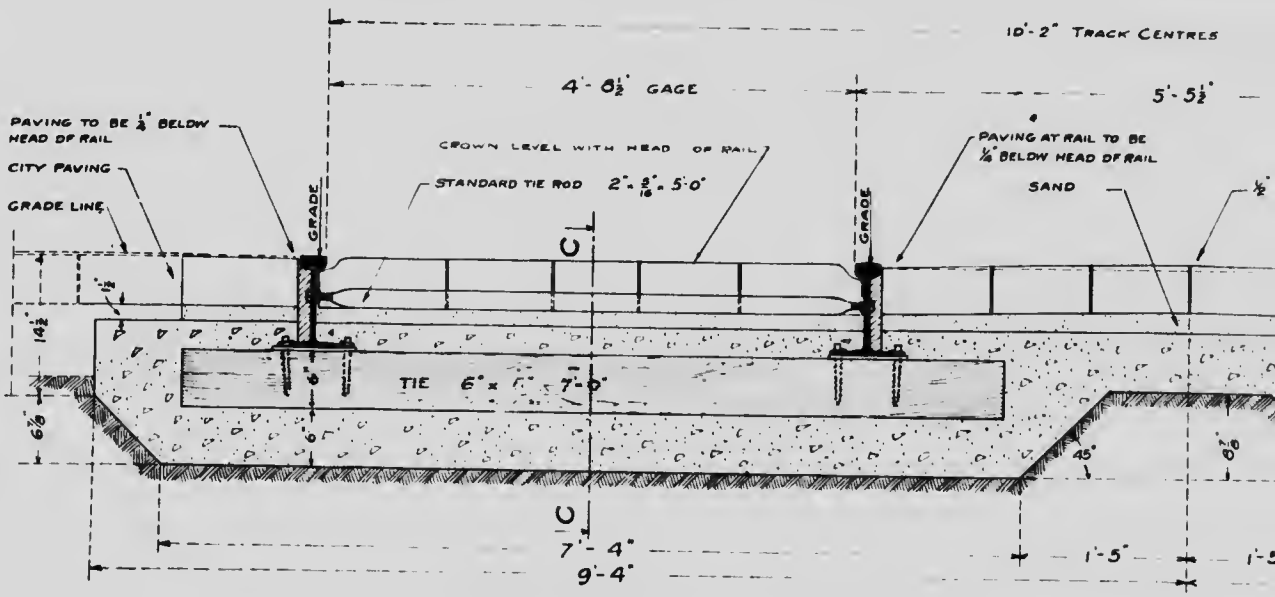
AL SECTION

C-C

E 1½" = 1 FOOT.

LENGTH OF RAIL IN FT	C TO C OF TIES SPACED	NUMBER OF TIES PER RAIL	LENGTH OF RAIL IN FT	C TO C OF TIES SPACED	NUMBER OF TIES PER RAIL
35	36½"	12	47	36½	16
36	34½"	13	48	35"	17
37	35½"	13	49	35½	17
38	36½	13	50	36½	17
39	34½"	14	51	35"	18
40	35½"	14	52	35½	18
41	36½"	14	53	36½	18
42	34½"	15	54	35"	19
43	35½"	15	55	35½"	19
44	36½"	15	56	36½"	19
45	34½"	16	57	35"	20
46	35½	16	58	35½	20

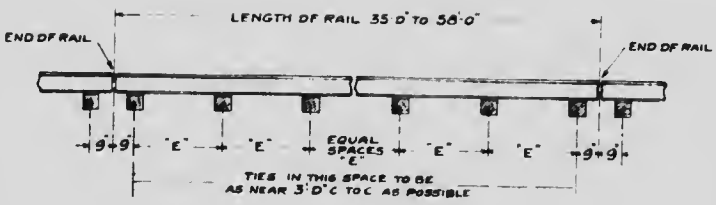
TYPE I (Fig. 7). Specifications: Grooved Girder Rail, 9 inch, 120 lb., 60 ft. length. Ties creosoted if soft wood, untreated if hard wood. Concrete foundations, tie plates, screw spikes, flat tie road set on edge, with six foot facing. Welded rail joints. Brow paving set in cement mortar.



SECTION A-A

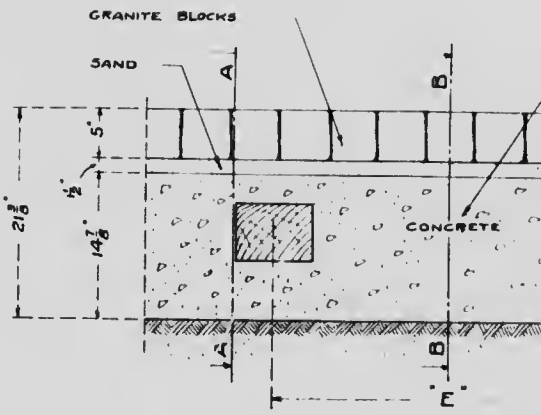
CROSS SECTIO

SCALE 1½ IN = 1 F



TIE SPACING

Scale 3/8"-1R



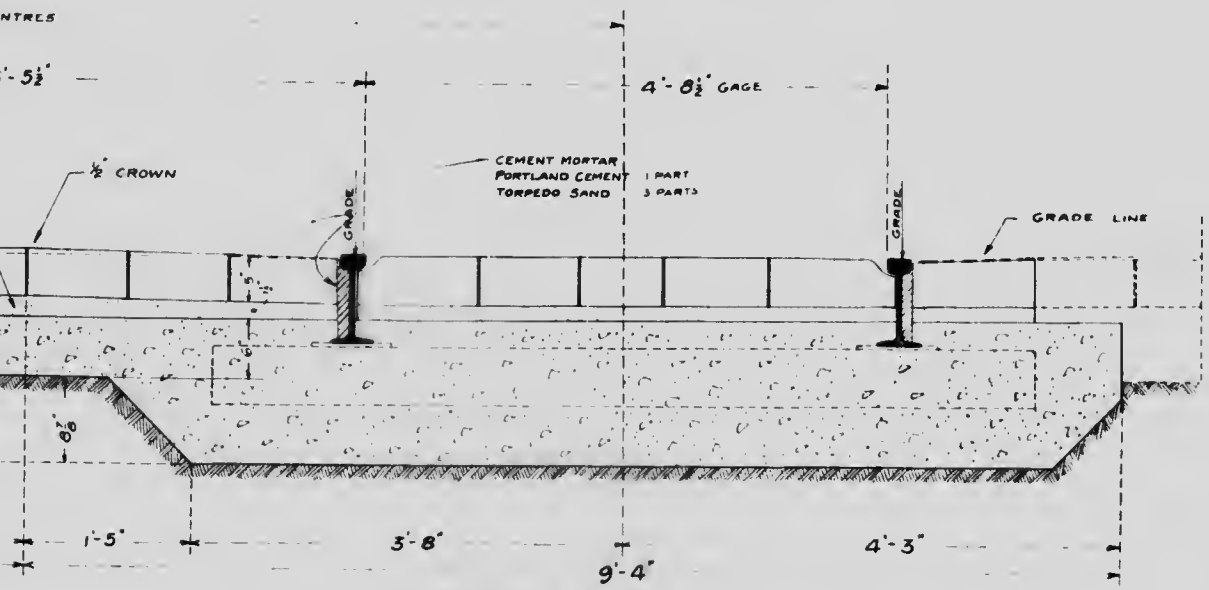
LONGITUDINAL SEC

C - C

SCALE 1½" = 1 Foot

TYPE 2 (Fig. 8) Specifications: 9 inch, 100 lb. Tee rail, 60 ft. length. Ties creosoted if soft wood, untreated if hard wood. Concrete foundation, tie plate, screw spikes, flat tie rods set on edge 6 ft. apart. Welded rail joints. Brow paving set in cement mortar.

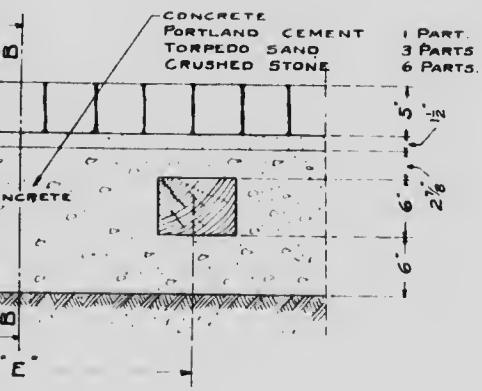
Figure No. 8



SECTION B-B

SECTION

IN = 1 F



L SECTION

- C

½" = 1 Foot

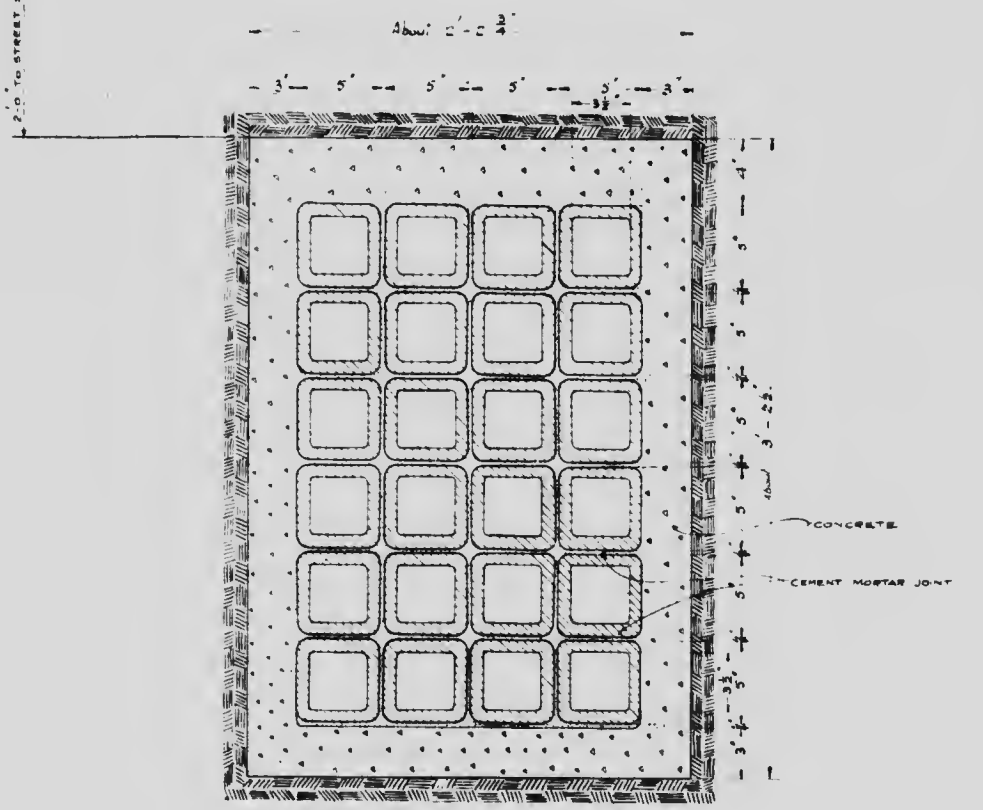
LENGTH OF RAIL IN FT	C TO C OF TIES SPACE "E"	NUMBER OF TIES PER RAIL	LENGTH OF RAIL IN FT	C TO C OF TIES SPACE "E"	NUMBER OF TIES PER RAIL
35	36½"	12	47	36½"	16
36	34½"	13	48	35"	17
37	35½"	13	49	35½"	17
38	36½"	15	50	36½"	17
39	34½"	14	51	35"	18
40	35½"	14	52	35⅝"	18
41	36½"	14	53	36¼"	18
42	34½"	15	54	35"	19
43	35½"	15	55	35⅝"	19
44	36½"	15	56	36¼"	19
45	34½"	16	57	35"	20
46	35½"	16	58	35⅝"	20

CROSS SECTION SHOWING MODERN
"T" RAIL AND TRACK CONSTRUCTION

BILL OF MATERIAL

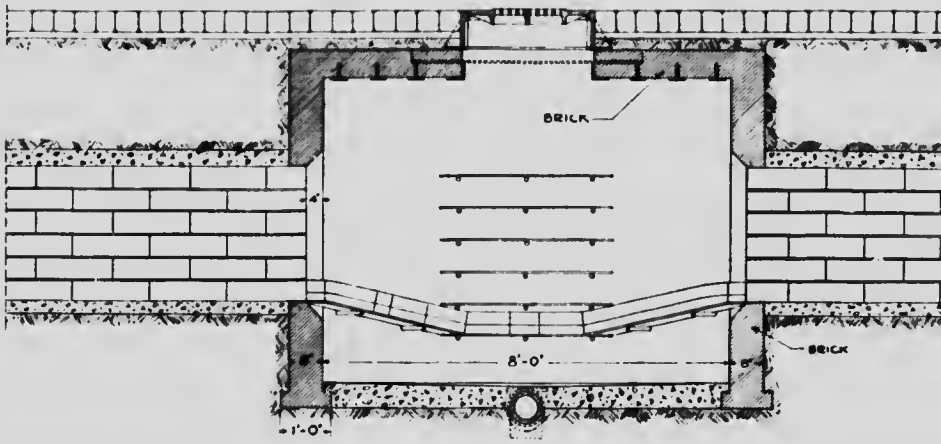
ESTIMATED AVERAGE QUANTITIES OF MATERIAL PER CONDUIT FOOT

MATERIAL	UNITS	NUMBER OF DUCTS										
		4	6	8	9	10	12	15	16	18	20	24
DUCT MATERIAL	DUCT FT	4	6	8	9	10	12	15	16	18	20	24
CEMENT	BBL	.039	.0503	.0714	.0834	.1084	.1284	.1584	.1714	.1914	.2114	.2514
SAND	CU YD	.0247	.0284	.0352	.0384	.0462	.0484	.0577	.0601	.0642	.0762	.0927
STONE	CU YD	.0657	.0538	.0622	.0684	.0702	.0715	.0788	.0872	.0874	.0972	.0982



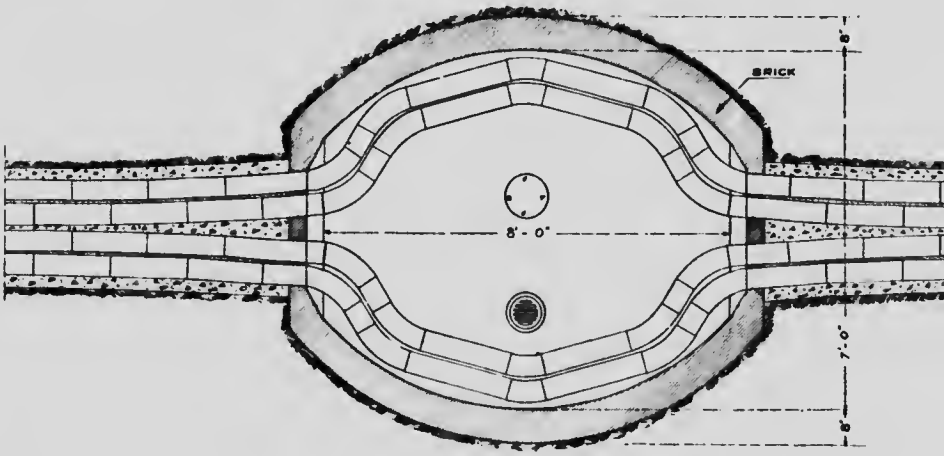
CROSS SECTION SHOWING STANDARD CONDUIT CONSTRUCTION.

Figure No. 9



LONGITUDINAL SECTION

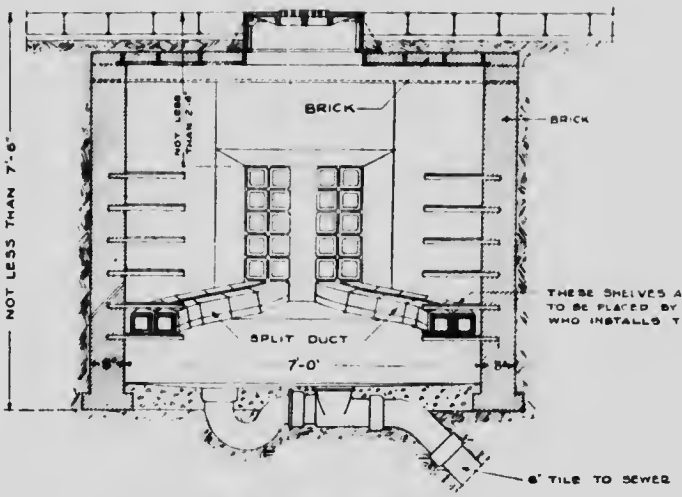
SCALE $\frac{3}{4}$"-1FOOT



SECTIONAL PLAN

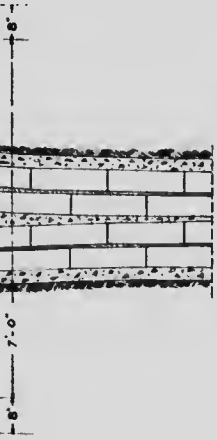
SCALE $\frac{3}{4}$"-1FOOT

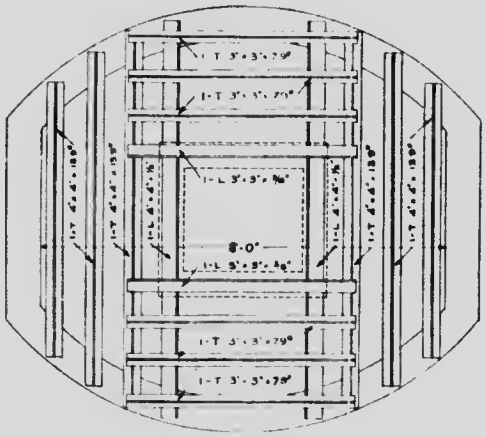
Figure No. 10



TRANSVERSE SECTION

SCALE $\frac{3}{4}$"=1FOOT





FRAMING PLAN

SCALE: $\frac{3}{4}$"=1FOOT

BILL OF MATERIAL

ESTIMATE OF AVERAGE QUANTITIES OF MATERIAL FOR TYPICAL MANHOLES

MATERIAL	5×6 BRICK MANHOLE	5×7 BRICK MANHOLE	7×8 BRICK MANHOLE
BRICK	1900	2400	2900
CEMENT	4/8 66LS	5.66 66LS	6.32 BBLS
SAND	1.67 CU YDS	2.47 CU YDS	3.34 CU YDS
STONE	0.42 CU YDS	0.55 CU YDS	0.80 CU YDS
STEEL ANGLES AND TEES	441 LBS	563 LBS	1037 LBS
COVER AND FRAME	1	1	1
6" P TRAP	1	1	1
6" GATE WATER VALVE	1	1	1
6" TILE DRAIN PIPE	15 FT	18 FT	15 FT

PLAN AND SECTION SHOWING STANDARD MANHOLE CONSTRUCTION FOR CONDUIT SYSTEM.

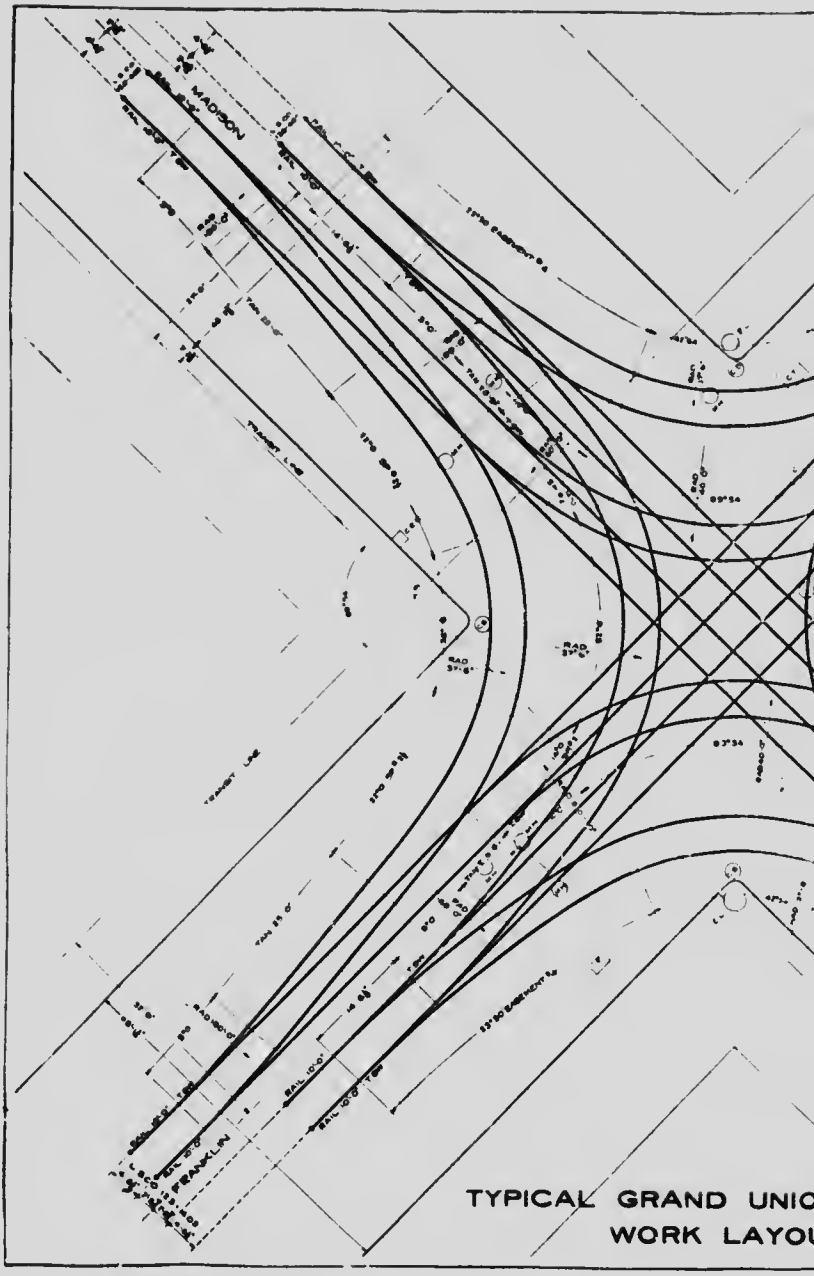
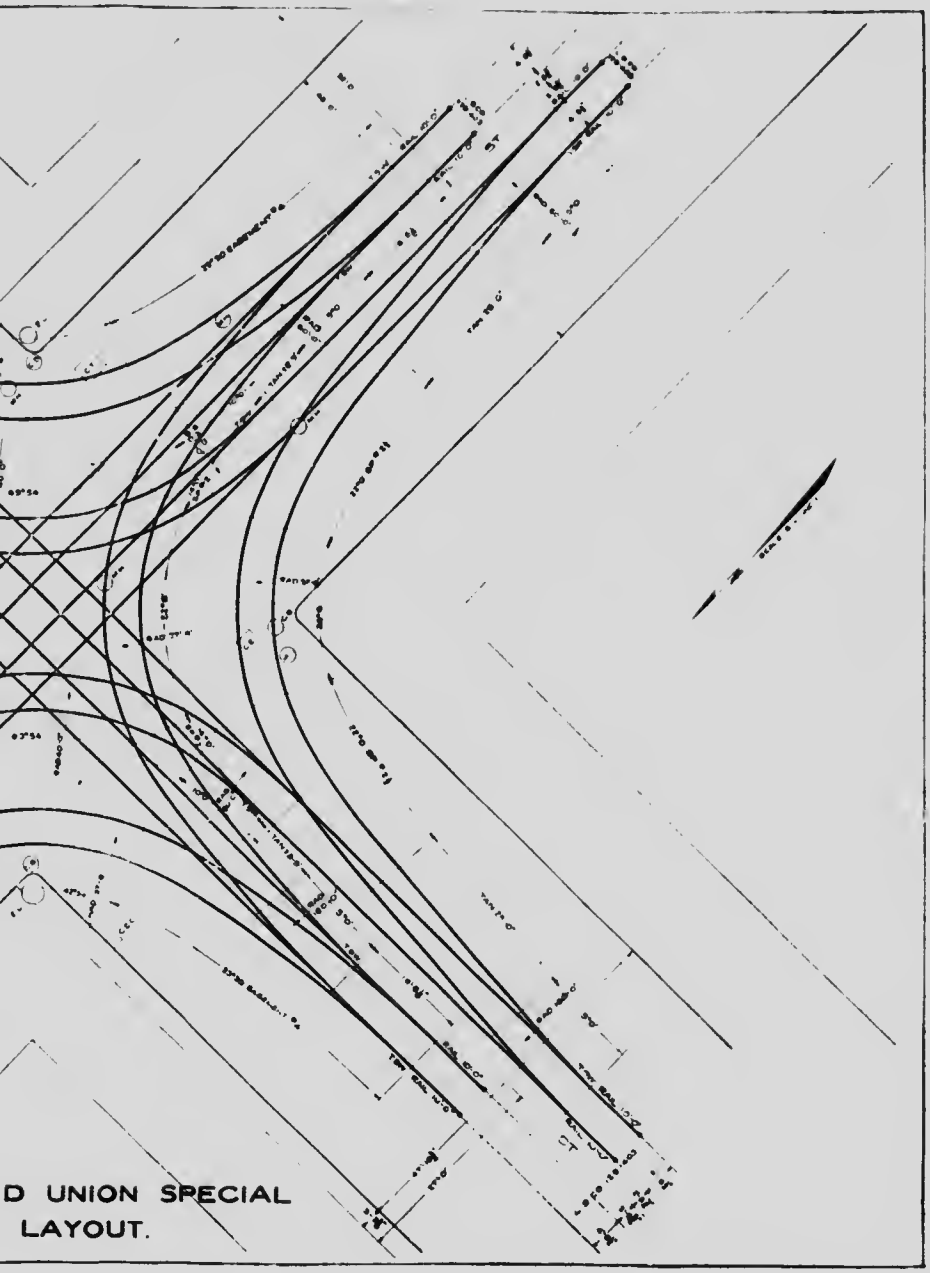


Figure No. 11



D UNION SPECIAL
LAYOUT.

the grooved rail should be used. Where the T-rail is used, however, and the street is paved, and if granite block is used for pavement, the blocks in contact with the rail should be uniformly cut so as to form a groove for the flange of the wheels. Where brick is used those in contact with the rail should be specially moulded to accomplish the same purpose.

Conduits.

Conduits sufficient to provide for all electric cables should be installed near the tracks. If desired, this work could be extensive enough to carry cables for the City lighting plant and under suitable arrangements for private corporations now having overhead wires in the streets. Plans are shown for typical underground conduit construction (Figure 9), also brick manhole construction (Figure 10).

Curves and Turnouts.

Curves should be built so that cars could pass without interference. Frequently this will require the rounding off of a few feet on the corner sidewalk, which may be objected to, but where such work has been installed in other cities, the results have not proved harmful, and objections on the part of the property owners have been withdrawn. Figure 11 shows a typical grand union special work layout so constructed as to admit of several cars being in motion on separate tracks at such an intersection at one time. The car movement in Toronto at several of the congested points, such as Yonge and College Streets, during the rush hours of travel, or at King and Dufferin Streets during the Exhibition period, would be materially aided and the average speed of the cars increased, without increasing their maximum speed, by the substitution of this class of special work for the present narrow centre work.

Figure No. 12

PLAN AND SECTION OF MODERN
P-A-Y-E CAR.

SECTION VI.

CAR AND SERVICE REQUIREMENTS.

New cars required—Schedule of service—P.A.V.E. cars as standard.

It is estimated that the transportation system outlined herewith, when completed, will require 1,100 cars for the transportation of a population of 718,000 in 1921. With 500 of the present cars retained in service on light lines of travel or rebuilt, there will be required 150 new cars to replace trailers and the poorer class of single truck motors. As fast as new lines are added to the system and population increases, new cars will be needed, the estimate being 250 for this purpose at the end of five years. The rest of the final requirements should be placed in service at the rate of 50 per annum.

Car requirements for the proposed track additions to the present system, are estimated as follows to furnish the service indicated on each street.

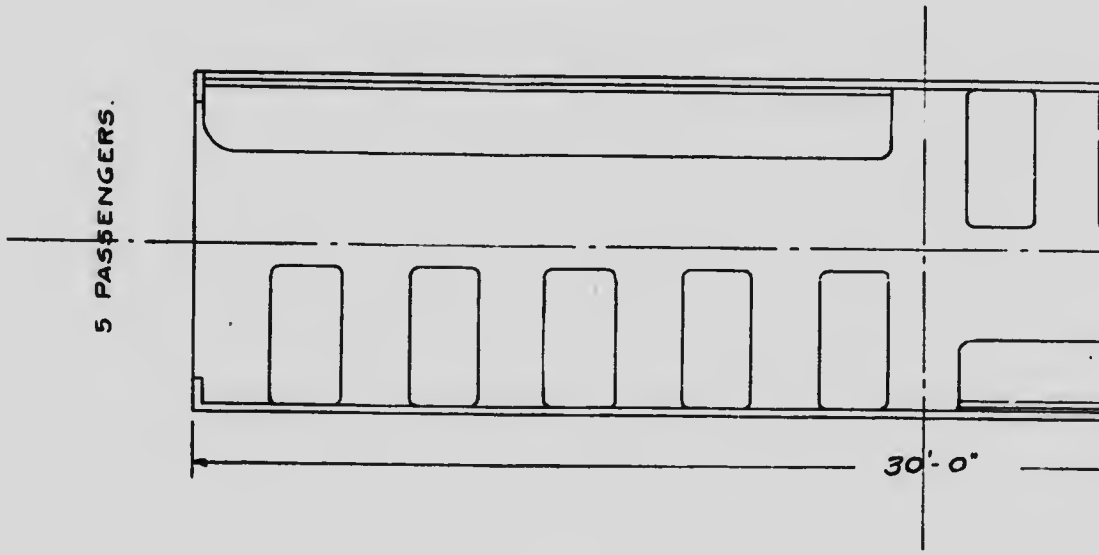
Street.	Round Trip Distance.	Running Time.	Rush Hour Headway.	Cars Required.
	Feet.	Min.	Min.	
Don Mills Road.....	33,500	35	5	7
Danforth Avenue.....	35,300	42	3	14
Gerrard Street.....	26,750	30	3	10
Dupont Street extension....	28,000	36	3	12
Dovercourt and Lakeview...	20,050	24	6	4
Church Street extension	9,000	15	3	5
Greenwood and Mortimer...	30,000	40	5	8
Pape Avenue	27,600	40	4	10
Christie and Clinton.....	32,500	48	4	12
Dufferin and Prospect.....	44,100	60	5	12

Street.	Round Trip Distance.	Running Time.	Rush Hour Headway.	Cars Required.
	Feet.	Min.	Min.	
Mount Pleasant Road.....	18,900	24	6	4
East York and Moore Ave..	18,100	24	6	4
Dunvegan and Avenue Road.	15,100	24	7	3
Forest Hill Road.....	16,000	24	7	3
Vaughan Road	20,800	28	7	4
Bathurst Street	17,600	24	7	3
Windermere Ave. and L. S..	38,200	42	7	6
St. Clair Avenue.....	62,180	69	3	23
Davenport Road	32,100	35	5	7
Weston Road	24,500	25	5	5
Dundas extension	22,200	24	3	8
Kingston Road	17,000	20	5	4
Yonge Street extension.....	38,900	42	3	14
Bloor Street extension.....	36,060	39	3	13
Total cars	.....	.....	.....	195

Car Equipment.

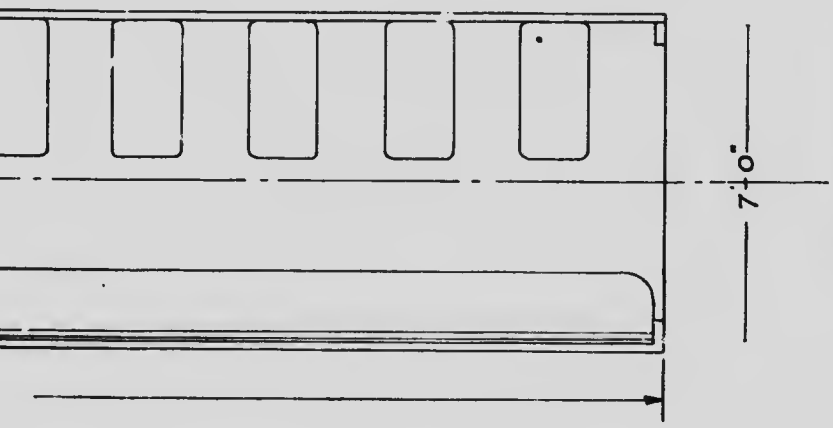
For the purpose of this report it is deemed sufficient to present to the citizens of Toronto certain general ideas as regards a type of car which might likely be found suitable to their conditions, rather than to attempt to define such car in minor details.

The car illustrated (Figure 12) is representative of a type which has been found serviceable in the city of Chicago and in other cities. It is primarily designed for all-year-round service, so as to prevent the duplication of car investment for both summer and winter. Being equipped with four 40-horse power motors, it is capable of fast service under heavy loading conditions and is heavy enough to withstand the severest duty likely to be encountered in city traction service. The car is built double-end, so as to be available for stub-end terminals, although for single-end operation it would be slightly modified in arrangement of platforms to advantage



SCALE 3/8" =

Figure No. 13



5 PASSENGERS

40 SEATS
15 STANDING IN CAR.
10 ON PLATFORMS
65 MAXIMUM.

PLAN SHOWING
SEATING ARRANGEMENT FOR
REBUILDING NARROW CAR

E 3/16" = 1 FT.

The type of fender used is adapted for congested streets where extension fenders would occupy too much track space. Car bumper protectors as used in Toronto could be applied in addition to this protection if desired.

With this type of car the conductor is in a position at all times to attend to the proper loading and unloading of passengers, and is not required to elbow his way through a crowded car to gather fares, the entering and leaving passengers being separated by platform railings so as to eliminate confusion at transfer points and lessen the time required for stops. The car is 8 ft. 6 inches in maximum width, 46 feet over-all, including 7-ft. 3-in. platforms, and has a seating capacity of 52 passengers. With a standard track centre of 10 ft. 2 in., as used in Chicago, the clearance between the sides of cars, 8 ft. 6 in. wide when passing, is 20 inches.

If the City cars of Toronto were rebuilt by lengthening the platforms and changing the seating arrangement, so as to conform to the style shown in Figure 13, the large cars now in use would become available for part of the trunk-line service and would be more in keeping with modern standards of equipment.

The specification of detailed car equipment is considered to be a matter to be finally taken care of by the local authorities of Toronto, but it is considered desirable in this connection to call attention to two types of prepayment cars differing somewhat from that illustrated, which, under certain conditions, are being introduced in the larger American cities with success. Within the past year car development has been so rapid that it would be practically impossible to define at the present time what may be termed a standard car for the immediate future. This development has taken place along the lines of reduced weight, increased facilities for loading, cross seats instead of longitudinal seats, diminution of accidents, increase of average running speed, maximum total carrying capacity for rush-hour service, and use of standard equipment for both summer and winter service.

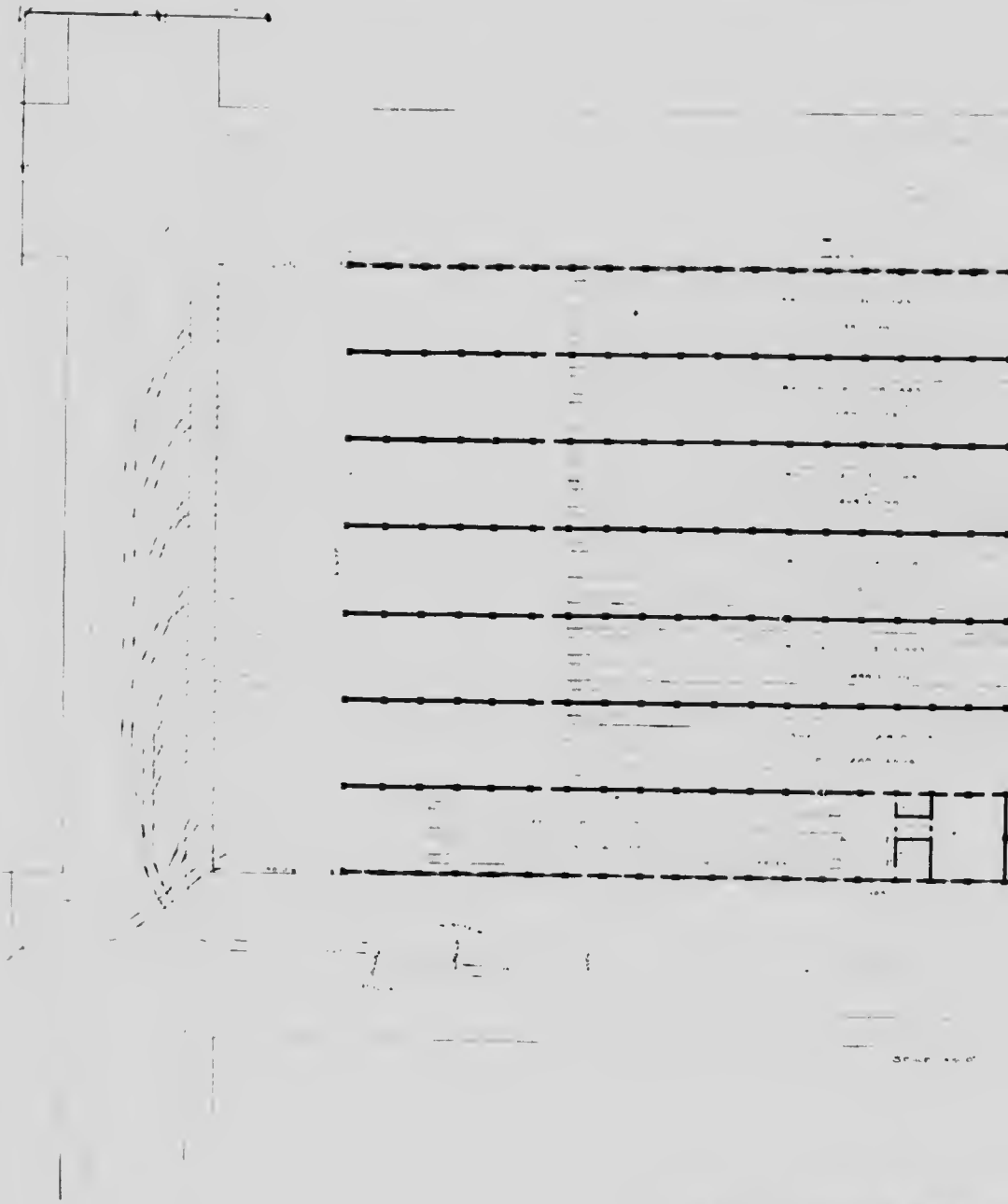
In the modifications of prepayment platforms the principal change has been in the use of the centre-entrance car, in which all of the platform space is concentrated at the centre under the direction of the conductor, an arrangement which provides maximum seating capacity for a given size of car body. This also makes possible for fairly level cities the location of the steps closer to the pavement than is usual.

A modification of this type that has been introduced in level cities, such as New York, is the double-deck car, which provides a large amount of extra capacity that is exceedingly useful during rush hours, thereby performing the function of a trailer, but without the increased street congestion that would result therefrom.

In New York a full convertible prepayment car has also been used with success, in which both side panels of the car body are removed during the summer time, the openings being protected by wire guards. This provides practically an open summer car, with cross-seats and centre aisle, and yet is available for winter service as a standard box car.

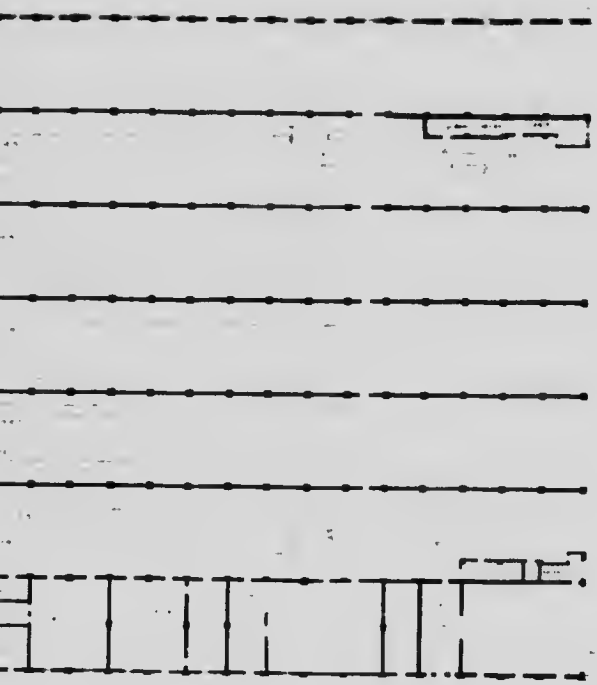
One of the latest types introduced in Philadelphia and Chicago is "the near-side car," in which the rear platform is dispensed with and the front platform enlarged sufficiently to accommodate both entrance and exit passage ways. While it has certain advantages, especially where used in conjunction with "the near side stop," as it then allows passengers to enter and leave the car on or near the street crossing walk, it is a single-ended car requiring terminal loops, and has not as great storage capacity on the platforms as the type illustrated. It therefore may, like the centre-entrance car, be considered in the experimental stage.

Figure No. 14.

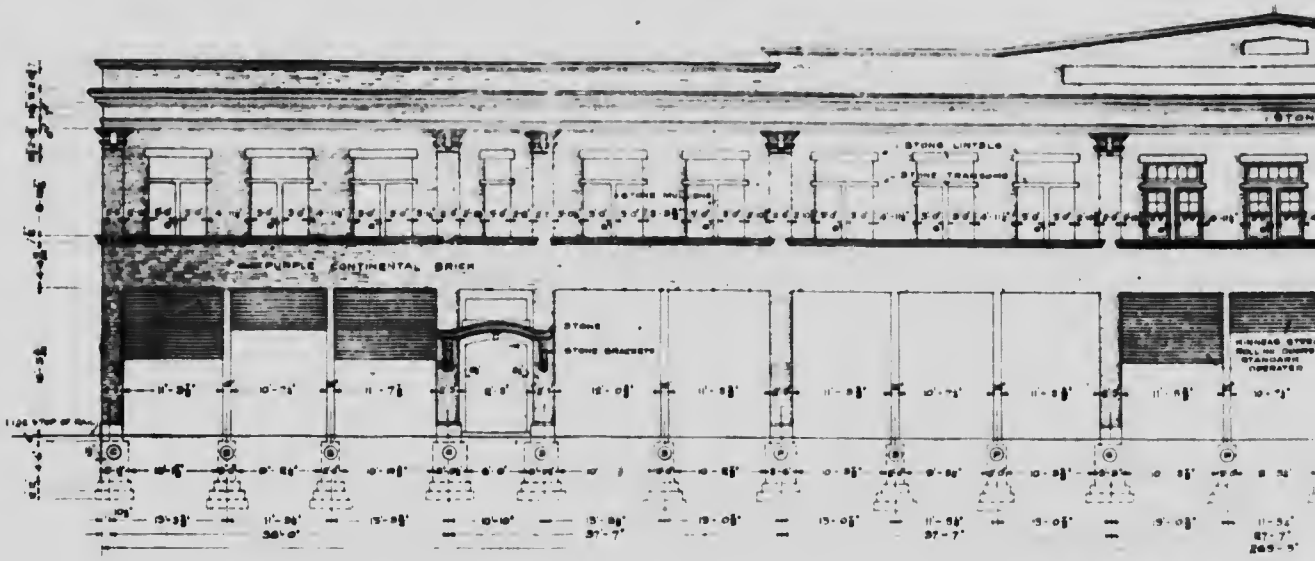


PLAN SHOWING ARRAN
TRACKS FOR MODERN

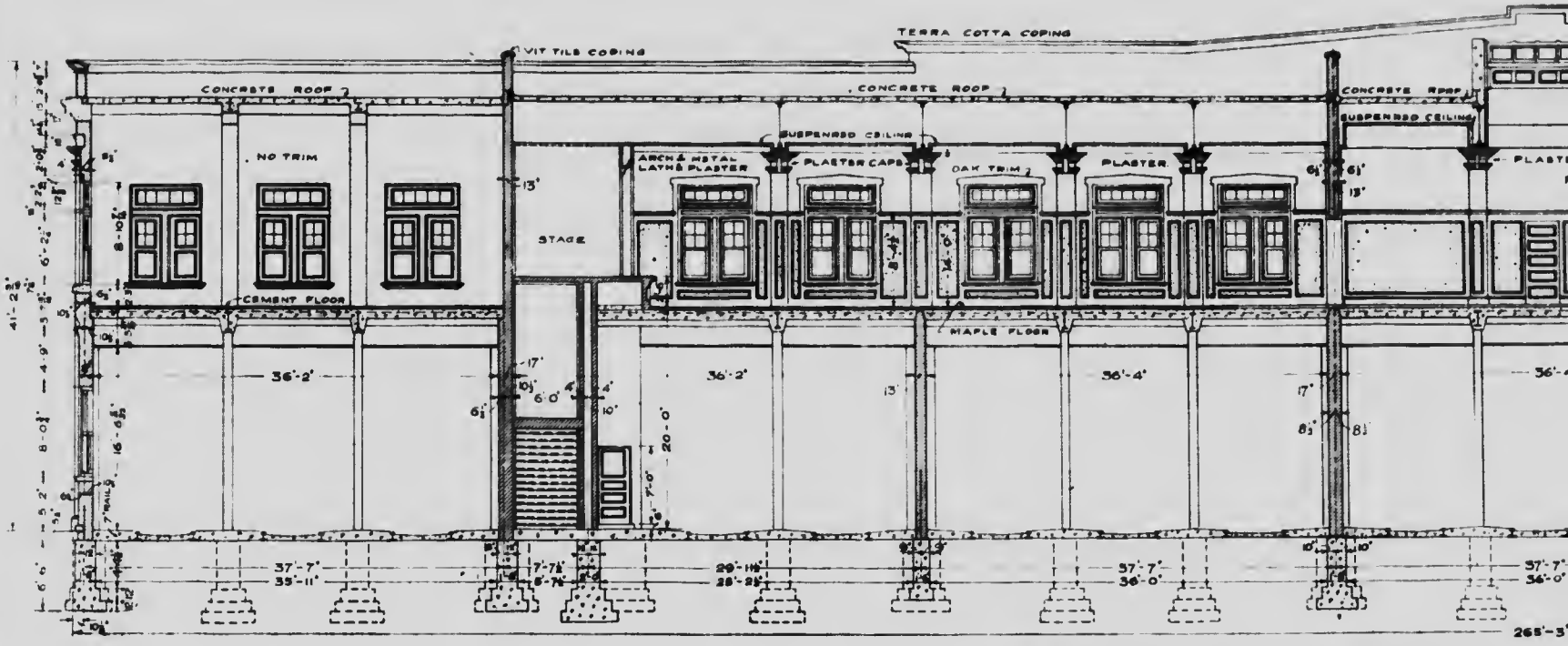
Figure No. 14.



ARRANGEMENT OF
ODERN CAR HOUSE

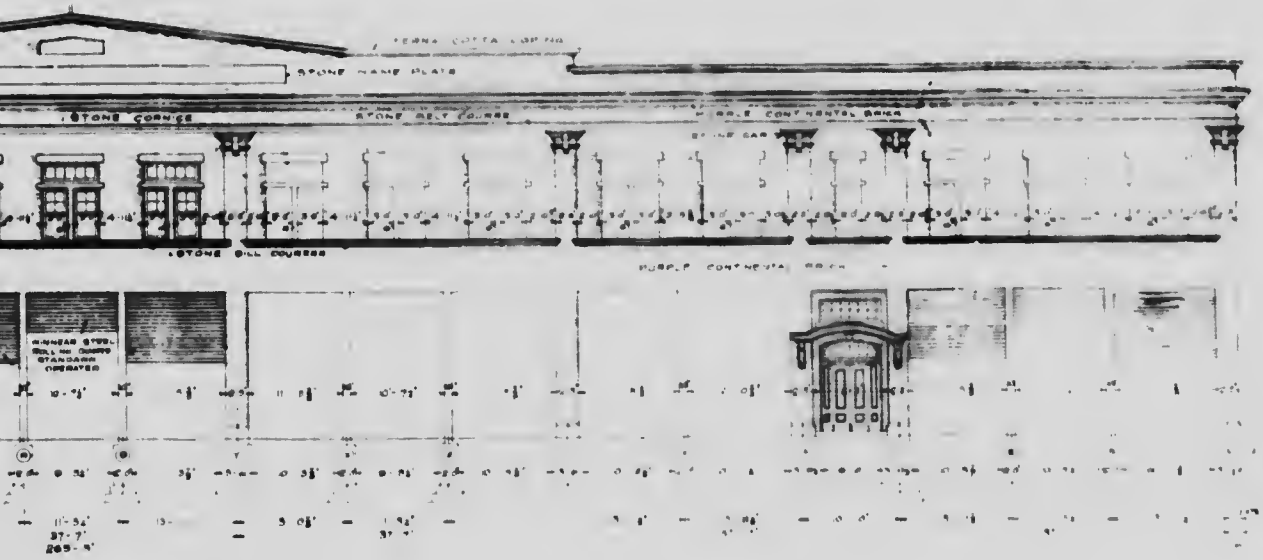


STREET E



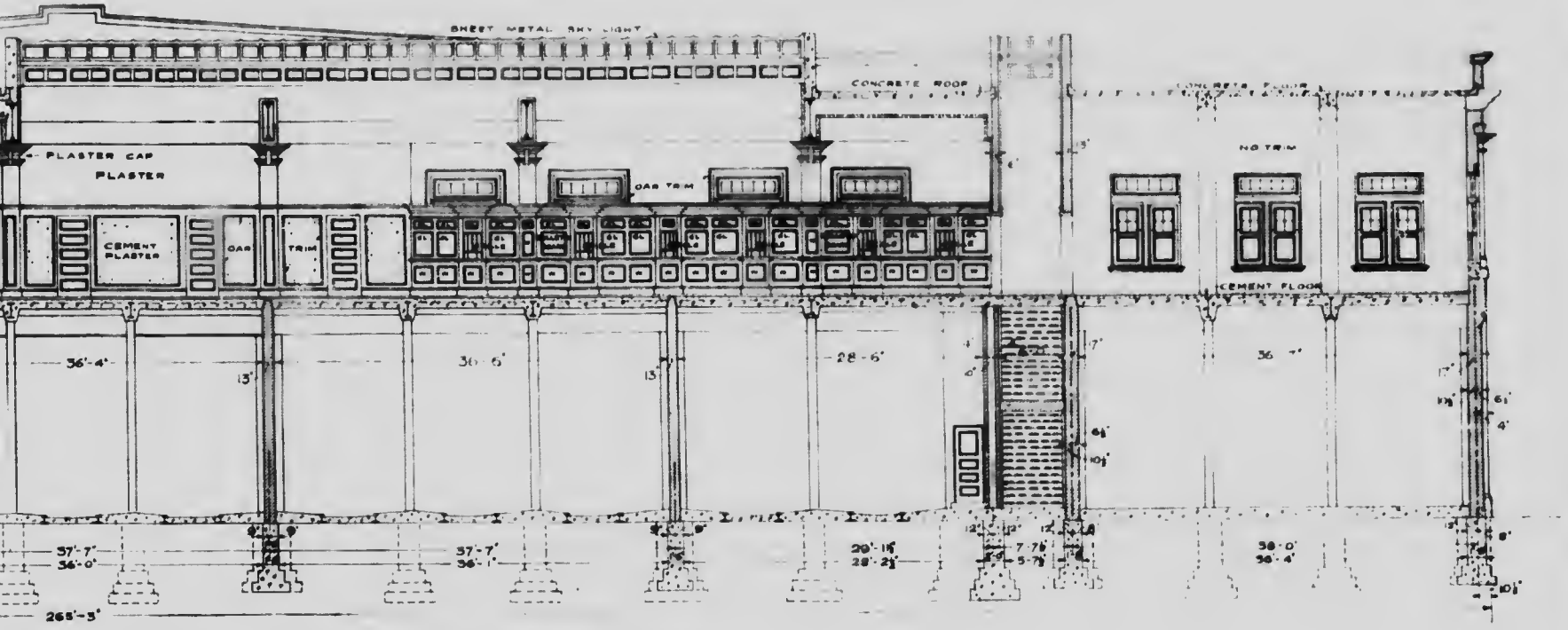
SECTION THRO. CLUB

Figure No. 15



CROSS SECTION AND STREET ELEVATION OF TYPICAL CAR HOUSE

T ELEVATION.



LUB AND TRAINMEN'S ROOM

SECTION VII.

CAR-HOUSES.

Additional car-houses necessary—Modern buildings and equipment—Fire-proof structures—Plans and elevations—Power-houses.

The present locations of car-houses in Toronto are quite convenient for the distribution of cars over the lines as they are. As the outlying territory is developed, additional car-house capacity will be needed and a new car distributing centre located to care for the cars to the east and north-east in the vicinity of Danforth and Pape Avenues. Generally speaking, no car-house should be so constructed as to allow of more than 25 or 50 cars being subject to loss by fire at any one time, and all structures of this class should be as near fire-proof as possible. With these requirements being considered as of prime necessity, the standard for car-house construction with track layout and working arrangements is recommended in accordance with Figures 14 and 15.

These figures show a modern car house with a repair and store room bay and six storage bays containing three tracks each, with a total capacity of 191 cars inside the building and room for 25 cars on the special work at the ends of the buildings, which could be used for temporary storage. A car house according to these plans was constructed recently, in which inspection pits were provided under 59.5 per cent. of the total tracks in the storage bays and under 76.6 per cent. of the total trackage in the repair bay. The repair bay was equipped with electric travelling cranes and a direct steam-heating system was installed, all bays being provided with heating coils under the walk between the tracks. Trainmen's rooms and offices for superintendents and clerks were located on the second floor.

Modern car-house practice provides for fire-proof construction and double-end operation, with the structure divided into bays or sections, and with reinforced concrete slab roofs. Car-houses of this character should be built, for the accommodation of 250 cars of the type already described, for about $410,000 or $1,600 per car.

Power-Houses.

The use of rotary converter sub-stations is recognized as standard and is in keeping with Toronto practice. Rotary converters of standard manufacture of 2,000 KW capacity are considered, from an analysis of the proposed installation, sufficiently small for economy of operation, and large enough to secure a low first charge per kilowatt. Sub-station estimates in this report are based on a requirement of 40 kilowatts capacity at the station for each car placed in service, the cost of the sub-station and equipment, exclusive of the ground used, being estimated at about £4[illegible] per KW.

SECTION VIII.

COSTS AND RETURNS.

Completed additions to present surface system conduits. Probable earnings. Returns from operation.

The total cost of the proposed additions to the present Toronto transportation system for 127 miles of new track (the City furnishing the roadbed and paving), 600 modern prepayment cars, additional car-houses, sub-stations and other equipment necessary, would be in the neighborhood of $8,762,000*, divided approximately as follows:

Cost of Improvements.

Track construction, 127 miles of single track (3.5 miles grooved rail; 123.5 miles "T" rail)	$2,127,000
Overhead wires, poles and cables	489,000
Car-houses	820,000
Cars	4,500,000
Power stations and equipment	326,000
Miscellaneous equipment (work cars, snow and ice machinery, line wagons, sprinklers, etc.)	100,000
Total	$8,762,000

The foregoing expenditure would be extended over a period of at least five years, during which time there would undoubtedly be a rapid growth of population. As it is estimated that the present traffic is nearly sufficient to warrant the outlay of capital suggested, provided all earnings were available for traction purposes, there should be no question as

* An additional expense would be incurred should it be desired to place electrical feeder and return cables underground. The necessary conduit and brick manhole plans accompany this report. (Figures 9 and 10.) Under Toronto conditions the cost of these ought not to exceed the following: manholes, $98; iron pipe laterals, 60c per foot; conduits, 11.6c for two ducts up to 10.1c for 18 ducts, per duct foot. The total amount invested in this class of construction would of course depend on the extent of the territory the City desired to free from overhead wires.

to the ability of such an improved system to earn all fixed charges and leave a satisfactory profit each year after the completion of the work. That the present traction company would profit at the same rate on these new expenditures as it profits on its present investment is not thought probable, as the monopoly at the present in effect gives all of the business to the present cars and tracks, and the passengers now ride as far as the cars go and walk the rest of the distance to their homes.

Probable Earnings.

Presuming the completion of the proposed additions by the close of 1915, the financial showing for the year 1918, for the entire system of 240 miles of track in the Toronto district, is estimated to be as follows:

Gross earnings	$10,800,000
Operating expenses, taxes, renewals, pavement charges, etc., at 70%	7,560,000
Net earnings	3,420,000

The above estimate is considered very conservative for the following reasons: (1) The earnings are based upon the present ruling habit, which averages $12.10 for the cars, as it is now covered by the present limited traction lines. Were the complete system considered by this report to be now in operation, there would unquestionably result a higher earning per capita than $12.10, which projected into the future, upon the proper law of increase, would result in gross earnings in excess of the above named figure. (2) Owing to the possibility of very cheap power being available for the operation of the electric system, a earning ratio as high as 70% is probably the maximum that could be considered (in estimating pavement charges). With such power available the actual operating ratio will probably be not to exceed [illegible] exclusive of pavement charges. These figures are made as a basis of approximate earnings and not as the operating ratio, necessarily governing the amount of net earnings that could be expected. The amount $3,420,000, capitalized at 6%, would support an investment of $61,800,000, or capitalized at 8%, approximately $50,000,000. These figures may be used correctly on the theory of a continuing investment on the part of the municipality or a company, but they should be used in whatever amount is found necessary to amortize the investment within the franchise life of the property as constructed and operated by a company under a franchise for a fixed term.

SECTION IX.

RE-ROUTING AND CAR SERVICE.

Schedules — Present terminals ample — Re-routing recommendations — Relief for Yonge Street — Down-town service — August service — Rush-hour service — Car congestion — Safety appliances.

Car schedules should be so constructed as to place the largest number of cars at the heaviest loading points at the proper time. This will always cause more or less bunching or congestion of cars in the down-town streets of large cities for a short time, particularly in the evening rush hours. The remedies generally consist of enlarging the individual car capacity, increasing the rate of acceleration and the use of different terminals.

Ample Terminals.

With modern equipment there should be no cause for unreasonable congestion in Toronto for many years to come. The business district is well supplied with desirable loops both east and west of Yonge Street, and south of King Street, and the cross town trunk lines have no interferences to contend with. The system of loops along Front Street amply provide terminals for south bound cars around the business centre. The down-town terminal facilities are not only considered sufficient for the service, but quite ample to accommodate the traffic of the future transportation system outlined in this report, provided re-routing and traffic regulations are instituted so as to use these terminal facilities to the best advantage. On the right use of these terminals rests the problem of congestion, and as the flow of travel is constantly changing, so the problem should be constantly studied. It is not owing to the lack of terminals in Toronto that congestion takes place, so much as it is owing to the failure to make a proper use of present terminals.

Re-routings Recommended.

The following re-routings of lines in the business centre is considered sufficient for the present:—

College Street. The proposed tracks in Terauley Street should be placed at once, and the College Street cars diverted from Yonge Street

south in Teraulay and Bay to Front Street, east to Scott, north to Wellington, west to Bay and north in Bay and Terraulay to College. This will afford all the relief needed for Yonge Street for some time to come, both at the south end and at Carlton and Yonge, where cars now become congested during rush hours.

Queen and Broadview.—Instead of terminating at Victoria Street, Queen Street should be operated as a cross-town trunk line by absorbing the Broadview line to the east. This will clear the Richmond Street interference with the Dundas line and the congestion which is observed frequently at Victoria and Queen.

Dundas Street.—Instead of using Queen Street west-bound from Victoria Street, the Dundas line should turn south in Victoria from Richmond to Adelaide, and west to York and north to Queen. Adelaide is not being used as much as it should, and Queen would be relieved of the Dundas cars over that part of the route now being used by the Parliament line.

Winchester cars should be given a better terminal down-town by being routed west in Richmond to York, south to Adelaide, and east to Victoria.

The Harbord Street line, instead of interfering with the Church line by turning at Church and Adelaide, should use the loop in Victoria, Richmond, Church and Adelaide.

Relief for Yonge Street.

Yonge Street. As the main north and south artery of the City, Yonge Street should be expected to carry a heavy car service at all times. When this service shall have reached the maximum of one large high-speed modern car every 25 seconds in one direction, relief must be had by diversion of vehicular traffic and re-routing lines elsewhere. A headway as low as 25 seconds between cars is here considered advisable only if Yonge Street can be kept fairly free from vehicle and intersecting car traffic. Ordinarily on a trunk line over which much congestion from either source occurs, it would be found difficult to operate a headway much lower than 25 seconds, *i.e.*, 145 cars per hour. This relief is at hand in Teraulay, which should be opened to Bloor Street. With this outlet, Yonge Street could be relieved of the Avenue Road line, which could go south in Teraulay to Front and Bay, or to a long loop in

Richmond, Victoria and Bay Streets. Church Street, south of Bloor, would afford an outlet for the Danforth Avenue line, most probably the future great trunk line to the north-east, which may be seeking a down-town terminal for some of its service. With Avenue Road and College Street being operated down Teraulay, Yonge Street would thus be cleared sufficient to accommodate the St. Clair Avenue line, which, by that time, should be the outlet for the development lines to the north-west and north-east, and handling so many passengers that transferring on to Yonge Street cars would have become inadvisable.

Victoria Street is quite as well located as Teraulay Street for trunk line service, and should be given equal consideration. Toronto is limited as to through streets north from the business centre, and should open Victoria to Bloor at any reasonable cost. This would prevent the crowding of traffic on either Yonge or Teraulay, those two streets and Victoria offering sufficient transportation facilities for many years to come.

Down-town Service.

In the business centre, trunk lines only should have their terminals, these lines being built up to maximum capacity by cross-town and extension line feeders. The more different lines of diverse headways to be handled on a given trunk, the more the light line cars interfere with the heavy-line cars, and cause congestion and slow movement where there should be the minimum. As a rule the longer the line the more difficult to maintain an even headway, so cars kept on cross-town lines, or on extension lines in new territory, give a more regular service by not going to the business centre. It will be noticed that new lines recommended in this report are either independent cross-town lines or extensions to present lines, thus working out this idea of transportation.

Present Service.

The service being given at the present time (September and October) on the City lines is considered objectionable, largely on account of the character of the cars being used rather than on account of their number. Traffic checking for the months of July and August showed a reasonable service at most times, and with only short periods of over loading, and those entirely during the busy rush hours, when heavy loads are always to be expected in any large city. Owing to the type of car used in Toronto, and the regulations preventing standing on running boards or front platforms, the proportion of seats furnished

to passengers carried is quite as liberal as will be found elsewhere in cities suitable for comparison with Toronto. The heavy trunk lines of travel furnished a reasonable service on the days checked at different loading points (see rush-hour service table, page 42), and showed but slight cause for reasonable criticism.

This condition is due largely to the class of equipment used, the open summer cars having nearly all their floor space occupied by seats, and the possible standing passengers being limited to so small a space as to show a large percentage of seats furnished to passengers. With from five to eight different exits and entrances on each car and the best of street conditions, passengers are handled rapidly, and severe censure would not be justified. Operating under winter conditions, however, the situation would be quite different. The same cars with longitudinal benches would seat a small number of passengers, the standing space would be greatly increased, and the percentage of standing to seated passengers be reversed.

Car Congestion.

At the points of greatest car congestion it was found that enough cars were being handled to warrant the relief recommended elsewhere by re-routing several of the lines. In From Street, one car passed east at Bay Street every 33 seconds. At King and Yonge, one car, not counting trailers, passed north in Yonge every 33 seconds, and east in King every 18 seconds, or an average of one car across the intersection every 20 seconds, which is nearing the limit for the present class of equipment. At Queen and Yonge a larger number of cars was handled with less congestion, one motor car going north or west, on an average, each 19 seconds during the rush hour. (At Queen Street there were no obstructions and more cars could have been handled, while at King and Yonge Streets, both streets were obstructed by building operations at the south-east corner.) At Richmond and Yonge Streets the car congestion during evening rush hours, in Richmond Street, was due to the crowding of too many lines into Victoria south of Queen—four lines with 153 cars from 5 to 6 p.m. rounding different curves (Figure 16) and using the north-bound track in that one block. At College and Yonge (Figure 17) 127 cars (including 22 trailers) were handled north in Yonge Street or west in College in one hour. At Richmond and Yonge Streets, 212 cars (including trailers), or an average of one car each 17 seconds, passed north or east during the evening rush period. It

RUSH HOUR CAR CONGESTION IN RICHMOND STREET WEST OF VICTORIA STREET
5.15 P.M. SEPT. 20 1912. FIGURE 6

RUSH HOUR CAR CONGESTION IN YONGE STREET AT COLLEGE STREET
5.30 P.M. SEPT. 20 1912 FIGURE 17

is believed that the re-routing of cars outlined elsewhere will correct these conditions until such time as modern equipment can be procured, when more cars may be put through any of these intersections with less difficulty.

Safety Appliances.

For the protection of the travelling public and pedestrians crossing the streets, the present equipment is amply provided with safety devices. With the possible exception of a secondary life-guard around the trucks of the small motor cars there would remain only the single question of proper maintenance. A system of inspections should be enforced so as to insure at all times the proper working of all safety devices.

Rush-Hour Service.

Rush-hour service, i.e., the number of cars on each line passing the point indicated during the morning and evening rush-hour period in the direction of heaviest travel was found to be as follows, on the dates mentioned:

Line.	Date.	Location of checking.	Direction of Cars.	No. of Cars Passing a.m. Rush. 7.00 to 8.30		No. of Cars Passing p.m. Rush. 5.00 to 6.30.	
				Motors	Trail's	Motors	Trail's
Avenue Road	July 26th	Bloor and Yonge Streets.	South	25	..	..	..
Avenue Road	July 26th	Bloor and Yonge Streets.	North	..	..	32	..
Dovercourt Road	July 31st	College Street	South	32	..	..	..
Dovercourt Road	July 31st	College Street	North	..	..	43	3
Church Street	August 13th	Bay and Front Streets...	West	20	..	..	..
Church Street	August 13th	Bay and Front Streets...	East	..	..	28	..
Dupont Street	July 29th	Avenue Road	South	28	..	..	..
Dupont Street	July 29th	Avenue Road	North	..	..	43	..
Winchester Street	August 23rd	Church Street	East	35	..	..	..
Winchester Street	August 23rd	Church Street	West	26	..	33	..
Belt Line	August 12th	Bay and King Streets..	East	35	..	28	..
Belt Line	August 12th	Bay and King Streets..	West	26	..	41	12
Parliament Street	August 24th	Wilton Avenue	South	60	..	..	..
Parliament Street	August 22nd	Sherbourne Street	East	..	..	64	..
Harbord Street	August 12th	Spadina and Adelaide...	South	31	..	..	..
Harbord Street	August 12th	Spadina and Adelaide...	North	..	..	32	..

Yonge Street	August 16th	Queen Street	South	36	..	..	..
Yonge Street	August 16th	Queen Street	North	..	..	46	..
College Street	August 19th	Yonge Street	South	50	21	..	..
College Street	August 19th	Yonge Street	North	..	..	52	35
Bathurst Street	August 13th	Bay and Front Streets	East	61	6	..	..
Bathurst Street	August 13th	Bay and Front Streets	West	..	..	65	12
Carlton Street	August 2nd	Yonge Street	West	29	5	..	..
Carlton Street	August 2nd	Yonge Street	East	..	..	36	..
King Street West	August 14th	Spadina Avenue	East	47	23	..	..
King Street West	August 14th	Spadina Avenue	West	..	..	59	28
King Street East	August 15th	Sherbourne Street	West	53	27	..	..
King Street East	August 15th	Sherbourne Street	East	..	..	80	26
Queen Street	August 1st	Bathurst Street	East	11	7	..	..
Queen Street	August 1st	Bathurst Street	West	..	..	63	7
Broadview Avenue	August 6th	Gerrard Street	South	15	..	..	..
Broadview Avenue	August 6th	Gerrard Street	North	..	..	59	..
Dundas Street	July 25th	Bathurst Street	South	52	3	..	..
Dundas Street	July 25th	Bathurst Street	North	..	..	66	..
Bloor Street	August 1st	Spadina Avenue	South	66	..	..	..
Bloor Street	August 1st	Spadina Avenue	North	..	..	60	10

SECTION X.

THE ALTERNATIVE.

Subway terminals—Yonge Street main line—Danforth Avenue branch—Down-town loop—Large territory opened—Surface feeder lines—Car service required — Costs of construction — Investment and return—Gerrard Street.

Should it be considered desirable or necessary for the transportation system of Toronto to be operated under more than one management for the next nine years, the greatest need for the new lines will be a terminal in the business centre of the City. This provided, construction of the necessary service and development lines could follow as rapidly as desired and circumstances would warrant. The success of the civic undertakings in Gerrard Street, Danforth Avenue and St. Clair Avenue will depend largely on the answer to this question. Without proper outlets such isolated lines generally lead a precarious existence, and in many ways prove a disappointment. They are patronized largely on account of necessity rather than from choice, and as a rule do not carry anywhere near the traffic to which they are justly entitled. Civic pride alone can hardly be relied upon to contribute double car fare day after day and year after year from those who may be in a position to exercise a choice in the matter. Given a proper rapid transit terminal in the territory where the passengers desire to be delivered, these same lines would be favored, the districts rapidly settled and satisfactory results obtained.

For the purpose of providing a down-town outlet for the civic lines now being built and any other lines which it may be thought desirable to construct, it is understood that the City is in a position where it can select only a subway or elevated system of roadway inside the City limits of 1891, owing to the operating rights for street car purposes on the surface of the streets being controlled by the Toronto Railway Company.

Subways.

Subways have their uses in congested areas where surface terminals are insufficient for traffic needs and where elevated structures would be objectionable. For the support of subways there should be densely populated districts some distance from the business centre seeking rapid

transit, which other means of transportation are unable to provide. The subways of New York and Boston were not constructed until after all other classes of transportation had reached their limit of carrying capacity. Under these conditions only will a subway, as a subway, pay its way. As an inlet for an extended system of surface lines serving a large territory the governing reasons for the adoption of a subway change to such an extent that its construction is occasionally warranted.

Civic Terminals.

For the purpose of caring for the situation which at present confronts the City of Toronto, in case a co-operative plan of action between the Toronto Railway Company and the City is not thought advisable, there can be constructed a subway system of railway as an inlet for the car lines in the St. Clair Avenue and the Danforth Avenue districts, the main line being constructed in Yonge Street with a branch line to the east in Bloor Street, divided as follows:—(Figure 18.)

Double track shallow subway, as near the surface as practical, from Queen Street to St. Clair Avenue; with single track subway loop in Queen Street, Bay Street, Temperance Street, and Yonge Street.

Double track shallow subway in Bloor Street from Yonge Street to Sherbourne Street.

Double track subway under proposed surface drive to be constructed from Sherbourne Street to Parliament Street along the south embankment of Rosedale Valley.

Double track roadway below the driveway on the proposed bridges across Rosedale Valley and the Don River to Broadview Avenue, with a short subway to connect the tracks on the two bridges and a tunnel incline from the east end of the Don River Bridge to Broadview and Danforth.

The foregoing provides for:—

Single track down-town subway loop	2,240	feet
Double track subway in Yonge Street	13,375	"
Double track subway in Bloor Street	2,700	"
Double track under embankment drive, Sherbourne to Parliament	1,600	"
Double track under bridge driveway over Rosedale Valley	565	"
Double track subway, Valley Bridge to Don River Bridge	970	"
Double track under bridge driveway over Don River	1,665	"
Double track subway, Don River Bridge to Broadview	450	"

Down-town Loop.

The primary object being to provide a satisfactory terminal at the least cost, the subway is figured to loop back in the heart of the City, an extension to the Union Station on Front Street, or an enlarged loop in the business centre, being a matter for later construction should it be thought necessary. Should such extensions take place later a loop at the points designated would still be desirable. At present it is not considered a necessity or a source of much probable traffic for this subway line to go farther south than Temperance Street. Short-haul passengers prefer the surface cars, and long-haul passengers desiring to use the subway, would have but a short distance to walk from Front Street to Temperance and Bay Streets. The subway as planned admits of a stub being used at Temperance Street, temporarily, leaving the loop for other more extensive terminal to be constructed when the traffic requires it. In case the loop is omitted an initial saving of about $400,000 in the cost of the subway can be effected.

Large Territory Opened.

The foregoing is believed to be the most practical solution of the question of independent terminals for Civic Car lines. The main line would reach St. Clair Avenue, and open territory capable of expansion to a surface system of 27 miles of single track to the north. The branch line would reach Danforth Avenue and draw traffic from 17 miles of tracks to the north-east. With this large amount of surface mileage feeding its traffic into the subway the question of its being self-sustaining would depend only on the rapidity of settlements in the districts served.

Surface Feeder Lines.

The Civic Lines and proposed additions thereto would be those already recommended, excepting in the Mount Pleasant Cemetery district, as part of the needed improvements under a single system of management, as follows: single track to be changed to double track later, as required.

Track Construction.

	Double Track, feet	Single Track, feet
St. Clair Avenue, East York Ave. to Jane St.....	33,000	
Dufferin St. and Prospect Ave., St. Clair to Eglinton	3,500	1,850
Lake View Ave., St. Clair to Eglinton	3,000	3,700
Bathurst St., St. Clair Ave. to Eglinton	1,100	5,300
Vaughan Road, Bathurst St. to Eglinton		9,000
Dunvegan and Avenue Rd., St. Clair Ave. to Eglinton	3,000	4,550
Forest Hill Road, Dunvegan Ave. to Eglinton		5,000
East York Ave., St. Clair Ave. to Eglinton		[illegible]40
Danforth Ave., Broadview Ave. to City Limits.....	17,650	
Don Mills Road, Danforth to Woodbine	9,400	7,150
Pape Ave., Danforth to Don Mills Road	7,200	
Greenwood and Mortimer Ave., Danforth to Woodbine	3,000	5,400
Mount Pleasant Road, St. Clair Ave. to Victoria (Blythwood) Avenue	10,300	

Completed System.

This gives a double-track mileage of 13 and single-track * mileage of about 10; a total of 14 miles of single track using a terminal system of 9 miles of single track, a total Civic system of transportation when completed, with all double track, of 63 miles, probable at the end of ten years, all easily incorporated in the larger system available at that time.

Location of Stations.

For the terminal subway, stations (Figures 19 & 20), are located at:

Bay and Temperance; Yonge and Wilton; Yonge and College; Yonge and Wellesley; Yonge and Bloor; Yonge and Belmont; Yonge and Queen; Yonge and C. P. R. Crossing.

For the Danforth Avenue Branch, stations are located at:

Bloor and Sherbourne; Bloor and Castle Frank Road.

* There is a logical time in the development of traffic along a given line when double tracking should take place. A single track may be operated effectively with the proper number of turnouts for accommodating a headway of five minutes each way, but as a general rule, when it is necessary to have turnouts more frequent than three per mile, corresponding to an average of two and one-half minutes headway, double tracking becomes advisable.

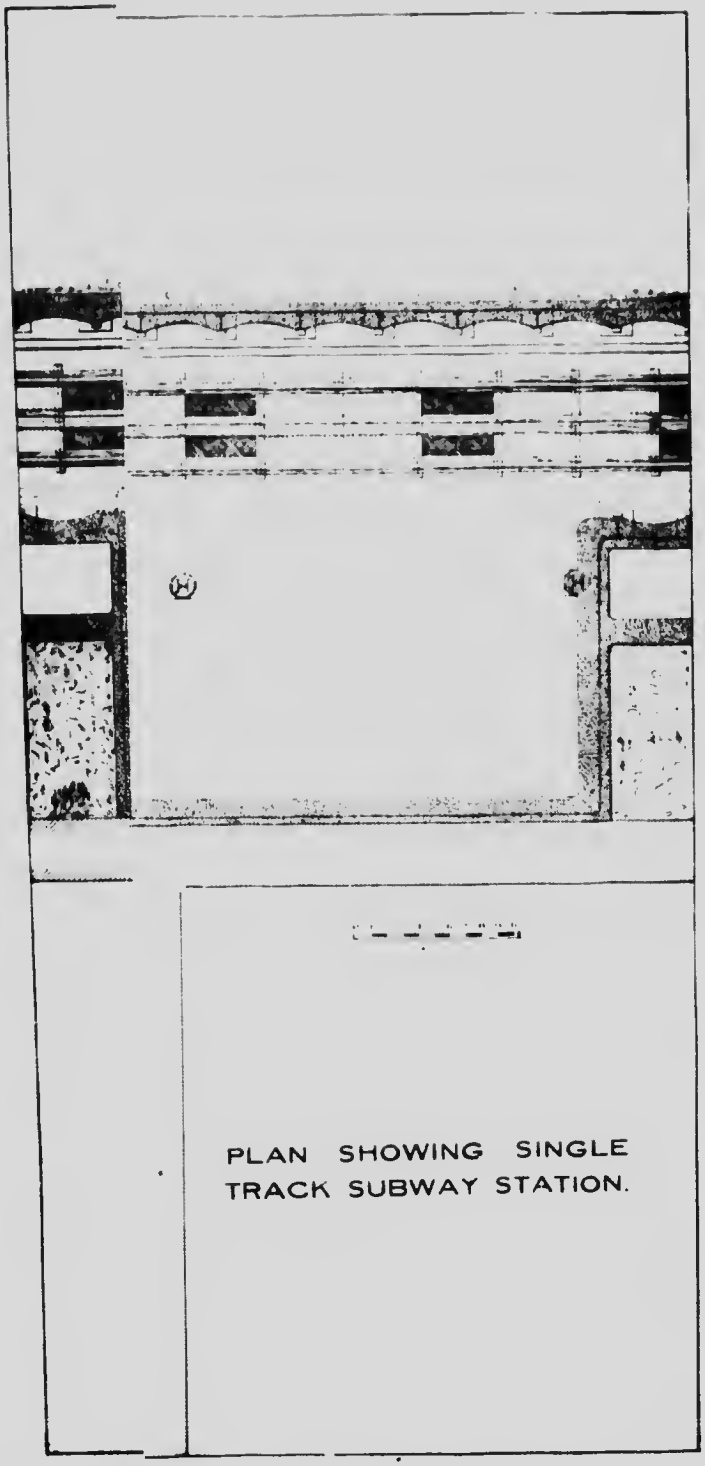
Single Track, feet

4,850
3,700
5,300
9,000
4,550
5,000
[illegible]00
7,150
5,100

* mileage
ial system
tion when
he end of
ailable at

located at:
l College:
nt: Yonge

a given line
be operated
a headway
ary to have
an average
advisable.



Fi

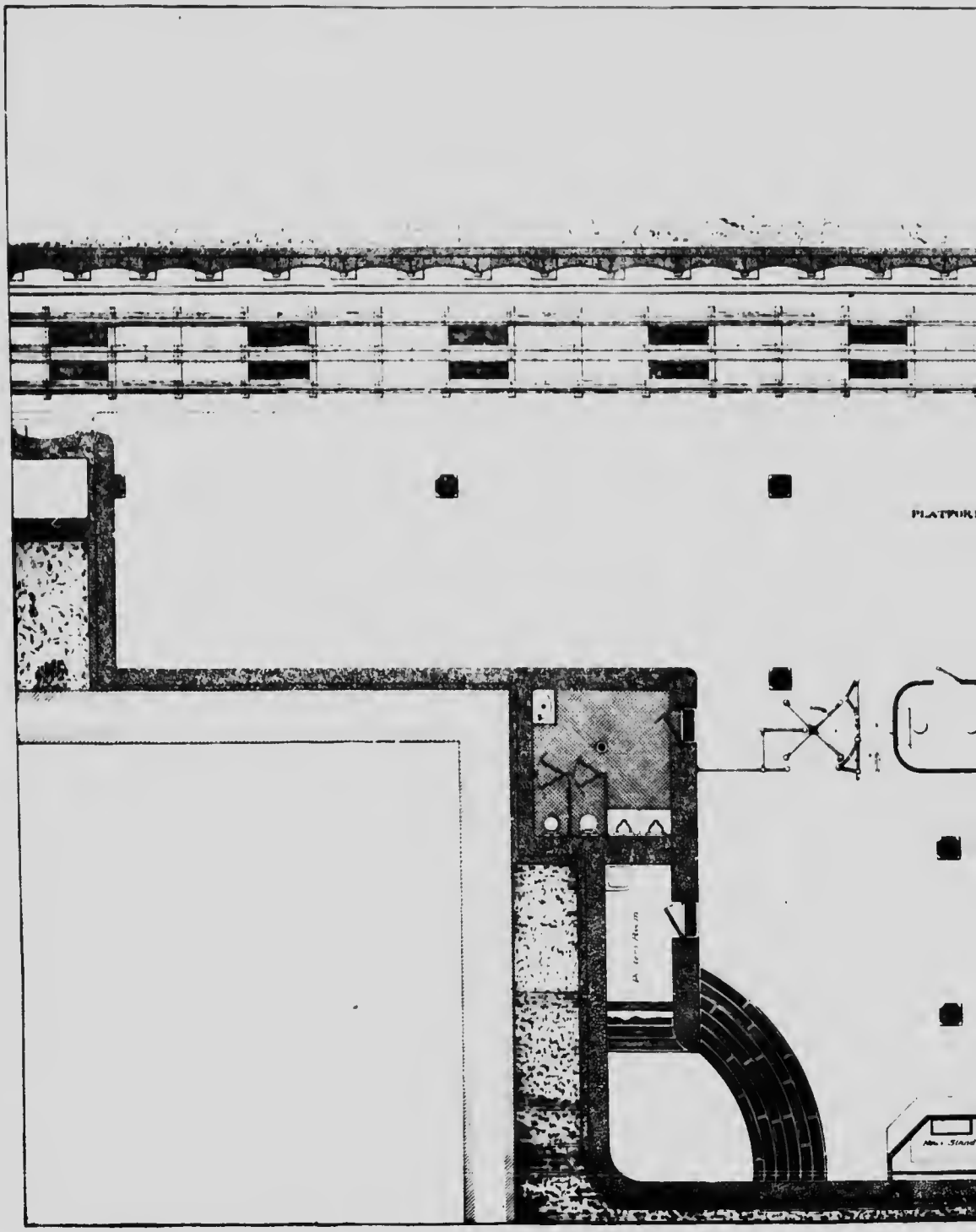
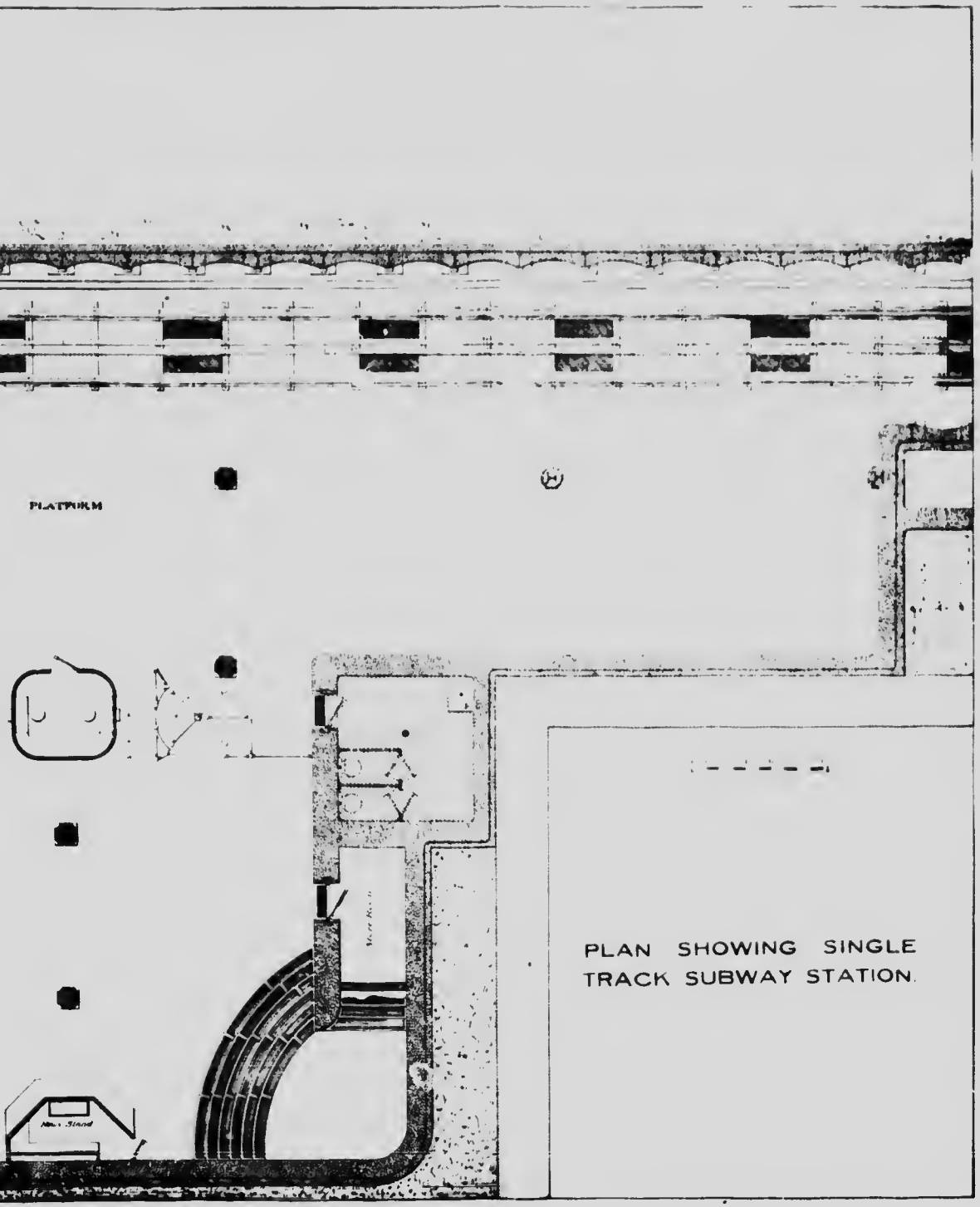


Figure No. 19.



PLAN SHOWING SINGLE TRACK SUBWAY STATION.

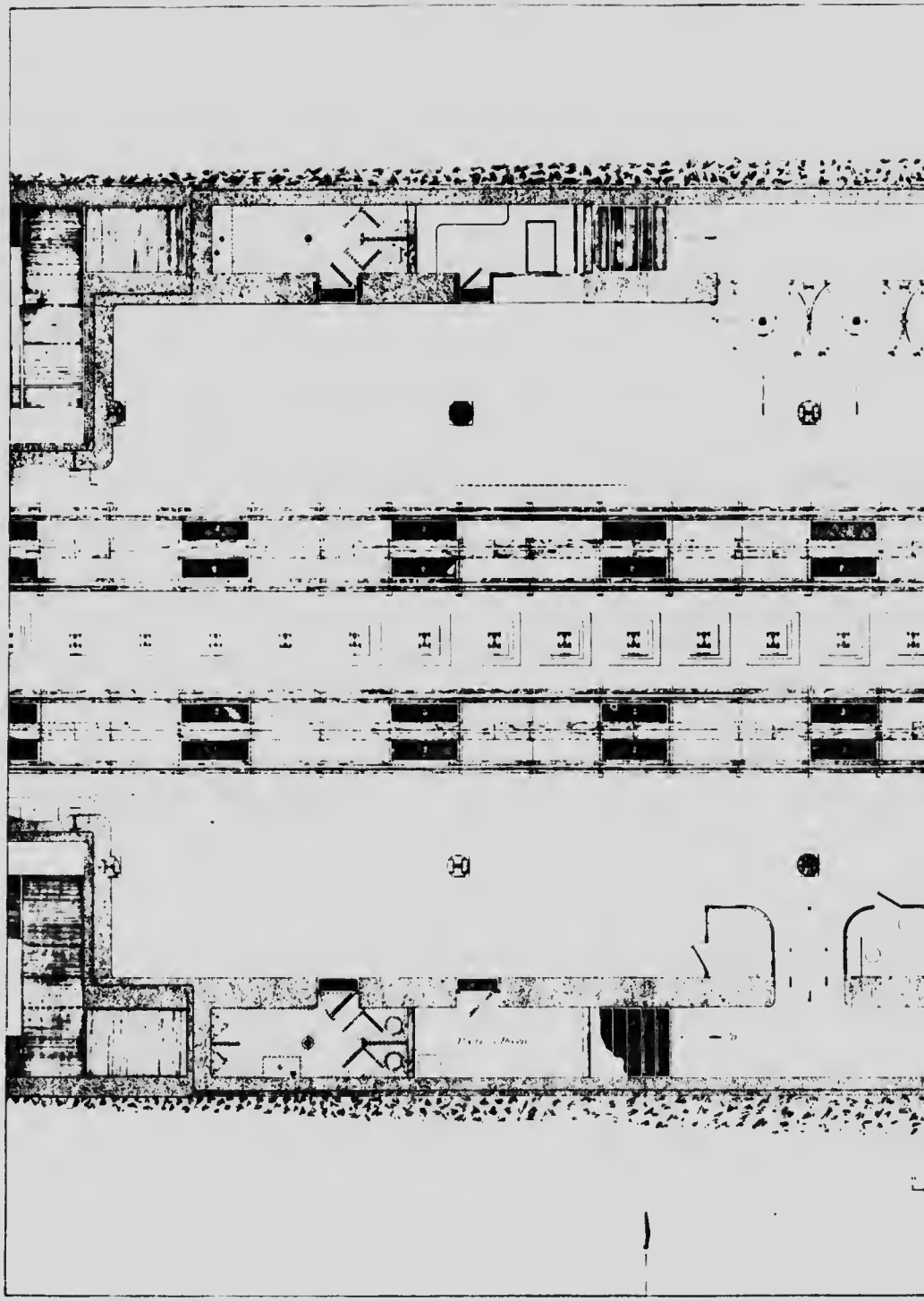
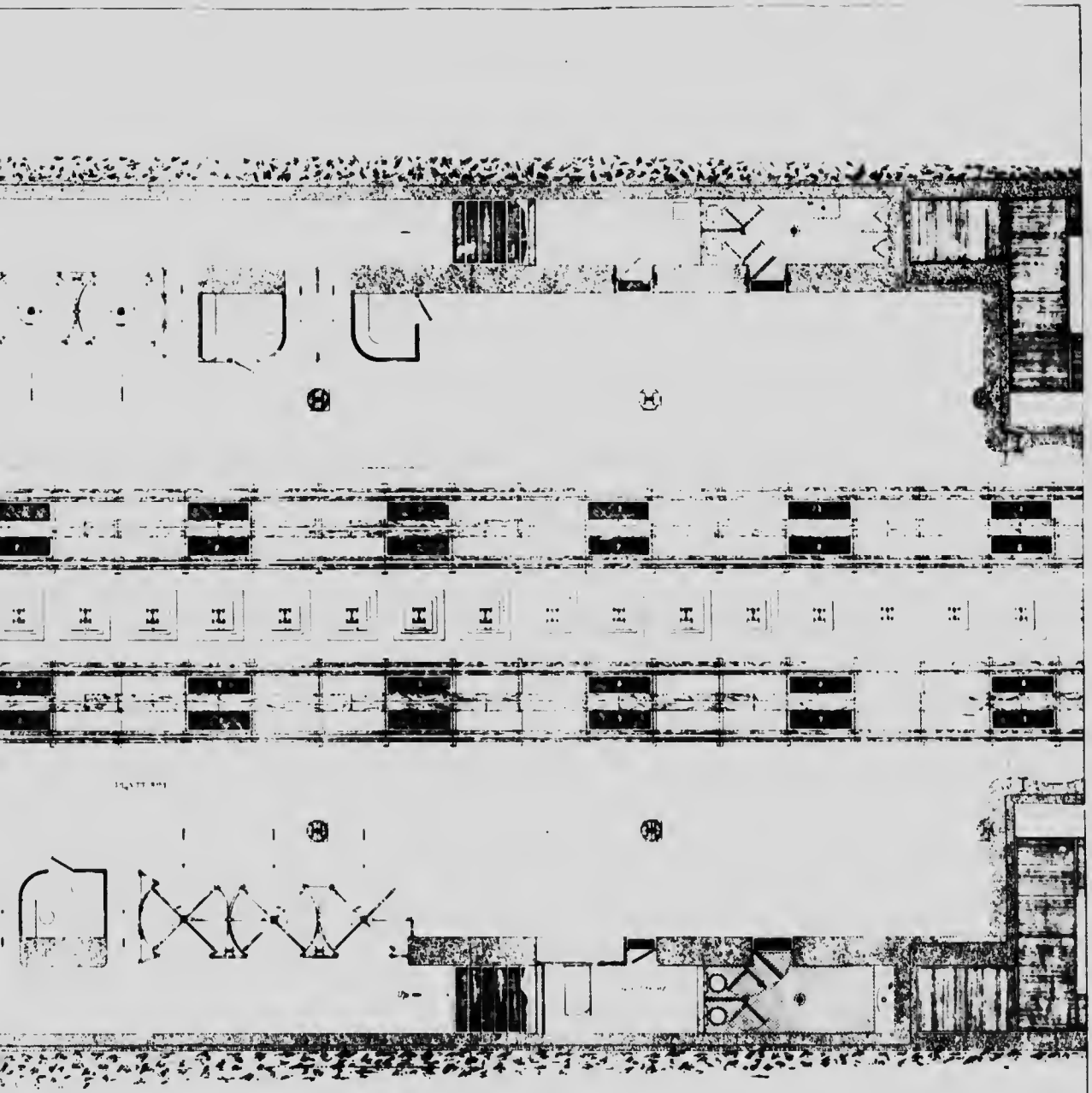


Figure No. 20



PLAN SHOWING DOUBLE TRACK
SUBWAY STATION.

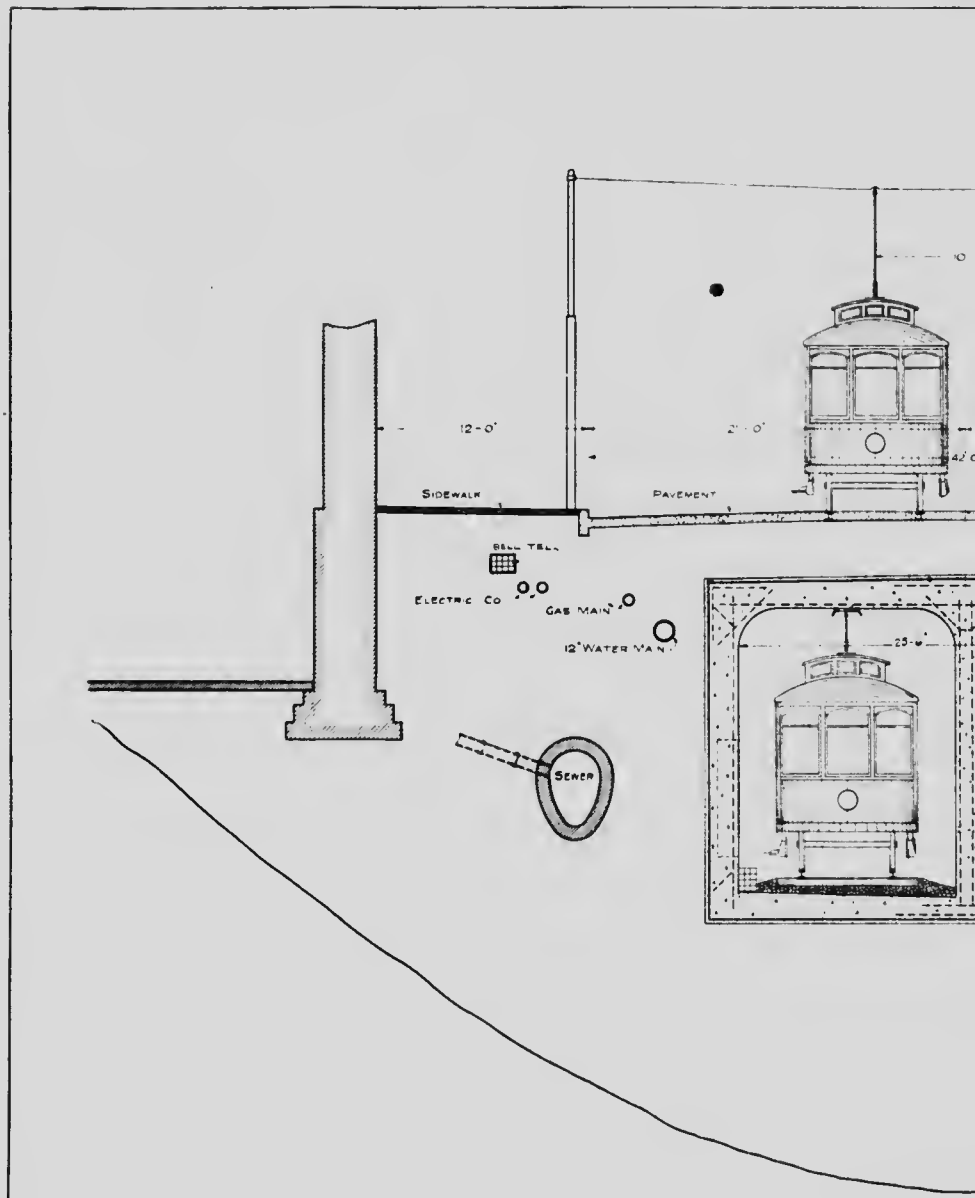
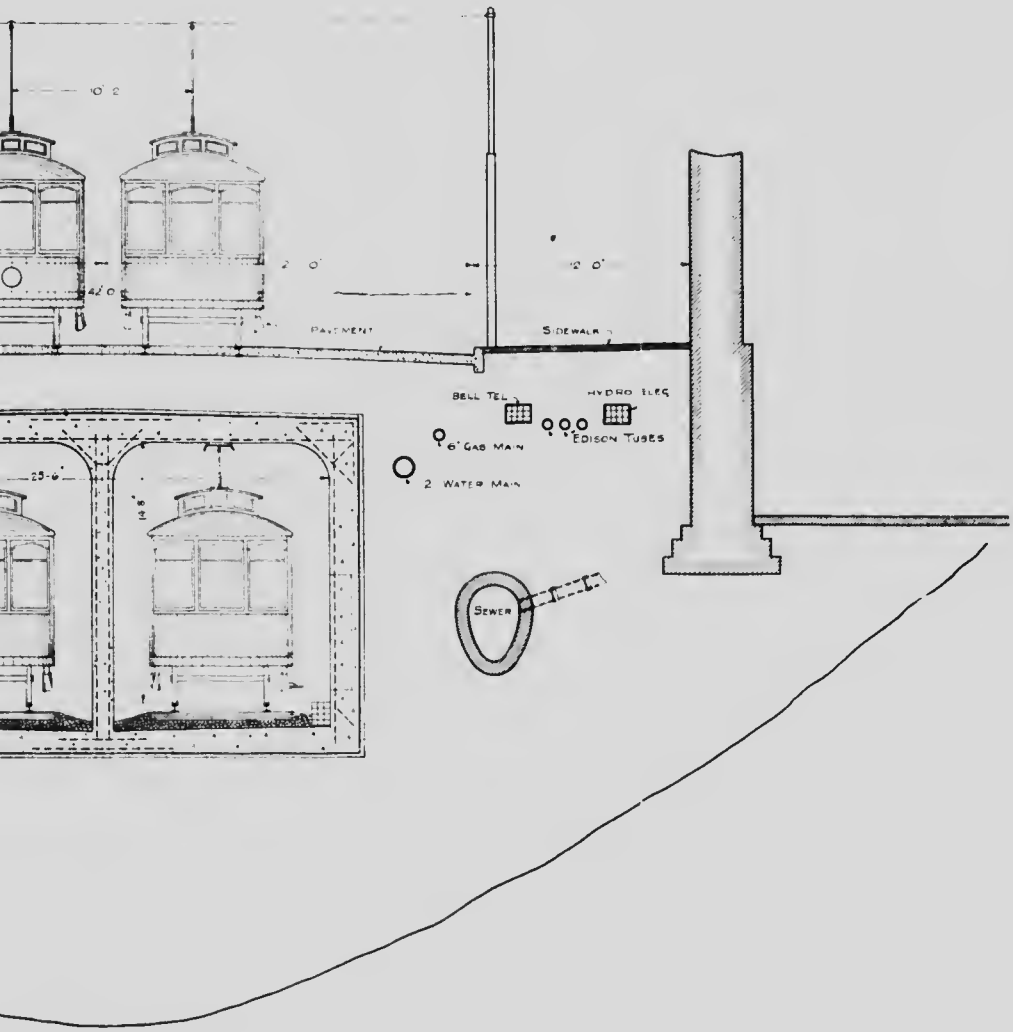

12'-0"
SIDEWALK
PAVEMENT
ELECTRIC CO
GAS MAIN
12" WATER MAIN
SEWER

Figure No. 21



CROSS SECTION SHOWING PROPOSED
DOUBLE TRACK SUBWAY

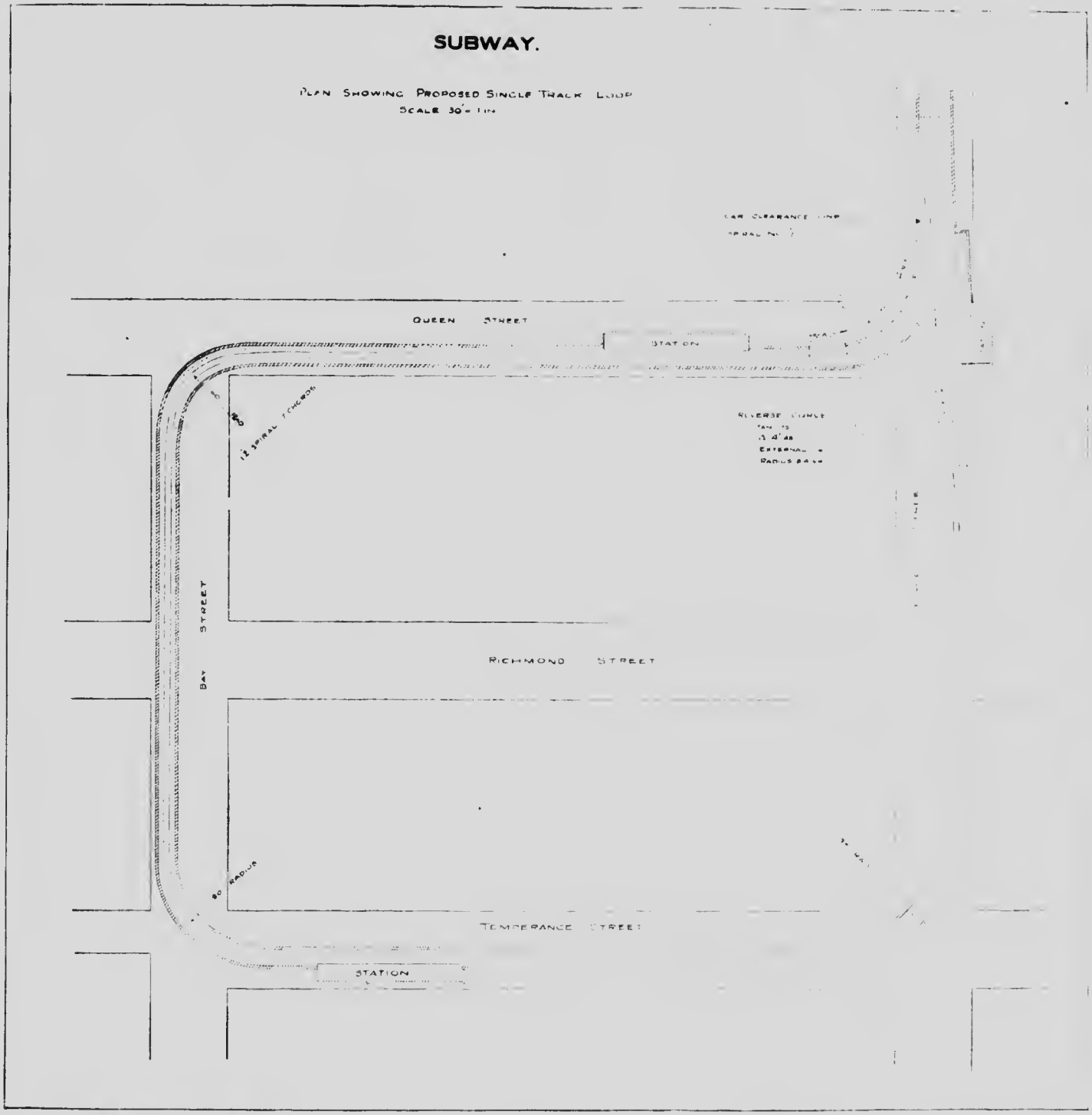

SUBWAY.
PLAN SHOWING PROPOSED SINGLE TRACK LOOP
SCALE 30'= 1 in
QUEEN STREET
STATION
BAY STREET
RICHMOND STREET
TEMPERANCE STREET
STATION

Figure No. 22

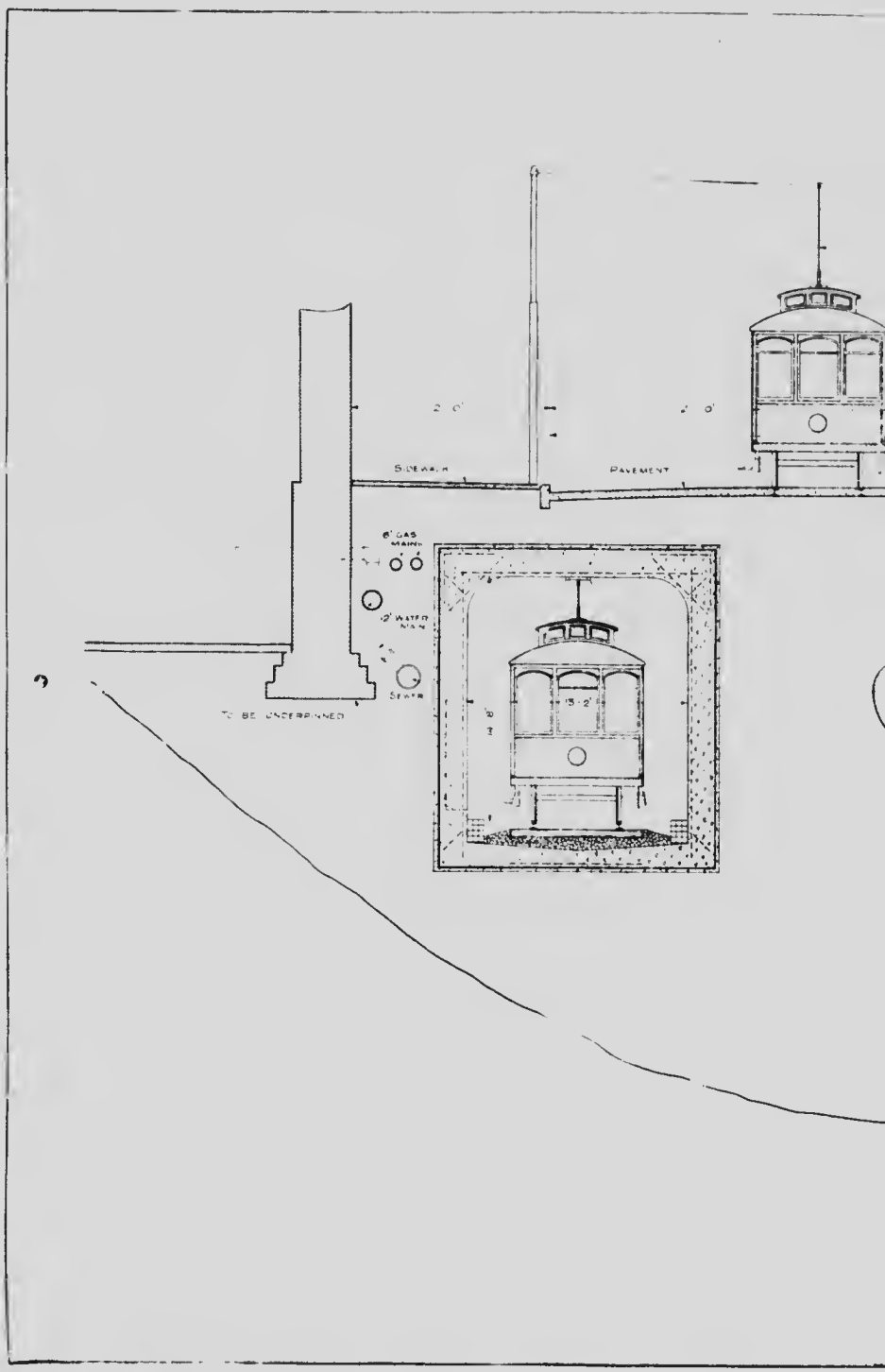
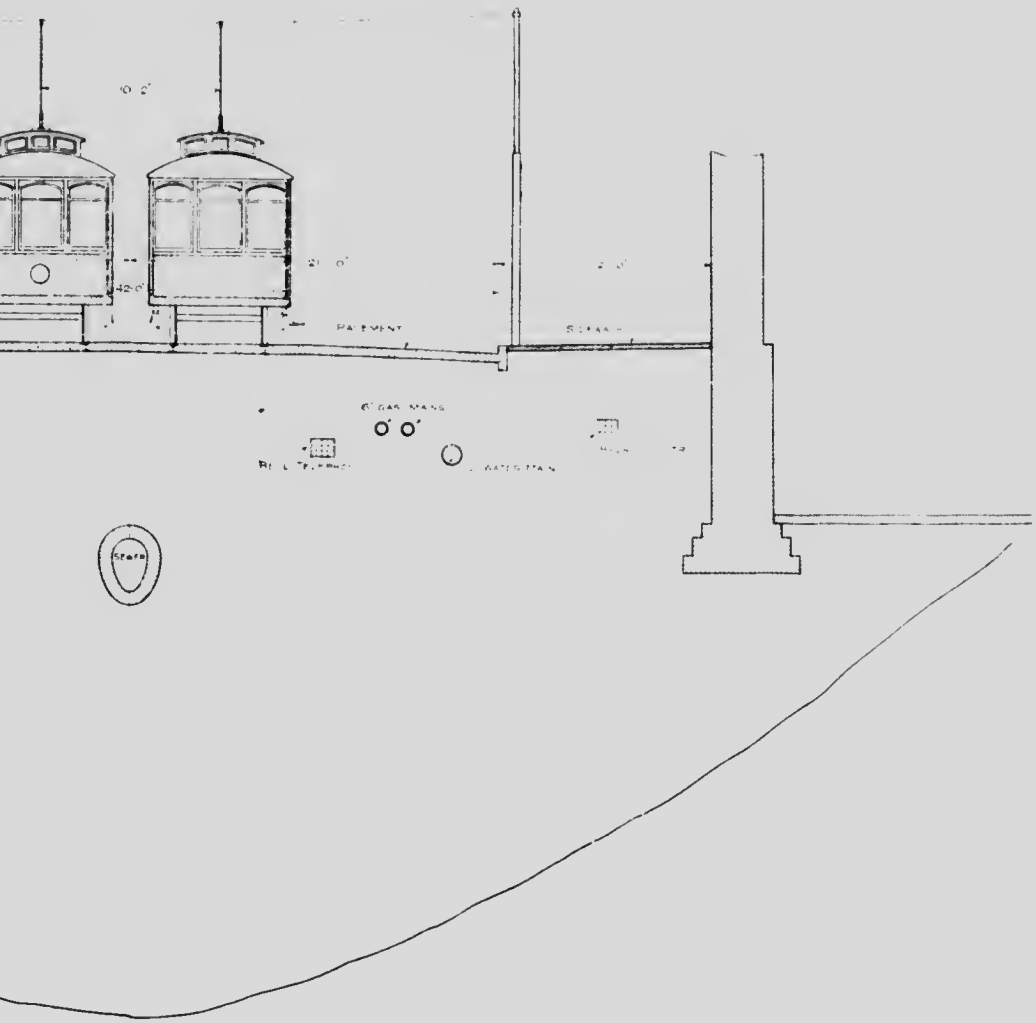
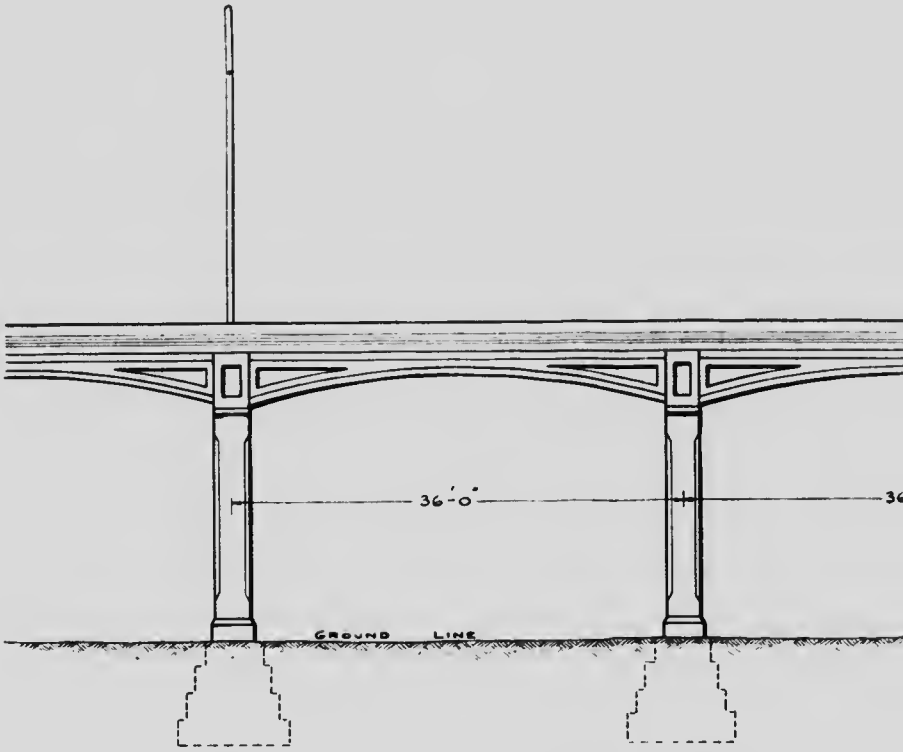

SIDEWALK
PAVEMENT
6" GAS MAINS
2" WATER MAIN
SEWER
TO BE UNDERPINNED

Figure No. 23

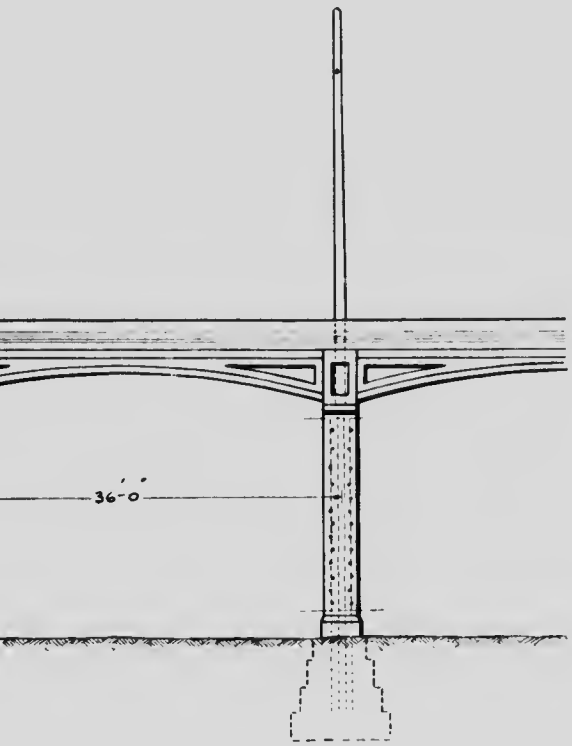


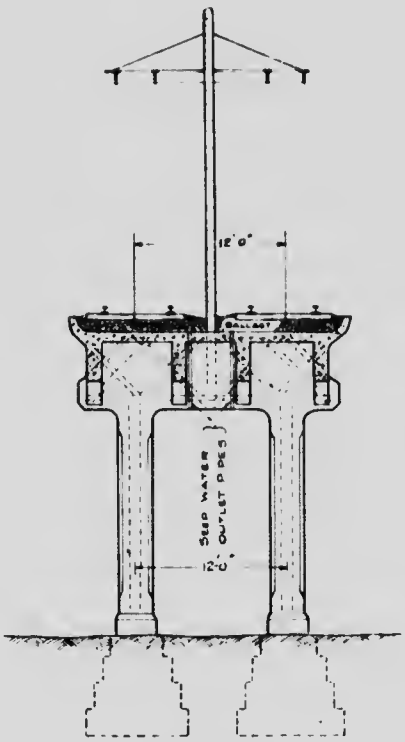
CROSS SECTION SHOWING PROPOSED
SINGLE TRACK SUBWAY.



ELEVATION

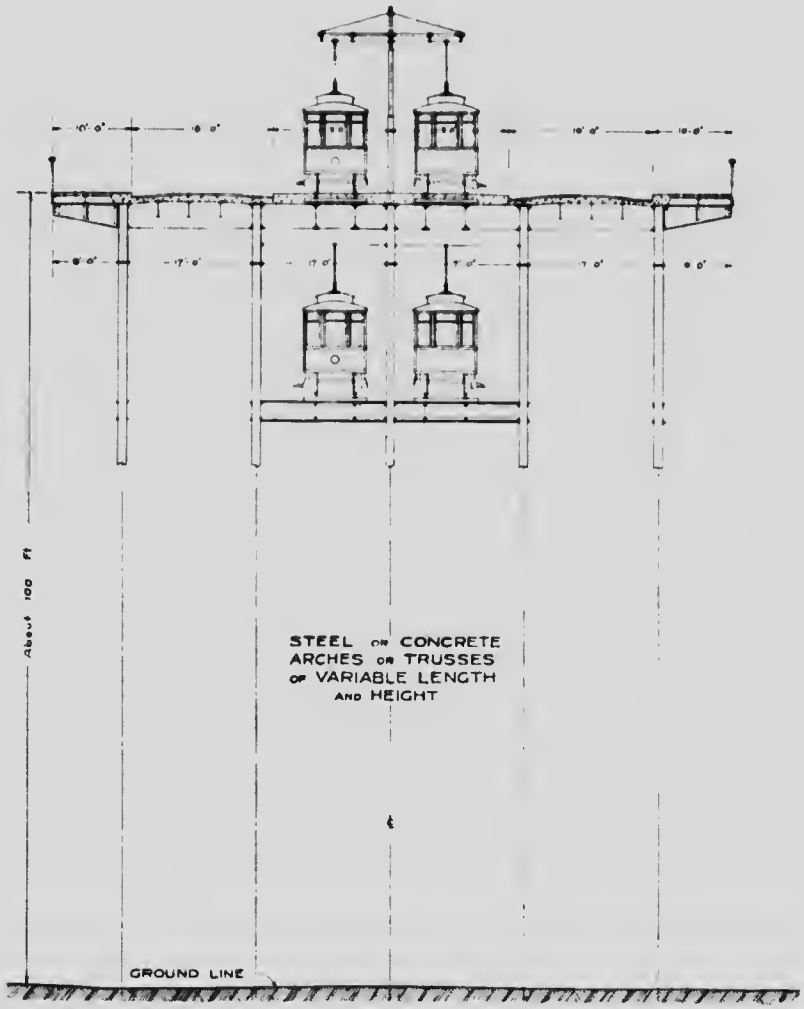
Figure No. 24





SECTION

CROSS SECTION SHOWING CONCRETE ELEVATED STRUCTURE FOR USE ON PRIVATE RIGHT OF WAY.



CROSS SECTION SHOWING PROPOSED TRACKS ON RIVER AND VALLEY BRIDGES CONNECTING BLOOR ST. AND DANFORTH AVE.

Figure No. 25

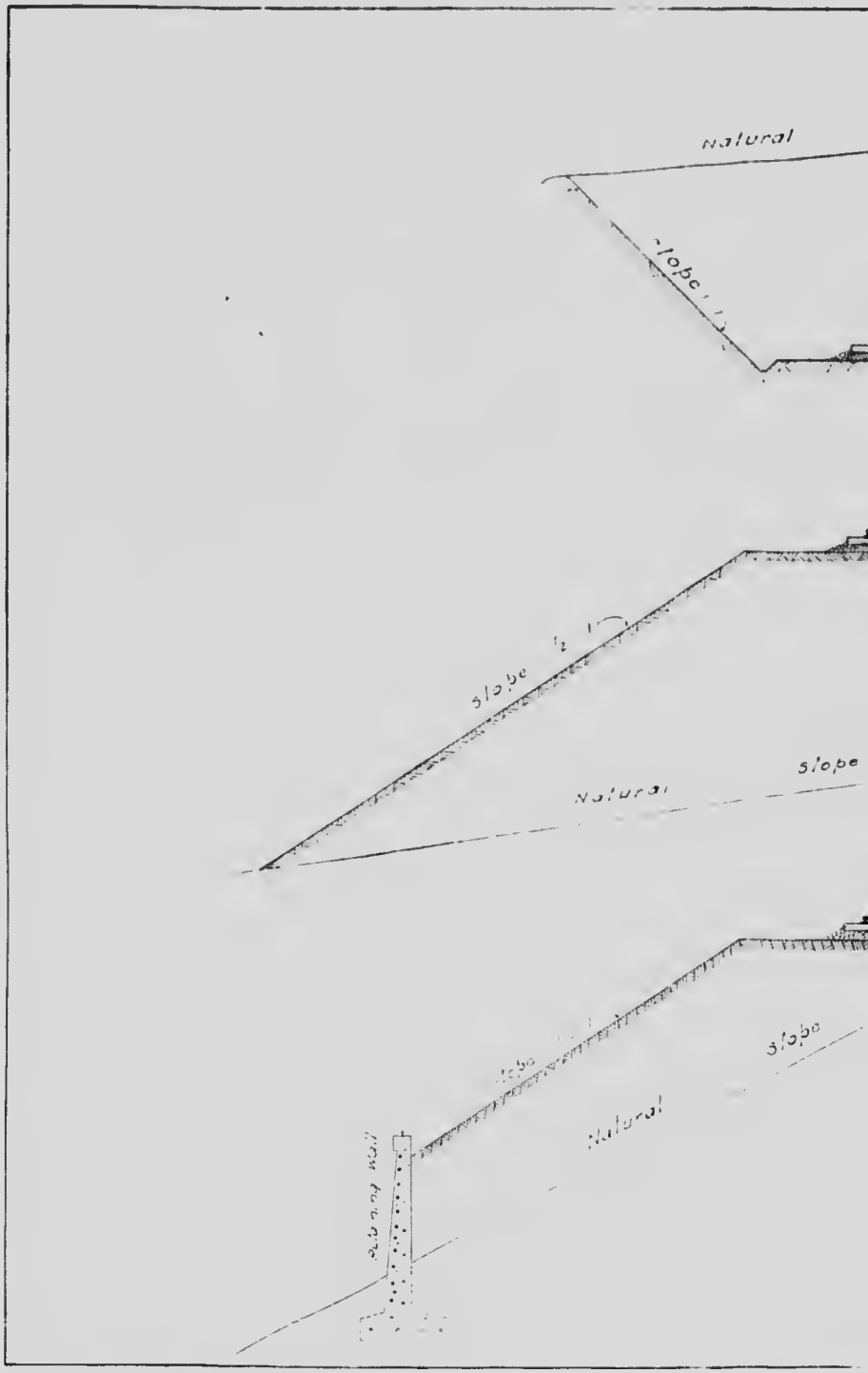
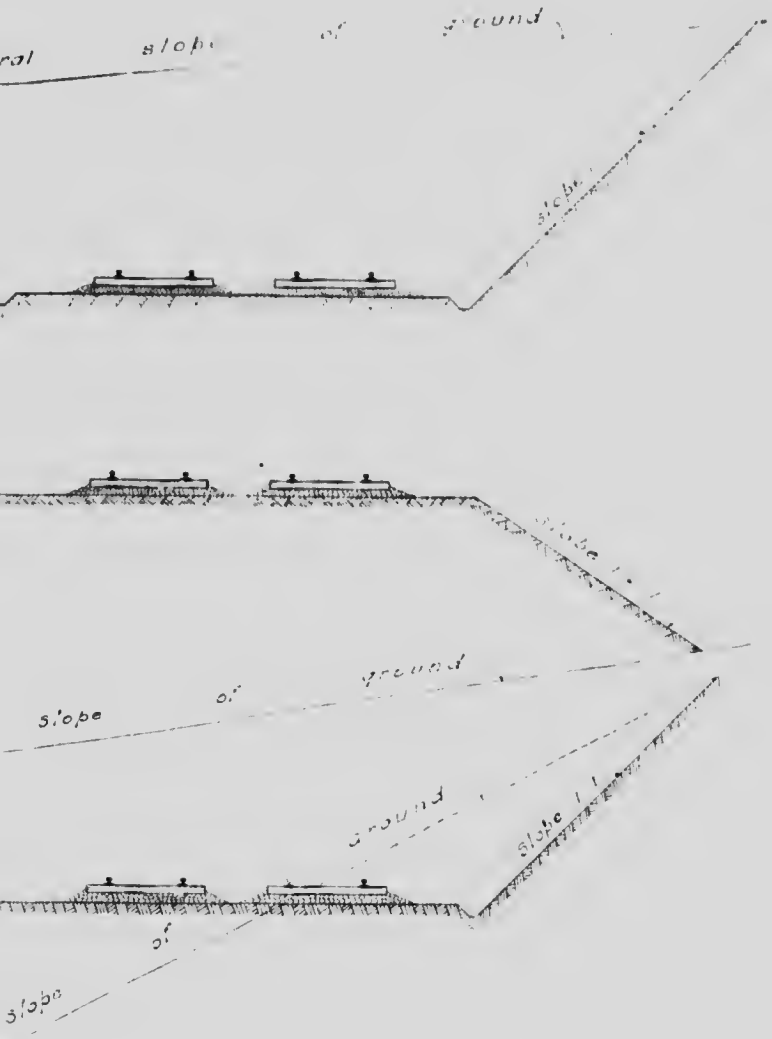

Natural
slope
slope
Natural
slope
slope
Natural
slope
Retaining Wall

Figure No. 26



CROSS SECTION SHOWING ROADWAY
CONSTRUCTION FOR TRACKS
IN ROSEDALE VALLEY

Cost of Terminal Plan.

A cross section of the subway for Yonge Street is shown in Figure 21. The estimate provides for the construction of a double-track reinforced concrete subway in the centre of the street, from Queen Street to St. Clair Avenue: stations, tracks, signal system, overhead and feeders, rebuilding of sewers, moving water pipes and connections, caring for gas mains, and electric and telephone cable conduits, maintaining surface car operation, and caring for street poles, protection to building foundations, and land damages, dumping ground for excavations, and repaving the street. The estimated cost is $1,328,000.*

Figures 22 and 23 show the plan and cross-section of the single-track subway loop in the business centre. The estimate includes station, track, caring for public utilities, damages, repaving the street, etc., complete, for which the cost estimate is $496,000.

* No reduction is made in this estimate for charges properly belonging to different City Departments for needed improvements which could be made at the same time, or for a proportional share of the work which would be paid by public service corporations already using, or desiring to use, space in the street. A large reduction could also be made in the estimate by the substitution of an elevated structure for the subway north of Belmont Street. The cost of the subway from Belmont Street to St. Clair Avenue is estimated at $1,425,000. A concrete elevated road (Figure 24), on a private right-of-way within 400 or 500 feet of Yonge Street, from about Belmont Street to the old City limits at Farnham Avenue, with surface tracks on a new street to be opened from that point to St. Clair Avenue, would cost, including right-of-way, one station, and the street opening, about $825,000. An elevated structure of steel, with posts back of the curb line, in Yonge Street, from Belmont Street to Farnham Avenue, would cost about $365,000 (with ballasted roadbed, $450,000), including probable land damages. Since the opening of the Boston and New York subways little has been heard of elevated structures, but in situations which would often warrant the construction of an elevated structure, a subway at two or three times the expense would be out of the question. An elevated structure will afford practically every advantage from the standpoint of operation possessed by a subway, and almost as rapid transit. The principal objections to the old style elevated system, as compared with a subway, are its obstruction to street traffic, its appearance on the street, and the fact that owners of abutting property may collect damages for noise and the deprivation of light and air. It is believed that these objections would largely disappear with a modern design of structure. If not, an elevated road would even then be much cheaper than a subway, which also is liable to cause some action for damages.

The cost of the Danforth Avenue Branch is closely associated with the costs of extensive civic improvements planned for that part of the City. It is proposed to use the new bridges for subway cars in the manner shown in Figure 25. The estimate is made for a double-track subway in Bloor Street, from Yonge Street to Sherbourne Street, from which point east, the estimate is based on the cost of changes and additions in the City improvements necessary to provide for car service; also the cost of a short subway under Castle Frank Road, to connect the two bridges, and a tunnel incline from the east end of the Don River Bridge to Broadview. The entire cost of this branch from Yonge Street to Broadview Avenue, is estimated at $1,338,000.*

Cars.

Subway cars should consist entirely for the present of surface cars, to be operated in St. Clair Avenue and Danforth Avenue, and Don Mills Road, and should be the regular equipment elsewhere recommended for City surface transportation, except that such as are purchased new should be constructed of steel or other non-combustible material. These cars should be so designed that they could be operated through the subway in trains, should the traffic warrant such operation in the future, or they could be used singly on surface lines in other parts of the City should different equipment be desired at any time for subway purposes.

Cars and Car Service Required.

This subway and surface system of transportation, when completed, will require about 150 cars of the type specified. The subway being supplied with its cars by the surface lines, they are shown in the number allotted to St. Clair Avenue, Danforth Avenue, and Don Mills Road. A 1½-minute rush-hour service in St. Clair is shown from Bay and Temperance to St. Clair and Prospect, every other car going west to Jane, giving a 3-minute service west of Prospect Avenue. In Danforth Avenue a through service of 3 minutes is given to the City Limits from Bay and Temperance. In Don Mills Road a 3-minute service is shown

* The estimates for the cost of the Danforth Avenue Branch are based on subway construction from Yonge Street to Sherbourne Street, in Bloor Street. This section could be covered much more economically by constructing a surface line along the south embankment of Rosedale valley, on the same level as the Yonge Street subway (Figure 26), starting at Yonge and Severn Street, and connecting with the proposed City improvements at Sherbourne. While the Bloor Street subway is in the direct line of travel, and the ravine road would lengthen the route and slightly increase operating expenses, yet the difference in cost is quite large ($600,000), and should be considered should economy of construction become necessary.

from Bay and Temperance to Leslie Avenue, and a 6-minute service from Leslie to Woodbine Avenue.

These lines would furnish a 1½-minute service from Broadview to Yonge, where they would join the 1½-minute service of the St. Clair lines, and altogether, with a moderate speed, furnish a rush-hour service of ¾ of a minute, south of Bloor Street: a service capable of handling 10,000 passengers per hour. As later requirements warrant, more service could be supplied the subway by routing other outside lines to Bay and Temperance, the subway being capable of caring for 250 cars per hour, but at a considerable sacrifice of speed as the headway decreases.

SERVICE.

The estimate for cars for the completed system of transportation outlined is as follows:—

Line.	Round trip distance.	Running time.	Rush hour headway.	Cars required.
	Feet.	Min	Min.	
St. Clair Avenue & Subway, Jane to Bay & Temperance	83,700	190	1½ & 3	52
Danforth Avenue & Subway, City Limits to Bay & Temperance	68,600	69	3	33
Don Mills Road & Subway, Woodbine to Bay & Temperance..	67,000	69	3 & 6	20
Bathurst Street	13,400	21	7	3
Vaughan (St. Clair North)	20,800	28	7	4
Forest Hill (St. Clair North)...	16,000	21	7	3
Dunvegan & Avenue Road	15,000	21	7	3
Mount Pleasant (from Yonge via St. Clair Avenue)	26,000	30	5	6
East York Avenue (from Yonge via St. Clair Avenue)	26,140	30	5	6
Dufferin & Prospect	16,500	20	5	4
Greenwood & Mortimer	16,800	20	4	5
Pape Avenue	14,400	20	4	5
Lake View Avenue	13,400	18	6	3
Total cars				147

Tracks.

The surface track construction is estimated according to the plans previously outlined for "T" Rail construction (Figure 8). (By substituting brick for the granite pavement and 80-lb. rail for the 100-lb. rail, there would be a reduction in cost, for these items, of $7,588 per single mile of track.) The subway estimates are based on standard 80-lb. "T" rail.

Car Houses.

Car houses would be needed in the neighborhood of St. Clair Avenue west of Yonge Street, to the north, and near Danforth and Pape Avenue to the north-east.

Power Station.

New sub-stations will be necessary for furnishing the power for operation in the Danforth Avenue District and the St. Clair District. Of the present Civic sub-stations, only those located at McPherson Avenue and Davenport Road, and at Edwin and Ruskin, have extra room available, and could be enlarged for this purpose.

COST OF CONSTRUCTION.

Roadway.

The cost of constructing the foregoing system of subway terminal of nine miles, including carrying charges, is estimated at $6,624,000. This would extend from Bay and Temperance Streets to St. Clair Avenue to the north, and Danforth Avenue to the north-east.

The outlying system of 14 miles of surface track contemplated (17 miles double, 10 miles single track), would cost $1,963,000, including road-bed and paving with granite, $1,230,000 of which should be used for 28 miles of surface track by the time the terminal was ready to receive cars. Part of this amount has already been provided in connection with the Civic lines being constructed in Danforth Avenue, from Broadview to the east City Limits, and in St. Clair Avenue, from Yonge to Prospect Avenue.*

* The costs of undertakings of such character as the foregoing could be partly provided for by setting aside funds received from the franchise-holding transportation companies, and using them for the general betterment of the City's transportation facilities and also by special assessments on the property in the districts to be benefited.

Cars.

Steel cars, suitable for combined surface and subway service, should be procured at $8,500 each, delivered in Toronto ready to operate.

Car Houses.

Car houses along the line of a modern car house shown in Figures 11 and 15, with proper provision for future requirements, should be constructed for about $150,000 each (capacity 100 cars each), exclusive of the land occupied.

Power and Power Stations.

Sub-stations of sufficient capacity to care for 150 cars will cost, approximately, $242,000.

Costs.

Double track subway in Yonge Street	$4,328,000
Single track subway loop	196,000
Danforth Avenue Branch (Yonge to Broadview)	1,338,000
Carrying charges on terminal system (7½ per cent. during construction (2½% per year)	162,000
Double track surface lines (17 miles)	1,190,000
Single track surface lines (10 miles)	172,000
P-A-Y-E steel cars (150 at $8,500)	1,275,000
Car houses	320,000
Substations and equipment	242,000
Miscellaneous—work cars, line wagons, snow, ice, and sprinkler equipment	50,000
	$10,173,000

Investment and Returns.

The financial success of this undertaking would depend entirely on the rapidity with which the territory to be served increased in population. At present the traffic to be had would not warrant the expenditure, but the guarantee of rapid transit within a short time should attract settlement at such a rapid rate as to double the population north of St. Clair and Danforth Avenues by the time the subway was completed. For quite a number of years after that time the increase should be from

12 to 15 per cent. per annum, as many persons would move from less favored districts to the zone of rapid transit.

Probable Receipts.

The population at present in the territory tributary to the proposed surface lines, is estimated at 60,000, about 37,000 of which could be counted on for patronage for a subway system. With this doubled, by the time the down-town terminals were completed, there would be a population of 74,000 of probable patrons which, at $12.40 per capita per annum, the rate Toronto is now paying (which would be a low rate for this outlying territory), would give an estimated income from passenger receipts for 1917 (if the completed system, costing $10,173,000, were operated), of $917,000. It is probable that the receipts per capita per annum would run from $15 to $18 for this outlying territory, as it is not within walking distance from the business district. Assuming this rate to average $16, the gross receipts from passenger service would be $1,184,000. Adding $20,000 for advertising and news stand privileges, the gross receipts for the first year of operation would be $1,204,000. Allowing 62 per cent. for operating expenses, including maintenance, during the first year of operation, there should remain $457,520 to meet fixed charges, renewals, taxes and amortization, if the latter is deemed advisable.

Partial System.

Assuming only the completion of the St. Clair Avenue line, the Mount Pleasant Road line, the Danforth Avenue line, one-half of the Don Mills Road line, and one-half of the Bathurst-Vaughan Road line (28 miles of surface track), at the time the subway was ready for traffic, the probable patrons in the districts to be served would amount to about 61,000, with probable passenger receipts (at $16 per capita) of $1,024,000 for the first year of operation. Other income, such as advertising and news stand privileges, should increase this to $1,044,000. Allowing 62 per cent. for operating expenses, including maintenance, during the first year of operation, there should remain $396,720 for fixed charges, etc., as given in the preceding paragraph.

The cost of the above-described partial system, with car houses, 100 cars, and the necessary power plant, is estimated to be $9,128,000. This includes the road-bed and paving for the surface lines, which could properly be charged to street improvement account rather than to the transportation investment. Assuming the entire amount to be carried

by the system, there would be required $365,120 to meet interest charges (at 4 per cent.), leaving $31,600 for depreciation, renewal, and other accounts.

Gerrard Street.

For the Civic line in Gerrard Street, which is not cared for in this plan, it is recommended that it be kept separate for the present, through-travel passengers paying a full 5-cent fare one way, and receiving a return check in the opposite direction good for a limited period. By accepting and issuing these return checks only to passengers boarding the cars at Gerrard and Greenwood when east-bound, and issuing them to all passengers requesting them when west-bound, most of the local riding on the line would be at the full fare rate, as in the rest of the City, and those desiring to use the Parliament line of the Toronto Railway Company in Gerrard Street to continue their journey down town, would be accommodated with practically a half-fare rate on the Gerrard line. This would not be an excessive rate for the few years remaining before the present franchise on Gerrard Street west of Greenwood Avenue expires, when the question will be disposed of, and would produce the largest amount of revenue the line is entitled to under the circumstances. The same plan could be used for St. Clair Avenue and Danforth Avenue, pending the construction of the subway terminals.

SECTION XI.

Motor Busses and Radials.

Motor busses—Depreciation—Maintenance—Rates of fare—Radial lines—Charge for use of City streets.

The use of motor busses from the nearest terminals of the Civic lines to the business centre has been suggested to cover the period between the completion of a surface line and the completion of the subway. This is not thought advisable. The motor bus can be profitably operated only in the districts where traffic is continuously heavy, on short hauls from one congested centre to another, or by charging much more than the regular street car fare. Toronto conditions do not seem to warrant the experiment.

Experiences Elsewhere.

Reports from different cities where motor busses are being used do not offer much encouragement for engaging in the business under Toronto conditions. When competing with existing electric lines, results have not been satisfactory, even when a higher fare has been charged. The principal difficulty seems to be on account of the large depreciation necessary on busses (generally 33 1-3 per cent.), and the heavy tire renewal charges. In a certain western city it was found necessary to double the fare to 10 cents per passenger on a route less than one mile long between two congested passenger centres, where transportation conditions were quite favorable. A gross business of $20 per day per bus was considered necessary to pay all charges, including interest on investment. The busses cost $1,500 each, averaged 50 miles per day, seated 16 passengers, and cost 36 cents per car mile to operate. The average daily receipts per bus were $14.22. The driver acted also as fare collector. A bus seating 25 passengers could be procured for $6,000, but the expense of a fare collector would be added.

A recent published analysis of the financial results of the New York bus lines gives the rate of speed at 7.2 miles per hour; average passenger capacity of busses, 35; tire expense, $2.21 per day per bus; cars in regular

service, 54; total necessary to maintain the service, 80; tire cost for the year for 80 cars, $844.55 per car; annual depreciation on busses, 33 1-3 per cent.; and passenger fares at 10 cents. For the year 1914, on a gross business of about $500,000, a deficit of $38,000 was reported.

At the Munich Convention of the International Street and Interurban Railway Association, in 1908, Mr. Manclere, General Manager of the General Omnibus Company of Paris, expressed the opinion that auto busses have a field of city service, provided the traffic will stand a much higher fare than charged on tramways for the same distance. Mr. Otto, Chief Engineer of the Berlin Tramways, said that motor busses could not be operated profitably except in special cases where there was no competition and when a high fare is charged. Sixty busses were required to furnish a regular street service of 47 busses. The cost was: 60 busses, $285,000; tires, $30,000; car houses and shops, $90,000.

Mr. Kuhles, Chairman of the Munich (pop. 600,000) Tramway Committee, said that the city had been compelled by circumstances to instal a motor bus service on certain streets. The cost of operation was 30 cents per car mile, against 10.8 cents per car mile for the tramways. He said the experiment had proved disastrous and the service would have to be abandoned.

Some of the London bus companies are reported as doing a profitable business, largely on account of their serving a congested district in the centre of the city, and caring for business centres not reached by the tramways. The lines competing with the tramways were not considered profitable. From the above it would appear that until the maintenance and depreciation expense on motor busses can be materially reduced they cannot compete successfully with electric tramways.

Radial Lines.

The Lake Shore Radial line now available for purchase by the City, is valuable principally as a terminal for radial lines operating west of the Humber River, under any plan of divided operation.

Conditions of this character have been met elsewhere by leasing the right to operate from year to year on a passenger basis, the amount received to be at least sufficient to maintain and renew the property, pay interest on its value, and, if the investment is to be retired, to

provide for a sinking fund. Reservation should be made of the right to operate the proposed Windermere Avenue line to the Sunnyside terminal, should the City so desire, that line carrying its share of the expense when in operation. The Kingston Road question could be disposed of in the same manner. Later, should the City so desire, all radials enable to connect with the subway could, by using the surface tracks, terminate in Front Street at the intersection of Wellington and Church Streets and St. Lawrence Market. Cars from the west could use Wellington Street, and those from the east Front Street, without interfering with the City service to any great extent. Cars should be approved by the City and limited to City standard weight. Express cars could be handled to St. Lawrence Market outside of rush hours of travel.

The question of a proper charge for the use of City tracks by radial lines is a much disputed matter, and most agreements are for short periods only. Frequently the radial cars become City service cars at the City limits, all receipts inside the municipality going to the City company in exchange for the terminal privileges. The question of operating several of the present radial lines over the City tracks to a down town terminal is somewhat complicated, owing to the several Toronto companies using different widths of track, varying from 4 feet $8\frac{1}{2}$ inches to 4 feet 11 inches. Joint use of the City tracks will require a change in the gauge of either the City or radial lines to conform to some agreed standard, preferably 4 feet $8\frac{1}{2}$ inches, before such service can be inaugurated. Assuming that these difficulties could be overcome, a fair charge to all outside companies, except the Metropolitan, in my judgment, would be 25 cents for each car mile that the radial cars operated over the City tracks, and, in addition, there would go to the City company all local City fares, but no charge to be made by the City company for passengers of the radial line coming from points outside the City into the City, or passengers going from points within the City to points outside the City.

The Metropolitan Radial occupies a position quite different from that of other suburban lines, and should not only pay the charge of 25 cents per car mile outlined for them, but also an additional charge sufficiently large to cover the particular traffic conditions which prevail in the north part of the City. The terminal at Cottingham Street is well within the traffic territory of the present City system, and to furnish the Metropolitan with a terminal in the business centre at the same rate

would be highly profitable to the Radial, and would result in the loss of a large amount of revenue on the part of the City lines. In order to arrive at a fair solution of this problem it would first be necessary to determine the zone north of Cottingham Street in which passengers walk to and from the City lines for their City transportation, and from which the Radial line, under present operating conditions, derives little if any revenue. This zone extends from a point one-half to three-fourths of a mile north of Cottingham Street, according to weather conditions. After fixing the northern boundaries of this zone, a fair basis for arriving at a proper charge for the use of the Yonge Street tracks of the City company would be, in addition to the charge of 25 cents per car mile, for the Metropolitan Radial, to turn over to the City company all south-bound fares collected below that point and all north-bound fares collected from passengers leaving the cars south of that point.

Devoting certain streets, on which fairly high speed can be maintained, to radial lines alone, is tolerated for small places where many streets are available for tracks, but Toronto has grown beyond that stage of its development.

APPENDICES.

I. Statistics of Toronto Railway

II. Description of Present Operating Routes.

APPENDIX I.

Toronto Railway Company.

Financial Statement.

The following data, taken from the annual report of the Toronto Railway Company for the year ending December 31st, 1911, to the shareholders, shows the business to be highly profitable at the present time:—

Earnings for 1911.			Per Cent.* of Gross Earnings
Gross earnings †		$1,851,511 42	
Charges for operating, maintenance, etc.		2,653,361 86	
			51.65%
Net earnings		$2,198,149 56	
			15.35%
From which net earnings was deducted the sum of $1,691,915, distributed as follows:			
Dividends	$634,158 95		13.80%
Bond interest, etc.	198,553 69		1.09%
		$869,712 64	15.20%
Payments to City—			
Percentage on earnings	$687,650 11		11.15%
Pavement charges	84,163 20		1.74%
General taxes	50,119 64		1.03%
		$822,233 21	16.32%
Total		$1,691,915 88	31.82%

* Percentages computed for this report.

† Referred to also as Gross Income

TORONTO RAILWAY COMPANY.

Income Account, 1911.

Gross earnings		$1,851,511 42
Operating, maintenance, etc.	$2,653,361 86	
Interest on bonds, etc.	198,553 69	
Percentage on earnings (to City)	687,650 11	
Pavements, taxes	131,582 80	
		3,671,148 79
Surplus earnings		$1,177,392 63

Profit and Loss Account.

December 31st, 1911.

Balance from last year		$3,619,660 65
Surplus earnings, after payment of all expenses, interest, taxes, etc.		1,177,392 63
		$4,797,053 28
Dividends—		
Stock bonus dividend	$1,000,000 00	
2 dividends at 1¾ per cent. each	280,000 00	
2 dividends at 2 per cent. each	391,158 95	
		$1,671,158 95
Balance from 1910	$3,619,660 65	
Less stock bonus dividend	1,000,000 00	
	$2,619,660 65	
Surplus for 1911 carried forward	506,233 68	
		3,125,894 33
		$4,797,053 28

TORONTO RAILWAY COMPANY.

COMPARATIVE STATEMENT, 1911-1910.

	1911	1910	Increase.
Gross income	$1,851,541 12	$1,377,116 19	$474,425 23
Operating and maintenance charges, etc.	2,653,361 86	2,237,187 75	416,174 11
Net earnings	2,198,179 56	2,139,928 44	58,251 12
Passengers carried	120,997,814	109,415,264	11,582,580
Transfers	18,730,671	12,630,756	6,099,915
Percentage of charges, etc. to passenger earnings	55.2	51.6	3.6

GENERAL STATEMENT, YEAR ENDING DECEMBER 31ST, 1911.

Assets.

Road and equipment, real estate and building, including pavements, etc.		$17,787,921 80
Advances to subsidiary companies		932,360 21
Stores in hand	$303,255 48	
Accounts receivable	419,518 70	
		722,774 18
Cash in bank		467,151 96
		$19,910,211 15

Liabilities.

Capital stock authorized $12,000,000 00		
Capital stock allotted	$10,971,600 00	
Capital stock unpaid	6,216 95	
		$10,968,383 05
Bonds outstanding —		
4½% sterling	$2,291,633 33	
4½% currency	935,000 00	
6% debenture	600,000 00	
		$3,829,633 33

Toronto Railway Company.

Liabilities—Continued.

Mortgages		$40,000 00
Accounts and wages payable	$345,584 27	
Accrued interest on bonds	67,205 68	
Dividend payable January 2nd	217,453 08	
		599,913 03
Toronto Power Co. sinking fund guarantee		122,665 14
Unredeemed tickets		112,845 81
Reserves—		
Provision for renewals	$900,000 00	
Suspense reserve	694,721 80	
	$1,594,721 80	
Less charges to date	717,551 33	
	$877,173 47	
Insurance fund for injuries and damages	203,672 69	
		1,080,846 16
Profit and loss		3,125,891 33
		$19,910,211 15

Comparativ Statement.		1902.	1901.
Gross Income ...	2,172,087 85	$1,831,908 37	$1,661,017 50
Operating, Main etc.	1,200,823 39	1,015,361 32	857,612 10
Net Earnings ...	971,261 46	819,547 05	803,405 40
Passengers Carried	53,055,322	44,137,678	38,848,087
Transfers	18,651,311	15,971,220	13,750,038
Percentage of (etc., to Passenge ings	55.3	55.3	51.6

FINANCIAL STATE

TORONTO RAILWAY Co

Statistical Statement for the Ye

Comparative Statement.	1911.	1910.	1909.	1908.	1907.	
Gross Income	$1,851,511 42	$1,377,116 19	$3,926,828 43	$3,610,272 98	$3,511,197 86	$
Operating, Maintenance, etc.	2,653,361 86	2,237,187 75	1,995,911 61	1,889,046 62	1,893,236 41	
Net Earnings	2,198,179 56	2,139,928 44	1,930,913 79	1,721,226 36	1,617,961 45	
Passengers Carried	120,997,844	109,115,264	98,117,991	89,139,571	85,571,788	
Transfers	48,730,671	42,630,756	38,151,596	32,700,576	31,370,825	
Percentage of Charges, etc., to Passenger Earnings	55.2	51.6	51.4	52.9	53.9	

L STATEMENT.

AILWAY COMPANY.

or the Years 1901 to 1911.

907.	1906.	1905.	1904.	1903.	1902.	1901.
,197 86	$3,109,739 61	$2,747,324 58	$2,111,534 24	$2,172,087 85	$1,831,908 37	$1,661,017 50
,236 41	1,646,515 27	1,560,137 42	1,121,179 51	1,200,823 39	1,015,361 32	857,612 10
,961 45	1,163,224 31	1,186,887 16	1,020,351 70	971,261 16	819,517 05	803,105 10
571,788	76,958,288	67,881,688	60,127,160	53,055,322	41,137,678	38,848,087
370,825	28,159,558	23,625,752	20,180,270	18,651,311	15,971,220	13,750,038
3.9	52.9	56.8	58.2	55.3	55.3	51.6

APPENDIX H.

Present Operating Routes.

Toronto Railway Company.

The transportation business of the City is being conducted by one company, with the following lines:

Avenue Road Line. From St. Clair Avenue and Avenue Road, via Avenue Road to Bloor Street, to Yonge Street, to Front Street, to Scott Street, to Wellington Street, to Yonge Street, thence north to starting point. Number of cars operated, 27. Round trip, miles, 6.90. Minutes for round trip, 54.

Bathurst Street Line. From Christie and Dupont Street via Dupont, Bathurst, Front to George Street, and return. Number of cars operated, 10. Round trip, miles, 8.25. Minutes for round trip, 60.

Belt Line. East and west from Bloor and Yonge Streets: Down Spadina and down Sherbourne to King, up Spadina and up Sherbourne to Bloor Street, to starting point. Number of cars operated, 38. Round trip, miles, 5.88. Minutes for round trip, 39.

Bloor Line.—From Lansdowne and Bloor Streets via Bloor, Spadina Avenue, College Street, McCaul Street, Queen Street, York Street, Front Street, Bay to Queen Street, thence to starting point. Number of cars operated, 10. Round trip, miles, 9.38. Minutes for round trip, 66.

Broadview Avenue Line. From Broadview Avenue and Danforth Avenue via Broadview, Queen, Church, Richmond, Victoria to Queen, thence to starting point. Number of cars operated, 25. Round trip, miles, 5.84. Minutes for round trip, 40.

Carlton Street Line.—From Royce Avenue and Lansdowne Avenue, via Lansdowne, College, Carlton, Parliament, Gerrard to Broadview Avenue: also starting from Broadview, taking the same streets to Royce Avenue. Number of cars operated, 11. Round trip, miles, 11.77. Minutes for round trip, 80.

Church Street Line. From South Drive and Sherbourne, via Sherbourne, Bloor, Church, Front, around Station loop to Front Street, returning the same way up Sherbourne to Elm Avenue, then around loop to starting point. Number of cars operated, 13. Round trip, miles, 6.15. Minutes for round trip, 15.

College Street Line. From High Park via Howard Park Avenue, Dundas, Lansdowne, College, Yonge, Front, Scott, Wellington to Yonge and return to starting point. Number of cars operated, 37. Round trip, miles, 9.19. Minutes for round trip, 70.

Dovercourt Line. From Van Horne and Dovercourt Road to Dovercourt, College, Ossington, Dundas, Queen, Shaw, to King, and returning by same route. Number of cars operated, 11. Round trip, miles, 5.01. Minutes for round trip, 35.

Dupont Street Line. From Bathurst and Dupont Streets via Dupont, Avenue Road, Bloor, Yonge, Front, Scott, Wellington to Yonge, thence returning by same route. Number of cars operated, 26. Round trip, miles, 7.32. Minutes for round trip, 51.

Dundas Street Line. From Keele and Dundas Streets via Dundas, Arthur, Bathurst, Queen, York, Richmond, Victoria to Queen, and return to starting point. Number of cars operated, 15. Round trip, miles, 10.56. Minutes for round trip, 72.

Harbord Street Line. From Bloor and Ossington via Ossington, Harbord, Spadina, Adelaide to Church, "Y"ing here and returning by same route. Number of cars operated, 17. Round trip, miles, 7.39. Minutes for round trip, 50.

King Street Line. From Sunnyside via King, to Scarboro Beach Park and back. Number of cars operated, 77. Round trip, miles, 16.63. Minutes for round trip, 100.

Parliament Street Line. From Greenwood Avenue and Gerrard Street via Gerrard, Parliament, Queen, Bay, Front, York to Queen, thence east to starting point. Number of cars operated, 10. Round trip, miles, 8.06. Minutes for round trip, 60.

Queen Street Line. From Boustead and Roncesvalles Avenue via Roncesvalles, Queen, York, Richmond, Victoria to Queen, thence west to starting point. Number of cars operated, 47. Round trip, miles, 7.52. Minutes for round trip, 66.

Winchester Street Line. From Winchester and Sumach via Winchester, Parliament, Wilton, Victoria to Adelaide, "Y" ing here and returning to starting point. Number of cars operated, 12. Round trip, miles, 4.53. Minutes for round trip, 32.

Yonge Street Line. From C. P. R. crossing and Yonge Street, via Yonge, Front, Union Station loop to Front, and returning to starting point. Number of cars operated, 30. Round trip, miles, 5.89. Minutes for round trip, 48.

A total of 17 lines with 569 motor cars and 73 trail cars.

Radial Lines.

In addition thereto, the same company controls and operates the following radial or suburban lines, which are separated from the City lines, but closely identified with the passenger movement:

The Toronto and York Radials in three divisions:

1st. The Metropolitan Division in Yonge Street, north from the old City limits; gauge, 4 feet $8\frac{1}{2}$ inches.

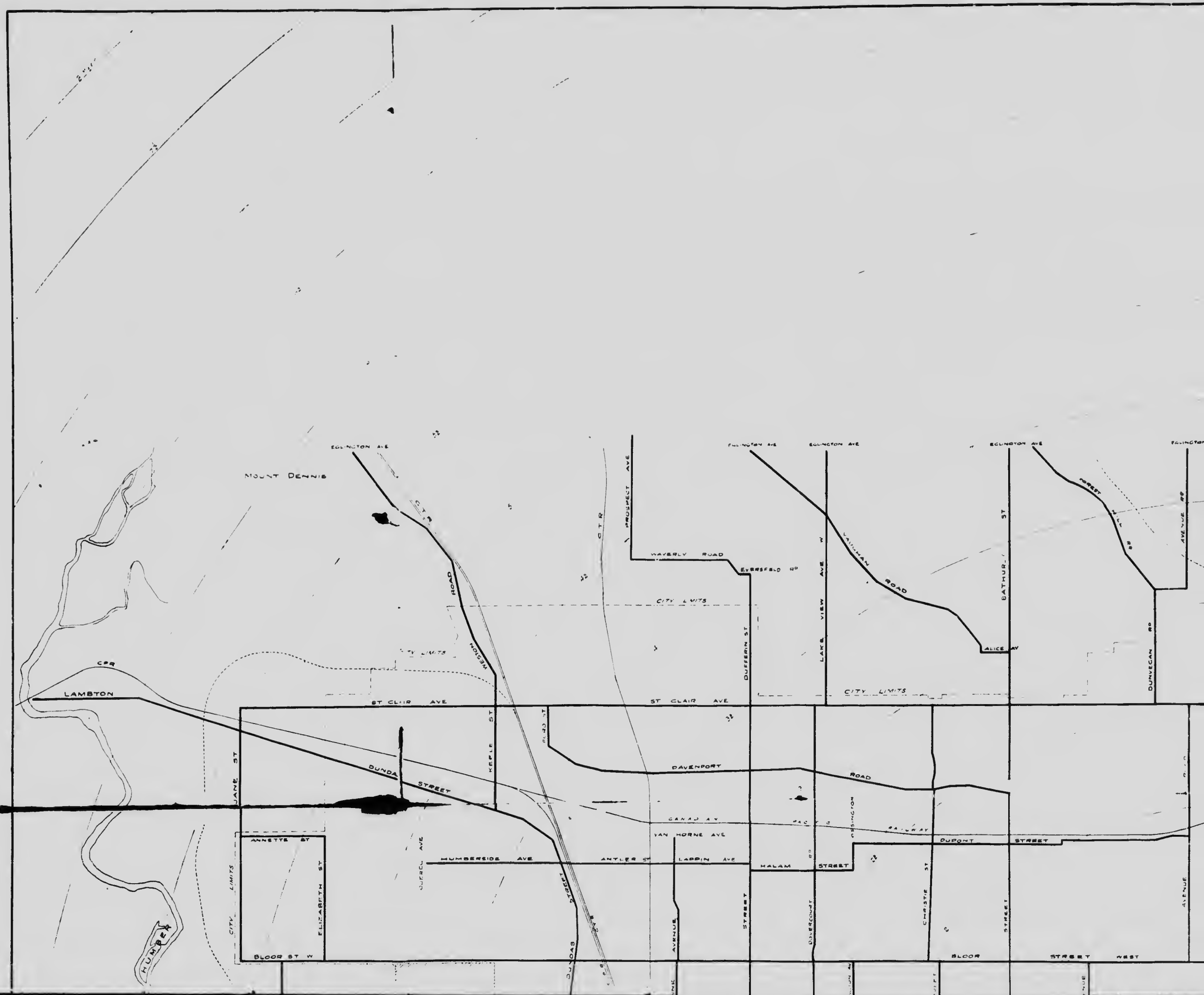
2nd. The Scarborough Division, from Woodbine east on Kingston Road; gauge, 4 feet $10\frac{7}{8}$ inches.

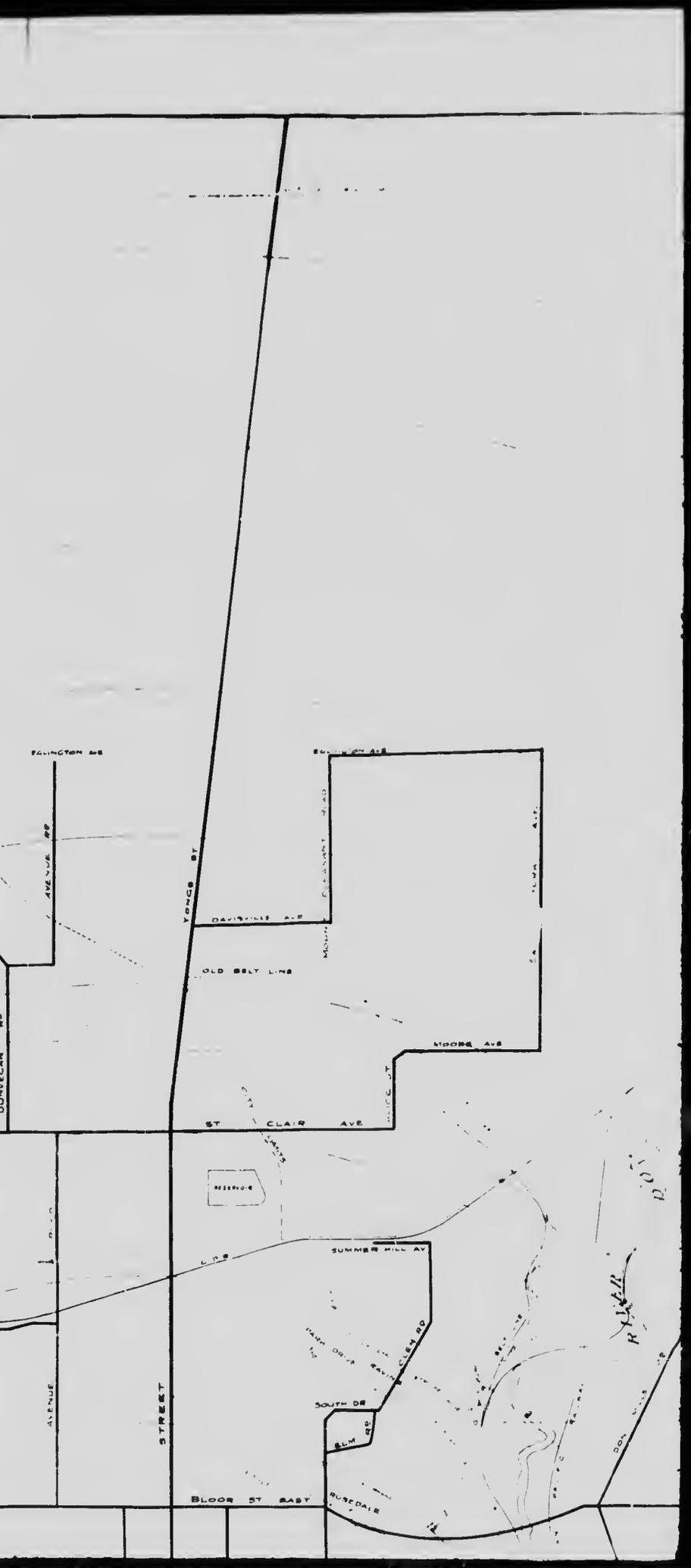
3rd. The Mimico Division, from Sunnyside west along the lake shore; gauge, 4 feet $10\frac{7}{8}$ inches.

The Toronto Suburban Railway, from Bathurst Street and Davenport Road north-west on Davenport Road and Weston Road, with a branch in Dundas Street, from Keele Street to Lambton; gauge, 4 feet $10\frac{3}{4}$ inches.

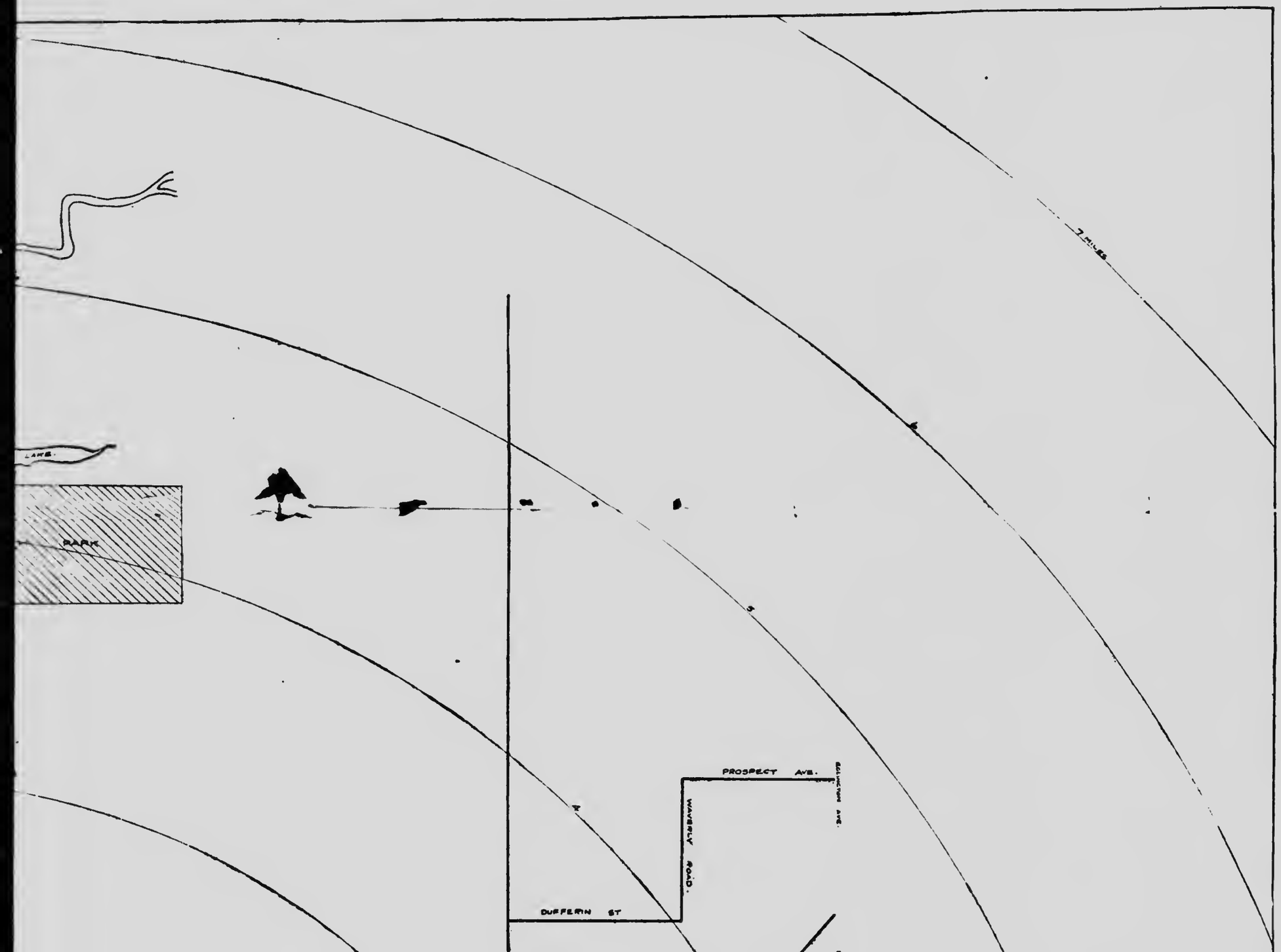
Civic Lines.

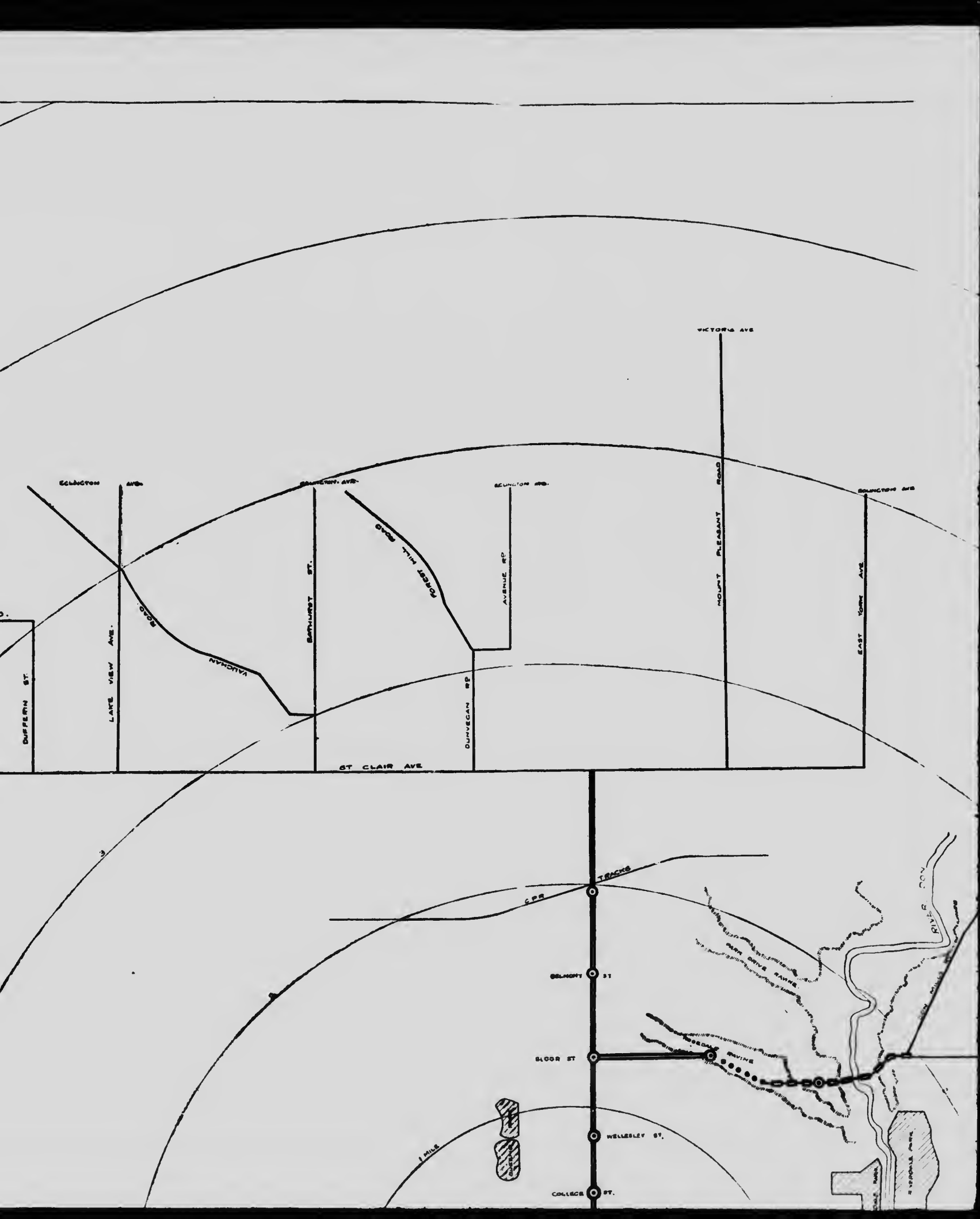
Several transportation lines are being constructed by the municipality, but are not in operation at present. These are on St. Clair Avenue, from Yonge Street west to Prospect Avenue; on Danforth Avenue, from Broadview Avenue east to the City limits, and on Gerrard Street, from Greenwood Avenue east to Main Street.

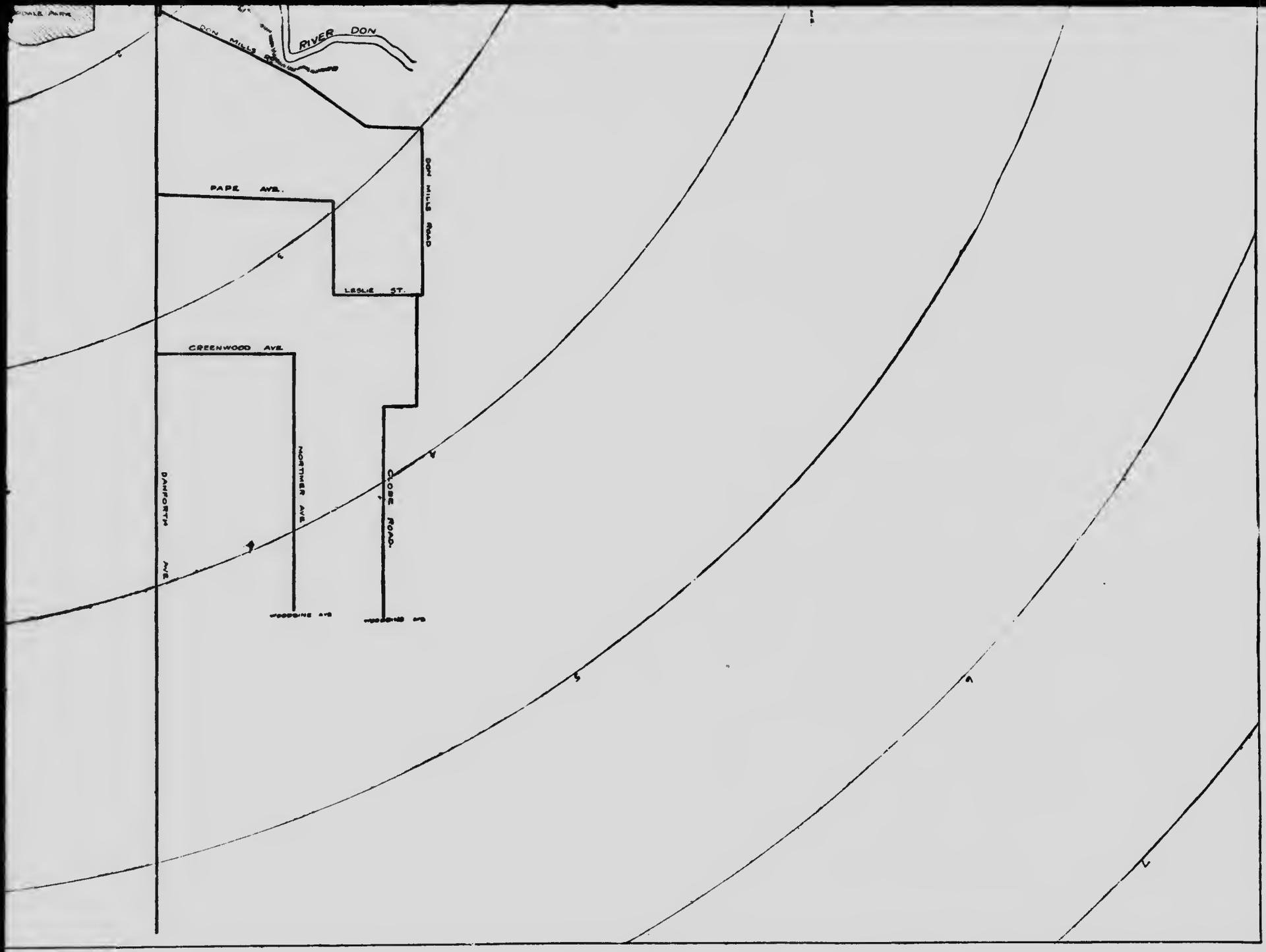

MOUNT DENNIS
EGLINGTON AVE
C.T.R.
ROAD
WESTON
CITY LIMITS
CPR
LAMBTON
ST CLAIR AVE
JANE ST
KEELE ST
DUNDAS STREET
DAVENPORT
ROAD
CANADIAN PACIFIC RAILWAY
VAN HORNE AVE
ANNETTE ST
HUMBERSIDE AVE
ANTLER ST
LAPPIN AVE
ELIZABETH ST
QUEBEC AVE
BLOOR ST W
HUMBER
PROSPECT AVE
WAVERLY ROAD
EVERSFELD RD
DUFFERIN ST
LAKE VIEW AVE
VAUGHAN ROAD
BATHURST ST
ALICE AV
FOREST HILL RD AVENUE
DUNVEGAN RD
HALAM STREET
DUPONT STREET
DUNDAS STREET WEST
DUNCAN STREET
CHRISTIE ST
BLOOR STREET WEST


EGLINGTON AVE
YONGE ST
DAVISVILLE AVE
OLD BELT LINE
MOORE AVE
ST CLAIR AVE
RESERVOIR
SUMMER HILL AV
SOUTH DR
ELM RD
BLOOR ST EAST
RUSEDALE
DON MILLS RD
STREET
AVENUE


CANADIAN PACIFIC RAILWAY
CANADIAN NORTHERN ONTARIO RAILWAY
DON MILLS ROAD
LESLIE ST
GLOBE
WOODBINE AVE
COWAN AVE
MORTIMER AVENUE
CITY LIMITS
DANFORTH AVENUE
SIDLEY AVE


LAKE.
PARK
PROSPECT AVE.
WAVERLY ROAD.
DUFFERIN ST


VICTORIA AVE
ECLINGTON AVE.
EGLINGTON AVE.
EGLINGTON AVE.
EGLINGTON AVE.
DUFFERIN ST.
LAKE VIEW AVE.
DUFFERIN ROAD
VAUGHAN ROAD
BATHURST ST.
FOREST HILL ROAD
AVENUE RD.
DUNVEGAN RD.
MOUNT PLEASANT ROAD
EAST YORK AVE.
ST CLAIR AVE
C.P.R. TRACKS
BELMONT ST
BLOOR ST
WELLESLEY ST.
COLLEGE ST.
1 MILE
RIVER DON
PARK DRIVE RAVINE
RAVINE


RIVER DON
DON MILLS
DON MILLS ROAD
PAPE AVE.
LESLIE ST.
GREENWOOD AVE.
DANFORTH AVE.
MORTIMER AVE.
CLOSE ROAD

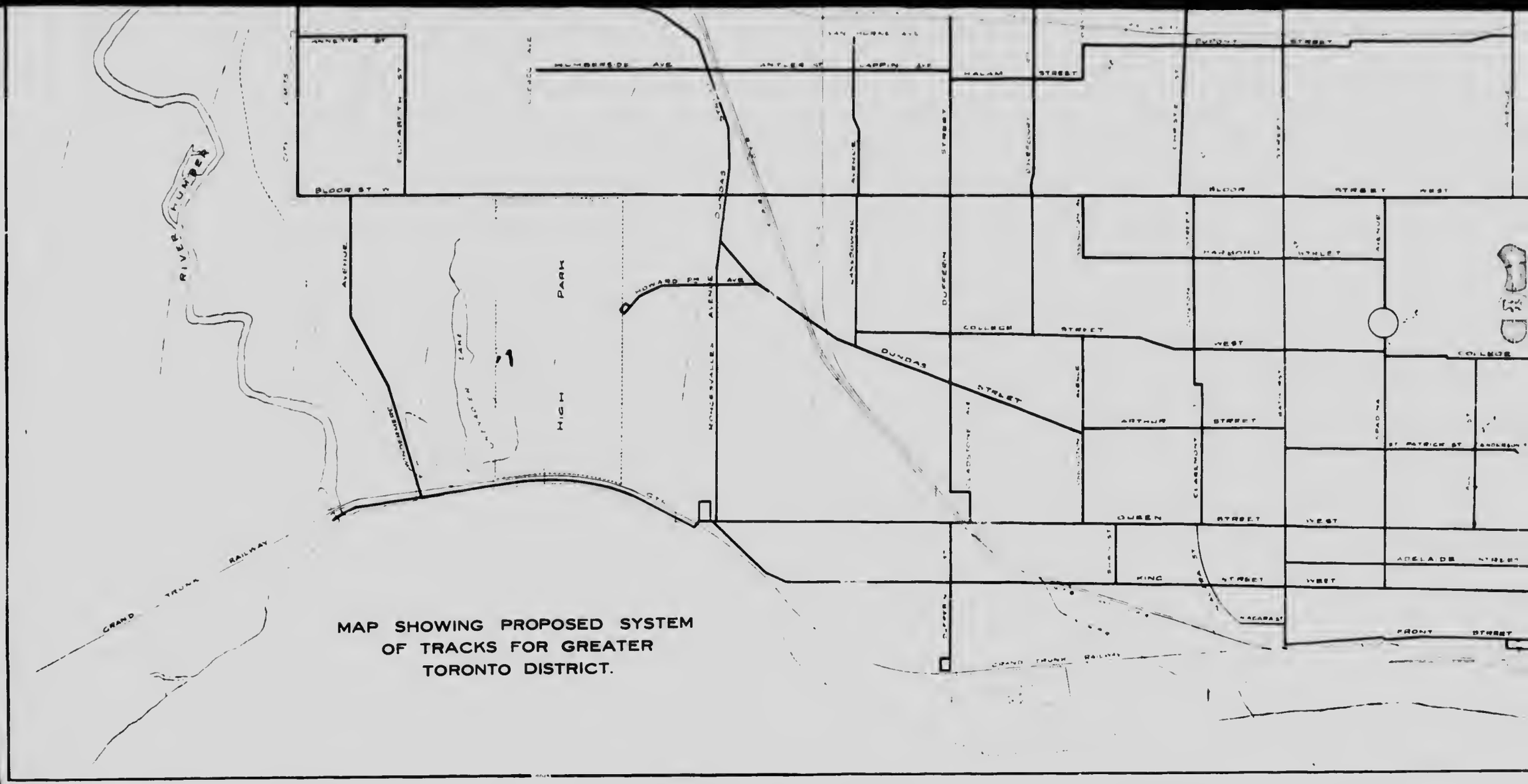
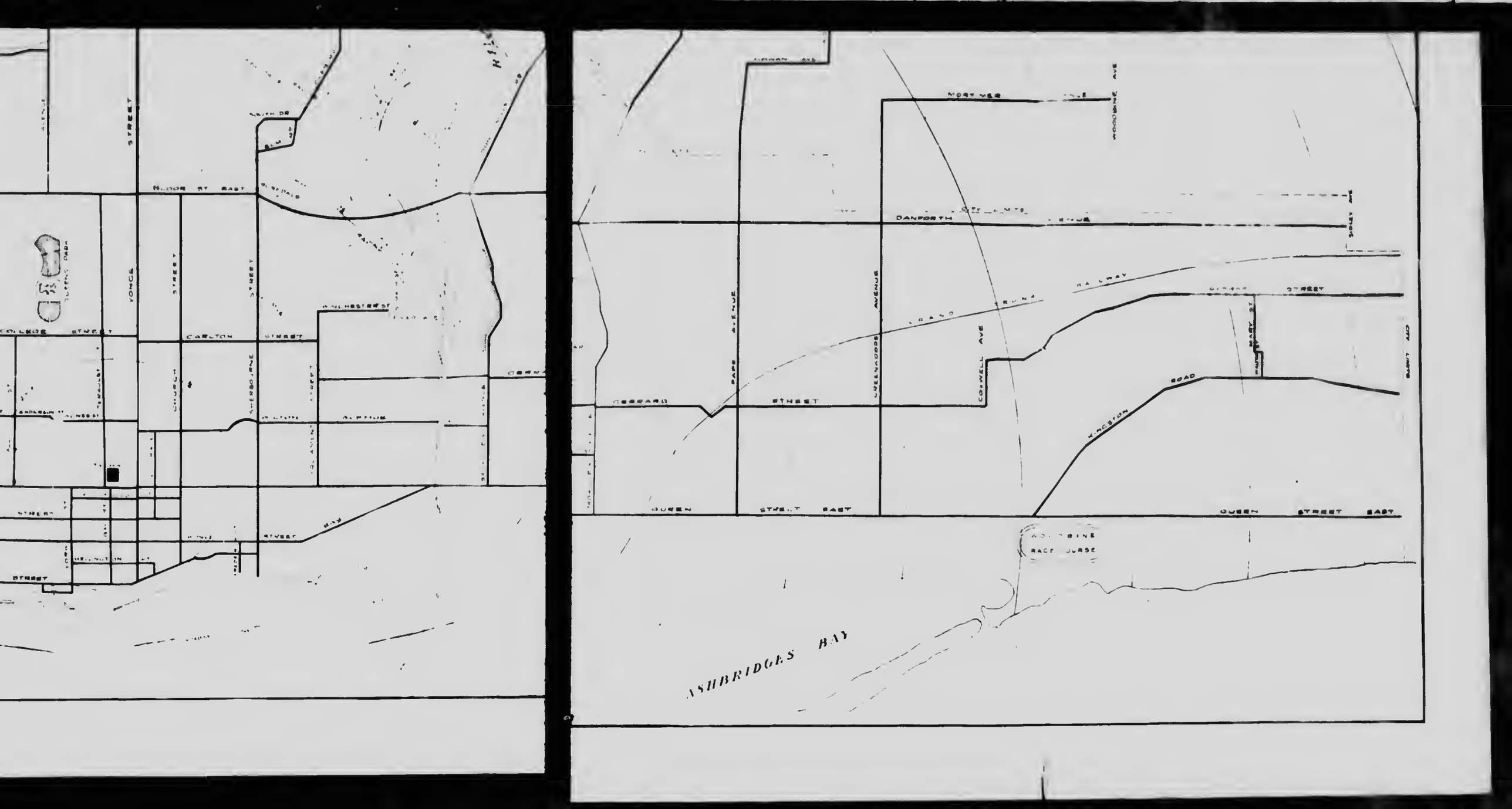

RIVER HUMBER
PARK
HIGH
DUNDAS STREET
COLLEGE STREET WEST
QUEEN STREET WEST
KING STREET WEST
FRONT STREET
GRAND TRUNK RAILWAY
MAP SHOWING PROPOSED SYSTEM
OF TRACKS FOR GREATER
TORONTO DISTRICT.

Figure No. 4


STREET
BLOOR ST EAST
YONGE
STREET
CHURCH
STREET
SHERBOURNE
STREET
CARLTON
STREET
COLLEGE STREET
ANDERSON ST
HOSKIN AVE
ST
STREET
BAY
STREET
DANFORTH AVENUE
GODDARD
STREET
PAPE AVENUE
GREENWOOD AVENUE
COXWELL AVE
GRAND TRUNK RAILWAY
QUEEN
STREET EAST
KINGSTON ROAD
WOODBINE AVE
WOODBINE RACE COURSE
ASHBRIDGES BAY

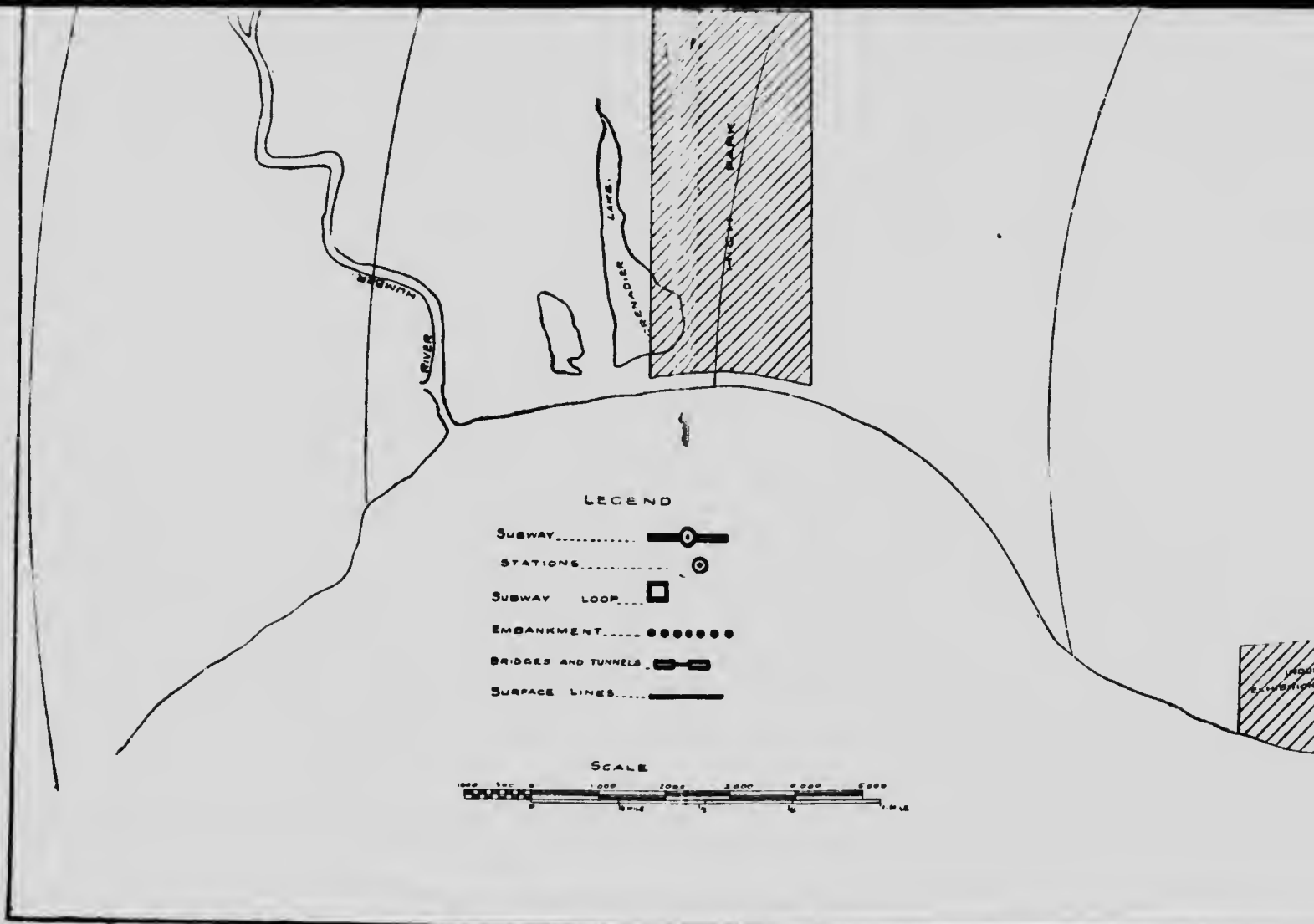
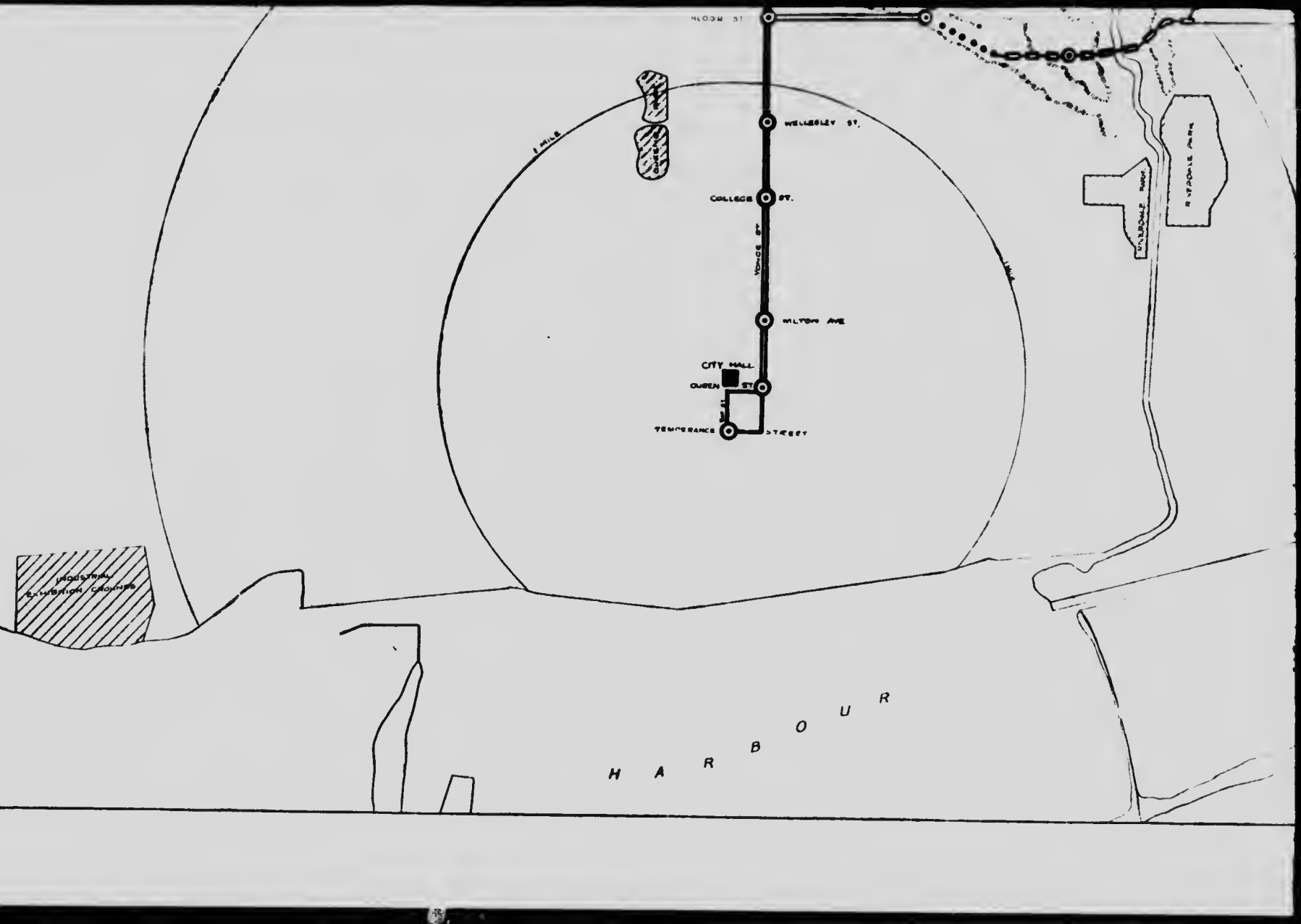
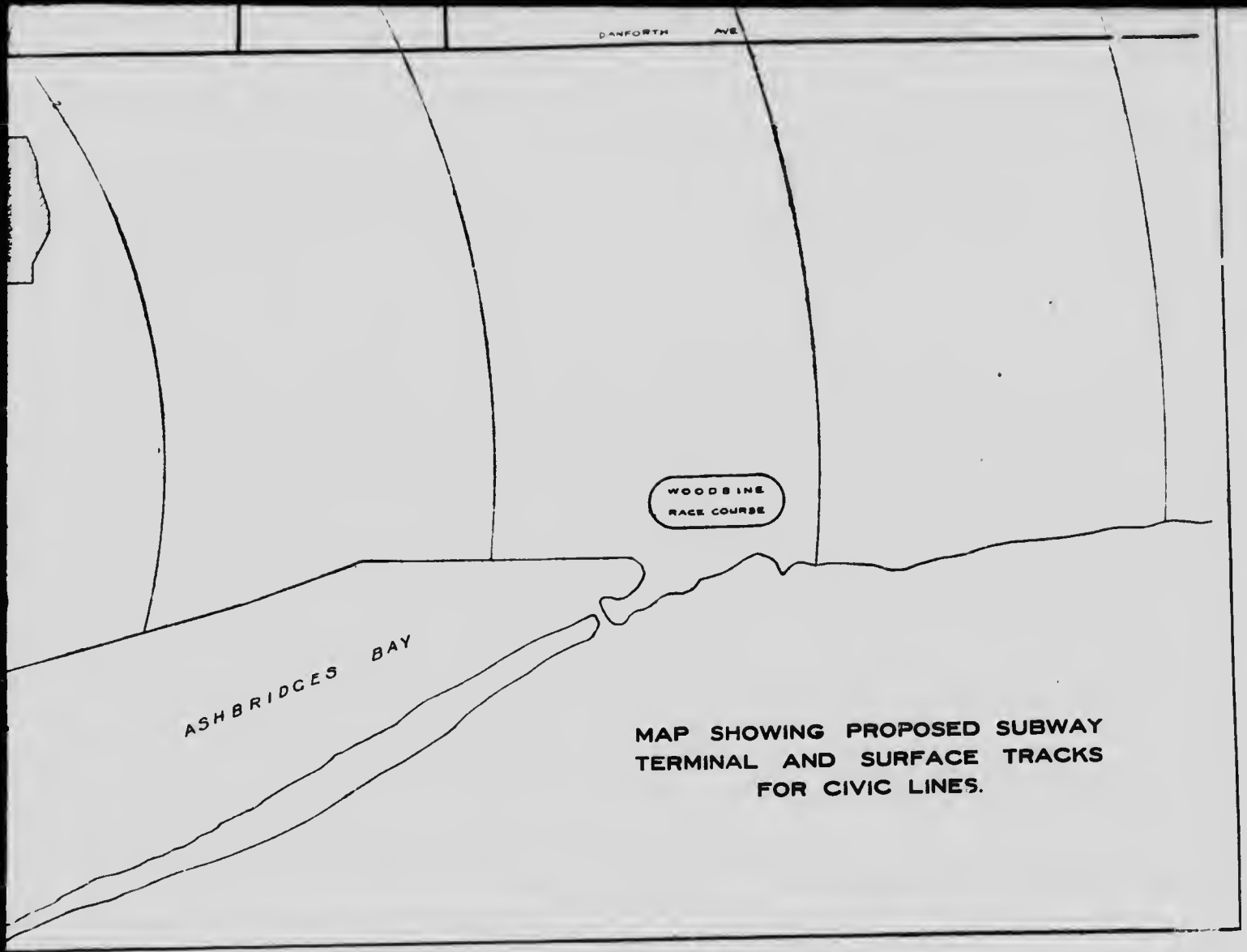

PARK
LAKE
RIVER
LEGEND
SUBWAY
STATIONS
SUBWAY LOOP
EMBANKMENT
BRIDGES AND TUNNELS
SURFACE LINES
SCALE

Figure No. 18


BLOOR ST.
WELLESLEY ST.
COLLEGE ST.
YONGE ST.
MILTON AVE.
CITY HALL
QUEEN ST.
TEMPERANCE STREET
1 MILE
QUEEN'S PARK
RIVERDALE PARK
INDUSTRIAL EXHIBITION GROUNDS
H A R B O U R



MAP SHOWING PROPOSED SUBWAY TERMINAL AND SURFACE TRACKS FOR CIVIC LINES.