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THE TOWN OF NORTH TORONTO

REPORT

Sewerage and Sewage Disposal

BY

MR. T. AIRD MURRAY, Consulting Civil Engineer

612 Continental Life Buildings, TORONTO

Printed by Order of the Town Council of North Toronto, June, 1909, by STEVENSON PRINTING Co., 184 Adelaide St. West, Toronto.



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To the Ratepayers of the Town of North Toronto.

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As a result of the discussions which have taken place at public meetings held to consider the proposed sewerage system for the Town of North Toronto, the Council of the town has decided to have the Engineer's report printed, so that the Citizens may have a thorough and detailed knowledge of the whole situation. It will no doubt be remembered that Messrs. Macallum and Murray were asked to make a report to the Council as to the best method of dealing with the whole sewerage question, and the cost of a sewerage system. Mr. T. Aird Murray is an expert in this particular class of work, and a good deal of thought and careful attention has been given to the subject, which in turn has been considered in detail by the Committee of the Council itself.

So as to be quite sure that the size of the sewers and the estimated cost are sufficient, the Council engaged an independent Engineer to give his views on the report submitted by Messrs. Macallum and Murray. They have also submitted the whole scheme to the Provincial Board of Health, of which Dr. Sheard, Medical Health Officer of the City of Toronto, is Chairman. The result has been that the Town's Engineer has endorsed in its entirety the whole report, and the scheme as outlined in the report has been also fully endorsed by the Provincial Board of Health.

The Council desires that each and every resident considers the report in detail, also giving particular attention to the following outstanding features :—

(1) The Town has an adequate supply of pure water, but has no permanent and proper means of disposing of this water when converted into sewage.

(2) Some sewage is being temporarily taken care of by private individuals by means of cess-pools and septic tanks; the result being that the liquid, which is not evaporated, finds its way into the sub-soil and the strata from which the Town's water supply is derived.

(2) Although the water supply at the present time is absolutely pure, a continuation of this condition of purity depends solely and wholly upon the sources being kept free from sewage pollution.

(4) The large proportion of the houses in the Town have cellars which are not provided with any satisfactory means of drainage. 'The proposed system will take care of cellar drainage, as well as water from the roofs in addition to sewage. (5) It is freely admitted on every hand that the time has arrived when the Town of North Toronto must provide some properly conducted system of sewerage, so as to maintain a clean bill of health.

(6) The installation of a proper system of sewerage will add materially to the natural advantages of the Town in inducing residents of a good class to build their homes within its limits.

(7) It will be observed that the estimated expenditure for the complete system is \$131,000. To provide for the retirement of this, it will take about \$8,000 per annum, this sum includes both principal and interest. Based on the present assessment, it means a tax of \$4 on every \$1,000 assessment, but with the rapidly increasing assessment of the town, it can readily be seen that this rate will be reduced materially within the next few years, particularly after the sewerage system is installed, as the influx of new residents will be greatly increased with the sewerage system in use.

Below will be found the figures showing the assessment for the last five years.

It is earnestly hoped that each and every citizen will take an active interest in this sewerage question, as it is one which vitally concerns the welfare of the town as such, as well as each citizen individually. The assessment figures for the past five years are as follows :--

1904	******	\$ 922,290
1905		1,062,079
1906		1,167,347
1907		1,413,248
1908		1,635,970
1909		2.000.000

(approx.)

It will be noted that the assessment has doubled in 5 years. The report, as will be seen, is of a general character, dealing both with the question of joining the City system and treating the sewage apart from the City. It, however, shows that the sewage of North Toronto can be dealt with more satisfactorily apart from the City than by joining the City system, and this is the policy as recommended and endorsed by the Provincial

Board of Health, that the Council have decided to adopt. Connecting with the City would entail serious pumping and very heavy maintenance, and is practically out of the queetion.

(Signed) A. J. BROWN,

Mayor.

W. PARKE,

Chairman Finance and Sewerage Committee.

W. J. DOUGLAS,

Town Clerk.

North Toronto Sewerage and Sewage Disposal.

REPORT.

By Mr. T. Aird Murray, C.E.

ASSOCIATED WITH MR. ANDREW F. MACALLUM, C. E., B.A. Sc., AND MR. A. L. MCALLISTER, C. E., B.A. Sc.

To the Mayor and Corporation, North Toronto.

Gentlemen :--

In accordance with our letter of the 18th February last; and a resolution passed by your Council March 2nd, last; conveying instructions, I beg to report with reference to the following points.

- A. The possibility of connecting and discharging the sewage of North Toronto with the Toronto City system.
- B. Providing North Toronto with a system of sewers to meet present and future requirements.
- C. As to disposing of the sewage within the district.
- D. Estimating the cost of A. B. and C. and reporting as to which of the methods A. and C. we consider advisable.

PRELIMINARY OBSERVATIONS.

This report is based upon data acquired by an examination of the district, obtaining the necessary levels and local information.

A plan is attached. The plan is not from actual survey, but is reduced to a half scale from one supplied to me by the courtesy of the Town Clerk. I cannot vouch for its accuracy, but I have satisfied myself that it is sufficiently correct for the purposes of this report.

The plan shows the surface topography of the district and the various watersheds into which it is divided, with heights of land marked above Toronto City datum; it also shows a proposed system of sewerage for the Town.

An appendix is attached to the report showing the principal data on which the conclusions are based.

REFERENCE "A."

"The possibility of connecting and discharging the sewage of North Toronto with the Toronto City Cystem."

The adopted method of sewage disposal, whether by connection with Toronto City, or by independent disposal, will have very little effect upon the general lines of sewers necessary to the district. An examination of the plan shows that North Toronto is divided into six watersheds, each having no connection with the other within the town boundaries. The dotted lines show the heights of land dividing each watershed. No. 1 watershed, to the North, is part of the main watershed of the River Don, while the others are tributary watersheds with streams flowing from North-West obliquely across the Town to the South-East.

Without a large amount of deep excavation or serious pumping, it is impossible to connect the drainage of these watersheds; and in order to connect ultimately with the City system, pumping is absolutely necessary, in order to make the connection at a point located at the South of Yonge Street.

The level of land at the East end of Merton Street is 278 feet, and at the West end 285. Allowing a sewer at the East end of Merton at 5 feet deep and a total fall of 10 feet for the sewer from East to West, we would have a depth of 22 feet at the corner of Yonge and Merton, and further allowing for a collecting tank of a capacity to hold one night's flow of sewage, bout another ten feet in depth would be required. This gives a total lift in order to reach the level of the City sewers of about 40 feet.

The drainage from watersheds Nos. 4, 5 and 6 will gravitate to this point, but only these watersheds would be affected by this pumping station. They could be connected by deep cutting by laying the sewer in Merton Street at one grade from East to West intercepting watersheds No. 4 and No. 5, and connecting them with watershed No. 6.

Watersheds Nos. 1, 2 and 3, however, can not be collected at the above point without deep cutting, and a consideration which may directly affect the Town's water-supply.

Watershed No. 1 can be brought by gravitation into watershed No. 2, with little difficulty. The height of land, namely 334 between the corner of Ranleigh and Ronan, in watershed No. 1, and the water course running parallel and north of Lawrence Avenue may be easily cut through.

The low level of watershed No. 3 at the point where the drainage from that district would collect is 287, while the height of land dividing this watershed from No. 4 is 324.

To pump the sewage from watershed No. 3 to No. 4 would entail a lift of about 55 feet, including an allowance necessary for depth of storage tank for night's supply.

The connection of watershed No. 2 with No. 3 presents a serious difficulty; if gravity is adopted, the cutting would, possibly, have the effect of draining the springs which supply the town with water.

On referring to the plan it is obvious that the point of collection must be located on the lower stretch of watershed No. 2, and in the vicinity of the point marked with the elevation 264 North of the East end of Victoria Avenue. In order to gravitate the sewage it would be necessary to cut a tunnel with a falling gradient South from this point into watershed No. 3.

To pump from watershed No. 2 to watershed No. 3 necessitates a lift of 83 feet, making allowance for depth of tank for night storage.

It is, therefore, apparent from an engineering point of view, quite possible to drain the whole of North Toronto into the City's system at Yonge Street, by a part method of pumping and a part method of gravitation. The part pumping including the installation of three pumping stations, the part gravitation including deep cutting in Merton Street and a short distance of cutting about 27 feet in depth between watersheds Nos. 1 and 2.

In order to effect a connection with the City without raising the sewage by power, that is, wholly by gravitation, it is necessary to follow out the various watersheds until such points are reached allowing connection to be made with City sewers. This would involve the construction of several miles of sewers through private lands outside the town limits, to say nothing of the enormous expense entailed.

If it is found desirable to connect with the City system it is recommended that the plan outlined above by part pumping and part gravitation be adopted, concentrating the sewage at a point at, or near, the junction of Merton with Yonge Street.

The pumping stations would include as follows:

Connecting watersheds Nos. 1 and 2 with No.	3—		
Cubic feet per minute to be pumped	169	c.	feet
Height of lift	83	1.	66
Length of delivery piping	600	1.	**

Connecting watersheds Nos. 1. 2 and 3 with No Cubic feet per minute to be pumped). 5— 321	с.	feet
Height of lift	55	1.	66
Length of delivery piping	2800	1.	66

Connecting watersheds Nos. 1, 2, 3, 4, 5 and 6 with Toronto City System-

Cubic feet per minute to be pumped	652	с.	feet
Height of lift	41	1.	66
Length of delivery piping	500	1.	**

REFERENCE "B."

"Providing North Toronto with a system of sewers to meet present and future requirements."

In this connection the first consideration is, whether the "combined" or "separate" system of sewage be adopted.

There appear to be obvious reasons for adopting the "separate" system.

The "separate" system of sewerage may be described as one of small diameter pipes, laid only for taking discharges of domestic sewage represented by the water consumption together with the small rain discharge from house roofs, and cellar drainage.

The combined system provides not only for the above but also for the surface drainage of all streets, entailing large diameter sewers. The general advantages of the "separate" system as compared with the combined are as follows :

(a) Smaller sewers, costing less comparatively, handled with greater ease.

(b) Providing self cleansing conditions at all times to a greater extent. A sewer of the capacity which about meets the normal flow allows of the complete and rapid removal of solids, preventing the stranding of solids and consequent production of sewer gas.

The particular advantages of the "separate" system, as compared with the "combined," to meet the conditions of North Toronto are as follows :—

(a) Either in case of adopting pumping to city system or dealing with sewage by methods of autonomy, it is obvious that the less the amount, and more constant the amount, the greater will be the economy in both first cost and maintenance.

(b) North Toronto is so well provided with small watersheds forming natural drainage courses, that there is no difficulty in dealing with road surface water by shallow gutter drains and discharging them into the nearest water course. Such provision can be best made as the necessity arises for finishing road surfaces, than by any complete system of taking such drainage.

This report emphatically pronounces in favor of the "separate" system.

Referring to the plan, a system of sewerage on the "separate" system is laid out. The sewers shown in thick black lines provide for streets at present supplied Other sewers shown provide for streets with water. laid out but not supplied with water. It noted that the direction of flow is ruled by already laid out but not will be the direction of the grade of the watershed. The lay out of the system anticipates the adoption of autonomy, and provides for two sewage disposal areas, viz., Nos. 1 and 2, at which points the sewage may be treated before discharging into the streams. (See reference C.)

The line of sewers as shown will be the same whether pumping to city system or autonomy is adopted, apart from an alteration in the direction of the flow of sewage in East York Avenue and Merton Street.

The street sewers apart from trunk sewers will be generally of 8 inch diameter laid at least 7 feet deep to take cellar drainage. The gradients and diameter of the pipes will give ample capacity for both domestic and roof water under conditions of heavy rains. In calculating the diameters of trunk sewers, consideration has been given to the possible full growth of the town, and the sizes are such that the whole of the drainage on the "separate" system can be dealt with when the town is built up, with a twentyfive per cent. margin left as a safety discharge factor.

Manholes are provided at heads of sewer lengths, changes of gradient, and at points of junction between two or more sewers.

Junction pieces are allowed for on the street lengths at every fifty feet to receive branch connections from houses.

The chief consideration in laying out the system has been the concentration of the sewage at as few points as possible by gravitation only.

Watersheds Nos. 1 and 2 can be easily concentrated at the low end of the stream forming watershed No. 2. The objection to gravitating this combined discharge in order to connect with the town South of watershed No. 2 has been referred to, viz., probable interference with the supply of water to the town springs.

Watersheds Nos. 3, 4, 5 and 6 can be gravitated to the lower end of watershed No. 3, which presents an elevation of 254, as against 285 at the junction of Yonge and Merton. This concentration involves cutting through the heights of land dividing Nos. 6 and 5, Nos. 5 and 4 and Nos. 4 and 3 watersheds by the trunk sewers laid in Merton St. and East York Ave. The greatest depth of cutting between watersheds Nos. 6 and 5 being 23 feet for a distance of 488 feet; between Nos. 5 and 4 cutting, 20 feet for 706 feet; and between Nos. 4 and 3 cutting 25 feet for 561 feet. Where these depths occur it would be a serious matter to connect each house drain separately with the sewer; therefore, top, or high, level short lengths of 8 inch sewers are provided with natural watershed grades, at 7 feet deep, connecting with the trunk sewer at favorable points.

Assuming a town population of ten thousand, the above arrangement provides for a concentration of watersheds, Nos. 3, 4, 5 and 6, at disposal area No. 1 of 270,000 gals. per day, and of watersheds Nos. 1 and 2 at Disposal Area No. 2 of 30,000 gals. per day (dry weather flow in each case).

REFERENCE "C."

"As to disposing of the sewage within the district."

Having concentrated the sewage at the points marked Nos. 1 and 2 Disposal Areas, it is now a question of what treatment is reasonable and necessary, having due regard to the probable character of the sewage, and size and character of the streams into which it will ultimately discharge.

It is assumed that any system adopted should at least be capable of treating ten thousand persons or more than double the present population. The town is rapidly growing. Further, any system adopted should be sufficiently elastic to allow of extension to meet the requirements of the whole town when eventually built up, viz., a population of forty thousand (see appendix).

The sewage will be and is likely to continue of a domestic character, at least, the domestic proportion will probably at all times be greatly in excess of any possible waste products from manufacturing sources.

The amount of water supply per head, viz., 30 gals. per day (see appendix) gives a basis, allowing of an approximate determination of the strength of the sewage. By strict attention to all methods of keeping down water waste by leakages from mains and fittings, there is no reason why this rate of supply and strength of sewage should not remain constant.

The probable strength of the sewage may be fairly arrived at from the following typical analysis of sewage of towns on the "separate" system at 30 gals. water supply per head per day.

Ammonical Nitrogen	7.5
Oxygen absorbed in 4 hrs.	20.0
Suspended solids	40.0
(See Royal Commission 5th Report on Sewage Dispo	sal.

page 202.)

This represents a fairly strong domestic sewage. The strength depending on the amount of water supply per head. It is, however, a sewage easily treated, because of its concentration and constant quality.

Assuming the dry weather flow at 270,000 gals. per day for Area No. 1, and 30,000 gals. for Area No. 2.

If land intermittent filtration were possible, the least amount of land (of a first rate porous character such as a sand soil) which would be required (apart from land for sedimentation, etc.) would be 13 acres in the first instance, and $1\frac{1}{2}$ acres in the second, at a filtration rate of 20,000 gals. per acre per day. When such land of the desired quantity can be obtained easily and cheaply, this form of treatment is efficient. It is, however, seldom possible to obtain either the amount (allowing of extension for future requirements) or the suitable character of land. In the case of North Toronto it is impossible within reasonable limits of distance to obtain such land in the valleys in question.

There is, however, sufficient land in both these valleys to allow of Biological Filtration.

This system has the same effect upon the sewage as land intermittent filtration and the chemical changes which occur in the sewage are brought about by a similar process.

Biological Filtration implies filtering sewage through coarse material of broken slag or stone, by means of which organic matters both in suspension and solution are to a great extent retained. This retained matter undergoes within the filter a process of nitrification or oxidation, understood to be connected with the fermentative action produced by micro-organisms. The products of this chemical change of organic matters are inorganic, and as such are not subject to putrefaction. The products are partly given off in the form of gases, or as nitrates and nitrites in the effluent discharge.

This chemical change in sewage is the object of all modern methods of sewage treatment, whether by means of land or by artificially constructed nitrifying filters.

The adoption of the biological system means that much less area of land is required, independence of the porcesity character of the land, and at the same time an effluent which can be turned into streams without creating nuisance or offence. The

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land is only valued as far as it presents a base on which tanks and other structures may be safely erected.

Previous to subjecting sewage to biological filtration, it is expedient to adopt a form of preliminary treatment, in order to remove from sixty to seventy-five per cent. of the solids and floating greasy matter. This increases the duration of life of the filter, which will continue in action without disturbance for a period of from ten to fourteen years, after which the material may be calcined or washed.

The solids precipitated by sedimentation in tanks have to be removed periodically by either hand chain pumps or if possible by gravitation to dug-out pits in the land. It is then allowed to stand until sufficiently dried by drainage and evaporation to allow of it being carted and easily handled with spades. The solids now in the form of a compact sludge are of value as manure.

There is sufficient land in the neighborhood of both disposal areas for the purposes of biological filtration.

In the case of Disposal Area No. I about $1\frac{1}{2}$ acres of land would be ample.

In the case of Disposal Area No. 2 about $\frac{3}{4}$ acre of land would be ample.

In the case of Disposal Area No. 2, the site as marked upon the plan is located below the water pumping plant. The land on the East side of the stream is for a distance flat, but covered with light bush, which would require clearing. About 300 yds. further down the stream a cleared, almost circular plot of land presents itself, which is in every way suitable for the required purpose.

In the neighborhood of Disposal Area No. 1 there are several good sites to choose from.

REFERENCE "D."

"As to estimating the cost of A, B and C, and reporting as to which of the methods, A and C may be considered advisable."

- NOTE—In comparing the cost of methods of outfall, the cost of laying the pipe sewers will be practically the same in both cases.
- NOTE—The estimates are compiled with the assistance of Mr. A. I. McAllister, C.E., B.A.Sc., who has had a large experience in estimating the cost of public works of this description both in the United States and in Canada. Mn McAllister has been over the whole district with me several times and has made himself conversant with the conditions of the locality. The prices are in every case considered ample, and the actual work will probably cost less than the following estimates.

LAYING SEWERS FOR ALL STREETS SUPPLIED WITH WATER, INCLUDED IN BOTH SYSTEMS OF OUTFALL \$101,241.00.

A. COST OF CONNECTING TO TORONTO CITY Sewerage System Pumping from Watersheds Nos. 1 and 2 to No. 3	Y SYSTEM. \$101,241.00 6,300.00 . 6,600.00
Nos. 5 and 6 to City Connection	7,400.00
	\$121,541.00
Annual Maintenance for 3 pumping stations \$3,000 Capitalized at 5 per cent. Payment to City say \$100 per annum for each 1,000 gals, treated per day equals \$3,000 per	60,000.00
annum, capitalized at 5 per cent	60,000.00
Total cost of scheme to join City (A)	\$241,541.00
B. COST OF SEWERAGE SYSTEM.	
SEWERS FOR ALL STREETS SUPPLIED WITH	H WATER.
Sewers complete to Watersheds Nos. 3, 4, 5 and 6	\$86,709.00 14,532.00
Total cost of sewers at present required	\$101,241.00
SEWERS FOR ALL STREETS AT PRESENT BUT NOT SUPPLIED WITH WATER	LAID OUT
Sewers complete	\$8,842.00
TOTAL COST OF SEWERS FOR ALL STREETS AT PRESENT LAID OUT, WHETHER SUPPLIED WITH WATER OR OTHERWISE	\$110,083.00
(C) COST OF SEWAGE DISPOSAL WITHIN THE To Disposal Area No. 1 " 2	DISTRICT. \$22,000.00 8,000.00
	\$30,000.00
COMPARING COSTS OF A AND C.	
Sewerage System Disposal Areas Nos. 1 and 2	$\$101,241.00\ 30,000.00$
Total initial cost within district	\$131,241.00
cent.	14,000.00
Total cost with maintenance	\$146,241.00
Connecting with City system, including mainten- ance	\$241,541.00
maintenance	146,541.00
Extra cost incurred by joining City system	\$95,000.00

COST OF MAIN SEWERAGE AND SEWAGE DISPOSAL FOR EACH DISPOSAL AREA.

DISPOSAL	AREA	NO.	1	 \$108,709.00
DISPOSAL	AREA	NO.	2	 22,532.00

Total cost of system recommended for adoption \$131,241.00

The above report including the appendix attached is respectfully submitted for your consideration.

Yours obediently,

(Signed) T. AIRD MURRAY.

APPENDIX.

Present population of North Toronto, 4,206. Area of Town, 2,500 acres.

AREA OF WATERSHEDS.

No.	1	watershed	 120	acres
No.	2	44	 660	66
No.	3	44	 500	66
No.	4		 250	66
No.	5	44	 650	66
No.	6	**	 320	66

Total 2,500 acres

PRESENT NUMBER OF HOUSES TO EACH WATERSHED.

No.	. 1	watershed	 47	house
No.	. 2	**	 22	6.6
No	. 3	44	 254	**
No	. 4		 178	66
No	. 5	**	 245	66
No	. 6	"	 88	"
	Т	otal	 834	"

Area of watersheds available for building purposes after deducting for Roads, Streams, and Unsuitable Building Lands.

No.	1	watershed	deduct	20	per	cent.	equals	 96	acres
No.	2	**	**	40	per	cent.		 396	**
No.	3		66	10	per	cent.	"	 450	66
No.	4	66	66	7	per	cent.	" "	 233	66
No.	5	**	**	12	per	cent.	**	 572	66
No.	6	."	"	21	per	cent.	"	 253	**

Total Area available for building

Number of houses probable when Town is built up, at 4 houses per acre.

66

2,000 Acres X 4, equals 8,000 houses.

No. 1 watershed 384 houses No. 2 " No. 3 1;584 No. 4 932 No. 5 2,288 No. 6 1,012
Total
Number of houses on streets as at present laid out 834 Number of houses probable on streets as at present laid out
If present streets are built up 30,910 Future possible population 40,000
Percentage number of houses built as compared with the number probable in each watershed.No. 1 No. 2 5.7 per cent.No. 2 2.8 No. 3 2.8 No. 4 21.5 No. 5 29.4 No. 6 40.5
Population probable for each watershed.
$ \begin{array}{cccccccccccccccccccccccccccccccccccc$
Total 40,000 "
AMOUNT OF WATER SUPPLY. Pumped from springs located in East end of watershed No. 2. Amount pumped, year 1908
Amount allowed for sewage purposes, 30 gals. per head per day Probable water supply per day when Town is built up.
No. 1 watershed 57,600 gal. No. 2 " No. 3 " No. 4 " No. 5 " No. 6 "

Number of houses probable for each watershed.

Per day 1,200,000 gal.

DRY WEATHER FLOW

WET WEATHER FLOW.

For roof water allow 30 ft. x 20 ft. each house, equals 600 sq. feet, equals 86,400 sq. inches.

Allow 14 inches rain fall per day, equals 108,000 cub. inches in 24 hours, or 62.5 cub. feet.

Allow half of this in 6 hours, equals 31.25 cub. feet., or .086 c. feet per minute.

.086 in addition to .04 c. feet equals Total Wet Weather Flow of .12 c. feet per minute per house.

The following table shows the amount of discharge on above basis as compared with the amount the sewers can actually take at various points.

	Discharge in c. ft. per minute	Capability of sewer in c. ft. per minute.
At "A" on plan on Yonge St., Nos. 1 and 2 watersheds col-		
lected	129	152
At valley crossing watershed No. 2	169	240
Outfall sewer to valley No. 2	180	260
Outfall sewer to valley No. 1	488	859
East York Avenue	298	340
Merton Street	250	312
Collected at "G" Yonge Street	133	194
Collected at "C" East of Broad-		
way	127	160
Collected at "B" Yonge Street	82	152
Collected at "H" Eglinton	108	160

COST OF SEWERS.

Cost of sewers from watersheds Nos. 3, 4, 5 and 6, discharging at Disposal Area No. 1 applies to sewers in streets supplied with water. Prices include pipes, manholes and junctions complete.

	Cost.
Commencing at Disposal Area No. 1 to "E" on plans	800.00
East York Ave. greatest depth 25 feet	13,330.00
Merton Street, greatest depth, 23 feet	15,916.00
Merton Street, shallow sewer for house connections	2,346.00
Yonge Street (Merton to Glengrove Avenue)	6,020.00
Balliol Street	2,995.00
Davisville Avenue	1,893.00
Joseph Avenue	301.00
Glenwood Avenue	2,060.00
Soudan Avenue	2,749.00

Eglinton East	2.590.00
Cross Streets, Gordon, Stewart, East Beresford	2,000.00
Brownlow, Douglas, Evelyn, Lincoln and Gertrude	3.759.00
"F" on plan to Soudan (Trunk sewer)	1 893 00
Eglinton to Roehampton	999.00
Roehampton Avenue	1 907 00
Rochampton to "D" on plan	955.00
"E" to "C" on plan (Trunk Source)	200.00
Broadway Avanua	1 569 00
istoutinuty ittenue initiation initiation initiation	1,002.00
Carried forward	\$62,625.00
Brought forward	\$62,625.00
Broadway to Erskine (East)	255.00
Broadway to Erskine (West)	640.00
Erskine Avenue	1.894.00
Erskine to Woodward (East)	204.00
Erskine to Woodward (West)	244.00
Woodward Avenue	1.755.00
Woodward to Sherwood (East).	204.00
Woodward to Sherwood (West)	244.00
Sherwood Avenue	1.501.00
Crescent Avenue	456.00
Sheldrake Avenue	979.00
Franklin	979.00
Victoria Avenue	1 031 00
"G" on plan to "H" on plan Eglinton West	1.037.00
Eglinton West	1,894,00
"H" on plan to Briar Hill Avenue	1,488,00
Smiths Avenue	652.00
Montgomery Avenue	652.00
Kensington Avenue	1 553 00
Castlefield Avenue	313.00
Hawthorn Avenue	887.00
Briar Hill Avenue	939.00
Albertus Avenue	875.00
Roper Avenue	875.00
Glencairn Avenue	1 188 00
Glengrove Avenue	1 245 00
Grougeovo revoluto minimum minimum minimum	1,040.00

\$86,709.00

Cost of sewers from watersheds Nos. 1 and 2 discharging at Disposal Area No. 2. As per estimate above.

	Cost.
Commencing at Disposal Area No. 2 to Yonge St	\$2,392.00
Yonge St. Valley to North Boundary	2,894.00
"A" on Yonge to Bedford and Woburn	915.00
Woburn Avenue	509.00
"A" on Yonge to Ronan & Ranleigh	1.788.00
Ronan Avenue	1,474.00
Brechin Avenue	1,124.00
Roslin Avenue	1.124.00
Bowood Avenue	1,124.00
Ranleigh Avenue	1,188.00
Total for Watersheds 1 and 2	\$14,532.00

COST OF SEWERS COMPLETE.

Watersheds Nos. 3, 4, 5 and 6 to Disposal Area No. 1 \$86,709.00 Watersheds Nos. 1 and 2 to Disposal Area No. 2 14,532.00

SEWAGE DISPOSAL PURPOSES.

Amount of discharge based on dry weather flow 30 gals, per head, and for wet weather three times the dry weather flow.

Allow for population of 10,000 :--

Allow in accordance with proportionate area of each system as follows :--

DISPOSAL AREA NO. 1

Duplicate sedimentation tanks each 75 ft. x 20 ft. x 8 ft. deep, equals 75,000 gals., or a total of 150,000 gals., equals 13 hours flow.

Dosing tank supplying at the rate of 2 gals. per sq. yard of Area of filter.

Percolating filters, four in number, circular in shape, 50 ft. diameter by 6 ft. deep, equals 1744 cubic yards, equals about 150 gals. per cub. yard of filter.

Four drying Sludge Beds equal each, one discharge of sludge from tanks.

COST \$22,000.00

DISPOSAL AREA NO. 2.

Duplicate Sedimentation Tanks each 40 ft. x 7 ft. 6 in. x 8 ft. deep, equals 15,000 gals., or a total of 30,000 gals., equals 24 hours flow.

NOTE.—Owing to rapidity of growth this should soon be equal to 12 hours flow.

Dosing tank supplying at the rate of 2 gals. per square yard of Area filter.

Percolating filters, one in number, circular in shape, 40 feet diameter by 6 feet deep, equals 200 cubic yards, equals 150 gals. per cubic yard of filter.

Four Drying Sludge Beds equal each, one discharge of sludge from tanks.

COST, \$8,000.00

(Signed) T. AIRD MURRAY.



PLAN OF NORTH TORONTO MAIN SEWERAGE





THE STEVENSON PRINTING CO., 184 ADELAIDE ST. WEST, TORONTO.