



**SANITARY SEWAGE & WATER
INFRASTRUCTURE IMPACTS**

**CITY OF KINGSTON
URBAN GROWTH STRATEGY**

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J. L. Richards & Associates Limited
Consulting Engineers, Architects & Planners

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1.0 INTRODUCTION

The impact of the growth alternatives on the existing sanitary sewage and water infrastructure has been assessed. A computer model of the trunk sanitary sewers was developed by XCG Consultants Ltd. to assess the capacity of the sewer system relative to both existing and projected sewage flows. R. V. Anderson Associates Limited used a computer model of the water distribution network to identify those works required to support the continued development of Alternative 1, plus each of the other alternatives.

The assessment of the existing infrastructure is based upon the current collective knowledge of the existing systems. It is acknowledged that the sanitary sewer system is subject to infiltration and inflow which varies locally based on seasonal and/or precipitation events. The sewer model is not calibrated for such events but rather is based upon theoretical flow data, existing and projected connections, and local knowledge of the system.

The water model is based on water consumption data for the City and the theoretical water demand associated with projected residential and employment growth. Reasonable alternatives for meeting servicing needs have been identified. Other servicing options are possible. For example, an elevated tower could possibly be used in lieu of or in conjunction with ground level storage. Also, there may be more than one trunk watermain route available to service any particular alternative. Notwithstanding the foregoing, those scenarios identified form a reasonable basis for assessing the relative merits of the growth alternatives.

The works identified to support growth include work on the existing infrastructure plus those additional facilities required to provide service at the “front door” of the growth area. No consideration has been made for internal servicing requirements since these are considered to be the responsibility of the land developer and hence, the costs of such works would be borne by the developer.

2.0 SANITARY SEWAGE SYSTEM IMPACTS

The spreadsheet model of the City's trunk sanitary sewers was used to predict the impact of the various growth alternatives on the sanitary infrastructure. The model is based upon data from as-built drawings of the sewer system and the City's sewer design criteria. These criteria include residential flow rates of 350 litres per capita per day (Lpcd), the Harmon Peaking Factor, an infiltration allowance of 0.14 litres per hectare per second (L/ha.s), 28 cubic metres per hectare per day ($m^3/ha.d$) from industrial, commercial, and institutional (ICI) lands, and the population and employment figures presented elsewhere in this report.

The model was used to calculate the theoretical flows and the design capacity for each section of trunk sewer in the system. Those pipe sections, which theoretically exceed capacity, have been flagged as "bottlenecks." These sections are illustrated on Figures C-1 and C-2 for each of the five growth alternatives.

For the purpose of this study and the comparison of alternatives, only those pipe sections which have theoretical flows in excess of 105% of the pipe capacity have been identified as having to be twinned.

The model was designed to accommodate flow sharing between certain adjacent pipe sections to take advantage of available capacity. These modifications included:

- For twin sewers WI and WJ, 85-90% of the flow is directed to WI;
- For twin sewers WC and WD, all of the flow is directed to WC.

Without the above modifications, the modelling shows that one of the twin sections would surcharge while the other section would have spare capacity.

The sewer model also served to identify forcemains (FMs) which will have to be twinned, and sewage pumping stations (PSs) and water pollution control plants (WPCPs) which will require upgrading to accommodate expected sewage flows. The need to upgrade these facilities is based upon their current capacity versus projected flows associated with each alternative growth scenario. Table 2.1 identifies the trunk sections and the related facilities impacted by each of the growth alternatives. Table 2.2 presents the existing and projected capacities for the PSs and WPCPs.

TABLE 2.1 - Summary of Sanitary Infrastructure Impacts

	Alternative 1	Alternative 1 + 1A	Alternative 1 + 2	Alternative 1 + 3	Alternative 1 + 4
1.0 Sanitary Sewers					
	Location	Location	Location	Location	Location
1	Collins Bay Collector (WA) - 3 sections	Collins Bay Collector (WA) - 3 sections	Collins Bay Collector (WA) - 3 sections	Collins Bay Collector (WA) - 25 sections	Collins Bay Collector (WA) - 3 sections
2	Lincoln Drive (WC) - 1 section	Lincoln Drive (WC) - 1 section	Lincoln Drive (WC) - 1 section	Lincoln Drive (WC) - 20 sections	Lincoln Drive (WC) - 1 section
3	North- East Collector (WO) - 1 section	North- East Collector (WO) - 1 section	Pembridge Cr.(WD) - 8 sections	North- East Collector (WO) - 1 section	North- East Collector (WO) - 1 section
4	Bath Road (WP) 5 sections	Bath Road (WP) - 5 sections	NorthEast Collector (WO) - 1 section	Bath Road (WP) - 5 sections	Bath Road (WP) - 5 sections
5	North End Outfall Sewer (CI) 4 sections	North End Outfall Sewer (CI) 4 sections	Bath Road (WP) - 5 sections	North End Outfall Sewer (CI) - 4 sections	North End Outfall Sewer (CI) - 4 sections
6	North Harbour Front Interceptor (CK) - 3 sections	North Harbour Front Interceptor (CK) - 3 sections	North End Outfall Sewer (CI) - 4 sections	North Harbour Front Interceptor (CK) - 3 sections	North Harbour Front Interceptor (CK) - 3 sections
7	King Street (CP) - 2 sections	King Street (CP) - 2 sections	North Harbour Front Interceptor (CK) - 3 sections	King Street (CP) - 2 sections	King Street (CP) - 2 sections
8	Highway #15 Trunk (EA) - 18 sections	Highway #15 Trunk (EA) - 18 sections	King Street (CP) - 2 sections	Highway #15 Trunk (EA) - 18 sections	Highway #15 Trunk (EA) - 18 sections
9	Highway #15 Trunk (ED) - 2 sections	Highway #15 Trunk (ED) - 2 sections	Highway #15 Trunk (EA) - 22 sections	Highway #15 Trunk (ED) - 2 sections	Highway #15 Trunk (ED) - 2 sections
10	Trunk Interconnections (W0/WP; WC/WZ/WD; W1/WJ)	Trunk Interconnections (W0/WP; WC/WZ/WD; W1/WJ)	Highway #15 Trunk (ED) - 2 sections	Trunk Interconnections (W0/WP; WC/WZ/WD; W1/WJ)	Highway #2 - West Half - 23 sections
11			Trunk Interconnections (W0/WP; WC/WZ/WD; W1/WJ)		Highway #2 - East Half - 8 sections
12					Trunk Interconnections (W0/WP; WC/WZ/WD; W1/WJ)
2.0 Forcemains					
1	Butternut Creek	Butternut Creek	Butternut Creek	Butternut Creek	Butternut Creek
2		Collins Bay (CSC)		Westbrook	Highway #2 (Alternative 4)
3				Mona Drive	
4				Mile Square (Alternative 3)	
3.0 Pumping Stations					
1	Westbrook	Westbrook	Westbrook	Westbrook	Westbrook
2	Butternut Creek	Butternut Creek	Butternut Creek	Butternut Creek	Butternut Creek
3	North End	North End	North End	North End	North End
4		Collins Bay (CSC)		Mona Drive	Highway #2 (Alternative 4)
5				Days Road	
6				Mile Square (Alternative 3)	
4.0 Water Pollution Control Plants					
1	Kingston West	Kingston West	Kingston West	Kingston West	Kingston West
2	Ravensview	Ravensview	Ravensview	Ravensview	Ravensview

Notes:

- 1 Refer to Figures C-1 and C-2 for pipe section and facility locations.
- 2 Trunk sewers have a two letter pipe indicator (e.g. WA, CA, EA). The first letter indicates whether the trunk sewer is in Kingston West, Centre, or East. The second letter refers to the particular trunk sewer.
- 3 The number of sections indicates the number of sewer sections - manhole to manhole. Section lengths vary.

There are several key sanitary infrastructure projects which have not been identified in Figures C-1, C-2, and Table 2.1, since they are already under design or construction. These projects, which do not impact on the evaluation process, include the following:

- Utilities Crossing of the Great Cataraqui River;
- River Street Pumping Station;
- Harbour Front Trunk Sewer from Brock Street to River Street PS;
- Combined Sewer Overflow (CSO) at River Street PS; and
- CSO at Kingston Centre Water Treatment Plant (WTP).

In addition, there are several pipe sections on the King Street trunk sewer (Section CP in the sewer model and Figure C-1), which theoretically exceed pipe capacity. This condition has been taken into consideration in the design of the adjacent CSO facility. No replacement or twinning of these pipe sections is proposed.

TABLE 2.2 - PS and WPCP Capacity Projections

Facilities	Existing Capacity	Alternatives (Projected Flows ²)					
		1	1A	2	3	4	5
Pumping Stations							
Westbrook ³	15	30	-	-	60	-	-
Mona Drive ³	190	-	-	-	540	-	-
Days Road ³	1320	-	-	1360 ⁴	1510	-	-
North End ³	580	1080	-	-	-	-	-
River Street ³	1100	1700	-	-	-	-	1900
Butternut Creek ³	125	225	-	260	-	-	-
Alternative 1A PS	-	-	190	-	-	-	-
Alternative 3 PS	N/A	-	-	-	430	-	-
Alternative 4 PS	N/A	-	-	-	-	210	-
Alternative 5 PS	N/A	-	-	-	-	-	193
WPCPs (m³/d)							
Kingston West	38,800	42,000	50,000	50,500	58,000	42,000	42,000
Ravensview	72,800	92,500	95,000	95,000	92,500	102,500	100,000
Notes:							
.1 Information from existing reports.							
.2 Projected flows based on sewer model analysis.							
.3 Existing PSs to be upgraded to support growth. New stations are required to service Alternatives 3, 4, and 5.							
.4 Predicted flows and existing capacity are very close. Assume no significant upgrade is required for Alternative 2.							

Several observations are noted regarding the infrastructure impacts noted in Tables 2.1 and 2.2:

Alternative 1

- .1 Three bottlenecks are identified on the Collins Bay Collector (WA) and an additional one identified on Lincoln Drive (WC). There are no known problems identified with these areas. It is possible, however, that as Westbrook continues to develop, these sections may become problematic.
- .2 A bottleneck is identified on the North East Collector (WO). This pipe section has a flat gradient and is likely to become more problematic as development continues to occur within this particular sewershed.

- .3 Five pipe sections have been identified on the Bath Road sewer (WP). No known problems exist in this area. Assuming that there are indeed no problems, this area may continue to function satisfactorily without any necessary work.
- .4 Sewer interconnections are proposed to load share between adjacent sewers at WC/WZ/WD; WI/WJ; and WO/WP.
- .5 There are 4 bottleneck sections identified for the North End Sewer Outfall (CI). There are no known problems in these areas presently. These sections will become problematic following the upgrade of the North End Pumping Station and the full development of the service area.
- .6 The 3 sewer sections identified for the North Harbourfront Interceptor (CK) will be impacted when the North End Pumping Station is upgraded and pumping at its full capacity.
- .7 The existing bottleneck sections on King Street (CP) are not expected to experience any significant development and should continue to function without further impact.
- .8 The service area for the Rideau Community along Highway 15 was expanded by the former Township of Pittsburgh to include the St. Lawrence Business Park. The Highway 15 trunk sewer was not originally designed to accommodate this area and hence, there are a number of bottlenecks identified (EA).
- .9 The Highway 15 trunk sewer (ED) will have to be twinned to accommodate future growth within this service area.
- .10 The original forcemain from the Butternut Creek Pumping Station to Pumping Station B40 will have to be twinned in order to accommodate future growth in the Rideau Community.
- .11 Westbrook, Butternut Creek, and the North End Pumping Stations will require upgrades in order to accommodate growth associated with Alternative 1.
- .12 Both WPCPs will have to be expanded to accommodate projected growth.

Alternative 1 + 1A

- .1 No sewer upgrades are expected on the Ravensview trunk sewer (EE). A larger upgrade to the Ravensview WPCP would be required than for Alternative 1 (95,000 vs. 92,500 m³/d).
- .2 To service the Collins Bay Institution lands, a new sewage pumping station and forcemain would have to be constructed. Additionally, a larger expansion of the Kingston West WPCP would be required (50,000 vs. 42,000 m³/d).

Alternative 1 + 2

- .1 The development area associated with Alternative 2 is reflected in the current Official Plans for Kingston West and Kingston East. Servicing for these areas has, for the most part, already been taken into consideration.
- .2 There are 8 sewer bottlenecks identified on trunk sewer WD, the majority of which are on Pembridge Crescent.
- .3 Four additional sewer bottlenecks are identified on the Highway 15 trunk (EA). The upgrades to the Butternut Creek Pumping Station will be slightly greater in order to accommodate this alternative.
- .4 The projected flows at the Days Road Pumping Station will increase by approximately 3% with this alternative. This increase is considered too close to the existing capacity to suggest any significant work on the Days Road Pumping Station is required for this alternative.

Alternative 1 + 3

- .1 Alternative 3 was not identified in the original servicing plans for the former Township of Kingston, and consequently the impact on the sanitary infrastructure for this alternative is more significant.

- .2 The number of bottleneck sections on the Collins Bay Collector (WA) and the Lincoln Drive sewer (WC) are much greater.
- .3 A new pumping station and forcemain will be required in order to service this alternative. Significant impacts will be experienced at the Mona Drive and the Days Road Pumping Stations. The forcemain from Mona Drive will have to be twinned.
- .4 The flow at the Westbrook Pumping Station is expected to increase fourfold, thus necessitating a significant upgrade to this station. It is anticipated a new forcemain from the station will be extended to the vicinity of the Westbrook/Woodbine Road intersection, at which point the forcemain will connect into the internal sewer system within the Alternative 3 area. This will result in a slight oversizing of the sewer through Alternative 3. This will avoid forcemain twinning along Woodbine Road, as well as a significant reduction in sewer twinning along the upper reaches of the Collins Bay collector sewer (WA).

Alternative 1 + 4

- .1 Alternative 4 will require the construction of a trunk sanitary sewer along Highway 2, within the St. Lawrence Community, in order to service future development lands. A pumping station and forcemain is required on the south side of the highway in order to accommodate the varied topography.
- .2 The section of trunk sewer running southerly from the most easterly trunk sewer to the pumping station will be on private lands. The cost of this section of sewer has not been included in the cost projections for this alternative.

Alternative 1 + 5

- .1 This alternative involves the construction of a sewage pumping station and forcemain north of Highway 401 at Division Street.
- .2 One additional sewer bottleneck has been identified on the North End Sewer Outfall (CI).

3.0 WATER SYSTEM IMPACTS

The impact of the alternative growth scenarios on the City's existing water infrastructure was assessed. Estimates of average and maximum day demand and peak hour demand were made based upon City and Ministry of Environment design criteria and the projected residential and ICI development. The City's water distribution network model was used to assess the existing system's ability to satisfy projected demands and to identify possible improvements to support the growth alternatives.

Water treatment plant capacity, water storage, and system pumpage requirements were also estimated. The proposed trunk watermains, booster stations, and storage facilities are illustrated on Figure C-3. Table 3.1 lists the various works required to support the growth alternatives.

There are several watermain projects illustrated on Figure C-3 which are identified as work to be completed in 2003. These projects have been taken into consideration in the modelling assessment but they are not included in the works listed in Table 3.1, nor have they been included in the cost estimates presented elsewhere in this report.

Figure C-3 identifies new trunk watermains with a solid bold line, an indication of pipe size, and the alternative number. A dashed, bold line is used to indicate trunk watermains "by others." These mains are considered internal to the individual development areas and would be constructed by the developers. No cost estimate was prepared for these watermains.

TABLE 3.1 – Water System Improvements

Alternative 1		
Required Works	Size	Length
Watermain		
King Street/Front Road WM	400 mm	1,780 m
Counter Street WM	400 mm	800 m
Princess Street WM	400 mm	690 m
Centennial Drive WM	400 mm	1,295 m
Bath Road Interconnection	300 mm	50 m
Gore Road-Elliott Avenue WM	400 mm	1,440 m
Creekford Road WM	400 mm	475 m
Booster Stations/Storage		
Gardiners Road Upgrade	-	
Creekford Elevated Trunk	4,500 m ³	
O'Connor Drive BS and Reservoir	15,400 m ³	
Gore Road BS and Reservoir	4,500 m ³	
Water Treatment Plants (WTP)		
Kingston West WTP	48 ML/d	
Alternative 1 + 1A		
Kingston West WTP	59 ML/d	-
Alternative 1 + 2		
Kingston West WTP	57 ML/d	-
Alternative 1 + 3 (additional works)		
Taylor-Kidd Trunk WM	400 mm	2,140 m
Booster Station and Reservoir	9,100 m ³	
Kingston West WTP	69 ML/d	
Alternative 1 + 4 (additional works)		
CFB Kingston Trunk WM	300 mm	910 m
Kingston West WTP	60 ML/d	
Alternative 1 + 5 (additional works)		
Division Street WM	400 mm	385 m
Dauphin Woods Connecting WM	300 mm	165 m
Booster Station and Reservoir	4,500 m ³	
Kingston West WTP	58 ML/d	

The proposed works for the various growth alternatives are summarized as follows:

Alternative 1

- .1 Trunk 400 mm watermains are proposed on King Street/Front Road, Counter Street, and Princess Street to link the City West and City Centre water systems to improve overall performance.
- .2 A 400 mm trunk main is proposed for Centennial Drive, in conjunction with road extension and railway grade separation.
- .3 The existing control valve on the Bath Road watermain should be opened to provide an additional link between City West and Centre systems.
- .4 The Gore Road/Elliott Avenue watermain crossing with booster station and reservoir are proposed to support continued growth in the Rideau Community. This crossing could be constructed with the third bridge crossing or completely independently.
- .5 The Creekford Road elevated storage tower and 400 mm trunk watermains are scheduled for 2004 construction to satisfy existing water pressure and demand issues in the Pressure Zone 2 area of Kingston West. Improvements to the Gardiners Road BS are scheduled to coincide with this work.
- .6 The O'Connor Drive reservoir and BS are proposed to further augment water storage and pumpage requirements associated with continued development within the northwesterly portion of Kingston West.
- .7 The Kingston West WTP would have to be expanded to 48 ML/d.

Alternative 1 + 1A

- .1 The Kingston West WTP would have to be expanded to 59 ML/d.
- .2 Development of the Alternative 1A lands will require the construction of internal trunk watermains to provide sufficient water to those areas.

Alternative 1 + 2

- .1 Development of the Alternative 2 lands will require the construction of internal trunk watermains to provide sufficient water to those areas.
- .2 The Kingston West WTP would have to be expanded to 57 ML/d.

Alternative 1 + 3

- .1 This scenario will require a 400 mm trunk watermain along Taylor-Kidd Boulevard to service the area.
- .2 A water booster station and water storage reservoir are proposed in the vicinity of Taylor-Kidd and Collins Creek.
- .3 An internal trunk watermain looped to the 300 mm watermain on Westbrook Road is proposed to provide sufficient water throughout the development area.
- .4 The Kingston West WTP would have to be expanded to 69 ML/d.

Alternative 1 + 4

- .1 A second trunk main from CFB Kingston to the westerly limit of Area 9 in Alternative 4 is proposed to provide a looped main to the development area. An internal loop is proposed to link with the existing trunk main in the vicinity of the Milton tower.
- .2 The Kingston West WTP would have to be expanded to 60 ML/d.

Alternative 1 + 5

- .1 A 400 mm trunk watermain is proposed along outer Division Street to a new BS and reservoir just north of Highway 401.
- .2 A second trunk main from the Dauphin Woods area is proposed to link with an internal trunk main within the Alternative 5 area.

- .3 The Kingston West WTP would have to be expanded to 58 ML/d.

4.0 CONSTRUCTION TIMING

An estimate of construction timing is necessary to assist in the present value analysis of costs for the growth alternatives. There are no specific dates for the works associated with growth in Alternative 1. Noted exceptions include the following works which are scheduled for 2004: 400 mm diameter trunk watermain and elevated storage tank on Creekford Road and the Gardiners Road Booster Station upgrade. The North End Pumping Station upgrade is scheduled for approximately 2008.

The timing of proposed works will in part be dictated by such matters as market demand for housing and/or employment lands, the interests of landowners within the development community, and the City's ability to plan and pay for supporting infrastructure. Recognizing these uncertainties, an attempt was made to identify works as occurring within approximately 5 year periods during the planning horizon.

The works associated with Alternative 1 are assumed to occur within the 1 to 5 or 6 to 10 year period. Others, such as the Gore-Elliott watermain crossing to Kingston East, are anticipated in the next 11 to 15 years.

Prior to any development within alternative areas 1A, 2, 3, 4, or 5, the landowners will have to prepare secondary plans and supporting studies for the review and approval of the City. This work may take approximately 5 years to complete. It may take a further 2 or 3 years before development within the area starts to possibly place a demand on the existing infrastructure and/or before any supporting infrastructure is constructed. Therefore, work supporting development within Alternatives 1A, 2, 3, 4, or 5 is assumed to commence within 6 to 10 years.

There are certain sewer sections which have been identified as bottlenecks. Some of these sections have not previously been identified as problem areas and they are not expected to experience significant growth. Perhaps no issues actually exist. It is assumed these areas will be monitored and if essential, any remediation will be undertaken. Because there are no known problems in these areas at present, it is assumed any necessary work will occur in the 16 to 20 year period.

The scheduling of WPCP and WTP upgrades is largely a function of available capacity and the rate of growth. Table 4.1 presents a summary of rated versus uncommitted capacity for the treatment plants. The remaining life expectancy is also estimated.

TABLE 4.1 – Rated Versus Uncommitted Plant Capacity

	Kingston West WPCP	Ravensview WPCP	Kingston West WTP	Kingston Centre WTP
Rated Capacity	38,800 m ³ /d	72,800 m ³ /d	46 ML/d	118 ML/d
Daily Flow ¹	28,012 m ³ /d	69,464 m ³ /d	37.9 ML/d	77.1 ML/d
Committed Flow ²	1,238 m ³ /d	3,053 m ³ /d	1.7 ML/d	3.39 ML/d
Uncommitted Capacity	9,550 m ³ /d	283 m ³ /d	6.4 ML/d	37.51 ML/d
Years Remaining ³	14.0	0.3	7.0	38.4

Notes:

- .1 Based on average annual daily flow from 2001 to 2003 for WPCPs and maximum day flows for WTPs.
- .2 Flow is based upon the number of committed units times the estimated population and per capita flow rate. Per capita flow is based upon the three-year average day flow and the connected population for WPCPs. Per Capita flow for WTPs is based upon the maximum day flows and connected population. The number of committed units is based upon City Planning data to December 2003. Plans with a holding designation are excluded from these calculations.
- .3 Years remaining are based on uncommitted capacity and the historical residential growth rates for Kingston West versus Kingston Centre and East (402 versus 342 units/year). The same per capita flow rate identified above assumed.

5.0 COST ESTIMATES

Construction cost estimates for the works required to support each growth alternative were developed using a variety of data sources including recent project costs and local knowledge. The local construction industry was consulted and a database developed to estimate the cost of sewer, watermain, and forcemain construction for varying field conditions. Rock was assumed to be 1.0 metre below ground elevation in all but the valley lands. Restoration costs were based upon the existing ground surface conditions and the depth of trench. Sewers and forcemains were assumed to twin existing pipes to facilitate continued service during construction. Existing

pipes were assumed to remain in service, hence, new pipes will primarily handle the flows associated with growth.

The construction cost estimates for booster stations, water storage facilities, pumping stations, and water and wastewater treatment plants were based on the projected capacity upgrades, assumptions about the expected work, and construction costs for similar work.

The sanitary and water facilities have not undergone detailed condition and/or performance evaluations and hence the construction cost estimates are approximate. Similarly, no field or geotechnical surveys have been conducted along the route of any pipe works. Notwithstanding this, the cost estimates present a reasonable cost comparison between the alternatives.

Table 5.1 summarizes the estimated costs and approximate construction timing for the works associated with each alternative. The estimates include the construction cost plus a 40% allowance for contingencies (25%) and engineering (15%).

**TABLE 5.1 - Construction Cost Estimates
ALTERNATIVE 1**

1.0 Sanitary Sewers	Location	Cost	Timing (yrs)	Note	Rates \$	Impost \$	
.1	Collins Bay Collector (WA) -3 sections	162 (m)	\$170,000	16-20	1	--	\$170,000
.2	Lincoln Drive (WC) - 1 section	52	\$50,000	16-20	1	--	\$50,000
.3	North-East Collector (WO) -1 section	89	\$120,000	6-10	1	--	\$120,000
.4	Bath Road (WP) -5 sections	591	\$420,000	11-15	1	--	\$420,000
.5	North End Outfall Sewer (CI) -4 sections	219	\$240,000	6-10	1	--	\$240,000
.6	North Harbour Front Interceptor (CK) -3 sections	362	\$510,000	6-10	1	--	\$510,000
.7	King Street (CP) -2 sections	55	\$80,000	11-15	1	--	\$80,000
.8	Highway #15 Trunk (EA) -18 sections	1364	\$1,300,000	11-15	1	--	\$1,300,000
.9	Highway #15 Trunk (ED) -2 sections	218	\$190,000	6-10	1	--	\$190,000
.10	Trunk Interconnections (WO/WP; WC/WZ/WD; WI/WJ)		\$20,000	6-10	1	--	\$20,000
	Sub-Total		\$3,100,000			--	\$3,100,000
2.0 Forcemains							
.1	Butternut Creek	614 (m)	\$340,000	6-10	2	--	\$340,000
	Sub-Total		\$340,000			--	\$340,000
3.0 Pumping Stations							
.1	Westbrook	30 (Lps)	\$200,000	6-10	2	--	\$200,000
.2	Butternut Creek	230	\$1,000,000	6-10	2	--	\$1,000,000
.3	North End	1080	\$3,200,000	5	3	\$1,984,000	\$1,216,000
	Sub-Total		\$4,400,000			\$1,984,000	\$2,416,000
4.0 Sewage Treatment Plants							
.1	Kingston West	42000 (m ³ /d)	\$4,000,000	11-15	4	--	\$4,000,000
.2	Ravensview	92,500	\$97,500,000	1-5	5	\$72,800,000	\$24,700,000
	Sub-Total		\$101,500,000			\$72,800,000	\$28,700,000
	Total Sewer Infrastructure Estimated Cost		\$109,340,000			\$74,784,000	\$34,556,000
5.0 Trunk Watermains							
.1	Creekford Road to Water Tower	475 (m)	\$400,000	1	7	--	\$400,000
.2	Creekford Road Tower to Growth Area 1	475	\$385,000	6-10	7	--	\$385,000
.3	King Street-Front Road	1,780	\$1,450,000	6-10	6	\$725,000	\$725,000
.4	Bath Road	50	\$50,000	1-5	6	\$25,000	\$25,000
.5	Counter Street	800	\$660,000	1-5	6	\$330,000	\$330,000
.6	Princess Street	690	\$560,000	1-5	6	\$280,000	\$280,000
.7	Gore-Elliot	1,440	\$1,500,000	11-15	7	--	\$1,500,000
.8	Centennial Drive	1,295	\$1,050,000	6-10	7	--	\$1,050,000
	Sub-Total		\$6,055,000			\$1,360,000	\$4,695,000
6.0 Water Booster Stations							
.1	O'Connor Drive	68.6 (ML/d)	\$3,600,000	6-10	7	--	\$3,600,000
.2	Gore-Elliot	11.2	\$1,630,000	11-15	7	--	\$1,630,000
.3	Gardiniers Road		\$700,000	1	7	--	\$700,000
	Sub-Total		\$5,930,000			--	\$5,930,000
7.0 Water Storage							
.1	Creekford Road	4500 (m ³)	\$2,900,000	1	7	--	\$2,900,000
.2	O'Connor Drive	15,400	\$6,300,000	6-10	7	--	\$6,300,000
.3	Gore-Elliot	4,500	\$2,100,000	11-15	7	--	\$2,100,000
	Sub-Total		\$11,300,000			--	\$11,300,000
8.0 Water Purification Plants							
.1	Kingston West	48 (ML/d)	\$1,500,000	11-15	7	--	\$1,500,000
	Sub-Total		\$1,500,000			--	\$1,500,000
	Total Water Infrastructure Estimated Cost		\$24,785,000			\$1,360,000	\$23,425,000
	Total Estimated Cost		\$134,125,000			\$76,144,000	\$57,981,000
	Total Estimated Population		135,899			135,899	
	Estimated Population (Growth Only)		35,965				35,965
	Cost Per Capita (Total Population)		\$986.95			\$560.30	
	Cost Per Capita (Growth Only)		\$3,729.32				\$1,612.15

**TABLE 5.1 - Construction Cost Estimates
ALTERNATIVE 1 + 1A**

1.0	Sanitary Sewers						
	Location		Cost	Timing (yrs)	Note	Rates \$	Impost \$
.1	Collins Bay Collector (WA) -3 sections	162 (m)	\$170,000	16-20	1	--	\$170,000
.2	Lincoln Drive (WC) - 1 section	52	\$50,000	16-20	1	--	\$50,000
.3	North-East Collector (WO) -1 section	89	\$120,000	6-10	1	--	\$120,000
.4	Bath Road (WP) -5 sections	591	\$420,000	11-15	1	--	\$420,000
.5	North End Outfall Sewer (CI) -4 sections	219	\$240,000	6-10	1	--	\$240,000
.6	North Harbour Front Interceptor (CK) -3 sections	362	\$510,000	6-10	1	--	\$510,000
.7	King Street (CP) -2 sections	55	\$80,000	11-15	1	--	\$80,000
.8	Highway #15 Trunk (EA) -18 sections	1364	\$1,300,000	11-15	1	--	\$1,300,000
.9	Highway #15 Trunk (ED) -2 sections	218	\$190,000	6-10	1	--	\$190,000
.10	Trunk Interconnections (WO/WP; WC/WZ/WD; WI/WJ)		\$20,000	6-10		--	\$20,000
	Sub-Total		\$3,100,000			--	\$3,100,000
2.0	Forcemains						
.1	Butternut Creek	614 (m)	\$340,000	6-10	2	--	\$340,000
.2	Collins Bay (CSC)	300	\$200,000	16-20	2	--	\$200,000
	Sub-Total		\$540,000			--	\$540,000
3.0	Pumping Stations						
.1	Westbrook	30 (Lps)	\$200,000	6-10	2	--	\$200,000
.2	Butternut Creek	230	\$1,000,000	6-10	2	--	\$1,000,000
.3	North End	1080	\$3,200,000	5	3	\$1,984,000	\$1,216,000
.4	Collins Bay (CSC)	190	\$1,800,000	16-20	2	--	\$1,800,000
	Sub-Total		\$6,200,000			\$1,984,000	\$4,216,000
4.0	Sewage Treatment Plants						
.1	Kingston West	50000 (m ³ /d)	\$14,000,000	11-15	4	--	\$14,000,000
.2	Ravensview	95,000	\$100,500,000	1-5	5	\$72,800,000	\$27,700,000
	Sub-Total		\$114,500,000			\$72,800,000	\$41,700,000
	Total Sewer Infrastructure Estimated Cost		\$124,340,000			\$74,784,000	\$49,556,000
5.0	Trunk Watermains						
.1	Creekford Drive	475 (m)	\$400,000	1	7	--	\$400,000
.2	Creekford Road Tower to Growth Area 1	475	\$385,000	6-10	7	--	\$385,000
.3	King Street-Front Road	1,780	\$1,450,000	6-10	6	\$725,000	\$725,000
.4	Bath Road	50	\$50,000	1-5	6	\$25,000	\$25,000
.5	Counter Street	800	\$660,000	1-5	6	\$330,000	\$330,000
.6	Princess Street	690	\$560,000	1-5	6	\$280,000	\$280,000
.7	Gore-Elliot	1,440	\$1,500,000	11-15	7	--	\$1,500,000
.8	Centennial Drive	1,295	\$1,050,000	6-10	7	--	\$1,050,000
	Sub-Total		\$6,055,000			\$1,360,000	\$4,695,000
6.0	Water Booster Stations						
.1	O'Connor Drive	68.6 (ML/d)	\$3,600,000	6-10	7	--	\$3,600,000
.2	Gore-Elliot	11.2	\$1,630,000	11-15	7	--	\$1,630,000
.3	Gardiners Road		\$700,000	1	7	--	\$700,000
	Sub-Total		\$5,930,000			--	\$5,930,000
7.0	Water Storage						
.1	Creekford Drive	4500 (m ³)	\$2,900,000	1	7	--	\$2,900,000
.2	O'Connor Drive	15,400	\$6,300,000	6-10	7	--	\$6,300,000
.3	Gore-Elliot	4,500	\$2,100,000	11-15	7	--	\$2,100,000
	Sub-Total		\$11,300,000			--	\$11,300,000
8.0	Water Purification Plants						
.1	Kingston West	59 (ML/d)	\$8,000,000	11-15	7	--	\$8,000,000
	Sub-Total		\$8,000,000			--	\$8,000,000
	Total Water Infrastructure Estimated Cost		\$31,285,000			\$1,360,000	\$29,925,000
	Total Estimated Cost		\$155,625,000			\$76,144,000	\$79,481,000
	Total Estimated Population		148,549			153,546	
	Estimated Population (Growth Only)		48,615				53,612
	Cost Per Capita (Total Population)		\$1,047.63			\$495.90	
	Cost Per Capita (Growth Only)		\$3,201.17				\$1,482.52

**TABLE 5.1 - Construction Cost Estimates
ALTERNATIVE 1+2**

1.0 Sanitary Sewers	Location	Cost	Timing (yrs)	Note	Rates \$	Impost \$	
.1	Collins Bay Collector (WA) -3 sections	162 (m)	\$170,000	16-20	1	--	\$170,000
.2	Lincoln Drive (WC) - 1 section	52	\$50,000	16-20	1	--	\$50,000
.3	Pembridge Cr.(WD) - 8 sections	773	\$820,000	11-15	1	--	\$820,000
.4	North-East Collector (WO) -1 section	89	\$120,000	6-10	1	--	\$120,000
.5	Bath Road (WP) -5 sections	591	\$420,000	11-15	1	--	\$420,000
.6	North End Outfall Sewer (CI) -4 sections	219	\$240,000	6-10	1	--	\$240,000
.7	North Harbour Front Interceptor (CK) -3 sections	362	\$510,000	6-10	1	--	\$510,000
.8	King Street (CP) -2 sections	55	\$80,000	11-15	1	--	\$80,000
.9	Highway #15 Trunk (EA) -22 sections	1693	\$1,620,000	11-15	1	--	\$1,620,000
.10	Highway #15 Trunk (ED) -2 sections	218	\$190,000	6-10	1	--	\$190,000
.11	Trunk Interconnections (WO/WP; WC/WZ/WD; WI/WJ)		\$20,000	6-10	1	--	\$20,000
	Sub-Total		\$4,240,000			--	\$4,240,000
2.0 Forcemains							
.1	Butternut Creek	614 (m)	\$360,000	6-10	2	--	\$360,000
	Sub-Total		\$360,000			--	\$360,000
3.0 Pumping Stations							
.1	Westbrook	30 (Lps)	\$200,000	6-10	2	--	\$200,000
.2	Butternut Creek	260	\$1,000,000	6-10	2	--	\$1,000,000
.3	North End	1080	\$3,200,000	5	3	\$1,984,000	\$1,216,000
	Sub-Total		\$4,400,000			\$1,984,000	\$2,416,000
4.0 Sewage Treatment Plants							
.1	Kingston West	50500 (m ³ /d)	\$14,500,000	11-15	4	--	\$14,500,000
.2	Ravensview	95,000	\$100,500,000	1-5	5	\$72,800,000	\$27,700,000
	Sub-Total		\$115,000,000			\$72,800,000	\$42,200,000
	Total Sewer Infrastructure Estimated Cost		\$124,000,000			\$74,784,000	\$49,216,000
5.0 Trunk Watermains							
.1	Creeford Drive	475 (m)	\$400,000	1	7	--	\$400,000
.2	Creeford Road Tower to Growth Area 1	475	\$385,000	6-10	7	--	\$385,000
.3	King Street-Front Road	1,780	\$1,450,000	6-10	6	\$725,000	\$725,000
.4	Bath Road	50	\$50,000	1-5	6	\$25,000	\$25,000
.5	Counter Street	800	\$660,000	1-5	6	\$330,000	\$330,000
.6	Princess Street	690	\$560,000	1-5	6	\$280,000	\$280,000
.7	Gore-Elliot	1,440	\$1,500,000	11-15	7	--	\$1,500,000
.8	Centennial Drive	1,295	\$1,050,000	6-10	7	--	\$1,050,000
.9	Creeford Road Tower to Growth Area 2	950	\$650,000				
	Sub-Total		\$6,705,000			\$1,360,000	\$4,695,000
6.0 Water Booster Stations							
.1	O'Connor Drive	68.6 (ML/d)	\$3,600,000	6-10	7	--	\$3,600,000
.2	Gore-Elliot	11.2	\$1,630,000	11-15	7	--	\$1,630,000
.3	Gardiners Road		\$700,000	1	7	--	\$700,000
	Sub-Total		\$5,930,000			--	\$5,930,000
7.0 Water Storage							
.1	Creeford Drive	4500 (m ³)	\$2,900,000	1	7	--	\$2,900,000
.2	O'Connor Drive	15,400	\$6,300,000	6-10	7	--	\$6,300,000
.3	Gore-Elliot	4,500	\$2,100,000	11-15	7	--	\$2,100,000
	Sub-Total		\$11,300,000			--	\$11,300,000
8.0 Water Purification Plants							
.1	Kingston West	57 (ML/d)	\$8,000,000	11-15	7	--	\$8,000,000
	Sub-Total		\$8,000,000			--	\$8,000,000
	Total Water Infrastructure Estimated Cost		\$31,935,000			\$1,360,000	\$29,925,000
	Total Estimated Cost		\$155,935,000			\$76,144,000	\$79,141,000
	Total Estimated Population		148549			148,549	
	Estimated Population (Growth Only)		48615				48,615
	Cost Per Capita (Total Population)		\$1,049.72			\$512.59	
	Cost Per Capita (Growth Only)		\$3,207.55				\$1,627.91

**TABLE 5.1 - Construction Cost Estimates
ALTERNATIVE 1+3**

1.0 Sanitary Sewers	Location	Cost	Timing (yrs)	Note	Rates \$	Impost \$	
.1	Collins Bay Collector (WA) -25 sections	1506 (m)	\$3,000,000	6-10	1	--	\$3,000,000
.2	Lincoln Drive (WC) - 20 sections	1790	\$2,700,000	6-10	1	--	\$2,700,000
.3	North-East Collector (WO) -1 section	89	\$120,000	6-10	1	--	\$120,000
.4	Bath Road (WP) -5 sections	591	\$420,000	11-15	1	--	\$420,000
.5	North End Outfall Sewer (CI) -4 sections	219	\$240,000	6-10	1	--	\$240,000
.6	North Harbour Front Interceptor (CK) -3 sections	362	\$510,000	6-10	1	--	\$510,000
.7	King Street (CP) -2 sections	55	\$80,000	11-15	1	--	\$80,000
.8	Highway #15 Trunk (EA) -18 sections	1364	\$1,300,000	11-15	1	--	\$1,300,000
.9	Highway #15 Trunk (ED) -2 sections	218	\$190,000	6-10	1	--	\$190,000
.10	Trunk Interconnections (WO/WP; WC/WZ/WD; WI/WJ)		\$20,000	6-10	1	--	\$20,000
	Sub-Total		\$8,580,000			--	\$8,580,000
2.0 Forcemains							
.1	Butternut Creek	614 (m)	\$340,000	6-10	2	--	\$340,000
.2	Westbrook	800	\$400,000	11-15	2	--	\$400,000
.3	Mona Drive	578	\$350,000	6-10	2	--	\$350,000
.4	Mile Square	560	\$330,000	6-10	2	--	\$330,000
	Sub-Total		\$1,420,000			--	\$1,420,000
3.0 Pumping Stations							
.1	Butternut Creek	230 (Lps)	\$1,000,000	6-10	2	--	\$1,000,000
.2	Mona Drive	540	\$1,200,000	6-10	2	--	\$1,200,000
.3	Days Road	1510	\$3,400,000	6-10	2	--	\$3,400,000
.4	Mile Square	430	\$2,200,000	6-10	2	--	\$2,200,000
.5	North End	1080	\$3,200,000	5	3	\$1,984,000	\$1,216,000
.6	Westbrook	60	\$700,000	6-10	2	--	\$700,000
	Sub-Total		\$11,700,000			\$1,984,000	\$9,716,000
4.0 Sewage Treatment Plants							
.1	Kingston West	58000 (m ³ /d)	\$24,000,000	11-15	4	--	\$24,000,000
.2	Ravensview	92,500	\$97,500,000	1-5	5	\$72,800,000	\$24,700,000
	Sub-Total		\$121,500,000			\$72,800,000	\$48,700,000
	Total Sewer Infrastructure Estimated Cost		\$143,200,000			\$74,784,000	\$68,416,000
5.0 Trunk Watermains							
.1	Creekford Drive	475 (m)	\$400,000	1	7	--	\$400,000
.2	Creekford Road Tower to Growth Area 1	475	\$385,000	6-10	7	--	\$385,000
.3	King Street-Front Road	1,780	\$1,450,000	6-10	6	\$725,000	\$725,000
.4	Bath Road	50	\$50,000	1-5	6	\$25,000	\$25,000
.5	Counter Street	800	\$660,000	1-5	6	\$330,000	\$330,000
.6	Princess Street	690	\$560,000	1-5	6	\$280,000	\$280,000
.7	Gore-Elliot	1,440	\$1,500,000	11-15	7	--	\$1,500,000
.8	Centennial Drive	1,295	\$1,050,000	6-10	7	--	\$1,050,000
.9	Taylor Kidd Blvd.	2,140	\$1,790,000	6-10	7	--	\$1,790,000
	Sub-Total		\$7,845,000			\$1,360,000	\$6,485,000
6.0 Water Booster Stations							
.1	O'Connor Drive	68.6 (ML/d)	\$3,600,000	6-10	7	--	\$3,600,000
.2	Gore-Elliot	11.2	\$1,630,000	11-15	7	--	\$1,630,000
.3	Gardiners Road		\$700,000	1	7	--	\$700,000
.4	Mile Square	29.2	\$2,800,000	6-10	7	--	\$2,800,000
	Sub-Total		\$8,730,000			--	\$8,730,000
7.0 Water Storage							
.1	Creekford Drive	4500 (m ³)	\$2,900,000	1	7	--	\$2,900,000
.2	O'Connor Drive	15,400	\$6,300,000	6-10	7	--	\$6,300,000
.3	Gore-Elliot	4,500	\$2,100,000	11-15	7	--	\$2,100,000
.4	Mile Square	9,100	\$4,200,000	6-10	7	--	\$4,200,000
	Sub-Total		\$15,500,000			--	\$15,500,000
8.0 Water Purification Plants							
.1	Kingston West	69 (ML/d)	\$15,000,000	11-15	7	--	\$15,000,000
	Sub-Total		\$15,000,000			--	\$15,000,000
	Total Water Infrastructure Estimated Cost		\$47,075,000			\$1,360,000	\$45,715,000
	Total Estimated Cost		\$190,275,000			\$76,144,000	\$114,131,000
	Total Estimated Population		156,599			156,599	
	Estimated Population (Growth Only)		56,665				56,665
	Cost Per Capita (Total Population)		\$1,215.05			\$486.24	
	Cost Per Capita (Growth Only)		\$3,357.89				\$2,014.14

**TABLE 5.1 - Construction Cost Estimates
ALTERNATIVE 1+4**

1.0 Sanitary Sewers							
	Location		Cost	Timing (yrs)	Note	Rates \$	Impost \$
.1	Collins Bay Collector (WA) -3 sections	162 (m)	\$170,000	16-20	1	--	\$170,000
.2	Lincoln Drive (WC) - 1 section	52	\$50,000	16-20	1	--	\$50,000
.3	North-East Collector (WO) -1 section	89	\$120,000	6-10	1	--	\$120,000
.4	Bath Road (WP) -5 sections	591	\$420,000	11-15	1	--	\$420,000
.5	North End Outfall Sewer (CI) -4 sections	219	\$240,000	6-10	1	--	\$240,000
.6	North Harbour Front Interceptor (CK) -3 sections	362	\$510,000	6-10	1	--	\$510,000
.7	King Street (CP) -2 sections	55	\$80,000	11-15	1	--	\$80,000
.8	Highway #15 Trunk (EA) -18 sections	1364	\$1,300,000	11-15	1	--	\$1,300,000
.9	Highway #15 Trunk (ED) -2 sections	218	\$190,000	6-10	1	--	\$190,000
.10	Highway #2 -East Half -8 sections	1320	\$920,000	11-15	1	--	\$920,000
.11	Highway #2 - West Half -23 sections	2010	\$2,500,000	6-10	1	--	\$2,500,000
.12	Highway #2 - West Trunk	970	\$660,000	6-10	1	--	\$660,000
.13	Trunk Interconnections (WO/WP; WC/WZ/WD; WI/WJ)		\$20,000	6-10	1	--	\$20,000
	Sub-Total		\$7,180,000			--	\$7,180,000
2.0 Forcemains							
.1	Butternut Creek	614 (m)	\$340,000	6-10	2	--	\$340,000
.2	Highway #2	700	\$440,000	11-15	2	--	\$440,000
	Sub-Total		\$780,000			--	\$780,000
3.0 Pumping Stations							
.1	Westbrook	30 (Lps)	\$200,000	6-10	2	--	\$200,000
.2	Butternut Creek	230	\$1,000,000	6-10	2	--	\$1,000,000
.3	North End	1080	\$3,200,000	5	3	\$1,985,000	\$1,215,000
.4	Highway #2	210	\$1,900,000	11-15	2	--	\$1,900,000
	Sub-Total		\$6,300,000			\$1,985,000	\$4,315,000
4.0 Sewage Treatment Plants							
.1	Kingston West	42000 (m ³ /d)	\$4,000,000	11-15	4	--	\$4,000,000
.2	Ravensview	102,500	\$110,000,000	1-5	5	\$72,800,000	\$37,200,000
	Sub-Total		\$114,000,000			\$72,800,000	\$41,200,000
	Total Sewer Infrastructure Estimated Cost		\$128,260,000			\$74,785,000	\$53,475,000
5.0 Trunk Watermains							
.1	Creekford Drive	475 (m)	\$400,000	1	7	--	\$400,000
.2	Creekford Road Tower to Growth Area 1	475	\$385,000	6-10	7	--	\$385,000
.3	King Street-Front Road	1,780	\$1,450,000	6-10	6	\$725,000	\$725,000
.4	Bath Road	50	\$50,000	1-5	6	\$25,000	\$25,000
.5	Counter Street	800	\$660,000	1-5	6	\$330,000	\$330,000
.6	Princess Street	690	\$560,000	1-5	6	\$280,000	\$280,000
.7	Gore-Elliot	1,440	\$1,500,000	11-15	7	--	\$1,500,000
.8	Centennial Drive	1,295	\$1,050,000	6-10	7	--	\$1,050,000
.9	Highway #2	910	\$550,000	6-10	7	--	\$550,000
	Sub-Total		\$6,605,000			\$1,360,000	\$5,245,000
6.0 Water Booster Stations							
.1	O'Connor Drive	68.6 (ML/d)	\$3,600,000	6-10	7	--	\$3,600,000
.2	Gore-Elliot	11.2	\$1,630,000	11-15	7	--	\$1,630,000
.3	Gardiners Road		\$700,000	1	7	--	\$700,000
	Sub-Total		\$5,930,000			--	\$5,930,000
7.0 Water Storage							
.1	Creekford Drive	4500 (m ³)	\$2,900,000	1	7	--	\$2,900,000
.2	O'Connor Drive	15,400	\$6,300,000	6-10	7	--	\$6,300,000
.3	Gore-Elliot	4,500	\$2,100,000	11-15	7	--	\$2,100,000
	Sub-Total		\$11,300,000			--	\$11,300,000
8.0 Water Purification Plants							
.1	Kingston West	60 (ML/d)	\$8,000,000	11-15	7	--	\$8,000,000
	Sub-Total		\$8,000,000			--	\$8,000,000
	Total Water Infrastructure Estimated Cost		\$31,835,000			\$1,360,000	\$30,475,000
	Total Estimated Cost		\$160,095,000			\$76,145,000	\$83,950,000
	Total Estimated Population		149009			149,009	
	Estimated Population (Growth Only)		49075				49,075
	Cost Per Capita (Total Population)		\$1,074.40			\$511.01	
	Cost Per Capita (Growth Only)		\$3,262.25				\$1,710.65

**TABLE 5.1 - Construction Cost Estimates
ALTERNATIVE 1+5**

1.0 Sanitary Sewers	Location	Cost	Timing (yrs)	Note	Rates \$	Impost \$	
.1	Collins Bay Collector (WA) -3 sections	162 (m)	\$170,000	16-20	1	--	\$170,000
.2	Lincoln Drive (WC) - 1 section	52	\$50,000	16-20	1	--	\$50,000
.3	North-East Collector (WO) -1 section	89	\$120,000	6-10	1	--	\$120,000
.4	Bath Road (WP) -5 sections	591	\$420,000	11-15	1	--	\$420,000
.5	North End Outfall Sewer (CI) -5 sections	325	\$390,000	6-10	1	--	\$390,000
.6	North Harbour Front Interceptor (CK) -3 sections	362	\$510,000	6-10	1	--	\$510,000
.7	King Street (CP) -2 sections	55	\$80,000	11-15	1	--	\$80,000
.8	Highway #15 Trunk (EA) -18 sections	1,364	\$1,300,000	11-15	1	--	\$1,300,000
.9	Highway #15 Trunk (ED) -2 sections	218	\$190,000	6-10	1	--	\$190,000
.10	Trunk Interconnections (WO/WP; WC/WZ/WD; WI/WJ)		\$20,000	6-10	1	--	\$20,000
	Sub-Total		\$3,250,000			--	\$3,250,000
2.0 Forcemains							
.1	Butternut Creek	614 (m)	\$340,000	6-10	2	--	\$340,000
.2	Division/401	1400	\$1,100,000	6-10	2	--	\$1,100,000
	Sub-Total		\$1,440,000			--	\$1,440,000
3.0 Pumping Stations							
.1	Westbrook PS	30 (Lps)	\$200,000	6-10	2	--	\$200,000
.2	Butternut Creek	230	\$1,000,000	6-10	2	--	\$1,000,000
.3	North End	1080	\$3,200,000	5	3	\$1,985,000	\$1,215,000
.4	Division/401	190	\$1,800,000	6-10	2	--	\$1,800,000
.5	River Street	1900	\$300,000	6-10	2	--	\$300,000
	Sub-Total		\$6,500,000			\$1,985,000	\$4,515,000
4.0 Sewage Treatment Plants							
.1	Kingston West PCP	42000 (m ³ /d)	\$4,000,000	11-15	4	--	\$4,000,000
.2	Ravensview PCP	100,000	\$107,000,000	1-5	5	\$72,800,000	\$34,200,000
	Sub-Total		\$111,000,000			\$72,800,000	\$38,200,000
	Total Sewer Infrastructure Estimated Cost		\$122,190,000			\$74,785,000	\$47,405,000
5.0 Trunk Watermains							
.1	Creeford Drive	475 (m)	\$400,000	1	7	--	\$400,000
.2	Creeford Road Tower to Growth Area 1	475	\$385,000	6-10	7	--	\$385,000
.3	King Street-Front Road	1,780	\$1,450,000	6-10	7	\$725,000	\$725,000
.4	Bath Road	50	\$50,000	1-5	6	\$25,000	\$25,000
.5	Counter Street	800	\$660,000	1-5	6	\$330,000	\$330,000
.6	Princess Street	690	\$560,000	1-5	6	\$280,000	\$280,000
.7	Gore-Elliot	1,440	\$1,500,000	11-15	6	--	\$1,500,000
.8	Centennial Drive	1,295	\$1,050,000	6-10	7	--	\$1,050,000
.9	Division Street	385	\$320,000	6-10	7	--	\$320,000
.10	Dauphin Woods	165	\$110,000	6-10	7	--	\$110,000
	Sub-Total		\$6,485,000			\$1,360,000	\$5,125,000
6.0 Water Booster Stations							
.1	O'Connor Drive	68.6 (ML/d)	\$3,600,000	6-10	7	--	\$3,600,000
.2	Gore-Elliot	11.2	\$1,630,000	11-15	7	--	\$1,630,000
.3	Gardiners Road		\$700,000	1	7	--	\$700,000
.4	Division/401	31.7	\$2,900,000	6-10	7	--	\$2,900,000
	Sub-Total		\$8,830,000			--	\$8,830,000
7.0 Water Storage							
.1	Creeford Drive	4500 (m ³)	\$2,900,000	1	7	--	\$2,900,000
.2	O'Connor Drive	15,400	\$6,300,000	6-10	7	--	\$6,300,000
.3	Gore-Elliot	4,500	\$2,100,000	11-15	7	--	\$2,100,000
.4	Division/401	4,500	\$2,100,000	6-10	7	--	\$2,100,000
	Sub-Total		\$13,400,000			--	\$13,400,000
8.0 Water Purification Plants							
.1	Kingston West	58 (ML/d)	\$8,000,000	11-15	7	--	\$8,000,000
	Sub-Total		\$8,000,000			--	\$8,000,000
	Total Water Infrastructure Estimated Cost		\$36,715,000			\$1,360,000	\$35,355,000
	Total Estimated Cost		\$158,905,000			\$76,145,000	\$82,760,000
	Total Estimated Population		145,617			145,617	
	Estimated Population (Growth Only)		45,683				45,683
	Cost Per Capita (Total Population)		\$1,091.25			\$522.91	
	Cost Per Capita (Growth Only)		\$3,478.43				\$1,811.61