Attachment 1

Water & Wastewater Financial Plan and Rate Study

Final Report

GM BluePlan ENGINEERING

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Town of Whitchurch-Stouffville
GMBP Project Number: 720046

March 16, 2021

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March 16, 2021

GMBP File: 720046

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Town of Whitchurch-Stouffville
111 Sandiford Drive
Stouffville, ON
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Project No: 720046

RE: Water & Wastewater Financial Plan and Rate Study
Final Report

Dear Clayton,

GM BluePlan Engineering Limited (GMBP), is pleased to submit the Draft Final Report for the Town of Whitchurch-Stouffville Water & Wastewater Financial Plan and Rate Study project.

If you have any questions, or require any additional information, please contact the undersigned.

Yours truly,

GM BLUEPLAN ENGINEERING LIMITED

Per:

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Revision Log

Revision #	Date	Revised By	Revision Description
01	March 12, 2021	DB, ZF, MF	Draft issued to Town
02	March 16, 2021	DB, ZF, CH	Final issued to Town
03			
04			
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07			
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09			
10			

GM BluePlan Signatures

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President

EXECUTIVE SUMMARY

GM BluePlan Engineering (GMBP) was retained by the Town of Whitchurch-Stouffville (the Town) to assist in the development of a financial plan and rate study for its drinking water and wastewater service areas.

The development of a water financial plan and rate study for the Town is a requirement under *Ontario Regulation (O.Reg) 453/07 – Financial Plans*, made under the *Safe Drinking Water Act (SDWA), 2002*. The development of this financial plan is required in order to submit an application to renew the Town's municipal drinking water license, as per the abovementioned legislation. To complement the drinking water financial plan, the Town has also endeavored to develop a financial plan and rate study for its wastewater system. It should be recognized that this financial plan and financial statements are not required for regulatory purposes for the wastewater system.

A full cost recovery approach was applied to the development of this financial plan and rate study, which aims to ensure that all costs associated with providing the critical services of drinking water and wastewater are accounted for in the plan and that rates are set accordingly.

As part of the financial plan development, a review of various rate structure options was conducted, to investigate if alternative (and typically more complex) rate structures would provide benefit to the Town, as opposed to its current uniform volumetric charge structure. The analysis concluded that the current rate structure was adequate and beneficial for implementation moving forward, due to its straight-forward approach, ease of implementation, ease of understanding for customers, and past reliability in recovering costs.

In order to establish rates, a detailed review of all supporting information was completed, including existing rates (and rate structures) and associated revenue; operating expenditures and forecasts; capital expenditures and forecasts; and, the Town's Asset Management Plan (which forecasts the spending requirements to maintain or improve current levels of service over a 10-year period).

Additionally, a review of customer billing data was completed to investigate past demand trends and use them to estimate demand over the forecast period. As part of this review, two recent phenomena were investigated: the effect of newly installed water meters in the Town (which had a permanent impact moving forward); and, the impacts of COVID-19 on demand (which had a temporary impact that is expected to resolve). This analysis concluded that residential water use is declining at a modest annual rate of 3.4 liters per account per day.

A forecasting model was developed to identify current options to achieve full cost recovery for the water and wastewater systems. Inputs to the model included current financial data; current demand data and demand analysis results; growth and population forecasts; current rates; current and forecasted revenues; and, budget forecasts.

The model results provided a recommendation to keep rate increases low in the near-term (2021-2022) followed by larger increases in the medium-term (2023 and 2024). Rate increases would then be reduced from the years 2025 and beyond. This recommended scenario provides a balance, which is sensitive to the current economic impacts of COVID-19, while still focusing on addressing the infrastructure renewal needs sooner rather than over an extended period. This will result in a lower risk of service failures. The proposed rate increases are provided in the following Table.

	2020*	2021*	2022**	2023	2024	2025	2026	2027	2028	2029	2030
Water Rate Increase		0.0%	2.5%	9.0%	9.0%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
Water Rate ($/m3)	$2.1825	$2.1825	$2.2371	$2.4384	$2.6579	$2.7243	$2.7924	$2.8622	$2.9338	$3.0071	$3.0823
Wastewater Rate Increase		0.0%	2.5%	13.0%	13.0%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
Wastewater Rate ($/m3)	$2.9979	$2.9979	$3.0728	$3.4723	$3.9237	$4.0218	$4.1224	$4.2254	$4.3311	$4.4393	$4.5503
Typical Yearly Bill ($)	$1,237	$1,235	$1,213	$1,343	$1,487	$1,516	$1,546	$1,575	$1,615	$1,655	$1,697
*Average yearly consumption of ~240m3/year for a 5/8" service connection during COVID-19 impacts. **Average yearly consumption ~226m3/year for a 5/8" service connection once the effects of COVID-19 have receded. Refer to Customer Data Rate Structure Analysis (Appendix D) for detailed information on yearly consumption.											

The rationale and key decision factors that resulted in the proposed 10-year rate recommendations are:

- Full cost recovery, meeting the objectives of the Town's 2017 AMP is achieved within the 10-year forecast period. This includes addressing the backlog of infrastructure investment identified in the AMP.
- A reasonable level of revenues from users is assumed based on continued water use at pre-COVID-19 levels.
- Debt servicing is minimized in the short and medium term.
- Overall water and wastewater reserves are maintained above the minimum range for each year, with the exception of the year 2029. In this year, a decrease in the water reserve balance was tolerated to avoid an additional impact on rate increases. Note that this recommendation has the least impact on reserves of all options analyzed.
- The rate increase for the users is minimized in the immediate near term (2021 – 2022), increased in the medium term (2023 – 2024), then reduced to inflation only out to the end of the 10-year period (2025 – 2030). Note that this option has the lowest increase to user rates in the first two years of the analysis period.

Note that several factors could potentially put negative or positive pressure on rates moving forward, including climate change, changes in estimated future growth, impacts of COVID-19 and changes in Regional rates. These factors are documented for the Town's consideration, as well as their potential effect on the Town's financial situation and rates moving forward. These factors should be considered and monitored by the Town, and action should be taken accordingly if they begin to show signs of impact on the Town's financial situation.

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1 PURPOSE

GM BluePlan Engineering (GMBP) was retained by the Town of Whitchurch-Stouffville (the Town) to assist in the development of a financial plan and rate study for its drinking water and wastewater service areas.

The development of a water financial plan and rate study for the Town is a requirement under *Ontario Regulation (O.Reg) 453/07 – Financial Plans*, made under the *Safe Drinking Water Act (SDWA), 2002*. The development of this financial plan is required in order to apply to renew the Town's municipal drinking water license, as per the abovementioned legislation. To complement the drinking water financial plan, the Town has also endeavored to develop a financial plan and rate study for its wastewater system. It should be recognized that this financial plan and financial statements are not required for regulatory purposes for the wastewater system.

The following financial plan and rate study report provides the Town with a holistic and wide-reaching understanding of its water and wastewater systems, and the costs required to manage them into the future. Understanding the underlying forces that drive this financial plan and rate study, including capital plans; asset management plans; and, projected growth, is key to ensuring that the financial and rate recommendations detailed in this report are defensible. This is achieved through a detailed review of the data that drives water/wastewater finances and rates, ensuring that the recommendations are provided in this plan with confidence.

2 BACKGROUND

The Public Works Operations Division is responsible for maintaining the Town's water and wastewater systems; storm water management facilities; and, sewers, solid waste and recycling programs. The Water and Wastewater Division operates and maintains the Stouffville Water Distribution System, Wastewater Collection System and the Ballantrae/Musselman's Lake Water Distribution System. This includes distributing treated water purchased from York Region and conveying wastewater to Region facilities for treatment. Town-owned infrastructure includes water mains, valves, hydrants, bulk water filling water stations, and service connections. Wastewater infrastructure includes wastewater sewers, maintenance holes and lateral connections.

The Town owns and operates two water distribution systems that receive water from the Region of York treatment plants. The distribution systems consist of roughly 190 kilometers of watermains, 12,600 service connections and meters, 1,850 valves, 1,390 hydrants, and 1 bulk water filling stations. The wastewater collection system is comprised of 112 kilometers of sewers, 1860 maintenance holes (MH), and 7,308 lateral connections.

The Town's first drinking water financial plan was developed in 2011, in response to the enactment of O.Reg. 453/07. A second plan was developed in 2016, as part of the renewal of the Town's drinking water license. This plan will be the third drinking water financial plan developed under the regulation. This will also be the first financial plan developed for the Town's wastewater system.

The following subsections provide additional background information on regulatory requirements, as well as the components that make up this plan.

2.1 Full Cost Recovery

The analysis completed as part of this water and wastewater financial plan takes a full cost recovery approach. The principal of full cost recovery ensures that all costs necessary for delivering the service of drinking water are accounted for in the financial plan and when setting water or wastewater rates.

As part of the full cost recovery approach, the following costs are considered:

- Capital costs;
- Operating costs;
- Growth costs;
- Reserve contributions; and,
- Debt costs.

Full cost recovery is fundamental to achieving a long-term sustainable infrastructure financial plan. This financial planning exercise considers the detailed analysis completed under the 2017 Asset Management Plan (AMP) for Whitchurch-Stouffville. The 2017 AMP has identified a 10-year and 50-year program to address condition, performance, risk, and level of service for the existing water and wastewater infrastructure. Marrying the 2017 AMP with this financial analysis will establish a long-term sustainable infrastructure financial plan for the Town.

2.2 Regulatory Requirement Overview

The approach to completing the 10-year financial plan and the development of financial statements for water and wastewater systems aligns with the requirements of O.Reg. *453/07 - Financial Plans. Although these requirements apply to water systems only, they have been also applied to the wastewater financial plan as well. The following summarizes the requirements of O.Reg. 453/07 as they apply to the Town's existing water system.*

- The preparation and approval of a financial plan is required in order to make an application for the renewal of a municipal drinking water license.
- The financial plan must be approved by a resolution that is passed by Town council.
- The financial plan must apply to a period of at least six (6) years.

- The first year to which the financial plans must apply must be the year in which the drinking water system's existing municipal drinking water license would otherwise expire.
- The financial plan must include details of the proposed or projected financial position of the drinking water system itemized by:
  - Total financial assets;
  - Total liabilities;
  - Net debt;
  - Non-financial assets that are tangible capital assets, tangible capital assets under construction, inventories of supplies and prepaid expenses; and,
  - Changes in tangible capital assets that are additions, donations, write downs and disposals.
- The financial plan must include details of the proposed or projected financial position of the drinking water system itemized by:
  - Total revenues, further itemized by water rates, user charges and other revenues;
  - Total expenses, further itemized by amortization expenses, interest expenses and other expenses;
  - Annual surplus or deficit; and,
  - Accumulated surplus or deficit.
- The financial plan must include details of the drinking water system's proposed or projected gross cash receipts and gross cash payments itemized by:
  - Operating transactions that are cash received from revenues, cash paid for operating expenses and finance charges;
  - Capital transactions that are proceeds on the sale of tangible capital assets and cash used to acquire capital assets;
  - Investing transactions that are acquisitions and disposal of investments;
  - Financing transactions that are proceeds from the issuance of debt and debt repayment;
  - Changes in cash and cash equivalents during the year; and,
  - Cash and cash equivalents at the beginning and end of the year.
- The financial plan must include details of the extent to which the information described in above relates directly to the replacement of lead service pipes.
- Financial plans must be made available to members of the public on the Town's website or by request at no charge.
- Notice must be provided advising the public of the availability of the financial plans.
- A copy of the financial plan must be provided to the Ministry of Municipal Affairs and Housing.

In accordance with SDWA regulations, the Financial Plan will be represented in the following Financial Statements:

1. *Statement of Financial Position (Balance Sheet)*
   This statement highlights four key figures that describe the financial position of the Town's water system at the reporting date, including the cash resources, net debt position, non-financial assets and accumulated surplus or deficit.

In support of this Statement of Financial Position, two additional statements were prepared. The financial statements listed below illustrate the change in one of these four key aspects of the water system's financial position.

2. *Statement of Operations (Income Statement)*
3. *Statement of Cash Flow*

These statements coincide with the Financial Plan requirements for water systems licensing based on the specific requirements of Section 4(iii) of Regulation 453/07. Further descriptions of these statements are included in *Section 5 - Financial Statements* of this report.

As noted above, a minimum reporting period of 6 years is required for the statements under the regulation. The information developed in this plan includes these financial statements covering a period of 10 years. This is consistent with and supports the Town's budget process which covers a 10-year period.

Financial Statements

This section describes the three Financial Statements that comprise the 10-year Financial Plan for the water, wastewater, and stormwater systems. The Statements are appended to this report.

The Financial Position statement highlights four key figures that describe the financial position of the water system at the reporting date.

- The cash resources are cash and cash equivalents.
- The net debt position is calculated as the difference between liabilities and financial assets.
- The non-financial assets are assets that are, by nature, normally for use in service provision and include purchased, constructed, developed or leased tangible capital assets; inventories of supplies; and, prepaid expenses.
- The accumulated surplus or deficit is calculated as the sum of the net debt and non-financial assets. This indicator represents the net assets of the water system.

The two remaining statements illustrate the change in one of these aspects of the water, wastewater, and stormwater systems' financial position.

- The *statement of operations* reports the surplus or deficit from operations in the accounting period. The statement displays the cost of services provided in the period, the revenues recognized in the period and the difference between them. It measures, in monetary terms, the extent to which an organization has maintained its net assets in the period.
- The *statement of cash flow* reports the change in cash and cash equivalents in the accounting period, and how the water, wastewater, and stormwater systems financed its activities in the period and met its cash requirements.

The following financial statements representing the 10-year Financial Plan for the Water and Wastewater System are included In Appendix A to B:

1. Statement of Financial Position
2. Statement of Operations
3. Statement of Cash Flow

In addition, a Glossary of Terms for the Financial Statements is provided in Appendix C. The Glossary provides further explanations of the meaning and interpretation of specific categories or line item terms in the statements. The glossary should be read in conjunction with the respective statements.

3 METHODOLOGY

A detailed analysis of underlying factors that drive the management of infrastructure was as important as development of the financial model itself. A detailed review of the documents and files that support the key aspects for water and wastewater infrastructure management ensures that the financial plan is well supported and defensible. The documents reviewed included the Town's Asset Management Plan, capital plans, growth plans, policies and strategic documents, recovery models, reserve funds, and, existing fee structures/rates. These are foundational elements that fairly represent, and accurately inform the expenses related to service delivery for water and wastewater infrastructure. Existing and new expenses were identified to develop a total cost to sustain existing service levels.

The reviewed information and supporting analyses are described in Sections 3.1 to 3.2.

3.1 Current Financial Situation

3.1.1 Rate Revenue

The Town applies an established rate to metered water consumption to collect the revenue required to manage the infrastructure systems used to provide water and wastewater services.

The rate revenue is generated from a uniform volumetric charge applied to the customer's metered quantity of water ($/m3). There are two parts of the volumetric rate: one that funds the water expenditures and a second that funds the wastewater expenditures. The customer's water consumption is used with each rate to establish their monthly bill.

Our analysis included a review of the existing and alternative rate structures. The current rate structure has the benefit of being straight forward, easy to implement, and easy for the customer to understand. Moreover, it has historically proved a reliable vehicle for cost recovery despite weather driven variations in water sales. Alternative rate structures include lifeline rates, two-part rates with a fixed (meter) charge, increasing block rates, seasonal rates and various other more complex rate structures. In many cases, consideration of alternative rate structures is triggered by a concern of under-recovery of costs due to inadequate funding of fixed costs, legacy incentive-based structures for key users, inaccurate modelling of revenues, or inequity of rates between full time and seasonal users. Alternative structures can also be considered to influence needed behavioural change toward water conservation. These considerations were not a factor in the Whitchurch-Stouffville review. Our review suggests that there is currently no compelling argument in support of a change in the rate structure.

A review of the customer billing data was completed to determine reasonable demand forecasts for the financial model. As part of this review, two recent phenomena were considered that have affected recent billing data. First, the Town has recently been installing new water meters, which have produced more accurate readings. Second, an increase in demand was observed throughout the year 2020 due to the impacts of COVID-19. The impacts of these two items (i.e. new water meters and COVID-19) were considered in the analysis, and an assessment of trends in water use per customer was completed while considering these new factors and attempting to understand their effect on future demand. The trend analysis examined whether ongoing appliance replacements with newer water efficient models was causing a decline in demand per customer. This analysis concluded that residential water use is declining at a modest annual rate of 3.4 liters per account per day.

Refer to the Customer Data and Rate Structure Analysis Technical Memorandum (Appendix D) for the detailed results of the billing data review and alternative rate structure analysis.

3.1.2 Operating and Capital Expenditures

The Town has both an operating and capital budget. The operating budget is used to fund the annual costs to provide services, including the funds to operate and maintain infrastructure assets. The capital budget is primarily used to fund the construction of infrastructure assets. Additional information on what is included in each budget is provided below.

The Town's operating budget is a combination of:

- Expenditures for salaries, wages, benefits, etc.
- Expenditures for materials, chemicals, electricity, etc.
- The costs of Regional water and wastewater services.
- Debt servicing costs.
- Contributions to the capital budget (i.e. operating revenue that goes directly to fund the Capital Budget).

The Town's capital budget is a combination of:

- Expenditures to renew (rehabilitate or replace) existing assets.
- Expenditures to improve existing assets or build new assets to enhance service levels provided to existing customers.
- Expenditures to build new assets to provide proposed service levels to new customers.
- Expenditures for non-infrastructure activities, such as large studies and customer service programs, that are not practical to fund through the operating budget due to their large size.

At the end of each fiscal year any surplus in the operating budget is transferred to reserves.

The Town relies primarily on 'pay-as-you-go' capital financing where the annual contributions from rates are used to fund the annual capital program, rather than debt financing or reserve financing where capital expenditures are funded primarily through withdrawals from reserve funds that accumulate operating surpluses over time. It is recognized that the Town maintains reserve for the water and wastewater systems, however these are not the primary source of capital financing.

3.1.3 Summary of Current Financial Situation

Review of Operating Expenses

A summary of the historic operating expense actuals is provided in Table 1. Expenses have increased annually by roughly 6% and 12% for water and wastewater respectively over this 8-year period. This increase is largely attributed to the costs of Regional water and wastewater services. The combined regional water and wastewater rate has increased at an average annual rate of 9.6% from 2009 to 2019 and these services accounted for 85.6% of Town wastewater operating costs and 72.0% of Town water costs in the 2020 budget. Moving forward, Regional rates are forecasted to have increases of 3.5% (as opposed to the historic average of 9.6%). These increases will be confirmed by Region council in the fall of 2021.

Table 1: Operating Expense Actuals

	Actual								Budget		
	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	Growth Rate (2012-2019)
Total Water Expenses ($M)	$4.4	$4.1	$4.6	$5.2	$5.8	$5.9	$6.2	$7.1	$7.8	$7.8	6.8%
Annual Change in Water Expenses		-9%	14%	11%	12%	3%	5%	14%	10%	0%	
Total Water Consumption (1,000,000m3)	3.3	3.2	3.2	3.3	3.6	3.3	3.5	3.5	3.9	4.0	0.9%
Water Expense Unit Rate ($/m3)	$1.37	$1.29	$1.47	$1.57	$1.62	$1.82	$1.76	$2.04	$1.99	$1.96	5.9%
Annual Change in Water Unit Rate		-6%	13%	6%	3%	11%	-3%	14%	-3%	-1%	
Of which the Regional Charge	$0.74	$0.80	$0.86	$0.92	$0.95	$0.99	$1.08	$1.19	$1.19	$1.17	7.1%
Total Wastewater Expenses ($M)	$3.3	$3.7	$4.2	$4.8	$5.9	$6.7	$6.8	$7.8	$8.7	$9.2	13.0%
Annual Change in Wastewater Expenses		11%	13%	15%	22%	15%	1%	16%	11%	5%	
Total Wastewater Consumption (1,000,000m3)	2.8	2.7	2.8	2.9	3.1	2.9	3.1	3.1	3.2	3.2	1.3%
Wastewater Expense Unit Rate ($/m3)	$1.19	$1.36	$1.52	$1.68	$1.90	$2.33	$2.20	$2.57	$2.75	$2.85	11.6%
Of which the Regional Charge	$0.86	$0.97	$1.08	$1.21	$1.38	$1.55	$1.68	$1.82	$1.93	$1.91	11.3%
Annual Change in Wastewater Unit Rate		12%	11%	9%	12%	19%	-6%	14%	7%	3%	

Review of Capital Expenditures

A review of the 2021-2030 Capital Plan was completed. Projects were reviewed to determine the costs allocated to the different lifecycle activities. This was later used to compare the renewal needs identified in the Asset Management Plan.

A summary of the average 10 year planned capital expenditures is provided in Table 2. It is apparent from Table 2 that 45% of the water expenditures and 47% of the wastewater capital expenditures, respectively, are used to fund the renewal of existing assets (i.e. to keep infrastructure in a state of good repair and thereby maintain current levels of service (LOS) provided by the infrastructure systems).

Table 2: Average annual expenditures from the 10-year capital program.

System	Total 10-year Expenditures ($000)	Average Annual Expenditure ($000/year)	Lifecycle Activities	Average Annual Expenditure ($000/year)
Water	$31,570	$3,157	Non-Infrastructure	$60
			Expansion	$1,660
			Renewal	$1,410
			Disposal	$0
Wastewater	$35,782	$3,578	Non-Infrastructure	$260
			Expansion	$1,540
			Renewal	$1,610
			Disposal	$25

Review of the Asset Management Plan

The 2017 Asset Management Plan (AMP) was reviewed to determine the annual capital renewal need. The report identified an annual $3.2M and $2.2M 10-year and 50-year need respectively for both water and wastewater systems. These values represent the average expenditure to meet backlogged and projected infrastructure needs over the respective periods, in order to meet the objectives identified in the AMP. These values were compared to the results from the capital plan review which was $3M annually for both water and wastewater systems.

It should be noted that the 10 and 50-year need was greatly impacted by the cumulative deferred expenditure need (often referred to as a ‘backlog’) that has previously accrued. The annual capital renewal needs forecast from the AMP is provided in in Figure 1.

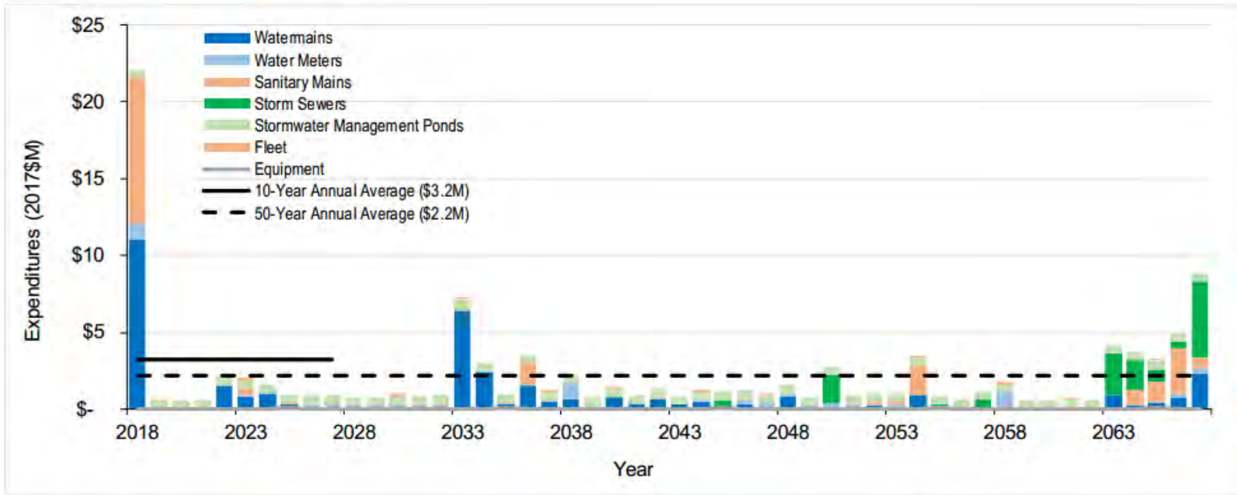


Figure 1: 2017 AMP - Figure 6-3 Annual Capital Renewal Needs Forecast – Environmental (2017$M)

Distributing the expenditures over a 10 or 50-year period improves the affordability of the revenue increases rather than increasing rates dramatically in the short term to address full cost recovery. This approach does come with risks, as the desired condition profile of the infrastructure system would not be met until later years when enough revenue can be generated to address the deferred expenditure needs. During this time the system will be operating at a higher risk of service failure due to the lack of required funding to renew aging assets. Staff will continue to prioritize expenditures to prevent the decline in LOS provided by the infrastructure systems, however this asset management strategy can result in higher repair and maintenance needs to operate assets that are in poor condition (but cannot be replaced due to a lack of capital funding). Additional perspective on this consideration is provided in Section 5 of this report.

3.2 Forecasting Future Financial Situations

3.2.1 Modelling Approach

The financial model was developed to analyze various options to achieve full cost recovery for the water and wastewater system. The model structure facilitates analysis of different scenarios, to illustrate the impact of alternative rate options and other drivers of financial performance. Cost drivers in the model include population and economic growth, property development, unit water demands, Regional rates, inflation, the cost of finance, and capital investment requirements for replacements, renewals and expansion. Cost recovery is based on metered water volumes and customer counts by class as well as the rate structure and the user specified profile of rate increases over the planning horizon. From a financial perspective, the model is compatible with PSAB standards and generates financial statements that fulfill reporting requirements under the SDWA.

The recommendations and outcomes of the financial model were used to clearly demonstrate the outcomes of spending and communicate their effects on levels of service and service delivery. This was achieved by analyzing the effect of sensitivities in the capital plan and asset management plans, as well as the associated sensitivities in the financial models required to achieve service levels.

3.2.2 Sources of Information

The Town's financial data was reviewed by members of the consulting team to determine the availability of information and were engaged throughout the project to inform any assumptions or interpretation of data required to develop the 10-year Financial Plan and Financial Statements. The information used to populate the financial model is provided in Table 3.

Table 3: Information sources used to develop the financial statements.

Input	Source of Data
Base Financial Data	• 2021 loan lending rates were provided by Infrastructure Ontario • Historic construction price indices were analyzed to determine reasonable inflation rates • Staff provided 2020 year-end reserve balances
Current Demands and Future Demand Estimates	• DC Report and Bylaws for population forecast • Analysis of billing data form 2013-2020 was used to determine the customer counts and consumption demand
Rates	• MS Excel file that included the 2019 and 2020 rates
Revenues	• Staff provided 2020 budget and 2021 preliminary budget non-rate revenue estimates.
Operations and Maintenance Costs	• Staff provided 2020 budget and 2021 preliminary budget operations and maintenance cost estimates.
Development Charges Information	• DC Report and Bylaws
Capital Plan	• 2021-2030 Capital Budget Forecast MS Excel file • 2020 Approved Capital Budget for 2020 costs • 2017 Asset Management Plan for future infrastructure renewal expenditures
Amortization Data	• 2019 TCA Information
Project Funding Sources	• 2021-2030 Capital Budget Forecast MS Excel file
Debt Service Information	• Town has no existing loans

3.2.3 Forecast Assumptions

Inflation:

- Regional Rate increases are assumed to be the estimated projected increase of 3.5% per year.
- The following rates were determined from an analysis of historic construction price indices:
  - Operating expenses were inflated at a rate of 2% per year.
  - Employee salaries were inflated at a rate of 1.8% per year.
  - Capital expenditures were inflated at a rate of 2.46% per year.

Demand:

- Base year, 2020, water consumption was set at estimated averages for that year reflecting the impact of COVID-19 and the new meters. Since COVID-19 represents a temporary impact to demand, an assumption that a transition back to 'normal' is phased from 2020 to 2022. Demand for ICI customers was determined from 2018 revenue, since it was determined to be the most accurate dataset for use in the analysis.
- Consumption rates (assumed to return to pre-COVID-19 norms by 2022) are estimated as the 2013-18 averages plus a 5% allowance for increase readings from new meters.
- The 2013-18 averages omit the observations that appear to be outliers.

Reserves:

- Reserves were mostly kept above the minimum range:
  - Water Capital Reserve - $1,350,000
  - Wastewater Capital Reserve - $1,450,000

4 FINANCIAL RESULTS

4.1 Option A – No Increase into Short-term High Increases into Inflation

The results of this analysis considered the scenario whereby no rate increase is applied in 2021, a moderate rate increase applied in 2022, and a significantly larger rate increase is applied in 2023 and 2024. Under this scenario, rate increases can be reduced by 2025 to the estimated rate of inflation. In this scenario, the reserve balances have been maintained throughout the 10-year period to ensure there are enough funds available in the event of an emergency. This avoids the need for any additional debt to cover the funding shortfall. This scenario also allows rate increases to return to levels that more closely match inflation from 2025 on, thus avoiding customer frustration with perpetually high rate increases.

A summary of the expenditures, revenues, and reserve balances are provided in Figures 2 to 4.

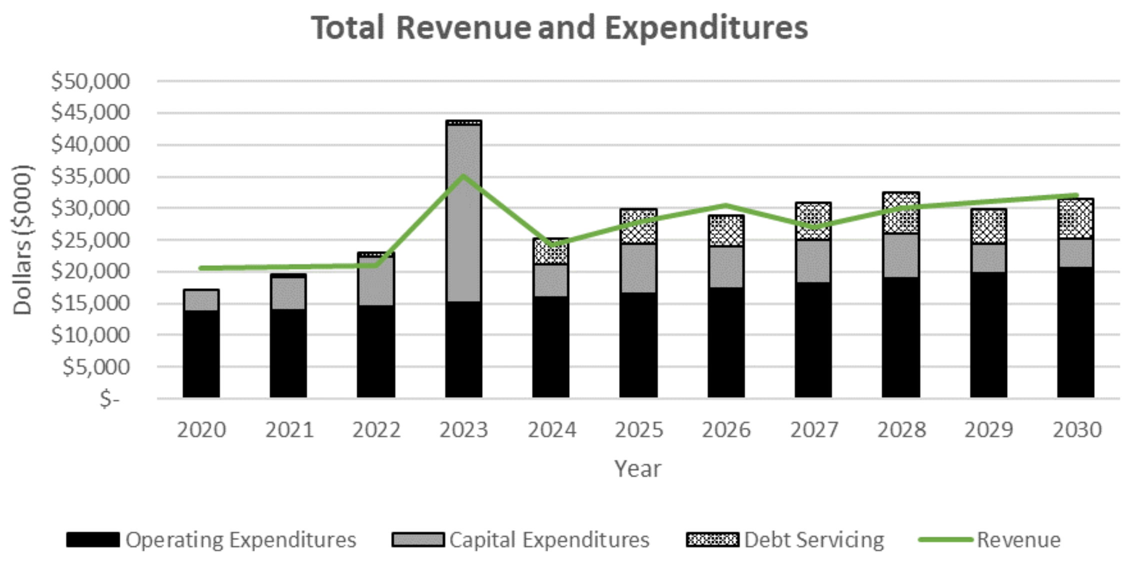


Figure 2: Option A - Water and Wastewater Expenditures and Revenue

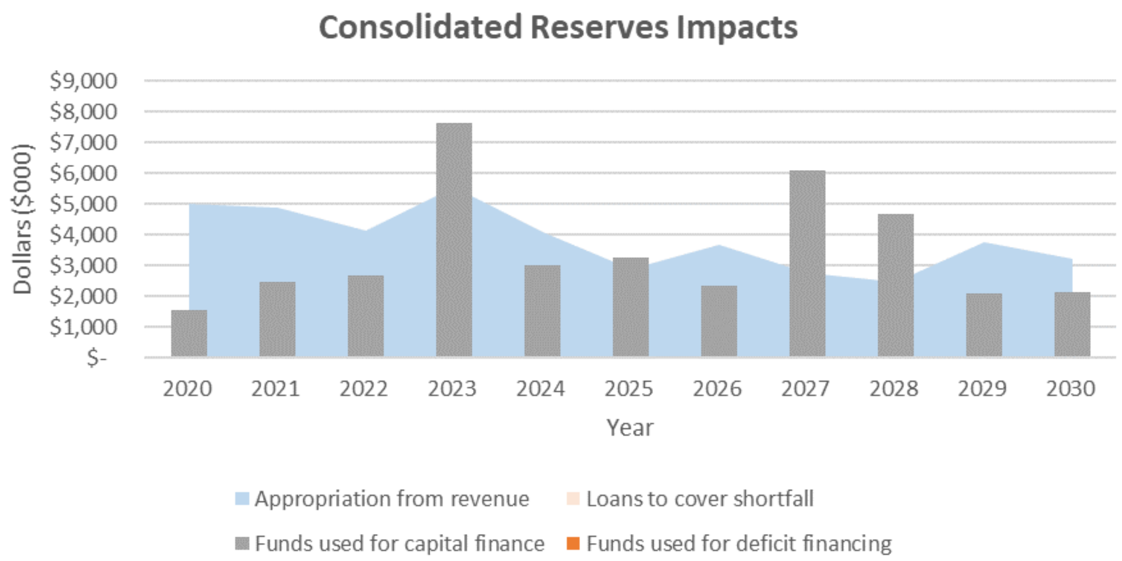


Figure 3: Option A – Water and Wastewater Reserve Impacts

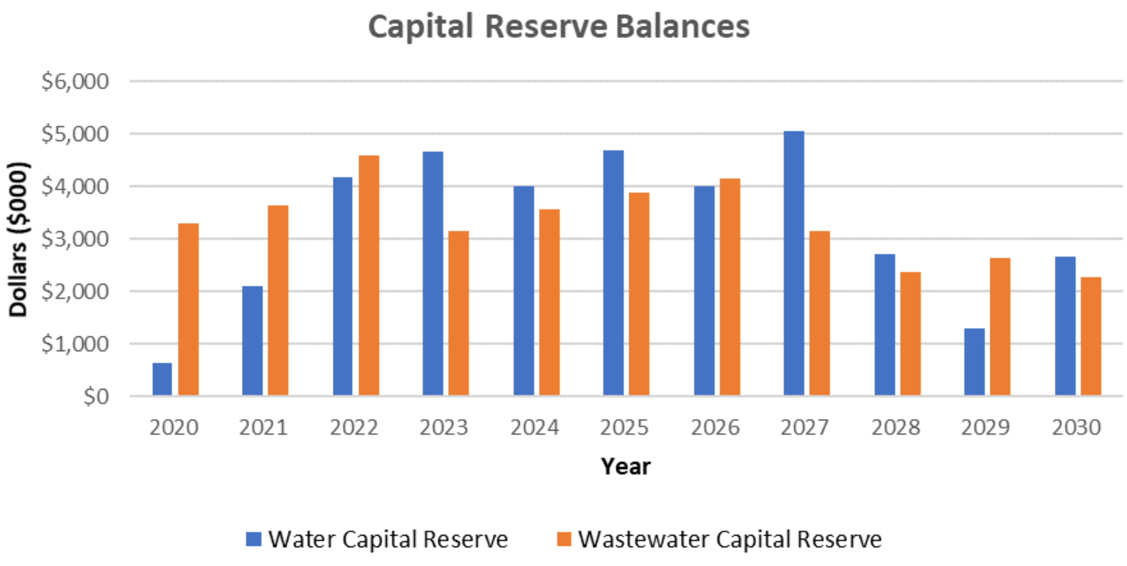


Figure 4: Option A - Year End Capital Reserve Balances

The results of this analysis demonstrate that if an increase in rate of 2.5% for water and wastewater are applied in 2022 followed by increases of 9.0% for water and 13.0% for wastewater from 2023-2024 then rates could be increased to address inflation from 2025 onward to fully fund the 10-year capital plan. The details of this scenario are summarized in Table 4.

Table 4: Option A - Rate Summary

	2020*	2021	2022**	2023	2024	2025	2026	2027	2028	2029	2030
Water Rate Increase		0.0%	2.5%	9.0%	9.0%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
Water Rate ($/m3)	$2.1825	$2.1825	$2.2371	$2.4384	$2.6579	$2.7243	$2.7924	$2.8622	$2.9338	$3.0071	$3.0823
Wastewater Rate Increase		0.0%	2.5%	13.0%	13.0%	2.5%	2.5%	2.5%	2.5%	2.5%	2.5%
Wastewater Rate ($/m3)	$2.9979	$2.9979	$3.0728	$3.4723	$3.9237	$4.0218	$4.1224	$4.2254	$4.3311	$4.4393	$4.5503
Typical Yearly Bill ($)	$1,237	$1,235	$1,213	$1,343	$1,487	$1,516	$1,546	$1,575	$1,615	$1,655	$1,697
*Average yearly consumption of ~240m3/year for a 5/8” service connection during COVID-19 impacts. **Average Yearly consumption ~226m3/year for a 5/8” service connection once the effects of COVID-19 have receded. Refer to Customer Data Rate Structure Analysis (Appendix D) for detailed information on yearly consumption.											

The rationale and key decision factors that resulted in the proposed 10-year rate recommendations (Option A) are:

- Full cost recovery, meeting the objectives of the Town’s AMP is achieved within the 10-year forecast period. This includes addressing the backlog of infrastructure investment identified in the AMP.
- A reasonable level of revenues from users is assumed based on continued water use at pre-COVID-19 levels.

- Debt servicing is minimized in the short and medium term.
- Overall water and wastewater reserves are maintained above the minimum range for each year, with the exception of the year 2029. In this year, a decrease in the water reserve balance was tolerated to avoid an additional impact on rate increases.
- The rate increase for the users is minimized in the immediate near term (2021 – 2022), increased in the medium term (2023 – 2024), then reduced to inflation only out to the end of the 10-year period (2025 – 2030).

4.2 Option B – Uniform Rate Increase

This option examines the impact of a uniform rate increase of 3.8% and 4.7% over the next 10 years for water and wastewater respectively. Like Option A, the reserve balances have been maintained throughout the 10-year period to ensure there are enough funds available in the event of an emergency. This scenario also avoids the need for any additional debt to cover the funding shortfall. From a customer perspective, this scenario trades off the sharp initial rate increases in 2022 and 2023 with the need for rate increases that always exceed inflation; replacing the short-lived aggravation with the large initial increases with constant frustration over relatively high and ongoing rate increase.

A summary of expenditures, revenues, and reserve balances are provided in Figures 5 to 7.

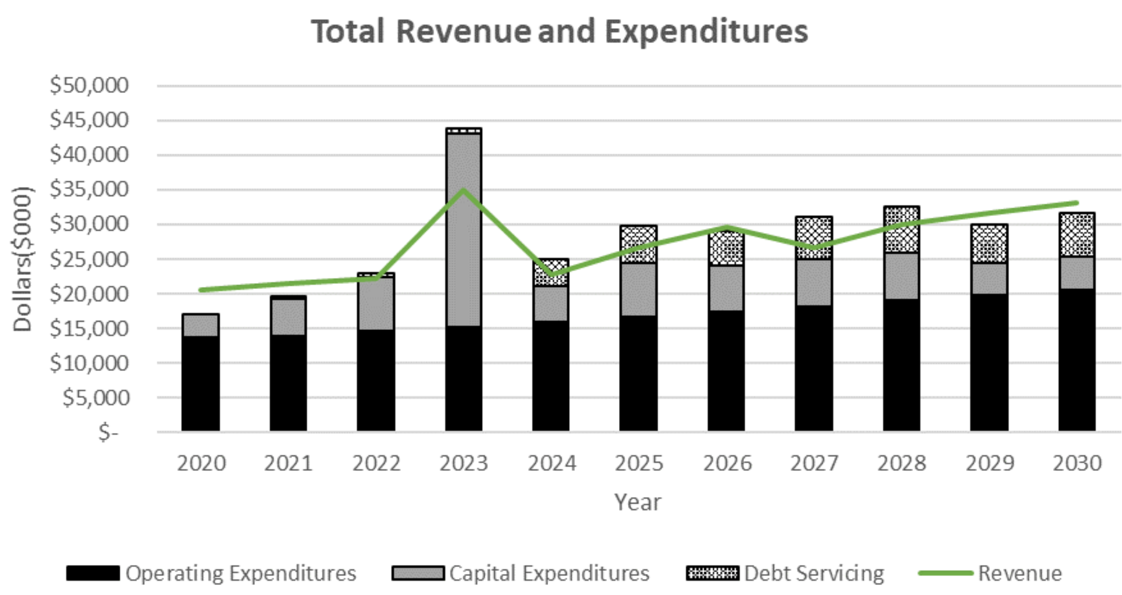


Figure 5: Option B – Water and Wastewater Expenditures and Revenue

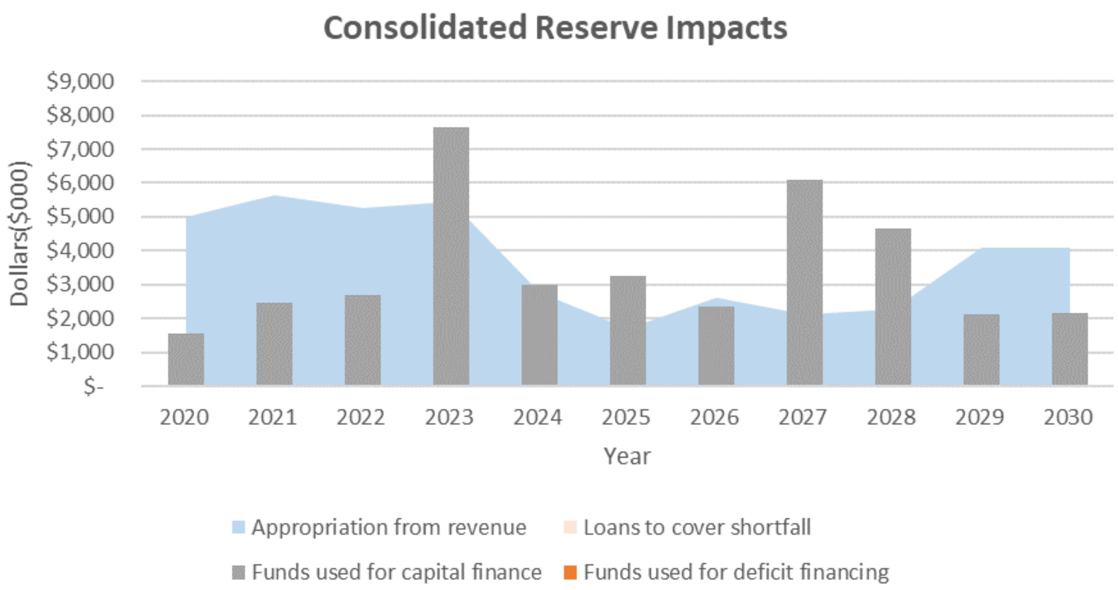


Figure 6: Option B – Water and Wastewater Reserve Impacts

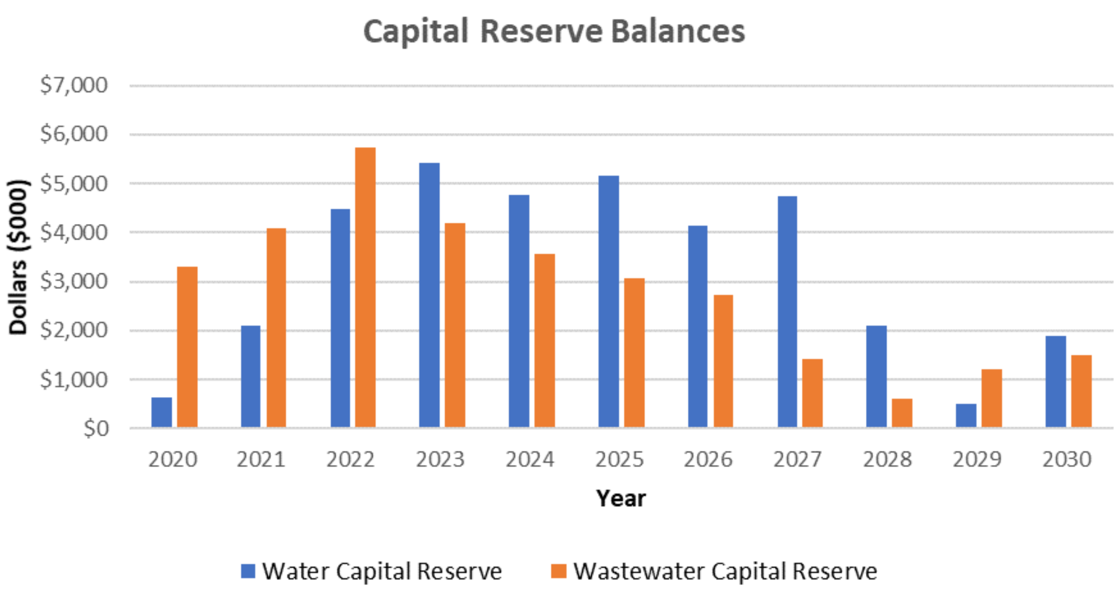


Figure 7: Option B - Year End Capital Reserve Balances

The results of this analysis demonstrate that a uniform increase from of 3.8% for water and 4.7% for wastewater is required to fully fund the 10-year capital plan. The details of this scenario are summarized in Table 5.

Table 5: Option B - Rate Summary

	2020*	2021	2022**	2023	2024	2025	2026	2027	2028	2029	2030
Water Rate Increase		3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%	3.8%
Water Rate ($/m3)	$2.1825	$2.2654	$2.3515	$2.4409	$2.5336	$2.6299	$2.7298	$2.8336	$2.9413	$3.0530	$3.1690
Wastewater Rate Increase		4.7%	4.7%	4.7%	4.7%	4.7%	4.7%	4.7%	4.7%	4.7%	4.7%
Wastewater Rate ($/m3)	$2.9979	$3.1388	$3.2863	$3.4408	$3.6025	$3.7718	$3.9491	$4.1347	$4.3290	$4.5325	$4.7455
Typical Yearly Bill ($)	$1,237	$1,288	$1,288	$1,336	$1,387	$1,439	$1,493	$1,549	$1,616	$1,686	$1,759

*Average yearly consumption of ~240m3/year for a 5/8" service connection during COVID-19 impacts.
**Average Yearly consumption ~226m3/year for a 5/8" service connection once the effects of COVID-19 have receded.
Refer to Customer Data Rate Structure Analysis (Appendix D) for detailed information on yearly consumption

The rationale and key decision factors that resulted in the proposed 10-year rate recommendations (Option B) are:

- Full cost recovery, meeting the objectives of the Town's AMP is achieved within the 10-year forecast period. This includes addressing the backlog of infrastructure investment identified in the AMP.
- A reasonable level of revenues from users is assumed based on continued water use at pre-COVID-19 levels.
- Debt servicing is minimized in the short and medium term.
- Overall water and wastewater reserves are maintained above the minimum range for each year, with the exception of 2028 and 2029. In these years, a decrease in reserve balances was tolerated to avoid an additional impact on rate increases.
- The rate increase for the users is kept constant over the 10-year period.

4.3 Option C - No Increase into a Uniform Increase

This option examines the impact of no rate increase in 2021 and 2022 followed by a uniform rate increase over the next 8 years. Like the previous options, the reserve balances have been maintained throughout the 10-year period to ensure there are enough funds available in the event of an emergency and avoids the need for any additional debt to cover the funding shortfall. Like Option B, this scenario trades off the sharp initial rate increases in 2022 and 2023 with the need for rate increases that always exceed inflation but which start two years later, again replacing the short-lived customer aggravation with the large initial increases with their constant frustration over relatively high and ongoing rate increase.

A summary of expenditures, revenues, and reserve balances are provided in Figures 8 to 10.

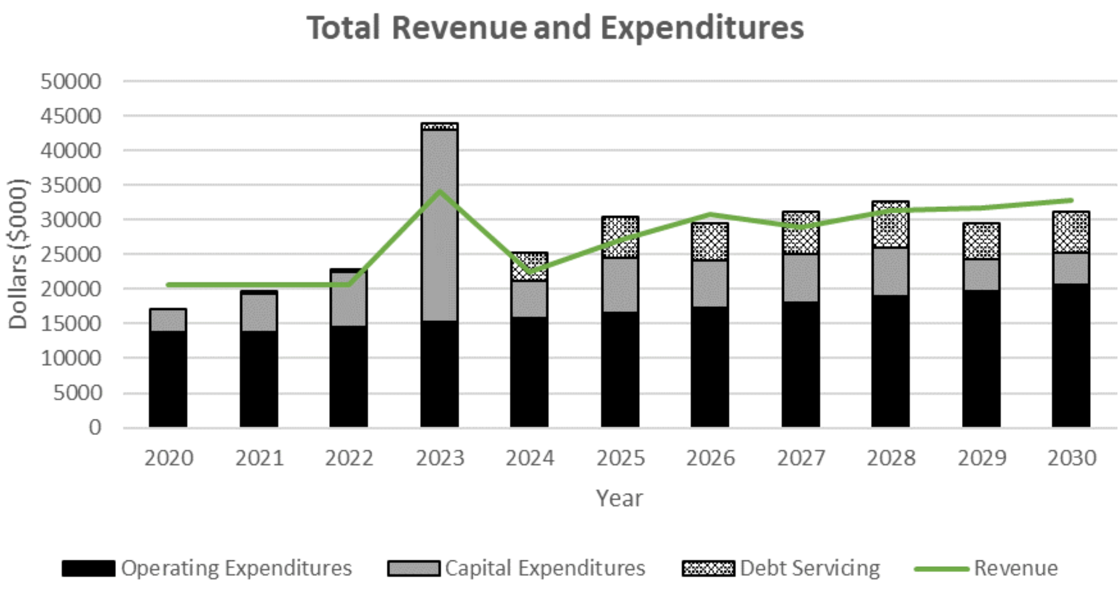


Figure 8: Option C - Water and Wastewater Expenditures and Revenue

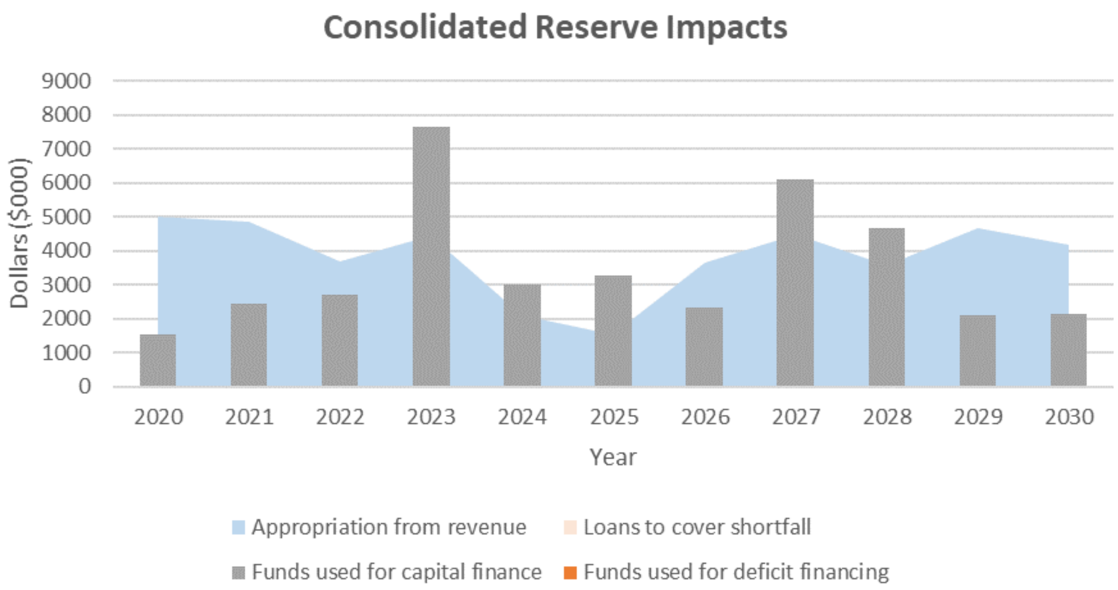


Figure 9: Option C – Water and Wastewater Reserve Impacts

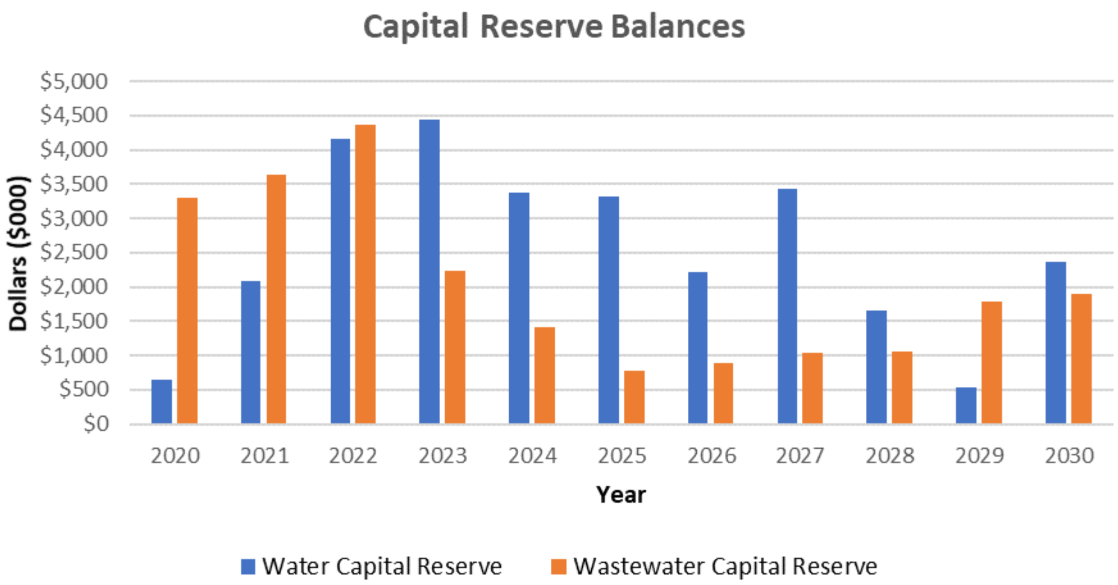


Figure 10: Option C - Year End Capital Reserve Balances

The results of this analysis demonstrate that a uniform increase of 7.0% for water and 8.8% for wastewater from 2023-2027 followed by a 0% increase in 2028 and 2029; and, a 2.5% increase in 2030 are required to fully fund the 10-year capital plan. The details of this scenario are summarized in Table 6.

Table 6: Option C - Rate Summary

	2020*	2021	2022**	2023	2024	2025	2026	2027	2028	2029	2030
Water Rate Increase		0.0%	0.0%	7.0%	7.0%	7.0%	7.0%	7.0%	0.0%	0.0%	2.5%
Water Rate ($/m3)	$2.1825	$2.1825	$2.1825	$2.3353	$2.4987	$2.6737	$2.8608	$3.0611	$3.0611	$3.0611	$3.1376
Wastewater Rate Increase		0.0%	0.0%	8.8%	8.8%	8.8%	8.8%	8.8%	0.0%	0.0%	2.5%
Wastewater Rate ($/m3)	$2.9979	$2.9979	$2.9979	$3.2617	$3.5487	$3.8610	$4.2008	$4.5705	$4.5705	$4.5705	$4.6847
Typical Yearly Bill ($)	$1,237	$1,235	$1,183	$1,272	$1,366	$1,469	$1,578	$1,696	$1,696	$1,696	$1,739
*Average yearly consumption of ~240m3/year for a 5/8" service connection during COVID-19 impacts. **Average Yearly consumption ~226m3/year for a 5/8" service connection once the effects of COVID-19 have receded. Refer to Customer Data Rate Structure Analysis (Appendix D) for detailed information on yearly consumption											

The rationale and key decision factors that resulted in the proposed 10-year rate recommendations (Option C) are:

- Full cost recovery, meeting the objectives of the Town's AMP is achieved within the 10-year forecast period. This includes addressing the backlog of infrastructure investment identified in the AMP.

- A reasonable level of revenues from users is assumed based on continued water use at pre-COVID-19 levels.
- Debt servicing is minimized in the short and medium term.
- Overall water and wastewater reserves are maintained above the minimum range for each year, with the exception of the years 2025 – 2028 (wastewater reserve) and 2029 (water reserve). In these years, a decrease in reserve balances was tolerated to avoid an additional impact on rate increases.
- No rate increase for the users is proposed in the immediate near term (2021 – 2022), increased over the following 5-year period (2023 – 2027), reduced to zero over the following 2-year period (2028 – 2029), then reduced to inflation only for the final year of the 10-year period (2030).

4.4 Option D – Moderate Increase into a Uniform Increase

Option C is a hybrid of Option A and B. This scenario examines the impact of a moderate rate increase in 2021 and 2022 followed by a higher uniform rate increase over the next 8 years. Like previous options, the reserve balances have been maintained throughout the 10-year period to ensure there are enough funds available in the event of an emergency and avoids the need for any additional debt to cover the funding shortfall. A summary of expenditures, revenues, and reserve balances are provided in Figures 11 to 13.

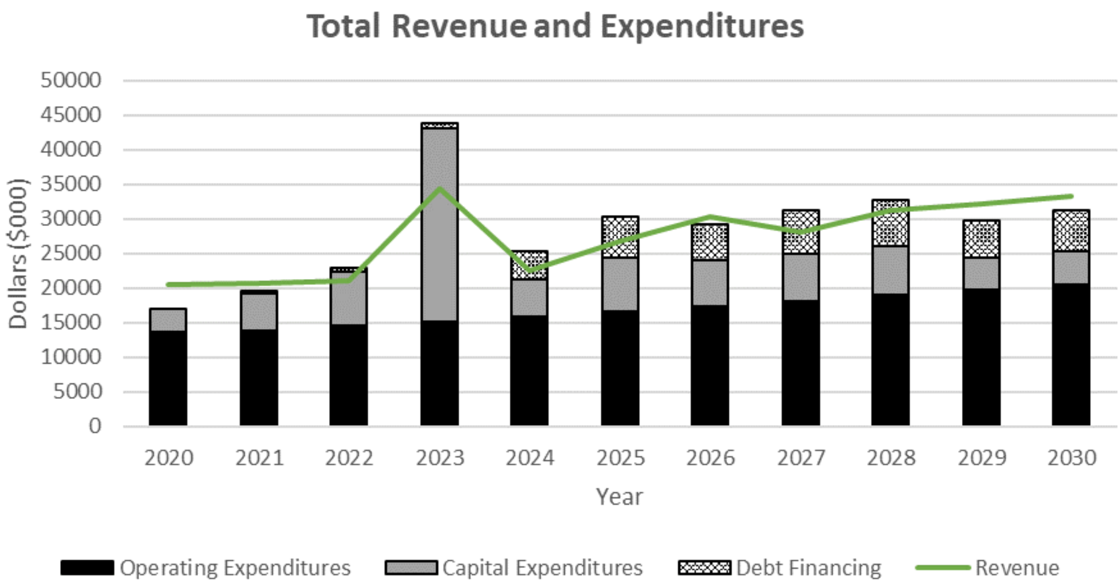


Figure 11: Option D – Water and Wastewater Expenditures and Revenue

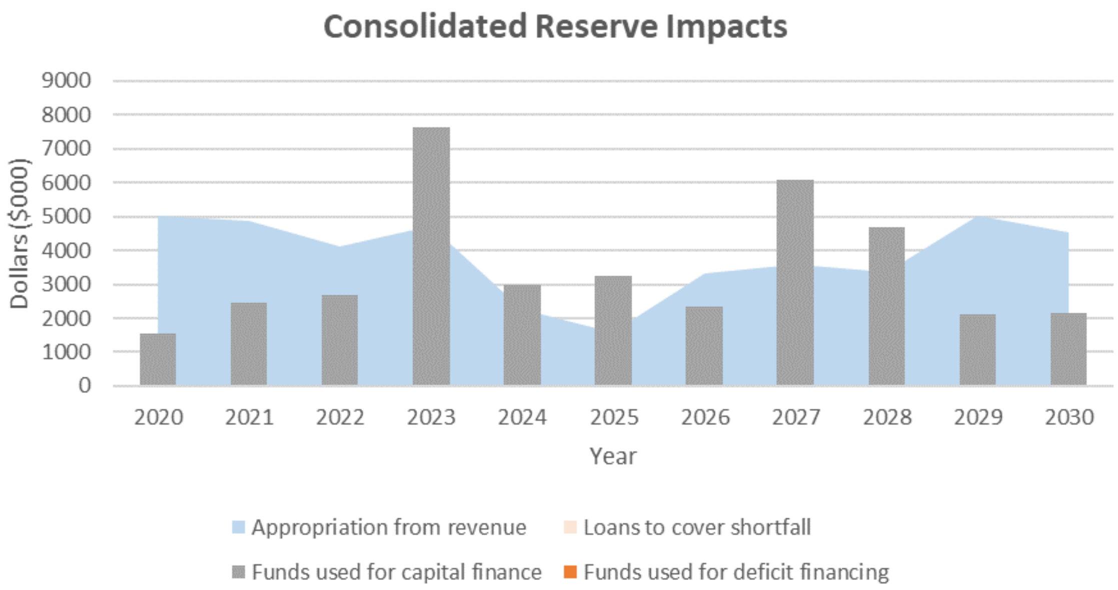


Figure 12: Option D – Water and Wastewater Reserve Impacts

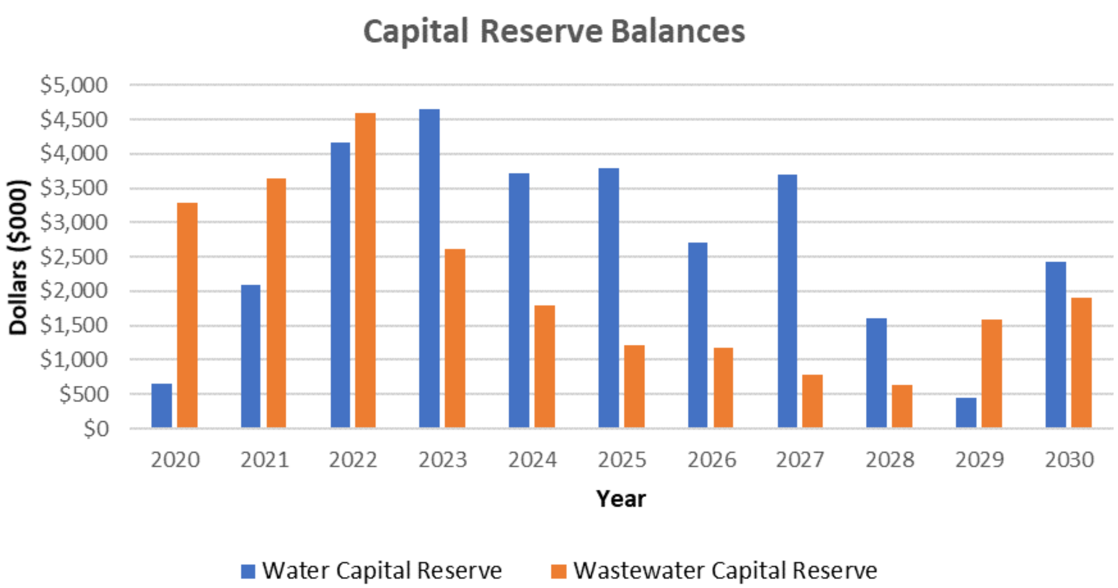


Figure 13: Option D - Year End Capital Reserve Balances

The results of this analysis demonstrate that if an increase of 2.5% for water and wastewater are applied in 2022, then a uniform increase of 5.9% for water and 7.5% for wastewater from 2023-2027 followed by a 2.5% increase for both from 2028-2030 are required to fully fund the 10-year capital plan. The details of this scenario are summarized in Table 7.

Table 7: Option D - Rate Summary

	2020*	2021	2022**	2023	2024	2025	2026	2027	2028	2029	2030
Water Rate Increase		0.0%	2.5%	5.9%	5.9%	5.9%	5.9%	5.9%	2.5%	2.5%	2.5%
Water Rate ($/m3)	$2.1825	$2.1825	$2.2371	$2.3690	$2.5088	$2.6568	$2.8136	$2.9796	$3.0541	$3.1304	$3.2087
Wastewater Rate Increase		0.0%	2.5%	7.5%	7.5%	7.5%	7.5%	7.5%	2.5%	2.5%	2.5%
Wastewater Rate ($/m3)	$2.9979	$2.9979	$3.0728	$3.3033	$3.5511	$3.8174	$4.1037	$4.4115	$4.5218	$4.6348	$4.7507
Typical Yearly Bill ($)	$1,237	$1,235	$1,213	$1,289	$1,369	$1,455	$1,546	$1,643	$1,684	$1,726	$1,769

*Average yearly consumption of ~240m3/year for a 5/8” service connection during COVID-19 impacts.
**Average Yearly consumption ~226m3/year for a 5/8” service connection once the effects of COVID-19 have receded.
Refer to Customer Data Rate Structure Analysis (Appendix D) for detailed information on yearly consumption

The rationale and key decision factors that resulted in the proposed 10-year rate recommendations (Option D) are:

- Full cost recovery, meeting the objectives of the Town’s AMP is achieved within the 10-year forecast period. This includes addressing the backlog of infrastructure investment identified in the AMP.
- A reasonable level of revenues from users is assumed based on continued water use at pre-COVID-19 levels.
- Debt servicing is minimized in the short and medium term.
- Overall water and wastewater reserves are maintained above the minimum range for each year, with the exception of the years 2025 – 2028 (wastewater reserve) and 2029 (water reserve). In these years, a decrease in reserve balances was tolerated to avoid an additional impact on rate increases.
- The rate increase for the users is minimized in the immediate near term (2021 – 2022), increased over the following 5-year period (2023 – 2027), then reduced to inflation only for the remainder of the 10-year period (2028 – 2030).

5 FINANCIAL IMPLICATIONS

All scenarios presented ensure the current capital investment needs are fully funded and address Asset Management renewal needs.

While it is preferable from a financial perspective to continue with rate increases through the next 2 years, the impacts from COVID-19, which have been a financial burden on customers, may warrant an alternate approach. This approach would forego any rate increases in 2021, and target higher rate increases once the economy recovers (estimated to occur in 2023).

Prior to COVID-19, Town council had approved two-years of 15% rate increases to address infrastructure needs. Rate increases of this magnitude are still recommended to collect the necessary revenues sooner rather than deferring capital projects to later years. The benefit of increasing renewal expenditures sooner results in lower risks of service delivery failure.

Additionally, there are several factors that will put pressure on the future financial situation, such as growth rates and climate change. Each of these can impact the financial situation by either increasing the costs (negative impacts) or decreasing the costs (positive impacts). Potential key factors are summarized in Table 8, which provides a description of these factors, as well as perspective on the impact of each factor on future financial situations.

It is apparent from Table 8 that there are several factors that could potentially put negative pressure on the financial situation of the Town's rate funded infrastructure systems, whereas in some scenarios positive pressure can also be applied. Note that the number of negative factors exceeds the number of positive factors. The financial model used to inform the analysis documented in this report has the capability to simulate the impact of these factors. These factors should be considered and monitored by the Town, and action should be taken accordingly, if they begin to show signs of impact on the Town's financial situation.

Table 8: Financial Impact Factors

Factor	Factors Causing Cost Increases	Factors Causing Cost to Decrease
Continuing to operate infrastructure systems with poor performing assets	Increased maintenance costs to react to failures or increased number of major repairs to keep facilities operating adequately until they are substantially rehabilitated/replaced.	
Grants from Senior Governments		Grants from the Federal and Provincial governments are relatively common in the infrastructure industry. The inconsistency makes it difficult to include in financial planning processes, however it is reasonable to expect some future one-time funding for infrastructure renewal activities.
System improvements to increase Levels of Service provided by infrastructure	Additional or larger assets to address basement flooding, improve fire flows, or improve reliability will require more capital funding.	
Climate Change	Increase in number/intensity of wet weather events may require upsizing of pipes and increased O&M from increased sediment run off, more capacity may be required at treatment plants and pump stations, etc. Increased cost to treat water due to the increase in temperatures (bacteria breeds faster, algae blooms, etc.	Extended droughts may result in increased water consumption, resulting in higher than expected revenue.
Consumption efficiency	Decreases demand and therefore decreases gross revenues.	
Better infrastructure renewal needs data	Staff continually improve the understanding of the short, medium and long-term infrastructure needs to maintain current LOS or achieve proposed LOS. The AMP renewal needs will be updated periodically as additional data is collected on asset performance.	
Population growth through greenfield development	Population growth in greenfield development requires new infrastructure to service development which increases long term O&M and capital renewal needs	
Population growth through intensification development	Population growth through intensification development does often require new infrastructure, but the needs are typically less than what is required for greenfield development. Places stress on old infrastructure from greater demand.	More customers increase demand which increases gross revenue.
Capital inflation	Capital inflation rates tend to be more volatile than consumer inflation. Periods with large amount of infrastructure construction in a short period can cause capital inflation that exceeds the rate of increases to household incomes, but the opposite is seen in periods of rapid economic downturn causing deflation in capital construction costs.	
Impacts of COVID-19	Several aspects related to the recovery from COVID-19 are still undetermined. The speed of recovery can have either a positive or negative affect on demand, which will affect the financial plan. Furthermore, the landscape if the economy post-COVID is uncertain, with several factors such as continued working from home of and the details surrounding re-opening of businesses possibly affecting demand and therefore the financial plan. These factors could have either a positive or negative financial impact, depending on their speed, scale and magnitude.	
Increases to Regional rate	Historically the Region's rate increases have been 9.6% from the years 2009 to 2019. The Region has forecasted rate increases moving forward of 3.5%. If the rate increases revert to their historical values (i.e. 9.6%), it will correspond to an increase in costs to the Town.	

6 ALIGNMENT WITH STRATEGIC PLAN

By implementing a full cost recovery approach, this financial plan ensures that all aspects of the core services of drinking water and wastewater are accounted for. It ensures that the appropriate funding is secured to meet all expenditure needs and continue providing high quality service now and into the future.

This methodology is in alignment with aspects of the Town's strategic plan, in particular the following core strategic pillars and priorities:

1. **Fiscal Sustainability.** Working toward a sustainable budget that ensures the protection and maintenance of core services now and into the future.
2. **Service Excellence.** Supporting a collaborative, timely, customer-focused approach to operations that enhances efficiency, effectiveness, and customer satisfaction.
3. **Asset Planning, Maintenance and Development.** Successful stewardship of the infrastructure and facilities required to support a growing community and vibrant economy.

7 CONCLUSIONS AND RECOMMENDATIONS

The financial analysis documented in this report demonstrates that the Town has the flexibility to pursue several rates increases to ensure full cost recovery of their water and wastewater system. The recommended option for rates moving forward keeps the Town's current rate structure (volumetric unit charge).

Option A is recommended, which provides a balance that is sensitive to the current economic impacts of COVID-19, while still focusing on addressing the infrastructure renewal needs sooner rather than over an extended period. This will result in a lower risk of service failures. The rate summary for this option is provided in Table 4.

It should be noted that the recommendations from Option A and Option D are similar. Both have nil, followed by moderate rate increases in 2021 and 2022; however, Option A recommends a more substantial increase over a shorter period (2023 and 2024), before returning to levels that closely match inflation. Option D recommends a less substantial increase over a longer period (2023 to 2027).

Option A is recommended, since the larger rate increases allow the Town to secure more funding to address the infrastructure backlog sooner, which reduces risk of unplanned service failures. This scenario also allows rate increases to return to levels that more closely match inflation from 2025 on, thus avoiding customer frustration with perpetually high rate increases.

It should also be noted that there are several factors that are documented in Section 5 that could put negative pressure on the financial situation. Costs associated with addressing these considerations will be competing with the costs to renew existing assets. Therefore, the faster rate increase proposed in Option A will provide the fiscal capacity to ensure funds are available to address these factors if or when they begin to impact the LOS provided by the infrastructure systems.

Financial Statements developed for water supply and wastewater collection operations under this study indicate that adequate financial resources are allocated to the systems over the next 10 years based on the planned capital expenditures and the cost to operate the system. These statements are provided in Appendices A and B.

APPENDIX A: Water Financial Statements

1. Statement of Financial Position for the Water System

Water Infrastructure Statement of Financial Position As at December 31 (in thousands of dollars)	**2021**	**2022**	**2023**	**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Financial assets										
Cash and cash equivalents	$ 5,987	$ 3,926	$ 2,002	$ 4,362	$ 2,525	$ 5,954	$ 4,215	$ 5,515	$ 7,267	$ 9,080
Accounts receivable - rate revenues	$ 722	$ 714	$ 787	$ 871	$ 902	$ 938	$ 971	$ 1,011	$ 1,047	$ 1,079
Accounts receivable - other revenue sources	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Investments	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total	$ 6,709	$ 4,640	$ 2,789	$ 5,233	$ 3,427	$ 6,892	$ 5,187	$ 6,526	$ 8,314	$ 10,160
Liabilities										
Accounts payable - wages	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Accounts payable - other payables	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
DC reserve (Deferred revenue)	$ 1,172	$ 1,480	$ -	$ 518	$ -	$ -	$ 166	$ 364	$ 482	$ 616
Short term debt	$ -	$ -	$ 2,061	$ 2,955	$ 962	$ 1,838	$ 919	$ 1,739	$ 869	$ -
Long term debt	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total	$ 1,172	$ 1,480	$ 2,061	$ 3,473	$ 962	$ 1,838	$ 1,085	$ 2,102	$ 1,351	$ 616
Net Financial Assets (Liabilities)	$ 5,538	$ 3,159	$ 728	$ 1,760	$ 2,465	$ 5,054	$ 4,102	$ 4,424	$ 6,963	$ 9,543
Non-financial assets										
Tangible capital assets										
TCA used in production	$ 40,308	$ 45,193	$ 51,346	$ 54,028	$ 60,780	$ 64,846	$ 66,637	$ 73,406	$ 74,801	$ 76,231
Work in progress	$ 5,684	$ 6,011	$ 9,399	$ 9,199	$ 7,297	$ 5,959	$ 8,896	$ 5,643	$ 5,643	$ 5,643
Less accumulated amortization	$ (6,836)	$ (7,521)	$ (8,284)	$ (9,082)	$ (9,980)	$ (10,939)	$ (11,901)	$ (12,934)	$ (13,984)	$ (15,052)
Total TCA	$ 39,155	$ 43,682	$ 52,461	$ 54,145	$ 58,098	$ 59,866	$ 63,632	$ 66,115	$ 66,460	$ 66,822
Inventories of supplies	$ -	$ 9	$ 9	$ 9	$ 10	$ 10	$ 10	$ 11	$ 11	$ 11
Prepaid expenses	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total	$ 39,155	$ 43,691	$ 52,470	$ 54,154	$ 58,108	$ 59,876	$ 63,642	$ 66,126	$ 66,471	$ 66,833
Accumulated surplus	$ 44,693	$ 46,850	$ 53,198	$ 55,914	$ 60,572	$ 64,930	$ 67,744	$ 70,549	$ 73,434	$ 76,377

2. Statement of Operations for the Water System

Water Infrastructure Statement of Financial Position As at December 31 (in thousands of dollars)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Revenues										
Rate revenues	8,667	8,563	9,448	10,448	10,828	11,253	11,655	12,129	12,559	12,953
Capital levy	-	-	-	-	-	-	-	-	-	-
Interest earned on cash and cash equivalents	40	60	39	20	44	25	60	42	55	73
Earned DC revenue	516	594	4,295	51	1,998	1,691	47	40	55	53
Other revenues	379	379	379	379	379	379	379	379	379	379
Total Revenues	9,602	9,596	14,162	10,899	13,250	13,349	12,141	12,590	13,048	13,458
Operating Expenses										
Meters - Labour	-	35	36	38	39	40	41	42	44	45
Allocated Labour	1,169	1,124	1,158	1,196	1,231	1,271	1,307	1,351	1,390	1,423
Clothing Allowance	2	2	2	2	2	2	2	2	3	3
Training Fees	24	24	25	26	27	28	29	30	30	31
Membership Fees, Dues, Subs	2	2	2	2	2	2	2	2	3	3
Telephone Services	4	2	3	3	3	3	3	3	3	3
Radio/Pager/Cell	5	2	2	2	3	3	3	3	3	3
Insurance	51	47	49	51	52	54	56	58	59	61
Contracted Services - Reading/Delivery	141	83	86	89	91	94	97	101	104	107
Professional Fees - Consultant	56	21	22	23	24	24	25	26	27	27
Audit Fees	2	2	2	2	3	3	3	3	3	3
Computer Lease Expense	0	1	1	1	1	1	1	1	1	1
Computer	25	25	26	27	27	28	29	30	31	32
Office Supplies	10	10	10	11	11	12	12	12	13	13
Postage	27	27	28	29	30	31	32	33	34	35
Advertising - General	3	3	3	3	3	4	4	4	4	4
Fuel	21	21	22	22	23	24	25	25	26	27
Vehicle Maintenance Supplies	8	8	8	8	8	9	9	9	10	10
Water Testing-Mat & Serv	42	43	44	46	47	49	50	52	53	55
Building Maintenance - Blk Water Statn	3	3	3	4	4	4	4	4	4	4
Tools	9	9	9	9	10	10	10	11	11	11
Hydrants - Materials	50	51	52	54	56	58	60	62	64	65
Meters - Materials/Contract	50	80	82	85	88	91	93	97	100	102
Water Srv/Material Contract	100	102	105	109	112	116	119	124	127	131
Watermains - Materials/Contract	102	104	107	111	115	119	122	127	130	134
Miscellaneous Expenses	3	3	3	3	3	3	3	3	3	3
Payment To Others-Reg'L Levy	4,643	4,879	5,112	5,368	5,617	5,895	6,165	6,478	6,773	7,054
Bank Charges	3	3	3	4	4	4	4	4	4	4
Facility Rentals Expense	36	37	38	39	40	42	43	45	46	47
Total Operating Expenses	6,592	6,754	7,045	7,366	7,676	8,021	8,354	8,742	9,103	9,442
Net Operating Revenue	3,010	2,842	7,117	3,533	5,574	5,328	3,788	3,848	3,945	4,016
Less amortization of tangible assets	(614)	(685)	(763)	(798)	(898)	(959)	(962)	(1,032)	(1,050)	(1,068)
Earnings Before Interest	2,396	2,157	6,354	2,735	4,676	4,369	2,825	2,816	2,895	2,948
Less Interest on short term loans	-	-	(6)	(18)	(18)	(11)	(11)	(11)	(11)	(5)
Less Interest on long term debt	-	-	-	-	-	-	-	-	-	-
Annual Surplus (Deficit)	2,396	2,157	6,348	2,717	4,658	4,358	2,814	2,805	2,884	2,943
Accumulated Surplus at beginning of year	42,297	44,693	46,850	53,198	55,914	60,572	64,930	67,744	70,549	73,434
Accumulated Surplus at end of year	44,693	46,850	53,198	55,914	60,572	64,930	67,744	70,549	73,434	76,377

3. Statement of Cash Flow for the Water System

Water Infrastructure Statement of Financial Position As at December 31 (in thousands of dollars)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Cash from operations										
Earnings before interest expenses	$ 2,396	$ 2,157	$ 6,354	$ 2,735	$ 4,676	$ 4,369	$ 2,825	$ 2,816	$ 2,895	$ 2,948
Less earned DC revenue	$ (516)	$ (594)	$ (4,295)	$ (51)	$ (1,998)	$ (1,691)	$ (47)	$ (40)	$ (55)	$ (53)
Plus DC contributions	$ 881	$ 902	$ 924	$ 947	$ 971	$ 994	$ 1,019	$ 1,044	$ 601	$ 616
Plus amortization of tangible capital assets	$ 614	$ 685	$ 763	$ 798	$ 898	$ 959	$ 962	$ 1,032	$ 1,050	$ 1,068
Total	$ 3,375	$ 3,151	$ 3,746	$ 4,429	$ 4,546	$ 4,631	$ 4,760	$ 4,853	$ 4,492	$ 4,579
Cash from the Movement of Balance Sheet Account										
Accounts payable - increase/(decrease)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Pensions and other employee benefits - increase/(decrease)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Accounts receivable - (increase)/decrease	$ (10)	$ 9	$ (74)	$ (83)	$ (32)	$ (35)	$ (34)	$ (39)	$ (36)	$ (33)
Inventory - (increase)/decrease	$ 9	$ (9)	$ (0)	$ (0)	$ (0)	$ (0)	$ (0)	$ (0)	$ (0)	$ (0)
Prepaid expenses - (increase)/decrease	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total	$ (1)	$ (0)	$ (74)	$ (84)	$ (32)	$ (36)	$ (34)	$ (40)	$ (36)	$ (33)
Proceeds of New Debt										
Short term loans	$ -	$ -	$ 2,061	$ 1,924	$ -	$ 1,838	$ -	$ 1,739	$ -	$ -
DC reserve loans	$ -	$ -	$ 1,891	$ -	$ 888	$ 1,253	$ -	$ -	$ -	$ -
Long term loans	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total	$ -	$ -	$ 3,952	$ 1,924	$ 888	$ 3,090	$ -	$ 1,739	$ -	$ -
Captial Finance										
Interest costs	$ -	$ -	$ (6)	$ (18)	$ (18)	$ (11)	$ (11)	$ (11)	$ (11)	$ (5)
Repayment of short-term debt	$ -	$ -	$ 0	$ (1,031)	$ (1,993)	$ (962)	$ (919)	$ (919)	$ (869)	$ (869)
Repayment of DC loans	$ -	$ -	$ -	$ (378)	$ (378)	$ (556)	$ (806)	$ (806)	$ (428)	$ (428)
Repayment of long-term debt	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total	$ -	$ -	$ (6)	$ (1,427)	$ (2,389)	$ (1,529)	$ (1,736)	$ (1,736)	$ (1,308)	$ (1,303)
Cash used to finance tangible asset investments										
New project investments	$ (1,364)	$ (5,212)	$ (9,542)	$ (2,482)	$ (4,851)	$ (2,727)	$ (4,728)	$ (3,515)	$ (1,395)	$ (1,430)
Total	$ (1,364)	$ (5,212)	$ (9,542)	$ (2,482)	$ (4,851)	$ (2,727)	$ (4,728)	$ (3,515)	$ (1,395)	$ (1,430)
Cash Surplus (Deficit)	$ 2,010	$ (2,061)	$ (1,924)	$ 2,361	$ (1,838)	$ 3,429	$ (1,739)	$ 1,300	$ 1,752	$ 1,813
Cash and cash equivalents, start of year	$ 3,977	$ 5,987	$ 3,926	$ 2,002	$ 4,362	$ 2,525	$ 5,954	$ 4,215	$ 5,515	$ 7,267
Cash and cash equivalents, end of year	$ 5,987	$ 3,926	$ 2,002	$ 4,362	$ 2,525	$ 5,954	$ 4,215	$ 5,515	$ 7,267	$ 9,080

APPENDIX B: Wastewater Financial Statements

1. Statement of Financial Position for the Wastewater System

Wastewater Infrastructure Statement of Financial Position As at December 31 (in thousands of dollars)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Financial assets										
Cash and cash equivalents	$ 4,721	$ 5,731	$ 70	$ 2,007	$ 4,557	$ 8,216	$ 11,187	$ 14,871	$ 18,956	$ 23,129
Accounts receivable - rate revenues	$ 795	$ 815	$ 932	$ 1,065	$ 1,108	$ 1,148	$ 1,190	$ 1,243	$ 1,282	$ 1,324
Accounts receivable - other revenue sources	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Investments	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total	$ 5,516	$ 6,547	$ 1,002	$ 3,072	$ 5,665	$ 9,364	$ 12,377	$ 16,114	$ 20,238	$ 24,452
Liabilities										
Accounts payable - wages	$ 16	$ 17	$ 17	$ 18	$ 18	$ 19	$ 19	$ 20	$ 21	$ 21
Accounts payable - other payables	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
DC reserve (Deferred revenue)	$ -	$ -	$ -	$ 0	$ -	$ -	$ 0	$ -	$ -	$ -
Short term debt	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (0)	$ (0)	$ (0)
Long term debt	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total	$ 16	$ 17	$ 17	$ 18	$ 18	$ 19	$ 19	$ 20	$ 21	$ 21
Net Financial Assets (Liabilities)	$ 5,500	$ 6,530	$ 985	$ 3,054	$ 5,647	$ 9,345	$ 12,357	$ 16,094	$ 20,218	$ 24,431
Non-financial assets										
Tangible capital assets										
TCA used in production	$ 86,358	$ 88,887	$ 104,019	$ 106,911	$ 111,942	$ 116,405	$ 118,423	$ 119,134	$ 119,552	$ 121,498
Work in progress	$ 5,131	$ 5,220	$ 8,421	$ 8,326	$ 6,281	$ 5,809	$ 5,936	$ 8,689	$ 11,510	$ 12,882
Less accumulated amortization	$ (17,697)	$ (19,115)	$ (20,720)	$ (22,360)	$ (24,058)	$ (25,819)	$ (27,598)	$ (29,377)	$ (31,157)	$ (32,958)
Total TCA	$ 73,793	$ 74,992	$ 91,720	$ 92,878	$ 94,165	$ 96,395	$ 96,761	$ 98,446	$ 99,904	$ 101,421
Inventories of supplies	$ 0	$ 0	$ 0	$ 0	$ 0	$ 1	$ 1	$ 1	$ 1	$ 1
Prepaid expenses	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total	$ 73,794	$ 74,992	$ 91,720	$ 92,878	$ 94,166	$ 96,396	$ 96,761	$ 98,447	$ 99,905	$ 101,422
Accumulated surplus	$ 79,294	$ 81,522	$ 92,705	$ 95,932	$ 99,812	$ 105,741	$ 109,119	$ 114,540	$ 120,123	$ 125,853

2. Statement of Operations for the Wastewater System

Wastewater Infrastructure Statement of Financial Position As at December 31 (in thousands of dollars)	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030
Revenues										
Rate revenues	$ 9,545	$ 9,784	$ 11,184	$ 12,780	$ 13,301	$ 13,779	$ 14,277	$ 14,913	$ 15,384	$ 15,884
Capital levy	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Interest earned on cash and cash equivalents	$ 50	$ 47	$ 57	$ 1	$ 20	$ 46	$ 82	$ 112	$ 149	$ 190
Earned DC revenue	$ 1,097	$ 1,237	$ 9,320	$ 220	$ 810	$ 2,808	$ 157	$ 2,044	$ 2,103	$ 2,167
Other revenues	$ 398	$ 398	$ 398	$ 398	$ 398	$ 398	$ 398	$ 398	$ 398	$ 398
Total Revenues	$ 11,090	$ 11,467	$ 20,960	$ 13,400	$ 14,530	$ 17,031	$ 14,914	$ 17,467	$ 18,034	$ 18,639
Operating Expenses										
Allocated Labour	$ 387	$ 403	$ 415	$ 427	$ 441	$ 454	$ 467	$ 485	$ 497	$ 509
Clothing Allowance	$ 2	$ 2	$ 2	$ 2	$ 2	$ 2	$ 2	$ 2	$ 2	$ 2
Membership Fees, Dues, Subs	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1
Telephone Services	$ 2	$ 1	$ 1	$ 1	$ 2	$ 2	$ 2	$ 2	$ 2	$ 2
Radio/Pager/Cell	$ 3	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1
Insurance	$ 42	$ 40	$ 41	$ 43	$ 44	$ 45	$ 47	$ 49	$ 50	$ 51
Contracted Srv - Cctv Inspection Srvc	$ 50	$ 53	$ 55	$ 56	$ 58	$ 60	$ 62	$ 65	$ 66	$ 68
Audit Fees	$ 2	$ 2	$ 2	$ 2	$ 2	$ 2	$ 2	$ 2	$ 3	$ 3
Computer Lease Expense	$ 0	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1
Computer	$ 36	$ 38	$ 40	$ 41	$ 42	$ 44	$ 45	$ 47	$ 48	$ 49
Office Supplies	$ 7	$ 8	$ 8	$ 8	$ 8	$ 9	$ 9	$ 9	$ 10	$ 10
Postage	$ 20	$ 21	$ 22	$ 23	$ 23	$ 24	$ 25	$ 26	$ 26	$ 27
Vehicle Maintenance Supplies	$ 2	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1
Laterals - Material/Contract	$ 56	$ 59	$ 61	$ 63	$ 65	$ 67	$ 69	$ 72	$ 74	$ 76
Mains - Materials/Contract	$ 65	$ 69	$ 71	$ 73	$ 76	$ 78	$ 81	$ 84	$ 86	$ 88
Payment To Others-Reg'L Levy	$ 6,178	$ 6,691	$ 7,008	$ 7,334	$ 7,709	$ 8,063	$ 8,438	$ 8,898	$ 9,267	$ 9,665
Bank Charges	$ 2	$ 2	$ 2	$ 2	$ 3	$ 3	$ 3	$ 3	$ 3	$ 3
Facility Rentals Expense	$ 36	$ 38	$ 39	$ 41	$ 42	$ 43	$ 45	$ 47	$ 48	$ 49
Equipment Rentals Expense	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0	$ 0
Advertising - General	$ 2	$ 2	$ 2	$ 2	$ 2	$ 2	$ 2	$ 2	$ 2	$ 2
Fuel	$ 4	$ 3	$ 3	$ 3	$ 4	$ 4	$ 4	$ 4	$ 4	$ 4
Repairs/Mtnce - Equip - Mat	$ 2	$ 2	$ 2	$ 2	$ 2	$ 2	$ 2	$ 2	$ 2	$ 2
Storm Water Mgmt	$ 361	$ 382	$ 394	$ 406	$ 421	$ 434	$ 448	$ 465	$ 477	$ 491
Miscellaneous Expenses	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1
Total Operating Expenses	$ 7,257	$ 7,820	$ 8,172	$ 8,534	$ 8,951	$ 9,342	$ 9,757	$ 10,267	$ 10,671	$ 11,108
Net Operating Revenue	$ 3,833	$ 3,647	$ 12,788	$ 4,866	$ 5,578	$ 7,689	$ 5,158	$ 7,200	$ 7,363	$ 7,531
Less Amortization of tangible assets	$ (1,388)	$ (1,418)	$ (1,605)	$ (1,639)	$ (1,698)	$ (1,760)	$ (1,780)	$ (1,779)	$ (1,780)	$ (1,801)
Earnings Before Interest	$ 2,444	$ 2,229	$ 11,183	$ 3,227	$ 3,880	$ 5,929	$ 3,378	$ 5,422	$ 5,582	$ 5,730
Less Interest on short term loans	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Less Interest on long term debt	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Annual Surplus (Deficit)	$ 2,444	$ 2,229	$ 11,183	$ 3,227	$ 3,880	$ 5,929	$ 3,378	$ 5,422	$ 5,582	$ 5,730
Accumulated Surplus at beginning of year	$ 76,849	$ 79,294	$ 81,522	$ 92,705	$ 95,932	$ 99,812	$ 105,741	$ 109,119	$ 114,540	$ 120,123
Accumulated Surplus at end of year	$ 79,294	$ 81,522	$ 92,705	$ 95,932	$ 99,812	$ 105,741	$ 109,119	$ 114,540	$ 120,123	$ 125,853

3. Statement of Cash Flow for the Wastewater System

Wastewater Infrastructure Statement of Financial Position As at December 31 (in thousands of dollars)	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028
Cash from operations										
Earnings before interest expenses	$ 2,444	$ 2,229	$ 11,183	$ 3,227	$ 3,880	$ 5,929	$ 3,378	$ 5,422	$ 5,582	$ 5,730
Less earned DC revenue	$ (1,097)	$ (1,237)	$ (9,320)	$ (220)	$ (810)	$ (2,808)	$ (157)	$ (2,044)	$ (2,103)	$ (2,167)
Plus DC contributions	$ 636	$ 652	$ 668	$ 685	$ 701	$ 719	$ 736	$ 754	$ 436	$ 446
Plus Amortization of tangible capital assets	$ 1,388	$ 1,418	$ 1,605	$ 1,639	$ 1,698	$ 1,760	$ 1,780	$ 1,779	$ 1,780	$ 1,801
Total	$ 3,372	$ 3,062	$ 4,136	$ 5,331	$ 5,470	$ 5,600	$ 5,737	$ 5,911	$ 5,695	$ 5,810
Cash from the Movement of Balance Sheet Account										
Accounts payable - increase/(decrease)	$ 0	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 1	$ 0	$ 1
Pensions and other employee benefits - increase/(decrease)	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Accounts receivable - (increase)/decrease	$ (13)	$ (20)	$ (117)	$ (133)	$ (43)	$ (40)	$ (41)	$ (53)	$ (39)	$ (42)
Inventory - (increase)/decrease	$ -	$ (0)	$ (0)	$ (0)	$ (0)	$ (0)	$ (0)	$ (0)	$ (0)	$ (0)
Prepaid expenses - (increase)/decrease	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total	$ (13)	$ (19)	$ (116)	$ (133)	$ (43)	$ (39)	$ (41)	$ (52)	$ (39)	$ (41)
Proceeds of New Debt										
Short term loans	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ (0)	$ (0)	$ (0)
DC reserve loans	$ 819	$ 1,106	$ 9,395	$ 2,157	$ 3,162	$ 5,417	$ 3,668	$ 6,049	$ 5,758	$ 6,532
Long term loans	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total	$ 819	$ 1,106	$ 9,395	$ 2,157	$ 3,162	$ 5,417	$ 3,668	$ 6,049	$ 5,758	$ 6,532
Captial Finance										
Interest costs	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Repayment of short-term debt	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Repayment of DC loans	$ (358)	$ (521)	$ (743)	$ (2,621)	$ (3,053)	$ (3,328)	$ (4,247)	$ (4,760)	$ (4,091)	$ (4,811)
Repayment of long-term debt	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Total	$ (358)	$ (521)	$ (743)	$ (2,621)	$ (3,053)	$ (3,328)	$ (4,247)	$ (4,760)	$ (4,091)	$ (4,811)
Cash used to finance tangible asset investments										
New project investments	$ (4,057)	$ (2,617)	$ (18,333)	$ (2,797)	$ (2,986)	$ (3,990)	$ (2,145)	$ (3,464)	$ (3,238)	$ (3,318)
Total	$ (4,057)	$ (2,617)	$ (18,333)	$ (2,797)	$ (2,986)	$ (3,990)	$ (2,145)	$ (3,464)	$ (3,238)	$ (3,318)
Cash Surplus (Deficit)	$ (238)	$ 1,011	$ (5,661)	$ 1,936	$ 2,550	$ 3,659	$ 2,971	$ 3,684	$ 4,085	$ 4,172
Cash and cash equivalents, start of year	$ 4,958	$ 4,721	$ 5,731	$ 70	$ 2,007	$ 4,557	$ 8,216	$ 11,187	$ 14,871	$ 18,956
Cash and cash equivalents, end of year	$ 4,721	$ 5,731	$ 70	$ 2,007	$ 4,557	$ 8,216	$ 11,187	$ 14,871	$ 18,956	$ 23,129

APPENDIX C: Glossary of Terms

1.0 GLOSSARY OF TERMS

1.1 Statement of Financial Position

Financial Assets - assets that could be used to discharge existing liabilities or finance future operations and are not for consumption in the normal course of operations. Financial assets include cash, investments, accounts receivable, etc.

Physical assets (such as inventories of supplies, tangible capital assets), and leased assets are not financial assets. Control of such assets creates an opportunity to produce or supply goods and services, rent to others, use for administrative purposes or for the development, construction or repair of other tangible capital assets. Control of such assets does not give rise to a present right to receive cash or another financial asset.

Assets, such as prepaid expenses, for which the future economic benefit is the receipt of goods or services rather than the right to receive cash or another financial asset, are not financial assets. Similarly, certain deferred liabilities are not financial liabilities when the outflow of economic benefits associated with them is in the nature of goods or services rather than a contractual obligation to pay cash or another financial asset.

Liabilities - present obligations of a local government to others arising from past transactions or events, the settlement of which is expected to result in the future sacrifice of economic benefits. Liabilities have three essential characteristics:

- They embody a duty or responsibility to others, leaving a local government little or no discretion to avoid settlement of the obligation;
- The duty or responsibility to others entails settlement by future transfer or use of assets, provision of goods or services, or other form of economic settlement at a specified or determinable date, on occurrence of a specified event, or on demand;
- The transactions or events obligating the local government have already occurred.

Net Debt - a term used to describe the first indicator of a government's financial position. The net assets of a government represent the net economic resources recognizable by the government. The two dimensions of the government's financial position are combined to calculate this second indicator of a government's financial position, called its accumulated surplus or deficit.

Net debt is measured as the difference between a government's liabilities and financial assets. This difference bears directly on the government's future revenue requirements and on its ability to finance its activities and meet its liabilities and contractual obligations. Net debt provides a measure of the future revenues required to pay for past transactions and events. The extent of a government's net debt and the financial ability of the government to service that debt is an important test of the sustainability of that government. It is possible, however, that a government's financial assets could exceed its liabilities. In such circumstances, this indicator of a government's financial position would be called "net financial resources" and it would provide a measure of the net financial assets on hand that can provide resources to finance future operations.

A government's net debt is an important indicator of a government's financial position, highlighting the financial affordability of future government service provision. A net debt position represents a "lien" on the ability of the government to apply financial resources and future revenues to provide services. Non-financial assets are added to net debt to calculate the other indicator of a government's financial position — its accumulated surplus or deficit. Non-financial assets are "prepaid service potential". Reporting a government's recognized non-financial resources as part of its financial position provides information necessary for a more complete understanding of a government's debt position, financial position and future operating requirements.

Non-financial Assets - tangible capital assets and other assets such as prepaid expenses and inventories of supplies. Non-financial assets are acquired, constructed or developed assets that are normally employed to deliver local government services, may be consumed in the normal course of operations and are not for sale in the normal course of operations.

Certain non-financial resources are, however, not given accounting recognition in government financial statements. For example, all government intangibles, and all-natural resources and Crown lands that have not been purchased by the government, are not given accounting recognition in government financial statements.

Accumulated Surplus or Deficit - calculated as the sum of the net debt of the government and its non-financial assets. This indicator represents the net assets of the government. The accumulated surplus or deficit of a government, or its net assets, is the residual interest in its assets after deducting its liabilities.

1.2 Statement of Operations

Revenues - including gains, can arise from: taxation; the sale of goods; the rendering of services; the use by others of local government economic resources yielding rent, interest, royalties or dividends; or receipt of contributions such as grants, donations and bequests. Revenues do not include borrowings, such as proceeds from debt issues or transfers from other local governmental units in a local government reporting entity.

Expenses - including losses, are decreases in economic resources, either by way of outflows or reductions of assets or incurrence of liabilities, resulting from the operations, transactions and events of the accounting period. Expenses include transfer payments due where no value is received directly in return. Expenses include the cost of economic resources consumed in, and identifiable with, the operations of the accounting period. For example, the cost of tangible capital assets is amortized to expenses as the assets are used in delivering local government programs. Expenses do not include debt repayments or transfers to other local governmental units in a local government reporting entity.

Surplus - a term used to describe the difference between the revenues and expenses in the period.

1.3 Statement of Cash Flows

The statement of cash flow should report how a government generated and used cash and cash equivalents in the accounting period and the change in cash and cash equivalents in the period. The statement of cash flow should report the cash and cash equivalents at both the beginning and end of the accounting period.

The statement of cash flow should report cash flows during the period classified by:

- Operating;
- Capital;
- Investing; and,
- Financing activities.

APPENDIX D: Customer Data and Rate Structure Analysis Report

Date:	2/25/2021	File:	720046
To:	Clayton Pereira, MBA, CPA, CGA		
From:	Mike Fortin, M.A., Economics Zachary Francisco, B.Sc.		
Project:	Whitchurch-Stouffville Water and Wastewater Financial Plan and Rate Study		
Subject:	Customer Data and Rate Structure Analysis		

TECHNICAL MEMORANDUM

TABLE OF CONTENTS

1 INTRODUCTION

This report documents the analysis of customer data and the evaluation of alternative rate structures for Whitchurch-Stouffville.

2 APPROACH

The client provided detailed billing data for water supply (WS), wastewater (WW) and stormwater services spanning the period 2013 Q1 to 2020 Q4. These files list all individual account transactions for water supply, wastewater and storm water services; these three services being billed to customers on a single invoice.

The data files describe individual customer bills for 15,296 customer accounts. For each bill, information is provided on customer class, meter size, billing date, meter read dates, type of service and other parameters. In total, there are 400,592 records for WS and WW accounts.

Customers are identified by unique account codes and meters are identified by unique meter codes that change when a meter is replaced. Data for WS and WW services1 were extracted from the files and 'cleaned' as described in Table 1.

Table 1 Criteria for Data Cleaning

Criteria for removal	Records dropped (% of total)
Duplicate account records	16,653 (4.2%)
records showing negative consumption	15 (0.004%)
Average daily consumption cannot be calculated due to missing information.	2,138 (0.5%)
Accounts with fewer than 24 bills over 32 quarters (2013 Q1 to 2020 Q4). This screening was done to assure sufficient data over time for each account to allow an analysis of temporal patterns in the data.	56,583 (14.1%)
Total number of dropped records (not equal to the column sum since some criteria are overlapping for a record)	71,859 (17.9%)

Average daily consumption (ADC) was used as the measure of consumption. This was estimated as the water use metered in a period divided by the number of days in that period, i.e. between the meter read date and the previous read date. Data were then grouped under the following categories: by year, old meter/new meter, pre-COVID/COVID, meter size and volume consumed. In most cases, the analysis relied primarily on a comparison of average ADC estimated for these different groupings.

Two customer classes were used for most of the analysis: residential customers (RES) who are individually metered households and industrial/commercial/institutional (ICI) customers.[2]

[1] These are accounts with service codes W01 (WS and WW service) or W04 (WS only). Accounts with service code of W09 or W10 were excluded (inactive or unmetered services).

[2] The RES class includes accounts coded 'RES' in the customer billing files. The ICI class includes accounts coded 'MR' (multi-residential), 'COM' (commercial) and 'IND' (industrial).

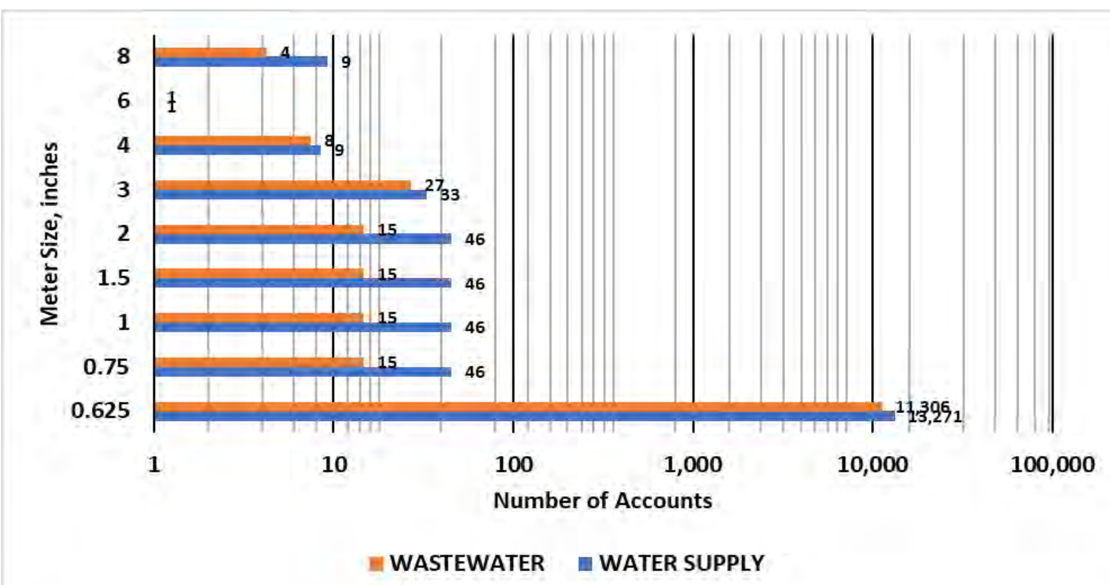
3 DATA SUMMARY

3.1 Customer counts by meter size, 2020

Customer counts are required in the financial analysis since they provided the basis for revenue calculations. The count is a count of unique account codes by meter size. Since the revenue calculation requires a total a count of customers, the full data set is used for this analysis rather than the cleaned data. The counts vary by quarter due to factors such as the timing of meter reads. For this reason, the 4 quarter average counts are used in the financial analysis. These counts are plotted below (please note the logarithmic scale).

Table 2 Customer Counts in 2020

METER SIZE, inches	WATER SUPPLY					WASTEWATER				
	Q1	Q2	Q3	Q4	Average	Q1	Q2	Q3	Q4	Average
0.625	13,980	13,472	13,000	12,633	13,271	12,023	11,521	11,031	10,648	11,306
0.75	1	1	1	0	1	1	1	1	0	1
1	180	161	173	169	171	57	45	57	47	52
1.5	41	25	26	27	30	38	23	24	25	28
2	110	70	71	68	80	101	60	63	59	71
3	19	17	29	25	23	17	12	26	16	18
4	1	1	1	3	2	1	1	1	2	1
6	1	1	1	1	1	1	1	1	1	1
8	4	19	7	7	9	2	7	4	4	4



Average Customer Counts in 2020

3.2 Metered Water Consumption

Estimates of metered water consumption, combined with customer counts, provide the basis for estimation of revenue from the volumetric rate. Accurate consumption estimates are required, so, this reason, the estimates are based on the cleaned data. Estimates are provided in Table 3 and Table 4. The final two columns of these tables provide the initial consumption assumptions for the financial analysis.

For the base year, 2020, values estimated for 2020 are used. These incorporate the combined impact of the new meters and of COVID 19 restrictions on water use. A return to normal is assumed to occur in 2022. These numbers are estimated as the 2013 to 2018 averages adjusted for the impact of new meters (see footnotes to tables and Appendix section 6.2)

Table 3 Average metered consumption of WS Customers, m3/account/day

	Historical data									Forecast period[a]	
METER SIZE	2013	2014	2015	2016	2017	2018	2019	2020	Avg	2020	2022+ [b]
0.625"	0.59	0.58	0.59	0.62	0.56	0.59	0.58	0.66	0.598	0.66	0.62
0.75	0.64	0.58	0.69	0.66	0.57	0.62	0.56	0.73	0.643	0.73	0.66
1	1.92	1.64	1.72	2.07	1.62	1.68	1.53	1.73	1.715	1.73	1.86
1.5	4.16	3.54	3.66	4.30	***9.72***	4.59	4.15	3.82	4.343	3.82	4.25[c]
2	7.68	7.78	7.17	8.09	7.34	7.81	7.10	6.35	7.975	6.35	8.03
3	22.60	24.42	32.97	32.33	27.59	33.31	49.95	42.05	36.12	42.05	30.31
4	15.10	17.38	16.36	14.62	3.62	3.88	3.21	6.44	4.584	6.44	12.42
6	***8.68***	27.63	20.07	31.14	39.41	50.72	31.88	31.23	29.89	31.23	35.48[c]
8	6.17	***25.17***	4.97	3.86	1.69	3.06	2.98	4.90	6.644	4.90	4.15[c]

NOTES:

a. Base year, 2020, usage is set at estimated averages for that year reflecting the impact of COVID 19 and the new meters. The transition back to 'normal' is assumed to be phased from 2020 to 2022.

b. Consumption rates, assumed to return to pre-COVID norms by 2022, are estimated as the 2013-18 averages plus a 5% allowance for increase readings from new meters.

c. As for note 'b' but the 2013-18 averages omit the observations that appear to be outliers (coloured cells)

Table 4 Average metered consumption of WS Customers with a WW service, m3/account/day

	Historical data									Forecast period[a]	
METER SIZE	2013	2014	2015	2016	2017	2018	2019	2020	Avg	2020	2022+ [b]
0.625"	0.61	0.60	0.61	0.63	0.57	0.59	0.58	0.65	0.60	0.65	0.63
0.75	26.27	19.34	14.03	20.87		30.67	20.45	18.64	21.47	18.64	23.35
1	1.45	1.35	1.58	1.74	1.82	1.69	1.63	1.29	1.57	1.29	1.69
1.5	5.33	4.29	4.19	4.27	22.60	4.90	5.24	4.61	6.93	4.61	4.82[c]
2	7.25	7.17	6.96	7.79	7.25	7.96	7.31	7.24	7.37	7.24	7.77
3	23.84	28.50	31.24	31.43	28.59	33.70	36.87	30.48	30.58	30.48	31.03
4	4.63	4.96	5.13	4.87	3.62	3.88	3.21	6.44	4.59	6.44	4.74
6	8.68	27.63	20.07	31.14	39.41	50.72	31.88	31.23	30.09	31.23	35.48[c]
8	6.17	25.17	4.97	3.86	1.69	3.06	7.22	10.65	7.85	10.65	4.15[c]

NOTES:

a. Base year, 2020, usage set at estimated averages for that year reflecting the impact of COVID 19 and the new meters. The transition back to 'normal' is assumed to be phased from 2020 to 2022.

b. Consumption rates, assumed to return to pre-COVID norms by 2022, are estimated as the 2013-18 averages plus a 5% allowance for increase readings from new meters.

c. As for note 'b' but the 2013-18 averages omit the observations that appear to be outliers (coloured cells)

3.3 Customer Demand Profile

A profile of customer demand ranked by ADC is required for the analysis of alternative rate structures. For this purpose, customers were grouped into 5 divisions or 'quintiles' each representing one fifth of total water sales within the class. Thus, the first quintile contains the smallest customers by water use and the fifth, the largest, with the aggregate consumption of customers in each of those quintiles summing to the same, one fifth of total demand.[3] This analysis was based on the 2019 customer data in order to avoid the disruptive influence of the COVID pandemic on water use.[4] Results are summarized in Table 5, Table 6, 0 and 0.

Table 5 Residential Customer Profile, 2019

	Number of accounts	Mean ADC – m^3/day			Sum/Ann	Win/Ann	Total m3/d	Median meter size
		Annual	Summer	Winter				
ALL ACCOUNTS INCLUDING THOSE WITH NO WW SERVICE (service codes W01 and W04)								
1st quintile	4,809	0.29	0.32	0.28	1.09	0.98	1,391	0.625”
2nd quintile	2,801	0.50	0.54	0.48	1.08	0.98	1,388	0.625”
3rd quintile	2,165	0.64	0.71	0.62	1.11	0.97	1,389	0.625”
4th quintile	1,686	0.82	0.91	0.80	1.11	0.97	1,389	0.625”
5th quintile	1,044	1.33	1.77	1.18	1.33	0.89	1,389	0.625”
All accounts	12,505	0.56	0.64	0.53	1.15	0.95	6,947	
ONLY ACCOUNTS WITH BOTH WS AND WW SERVICE (service code W01)								
1st quintile	3,666	0.30	0.321	0.292	1.08	0.98	1,087	0.625”
2nd quintile	2,447	0.50	0.535	0.485	1.08	0.98	1,215	0.625”
3rd quintile	1,960	0.64	0.705	0.623	1.10	0.97	1,258	0.625”
4th quintile	1,535	0.82	0.896	0.800	1.09	0.97	1,264	0.625”
5th quintile	810	1.24	1.326	1.201	1.07	0.97	1,007	0.625”
All accounts	10,418	0.56	0.610	0.545	1.09	0.97	5,830	

Table 6 ICI Customer Profile, 2019

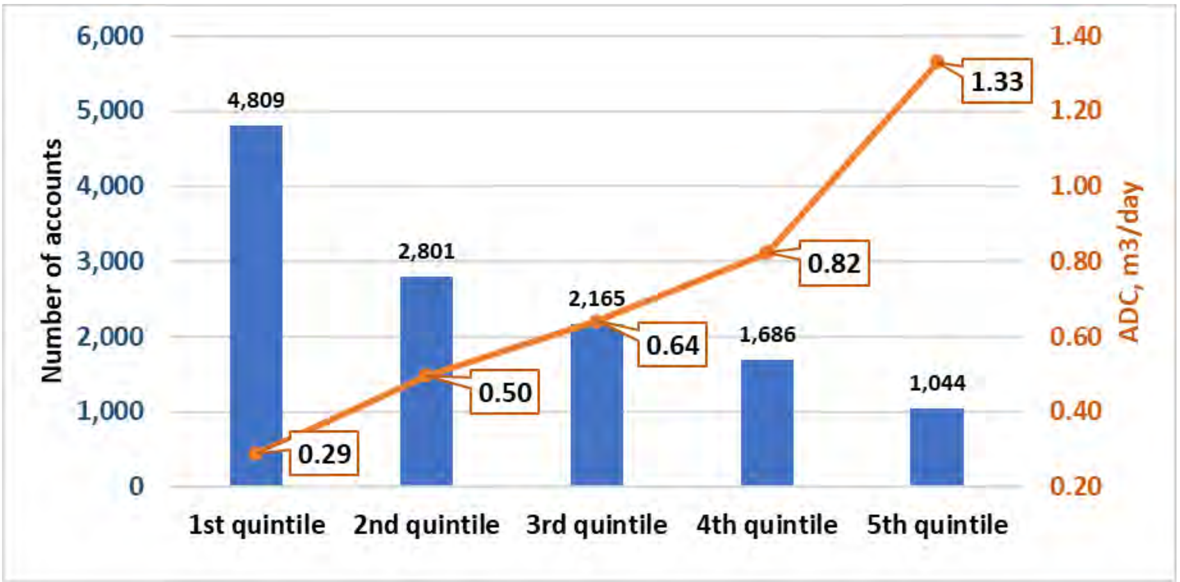
	Number of accounts	Mean ADC – m^3/day			Sum/Ann	Win/Ann	Total m3/d	Median meter size
		Annual	Summer	Winter				
ALL ACCOUNTS INCLUDING THOSE WITH NO WW SERVICE (service codes W01 and W04)								
1st quartile	352	1.4	1.6	1.4	1.10	0.95	508	0.625”
2nd quartile	34	15.2	15.7	14.7	1.03	0.97	518	2”
3rd quartile	12	37.6	59.1	18.5	1.57	0.49	451	3”
4th quartile	1	560.1	632.8	535.9	1.13	0.96	560	3”
All accounts	399	5.1	6.074	4.300	1.19	0.84	2,038	
ONLY ACCOUNTS WITH BOTH WS AND WW SERVICE (service code W01)								
1st quartile	325	1.5	1.6	1.4	1.09	0.95	478	0.625”
2nd quartile	33	15.4	15.9	14.8	1.03	0.97	507	2”
3rd quartile	12	37.6	59.1	18.5	1.57	0.49	451	3”
4th quartile	1	560.1	632.8	535.9	1.13	0.96	560	3”
All accounts	371	5.4	6.4	4.5	1.19	0.84	1,997	

NOTE: due to the smaller number of accounts, only four categories were used for the ICI analysis

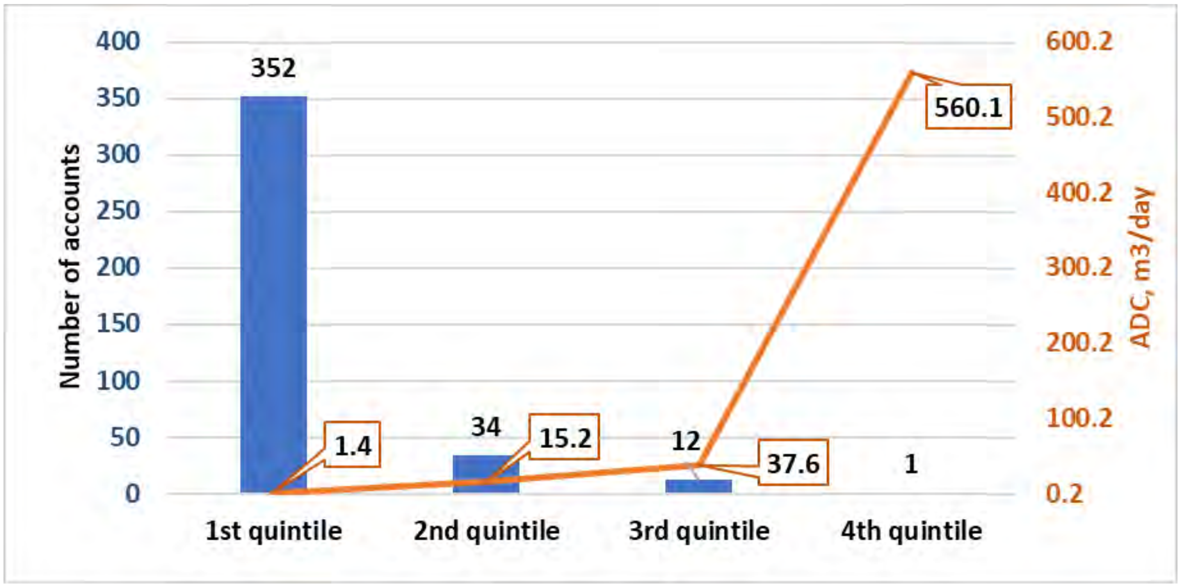
[3] This is an unconventional definition of quintile. Normally each quintile would contain one fifth of all customers, but in this case each quintile accounts for one fifth of total demand.

[4] Data for 2018 and 2019 were compared to see if new meters had a significant impact on the profiles. Since they appeared not to, 2019 data were used.

RES Customer counts and ADC (m3/day)



ICI Customer counts and ADC (m3/day)



It is immediately apparent that the largest customers, as a group, consume a disproportionate share of all water sold. Overall, 8% of residential customers and only 1 ICI customer consume 20% of total water sold. For the entire sample, the average demand of the largest residential customers is 5.5 times the average use of the smallest, while it is 400 times as large for the ICI customers. This sort of disparity is to be expected for ICI customers since this class contains everything from the small commercial offices and shops to large manufacturers. For residential customers the disparity is more surprising since the class represents a more homogeneous group, individually metered households.[5] The difference in water use

[5] Residential customers with meters larger than 1" were assumed to be ICI customers and were added to that

within this class can be explained by factors such as household size, lot size, types of water using appliances, and water using habits.

4 ANALYSIS OF AVERAGE DAILY CONSUMPTION

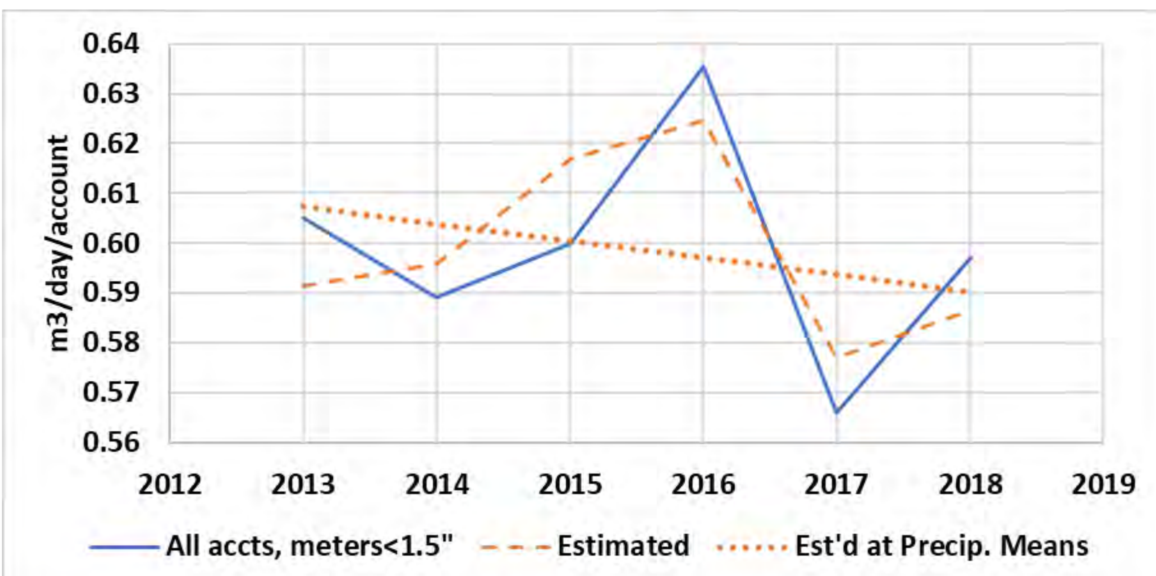
4.1 Natural Decline in Water Use

The analysis of declining ADC was based on the period 2013 to 2018 to avoid the influence of meter change outs and the COVID pandemic on water demand. After a preliminary assessment, the analysis was restricted to smaller meters—5/8" to 1'—since no consistent annual trend was evident for the larger meters.

ADC values for groupings of smaller meters are shown in Table 7 and the values for case C in this table are plotted in 0. The slope coefficients in Table 7 measure the annual decline in ADC. Converting to liters, the value for case C is 3.4 liters per account per year. This is consistent with levels of decline determined by the consultant for other Canadian municipalities. This value is used in the forecast of ADC for all accounts with meters smaller than 1.5 inches. ADC for larger meters is assumed to remain constant.

Table 7 ADC for Smaller Accounts, 2013 to 2018

	Meter size	Class	2013	2014	2015	2016	2017	2018	Slope coefficients[a]
A	0.625"	All accounts	0.59	0.58	0.59	0.62	0.56	0.59	-0.0033
B	0.625"	Residential	0.58	0.57	0.58	0.61	0.55	0.58	-0.0022
C	<1.5"	All accounts	0.61	0.59	0.60	0.64	0.57	0.60	-0.0034
D	<1.5"	Residential	0.59	0.58	0.59	0.62	0.56	0.59	-0.0023
a.	Regression estimates. The complete curve shown for case C in notes to the figure below.								



Average Daily Consumption for all Accounts with Meters < 1.5"

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group for the analysis.

NOTES: Estimated curve based on the following regression equation which considers both the year and the summer weather as determinants of water consumption

ADC = 1.0612 - 0.0398 * PRECIP - 0.0684 * RDAYS - 0.0034 * YEAR **R^2 = 0.659**

Variables: PRECIP = mm rain from Jun to Aug; RDAYS = days of rain from Jun-Aug; YEAR = 2013 to 2018
Estimated line: determined using the regression equation and shows the goodness of fit of the regression.
Estimated at precipitation: as above but precipitation data set at mean values for the period. This line shows the impact of the annual reduction in demand due to ongoing adoption of water efficient appliances.

4.2 Impact of New Meters and COVID

Table 8 summarizes results of the analysis of new meters and COVID. The comparison of ADC with new and old meters, in the second last column, follows expectations with the meter change-out causing a 6% to 7% increase in recorded volumes, i.e. the old meters were under-recording by that amount. This is somewhat higher than indicated by a brief review of literature which suggests that meter reading errors fall within the range of -2% to -4% for meters that are about 25 years old, the age of the replaced meters ((see Appendix section 6.2). For financial analysis purposes, a 5% is assumed for increased readings with the new meters.

The analysis suggests the COVID has caused an increase of about 13% in annual residential demand. This figure is consistent with findings of a brief literature review (see Appendix section 6.1).

Results for non-residential demand are inconclusive with the direction of the impact changing based on the category of data analyzed. Contradictory findings reflect difficulties in establishing clearly defined measures of consumption for various categories due to factors such as reading intervals that spanned periods of interest (i.e. peak and off-peak periods and with- and without-COVID periods). In the case of the non-residential accounts, there were also problems with small sample sizes that varied markedly across categories, with smaller samples in the 2019-20 periods.

For purposes of the financial analysis, ADC values estimated by meter size for 2020 are used to represent consumption during the COVID pandemic and consumption is assumed to return to pre-COVID levels, as measured by average ADC values for the 2013-18 period, once COVID restrictions end.

A final analysis of demand (not tabulated here) considered whether the impact of COVID lessened in Q3 after restrictions had been relaxed. Conclusive results could not be determined due likely to the data issues identified in the previous paragraph.

Table 8 Impact of New Meters and COVID on ADC

	Category	**Base case**	**With new meters**	**With new meters & COVID**	**Impact of meters**	**Impact of COVID**
	Period	**2013-18**	**2019-20**	**2019-20**		
Meter Size	**Class**	A	B	C	B/A	C/B
Average consumption per account, m3/d, Peak Season						
0.625”	Residential	0.63	0.67	0.76	105.7%	113.2%
All	Residential	0.66	0.70	0.80	105.8%	115.1%
All	Non-Res.	6.04	2.17	0.66	35.9%	30.3%
Average consumption per account, m3/d, Off-peak Season						
0.625”	Residential	0.558	0.530	0.506	94.9%	95.5%
All	Residential	0.569	0.531	0.507	93.2%	95.5%
All	Non-Res.	5.321	3.349	3.774	62.9%	112.7%
Average consumption per account, m3/d, All Year						
0.625”	Residential	0.579	0.623	0.675	107.4%	108.5%
All	Residential	0.599	0.634	0.691	105.9%	109.0%
All	Non-Res.	5.296	2.512	2.357	47.4%	93.8%

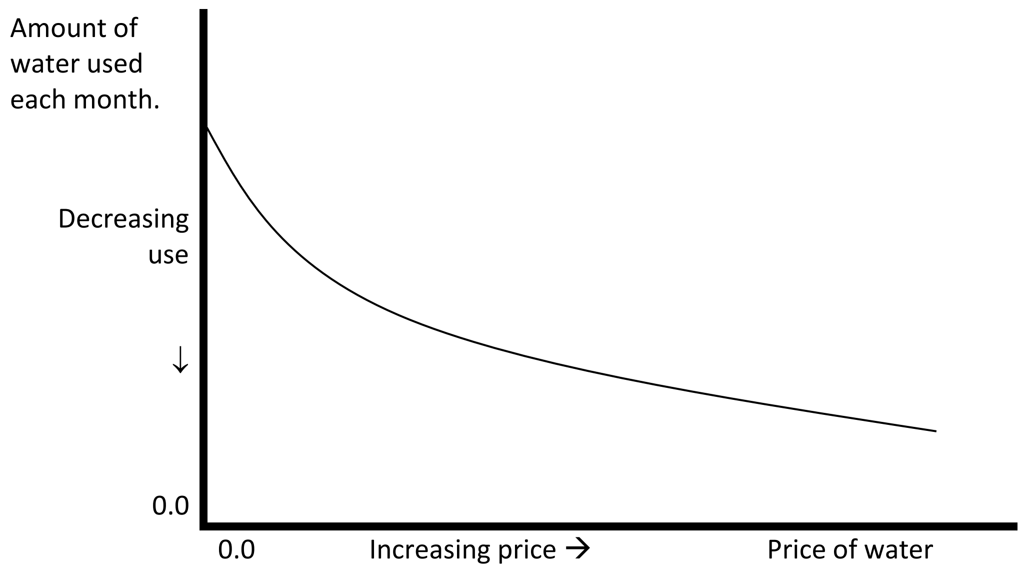
5 ANALYSIS OF ALTERNATIVE RATE STRUCTURES

The evaluation is intended to support discussions regarding the suitability of the current rate structure and to identify options that may be of interest in the future. Alternative municipal rate structures merit consideration because the choice of a rate structure can have an impact on water conservation, revenue stability, the equitable allocation of costs across customers and the affordability of water supply and wastewater services to low-income households.

Analysis is based on the water use by existing customers. It accounts for both residential and commercial customers as well as the profile of water usage within each customer class.

5.1 Approach

The basic premise for the quantitative assessment of water rates is that customers reduce their demand for water as the price of water increases—the increasing price gives the water customer an incentive to use less water. This inverse relationship is called a 'demand curve' and can be plotted in graphs like the one shown in 0.[6]



Demand Curve for Water

The steepness of the slope of this curve is a measure of the responsiveness of customer demand to changes in price. A shallow slope indicates low responsiveness, which is the case for municipal water demand. In fact, an increase in price is expected to increase total revenue from the sale of water since the reduction in revenues caused by lower demands is never enough to completely offset the positive impact on revenue of the higher price.

The price that is important to the customer, and that is considered in the analysis, is the total price on the water bill which is the combined water and wastewater rate since charges for these two services are based on metered water volumes. The existing rate structure simple in form whilst the alternative rate structures can be quite complex (see sections 5.2). When a complex rate structure is in place, the consumer typically does not have a clear understanding of the rate structure. For this reason, we

[6] Demand curves are explained in greater detail in Appendix section 6.3.

assume that consumers respond to the total bill rather than just the volumetric charge even though it is the volumetric charge that determines cost savings associated with water conservation efforts.

In addition to the demand curve, the quantitative analysis also accounts for revenue targets that drive rate setting. The schematic in Figure 1 depicts how this is done.[7] The starting point in the analysis is the combination of existing rates, demand levels associated with those rates and the revenues that result. An alternative rate structure is assumed for the municipality, for example a rate structure that charges 50% more for any water used in the peak summer season. The higher summer charge increases customer water bills and their demand response is calculated using the demand curve. Then the expected rate revenue is calculated. In this example, the revenue will be too high, so the rates are lowered somewhat while keeping the 50% summer markup. Demand and revenues are recalculated. The new revenues are once again compared to the revenue target and the rates are adjusted again as needed. As shown in the schematic, this cycle is repeated until revenues with the new rate structure equal the revenue target.

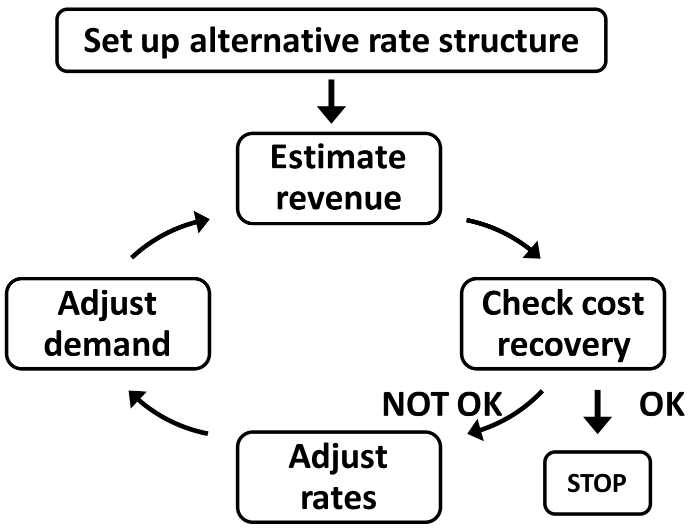


Figure 1: Estimating the Impact of Alternative Rate Structures

The calculations described above are completed for moderate to aggressive variations of selected rate structures that are described below.

The current water and sewer rate structure is a uniform volumetric charge with no fixed charge as follows:

Water service - $2.079/m^3, wastewater service - $2.725/m^3 and combined - $4.804/ m^3.

The following options are evaluated as alternatives to this rate structure:

Option 1 - Addition of a fixed charge to the uniform volumetric rate,
Option 2 - Lifeline rate to improve affordability for low-income households,
Option 3 – Conservation rate based on an increasing block or excess use volumetric charge.

[7] See Appendix section 6.3 for a description of the model used for this analysis.

5.2 Option 1 - Fixed Charge

Fixed charges are justified as a means of recovering certain fixed costs that are incurred whether a customer uses water or not. It provides a municipality with a base revenue that is unaffected by annual variations in use. The fixed charge can assume various formats as described below:

- **Uniform fixed charge** – A fixed charge levied in each billing period that is independent of the amount of water used, the meter size or the customer class. It is suited to recovery of costs such as billing and collecting that do not vary with volume. A single fixed charge is easy to administer since tracking of a customer's meter size is not necessary.
- **Meter charge** – This is a fixed charge per billing period that varies with the size of the customer's meter.[8] The charge recovers costs that vary with meter size. For example, costs for metering and service laterals increase with meter size. Water system fire protection capacity costs are also often included in the fixed charge. Meter charges for large industrial meters are typically over a hundred times greater than the charge for a residential meter. Generally, charges that vary by meter size are the fairest type of fixed charge.
- **Demand Charge** – A conservation oriented fixed charge per billing period that is based on the customer's peak demand. Different approaches are used to measure peak demand. For a retail rate, maximum month demand in the previous year is appropriate. The measure of peak demand for a customer remains constant for the billing year. This charge is common for electricity sales but not for water at the retail level. It is administratively onerous.
- **Minimum Bill** - A minimum charge per billing period that is levied even if no water is used. The volumetric charge kicks in on any water used in excess of the consumption allowance associated with the minimum bill. A minimum bill should be sufficiently low that only a small percentage of customers pay only the minimum bill. Otherwise, the minimum bill functions like a flat rate charge.

Fixed charges are primarily used to recover customer-related costs for meters, services, billing and collecting. They may also be used to recover certain capital costs such as those associated with the provision of capacity for fire protection.

The motivation for use of a fixed charge arises from three factors:

Most local costs are fixed so a large volumetric charge can cause varying revenues to be misaligned with relatively fixed costs.

Larger fixed charges can help overcome potential revenue shortfalls caused by declining residential water demand associated in part by the adoption of mandatory water efficient fixtures.

With a large fixed charge, the remaining volumetric charge more clearly communicates the magnitude of the Regional charge for water to end users.

A quantitative analysis was completed to gauge the potential impact of a fixed charge designed to recover 15% of required revenue. With a fixed charge of $15.72/month for the 5/8" meter, the volumetric charge falls to $4.12/m^3. The analysis showed annual demand falling by -0.8% in response to the change in rate structure. This is counterintuitive since the volumetric charge is lower suggesting a lower incentive to conserve water. However, this outcome can be understood when before and after utility bills are compared. Those shown in the table below are estimated annual water and sewer costs for customers following introduction of a revenue neutral meter charge:

[8] It can be based or water service size but meter size is normally used because the meter is an indicator of the supply capacity provided to the customer

Table 9 Impact of a Fixed Charge on Customer Bills

Customer	Existing Rate Structure	Addition of a fixed charge
Res-Small	$521	$616
Res-Average	$1,020	$1,054
Res-Large	$2,496	$2,328
ICI-Small	$2,556	$2,380
ICI-Average	$9,317	$8,384
ICI-Large	$61,726	$55,733

The conservation effect occurs because the numerous smaller customers experience a significant increase in their annual water and sewer bills. This increase initially motivates customers to reduce demand since customers usually react to the total bill and not the volumetric charge. However, any initial reduction in demand, if it occurs, is certain to diminish as customers realise that their water and sewer costs change little in response to changing water use. What remains however is the significant shift of system costs to smaller customers. This shift in costs to smaller customers is caused by the new meter charges that recover 15% of total costs. For the small customer, the cost of the new fixed charge exceeds savings in the volumetric charge. For larger customers the opposite is true.

The adoption of a fixed meter charge has both advantages and disadvantages:

PRO:	- revenue more stable in the face of seasonal and long-term declines in sales - may improve customer understanding of cost drivers
CON:	- negligible impact on water conservation with a likely adverse impact in the long run - less affordable to low-income households - more administrative effort to verify and maintain accurate meter information

5.3 Option 2 - Lifeline rate

The lifeline rate is a lower volumetric rate charged for an initial block of water consumed in the billing period. The lower charge reduces the overall cost of water and wastewater services for smaller customers who consume less water. These users are assumed to align with low-income households. The base charge is paid by residential customers on water used in excess of the lifeline block limit and by ICI customers on all water used.

The assumed rate structure for this option is an initial rate that is 30% of the base rate. After adjustments to assure revenue neutrality, the combined base rate is $6.238/m^3 and the initial lifeline rate is $1.871/m^3. The impact on water bills is shown in the following table. Small and average RES customers benefit while all other customers pay a higher bill to offset the revenue loss from the lifeline charge. As a result of these higher bills, annual water demand is forecast to fall 2.1%.

Table 10 Impact of a Lifeline Rate on Customer Bills

Customer	Existing Rate Structure	Lifeline Rate
Res-Small	$521	$309
Res-Average	$1,020	$947
Res-Large	$2,496	$2,771
ICI-Small	$2,556	$3,121
ICI-Average	$9,317	$11,375
ICI-Large	$61,726	$75,365

The adoption of a lifeline rate has both advantages and disadvantages:

PRO:	- Assists low-income households

CON:	- Poorly targeted since all RES customers benefit from the lifeline rate despite income status. - Cost allocation across customers is less equitable. - Rate setting can be more complex.

5.4 Option 3 – Conservation Rate Structures

With conservation rates, different formulations of the volumetric charge are used to achieve different objectives depending on their format and design.

Increasing block rate: With this structure, the price of water increases in steps as use in the billing period increases beyond designated thresholds. Typically, the first block covers the normal use of an average customer and the associated volumetric charge covers all operating costs but not necessarily capital costs. Subsequent blocks might cover high indoor use then outdoor water use. Volumetric charges for these blocks are used to recover operating and capital costs. The differential in the charge from one block to the next should be designed to give a clear incentive to the customer to conserve water; for example, rate differentials between the blocks of 5%, 10% or even 25% are not large enough to really make a noticeable difference on the typical residential water bill.

Water bill calculation with the increasing block rate structure:

Volumetric charge:

0 to 7 m^3/month at \$1.00/m^3,
8 to 15 m^3/month at \$1.50/m^3,
16+ m^3/month at \$2.00/m^3;

Customer water use in one month = 17 m^3

➔ Monthly water bill
= (\$1.00/m^3 x 7 m^3)
+ (\$1.50/m^3 x (15 m^3 - 7 m^3)
+ (\$2.00/m^3 x (17 m^3 - 15 m^3)
= \$23.00

An increasing block charge is most appropriate for residential customers. It is generally not suitable for ICI customers since the upper tier block is intended to target more discretionary water use with a high volumetric charge. While ICI water use is often amenable to considerable savings from water efficiency measures it is not a discretionary use in the way that lawn watering is. Targeting this type of use with a high volumetric charge is therefore not likely to be equitable nor is it justified on the basis of underlying cost structures for water supply operations. A hybrid rate structure comprising increasing block rates for RES customers and the uniform rate for ICI customers can be used to overcome this problem.[9]

Seasonal rates impose high volumetric charges on all water used during the peak water demand season. The off-peak season or base charge applies to water consumed during the remainder of the year. Seasonal charges are used in situations where seasonal demands are specifically targeted by conservation efforts. The rationale for a seasonal charge is that peak demands require over sizing of supply facilities relative to the capacity required to meet demand for the remainder of the year. With a seasonal charge, the extra costs of this excess capacity are recovered directly from that component of demand that causes those costs.

[9] Another approach to improve equity is called the humpback rate. It is a block rate structure in which two or three initial blocks follow the pattern of the increasing block rate structure. The final block(s) then reduce the volumetric charge back down to a level consistent with a full cost charge for large ICI users. This format encourages water conservation among residential customers by using the initial blocks to capture normal and high residential usage, while offering large users lower volumetric charges.

The **excess use rate** imposes a high volumetric charge on all demand during the peak water demand season in excess of a threshold or base demand. The threshold equals average off-peak season consumption or a modest multiple of this amount, for example 1.1 times winter demand. A base charge applies to all of a customer's off-peak season consumption and to peak season consumption that is below the threshold.

For both the seasonal charge and the excess use charge, the differential between the peak season and off-peak season charge must be large so customers notice the difference and have a strong incentive to save water.

Water bill calculation with excess use rates:

Volumetric charge:
Base charge: $1.00/m^3,
Excess use charge: $3.00/m^3 applied to demand above 110% of winter demand
Customer water use / month
= 20 m^3 in the summer
= 15 m^3 in the winter
➔ Monthly water bill
Summer = $1.00/m^3 x (1.1 x 15 m^3)
+ $3.00/m^3 x (20 m^3 – 1.1 x 15 m^3)
= $27.00
Winter = $1.00/m^3 x 15 m^3 = $15.00

Water budget rate structures are a variant of the increasing block rate structure in which the amount of water in each block is tailored to the needs of each specific customer. This requires that the utility set standards representing efficient water use that are applied to each customer based on the specific circumstances of that customer. For instance, the block limits might account for the size of the customer's lot, landscaping, expected precipitation and the number of persons in the household. In contrast, the traditional increasing block rate design uses the same block limits for all customers.

Each of these conservation rate structures has advantages and disadvantages. These are outlined in Table 11.

Table 11 Comparison of Conservation Oriented Volumetric Charges

Rate Structure	PROS*	CONS*
Uniform rate	Simple, easy to understand. Easy to implement and administer. Lower revenue volatility.	No targeted incentive for conservation. Less affordable for low-income households. Less equitable cost allocation.
Increasing block rate	Targeted incentive for conservation. Can be designed to assure affordability for low-income households. More equitable cost allocation.	Complex, customer may not understand. Increases revenue volatility by increasing reliance on variable summer demand. Not equitable for ICI customers.
Seasonal rate	Relatively simple, easier to understand. Targeted incentive for conservation. More equitable cost allocation	Requires relatively frequent meter reading (bimonthly) to measure summer use accurately. Increases revenue volatility by increasing reliance on variable summer demand. Less affordable for low-income households.
Excess use rate	Targeted incentive for conservation. More equitable cost allocation.	Complex, customer may not understand. Requires relatively frequent meter reading (bimonthly) to measure summer use accurately. Increase in revenue variability by increasing reliance on excess summer demand. Less affordable for low-income households.

Table 11 Comparison of Conservation Oriented Volumetric Charges

Rate Structure	PROS*	CONS*
Water budget rate	Targeted incentive for conservation. Can be designed to assure affordability for low-income households. Improved equity when applied to large ICI customers.	Very complex, customer may not understand. Administratively onerous to implement and maintain. Requires extensive public engagement to build awareness and understanding. Inequitable, can result in large water allocations to inefficient users and generate water bills for small users that exceed those for large users. Encourages large lot size and lower density development with high infrastructure costs. Increases revenue volatility by increasing reliance on variable summer demand.

* Based in part on AWWA, 2012. M1 Principles of Water Rates, Fees and Charges, 6th Edition.

5.5 Impact of Conservation Rate Structures on Demand

The impacts of three rate structures on demand were evaluated: an excess use rate, an increasing block rate and a seasonal rate. The quantitative tests were completed using customer demand date for 2019. Results were compared to water demands under the prevailing uniform rate structure. The scenarios assume that the new rate structure is applied to the residential bill but not the ICI bill.

This analysis has considered charge structures that target specific segments of demand such as summer use or the excess use of larger RES customers. Moderate and aggressive versions of each rate structure are evaluated, for example the aggressive scenario for the seasonal rate assumes that the volumetric rate charged for water used in the summer was 35% higher than the base or winter rate. Results of this analysis are summarized in Table 12 and Figure 2.

All the tested scenarios have a modest impact on seasonal and annual average customer demands. The most effective, the aggressive increasing block rate, yielded an estimated reduction in average annual demand of only 1.2%. This is well within the range of year-to-year variations of demand caused by seasonal weather patterns. This analysis suggests that very high volumetric charge rates are required to achieve even moderate reductions in water demand. Expected reductions in demand are small, less than 2%, even with the aggressive versions of the conservation rate structures.

Table 12 Impact of Conservation Rate Structures on Demand and Customer Bills

		Existing	Excess Use Rate - surcharge on demand > 1.1 times base demand		Increasing Block Rate - 1st block >=15m3 2nd block >=22 m3		Seasonal Surcharge - surcharge on all peak season demand	
			Moderate, 15% EU charge	Aggressive, 100% EU charge	Moderate, 35% premium on 3rd block	Aggressive, 76% premium on 3rd block	Moderate, 15% surcharge	Aggressive, 35% surcharge
RES Rates	Base	$4.80	$4.79	$4.75	$4.42	$4.31	$4.329	$3.827
	2nd block		na	na	$5.20	$5.07	na	na
	3rd block		na	na	$5.98	$7.60	na	na
	EU charge	$4.80	$5.51	$9.49	na	na	na	na
	Seasonal	na	na	na	na	na	$4.978	$5.166
ICI Rates		$4.80	$4.79	$4.75	$5.20	$5.07	$4.329	$3.827
Change in	Summer	na	-0.1%	-1.0%	-1.1%	-1.8%	-0.7%	-1.4%

Table 12 Impact of Conservation Rate Structures on Demand and Customer Bills

Demand	Winter	na	0.0%	0.0%	-0.5%	-0.7%	0.0%	0.0%
(%)	All year	na	-0.1%	-0.5%	-0.8%	-1.2%	-0.3%	-0.6%
Customer	Res-Small	$521	$519	$514	$479	$467	$538	$555
Bill	Res-Avg.	$1,020	$1,021	$1,024	$999	$1,006	$1,053	$1,088
($/year)	Res-Large	$2,496	$2,525	$2,635	$2,692	$2,926	$2,575	$2,658
	ICI-Small	$2,556	$2,550	$2,526	$2,723	$2,668	$2,304	$2,036
	ICI-Avg.	$9,317	$9,294	$9,205	$9,923	$9,723	$8,396	$7,421
	ICI-Large	$61,726	$61,576	$60,986	$65,743	$64,416	$55,629	$49,169

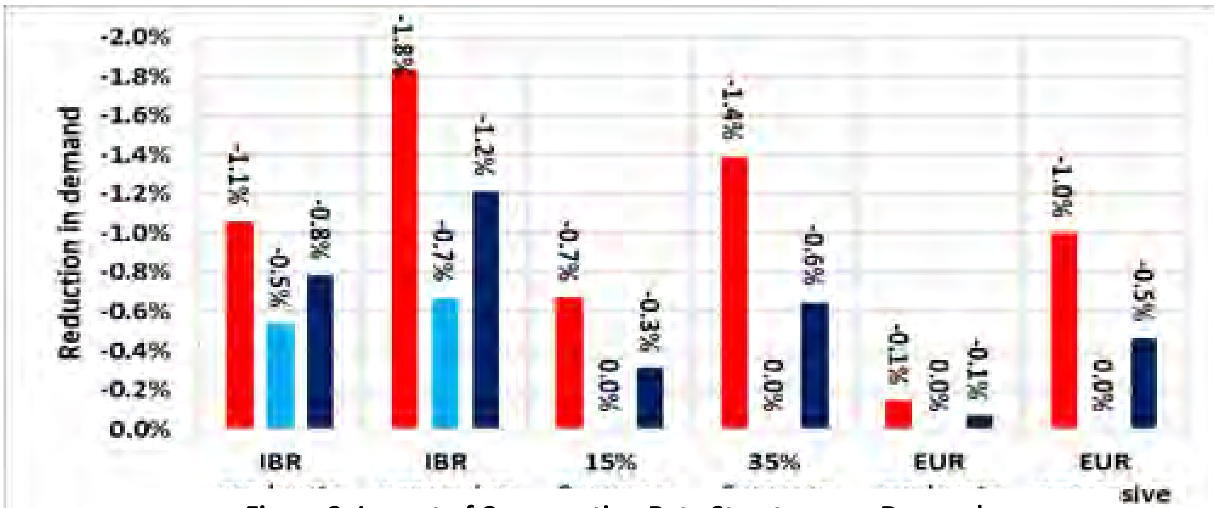


Figure 2: Impact of Conservation Rate Structures on Demand

5.6 Summary of the Rate Structure Evaluation

The intent of the comparative analysis presented in this section is simply to inform the client of alternative rate structures and provide a cursory assessment of their relative merits. No conclusion is reached regarding the preferred rate structure for Whitchurch-Stouffville, but a few observations can be made:

The current rate structure, a uniform volumetric rate with no fixed charge is the simplest possible rate structure that uses a volumetric charge. It is easy for the customer to understand and easy to administer.

A uniform volumetric rate with a fixed charge would help stabilize revenue by reducing reliance on peak-seasonal water sales. It also increases the water bill of the smallest water users.

The lifeline rate is sometimes advocated as a way of making water services more affordable to low-income households. It does this but is poorly targeted in that all customers benefit from the low charge on the first block of water consumed in a billing period.

A variety of rate structures can be used to promote water conservation. These tend to be complex and more difficult for the customer to understand. To be effective at reducing demand, these rate structures must use very high charges on the component of demand targeted by the rate.

These alternative rate structures should only be applied to individually metered residential customers who constitute a relatively homogenous class of customers. Given the wide diversity of non-residential and bulk metered residential customers (e.g. apartments), it is difficult to design any of the alternative rate structures in a manner that assures a reasonable degree of equity in the treatment of these customers.

6 APPENDICES

6.1 Review of Literature on the Impact of COVID on Demand

REFERENCE	SUMMARY AND COMMENTS
H. Cooley, P. H. Gleick, S, Abraham, W. Cai, 2020. Water and the COVID-19 Pandemic, Impacts on Municipal Water Demand. Issue Brief, PACIFIC INSTITUTE, July 2020. https://pacinst.org/wp-content/uploads/2020/07/Water-and-COVID-19_Impacts-on-Municipal-Water-Demand_Pacific-Institute.pdf	• Impact on total water demand in 41 US municipalities ranges from -18% to +17%. • Breakdown provided for individual cases: o Portsmouth, England – residential demand increased by 15% non-residential demand declined by 17% during lockdown. o San Francisco, California – residential demand increased by 10%, while non-residential demand declined by 32%
M. Nemati. 2020. “COVID-19 and Urban Water Consumption.” ARE Update 24(1): 9–11. University of California Giannini Foundation of Agricultural Economics.	• Increases for the period March to July in a mid-sized city in Northern California: • Single family res. – +9% • Multi. family res. – +23% • ICI – -22%

6.2 Review of Literature on Meter Age and Reading Accuracy

REFERENCE	SUMMARY AND COMMENTS
J. A. du Plessis & J. J. Hoffman, 2015. Domestic water meter accuracy, WIT Transactions on Ecology and The Environment, Vol 200, © 2015 WIT Press DOI: 10.2495/WS150171	• 11,000 household meters evaluated from 5 to 31+ years old, 91 meters tested in S. Africa. • 71.5% are within the 2% accuracy requirement of a new meter. • 9% of the meters 20 years and younger test outside the 2% accuracy band and 29% for meters 30 years and younger. • 8.8% of meters over registered and 8.8 % under registered for those meters falling between the 2% and 5% error band. Indicates that the majority of meters continue to read with relative accuracy as they age.
F.I. Arregui, 2003. C.V. Palau, L. Gascón, O. Peris, Evaluating domestic water meter accuracy. A case study. Conference paper, Pumps, Electromechanical Devices and Systems Applied to Urban Water Management (PEDS)	• Accuracy of 238 meters involving 2 brands tested in Spain. • Meter ages ranged up to 15 years • At 10 years old average accuracy was about -11% and -17% for the 2 brands of meters. Estimates read errors are well in excess of N. American experience perhaps due to a difference in the quality of meters being used in Spain.
M. D. Yee, 1999. Economic analysis for replacing residential meters. JOURNAL AWWA, VOLUME 9 1 , ISSUE 7	• 350 meters tested from US municipalities, having brass and plastic drive mechanisms • Plastic meter read errors averaged -3.2% at 10 years and -6.5% at 20 years • Brass meter read errors averaged -0.7% at 10 years, -1.3% at 20 years and -3.4% at 30 years

	Directly applicable to the current study.
H.D. Allender, 1996. Determining the economical optimal life of residential water meters. Water, Engineering and Management, September 1996.	• Tested 32 meters from US municipalities in 4 age groups: 15, 20, 25 and 30 years old • Reading errors for these were: 15-year-old, -0.6%; 20 year old, -1.0%; 25 year old, -4.2%; 30 year old, -18.4% Directly applicable to the current study.

6.3 Technical Note on Modeling Water Demand

The model used for analysis of water demand estimates how customers respond to changes in the average price of water and sewer services. The average price accounts for the cost associated with both the volumetric and fixed charges in a rate structure. The analysis imposes revenue neutrality in the test of each rate structure by adjusting charge levels to assure that total revenues remain unchanged.

Following sections explain the structure and logic of the model.

6.3.1 Treatment of Demand

Demand is disaggregated into two customer classes, residential (RES) and industrial / commercial / institutional (ICI). It is also disaggregated by size of customer within these classes and by season. Customer size categories used in the analysis will be based on consumption quintiles. For a given class of customer, residential or ICI, the total customer demand within each of the 5 quintiles represents 20% of the total amount of water used by that class. Thus, the first quintile represents the total demand of the smallest customers while the fifth quintile is the demand of the largest customers in the class.

The seasonal disaggregation of demand assumes two distinct demand periods based on monthly water sales at the wholesale level. The winter demand represents the base component of demand that is assumed to be constant throughout the year. For residential demand, this is the in-house component of demand. The portion of the summer season demand that exceeds this base component is the excess summer use and represents water used for lawn and garden irrigation, additional in-house uses in the summer (e.g., more frequent showers), pool filling, and other summer uses.

Excess summer use is often largely residential since many ICI customers have a relatively uniform year around demand while the seasonal demand of some such as nurseries, which use more water in the summer, is offset by others such as factories with scheduled summer closures. Our allocation of excess summer use for the analysis will be based on an analysis of ICI billing data.

Customers are assumed to respond to the average volumetric price of water within the season rather than the marginal price. This assumption reflects evidence from household surveys that customers may be aware of their total water and sewer bill but not of the rate structure or the unit price of water.

In the case of the single block rate (SBR) structure and seasonal rates, the average price of water is the single volumetric rate. In the case of block rate structures, the average price is estimated as the total volumetric charge for water used by an average customer within each sub-category of demand divided by that customer's demand.

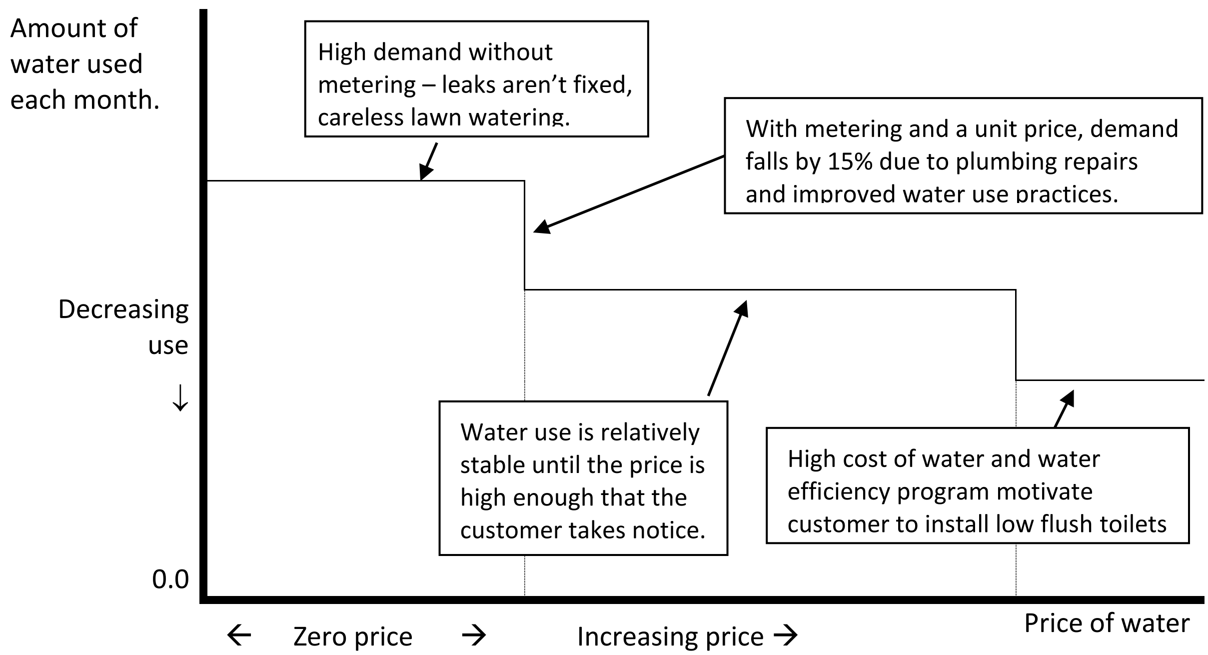
6.3.2 The Demand Curve

The basic premise of conservation water rates is that customers reduce their demand for water as the volumetric price of water increases—the increasing price gives the water customer an incentive to conserve water. To understand demand curves, first consider the probable response of an individual household to the increases in the price of water shown in 0. The demand curve here is the thin line that steps down as price increases—this shape is called a "step function".[10]

But elasticity describes a smooth continuous relationship between price and water demand, not an uneven step function. The demand relationship or curve is smoothed out because it describes the aggregate demand of many customers. For instance, 0, might be what the demand of 20 households looks like, while 0 might be for 1,000 households. The smoothing happens because different households use different amounts of water and respond in different ways to price - the individual differentials become small are no longer discernible.

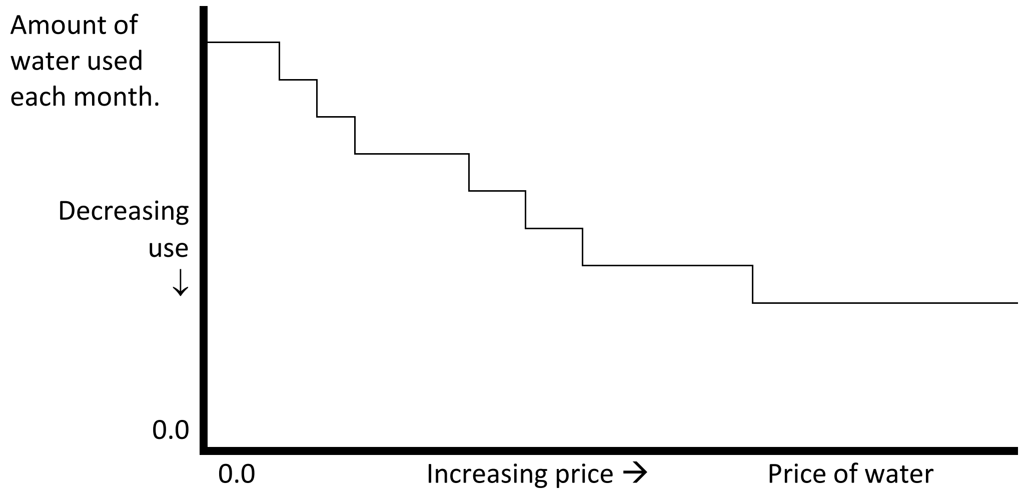
The price that customers are responding to is the total price including the water rate plus any wastewater rate or surcharge. Economists often assume that customers respond to the volumetric price on the utility bill. However, in the case of bills for water and wastewater services, residential customers usually do not know the volumetric price. They will only be aware of the total amount of the bill, and, may often not even know this amount if these services are billed on a combined utility bill with electricity. Under these circumstances, it is appropriate to assume that customers are responding to the average price, which will include the fixed cost component of charges for water and wastewater services.

AN INDIVIDUAL HOUSEHOLD'S DEMAND FOR WATER

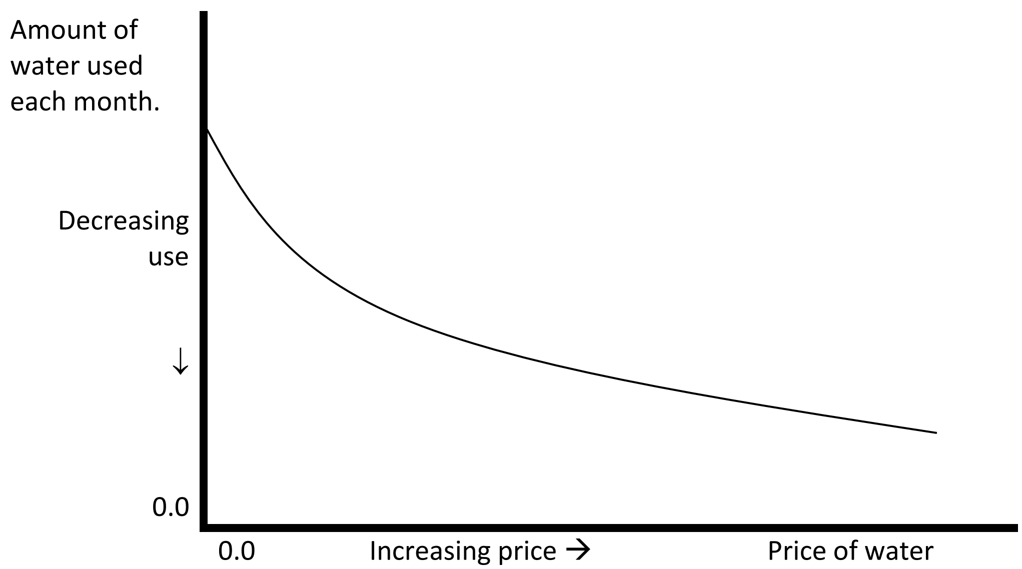


[10] In mathematics, a function is a relationship between two variables like price and demand. An equation is used to describe a function. A simple function for water demand might be the following:
Monthly household demand = 30 cu. meters – 0.2 x (price per cu. meter)

DEMAND FOR WATER – 20 HOUSEHOLDS



DEMAND FOR WATER – 1,000 HOUSEHOLDS



The strength of the relationship between the price of water and the demand for water is measured using a value called the price elasticity of demand or just elasticity.[11] Elasticity is a number that describes the downward slope of the smooth curve in 0. Because the slope is downward sloping, elasticity is a negative number. Estimates of price elasticity usually lie in the range of -0.05 to -1.0. This number is a ratio of the percentage change in demand and the percentage change in price that causes the change in demand. The mathematical expression for elasticity is:

Price elasticity of demand = (Percent change in demand) ÷ (Percent change in price)
= [(Change in water demand) ÷ (Original Water demand)]/ [(Change in price) ÷ (Original price)]
Change in demand for a given price elasticity and price change is calculated as follows:

[11] There are also elasticities to measure the response of demand to increases in household income, population growth, etc. Here, the term is only used to refer to price elasticity.

Percent change in demand = (Price elasticity of demand) x (Percent change in price)

For example, assume the price elasticity of demand for a commodity is -1.0. If the price increases by 10%, then the change in demand is:

(-1.0) x (10%) = -10%

If elasticity is -0.2, demand changes by:

(-0.2) x (10%) = -2%.

The strength of the relationship between the price of water and the demand for water is measured by the price elasticity of demand or just elasticity. Elasticity describes the steepness of the downward sloping demand curve. Because the slope is downward sloping, elasticity is a negative number. Elasticity is the ratio of the percentage change in demand and the percentage change in price that causes the change in demand.

The consultant has reviewed published research on price elasticities for previous conservation rate studies.[12] Key findings from reviewed literature are as follows:

- Newer estimates of price elasticities for residential water demand confirm that demand is inelastic.
- Summer or outdoor water demand is more elastic than indoor water demand.
- There is little work on industrial and commercial demand, but this work confirms that these demands are more elastic than residential demand.
- Long run demand is more elastic than short term demand. In the long run consumers have more opportunity to adjust demand through fixed asset investments.
- Price elasticity may be impacted by income level, but evidence is contradictory.
- There is evidence of a basic component of residential demand that is largely unresponsive to price.
- Contradictory findings exist on the use of marginal or average price as the appropriate measure of price for water demand.
- Price elasticity of residential demand may be higher when increasing block rates are used but the underlying cause of this is uncertain.

Based on information provided above, elasticity assumptions for the current study are given below:

Winter	-0.25
Summer	-0.25

[12] York Region Water for Tomorrow, 2001; York Region Long Term Water Conservation Strategy, 2013; Capital Regional District Conservation Water Rate Study, 2001.