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Staff Report

Corporate & Financial Services

Report To: **Special Meeting of Council**
Meeting Date: April 2, 2026
Report Number: CFS.26.022
Title: Value Engineering Exercise Review – Mill Street Pumping Station
Prepared by: Monica Quinlan, Director of Corporate & Financial Services; Adam Smith, CAO

A. Recommendations

THAT Council receive Staff Report CFS.26.022, entitled "Value Engineering Exercise Review – Mill Street Pumping Station";

AND THAT Council endorse staff's recommended approach to refine and optimize the Mill Street Pumping Station design, including:

- revisiting peak flow assumptions to consider a phased implementation approach to align certain infrastructure upgrades with actual growth;
- maintaining the integrity of the current design while identifying targeted opportunities to reduce or defer components where appropriate;
- undertaking a focused evaluation of the Caisson Submersible Pumping station option to determine its feasibility, risks, and potential value relative to the current design;

AND THAT Council acknowledge that the additional evaluation work is estimated at approximately $45,000 (plus HST) and will require an estimated 8–10 weeks to complete;

AND THAT Council acknowledge that further evaluation may impact the timing in awarding the Mill Street Pumping Station improvements and addressing identified constraints at the station.

B. Overview

The purpose of this report is to present the findings of the Value Engineering (VE) exercise approved through Staff Report CFS.26.009 and to outline a recommended path forward for the Mill Street Sewage Pumping Station (SPS) component of the Housing Enabling Water Systems (HEWS) project.

The VE exercise **was undertaken to ensure that the current design is optimized for cost, performance, constructability, and long-term operational efficiency prior to tender**.

C. Background

As outlined in previous reporting, the HEWS project represents a significant investment in wastewater infrastructure to support growth and enable housing within the Town.

To provide additional context, it is important to recognize that the increases between the HEWS funding application and the current project estimates are not isolated to the Mill Street Pumping Station.

At the time of the application, all components of the project were at varying levels of design maturity, with many elements remaining at a very conceptual stage. The application was developed within a compressed timeframe to align with funding opportunities and evolving development pressures within the Town. To understand the cost differentials the table below highlights the differences for each project from the grant application to the time of award:

Project Name	Application Total (Construction & Engineering)	Application Construction Only	Awarded Construction Only	Difference (Construction Application vs Award)
Craigleith Main Sewage Lift Station (MSLS)	$7,224,301	$6,334,875	$8,477,900	($2,143,025)
Bay Street Forcemain, Watermain & Storm Sewer	$16,906,509	$15,590,879	$17,927,450	($2,336,571)
Mill Street Sewage Pumping Station (SPS)	$10,660,319	$9,396,375	$19,941,000*	($10,544,625)
Total	**$34,791,129**	**$31,322,129**	**$49,256,900**	**($15,024,221)****

* Project not yet awarded – amount stated is the Issued for Construction Estimate inclusive of a 10% or $1.8M contingency.
** Difference **is only detailed for Construction Costs** excluding Utility relocations, engineering and etc. Note that contingencies are not included and total $2.9M (not awarded but held within the budget) plus $500K (included in the Craigleith MSLS award).

As the designs progressed, additional scope requirements, regulatory considerations and market factors were identified. These are detailed by the Capital Project Management Team which includes but is not limited to the below:

Project Impacted	Cost Variation	Cost Implication	Comments
Craigleith Main Sewage Lift Station	Addition of Odour Control	$500,000	Added during design to address resident complaints to MECP on odour.
Craigleith Main Sewage Lift Station	Increased Contingencies at Tender Stage	$500,000	Concern of high flows and pumping.
Craigleith Main Sewage Lift Station	Additional Site Works Craigleith LS	$350,000	Original Estimates did not include site works like paved access, Town IT ducting etc
Bay Street Forcemain, Watermain & Storm Sewer	Addition of Outfall Works	$2,000,000	The on-land portion of the Outfall including Road restoration over pipe on Grey St was taken from the Outfall project and added into Bay St Reconstruction to avoid Contractor overlap and duplication of CA/Insp. This was to be funded by a Transfer from the Outfall Project budget.
Bay Street Forcemain, Watermain & Storm Sewer	Elimination of Elgin St. SPS / Pumping of Temporary Water	$1,160,000	WW reported that a $2.5 million upgrade was required in the next 5 years and it was added to project scope due to the deepening of the wells requirement. Although it increased Bay St project by ~ $1.1 million it saved $2.5 million upgrade at Elgin St SPS.
Bay Street Forcemain, Watermain & Storm Sewer	Bay St. and Grey St. Stormwater Requirements	$1,400,000	Initially WT made an assumption that Grey St would be a rural cross section as it was currently. It was upgraded to an Urban Road as per engineering standards and council direction. Upsizing of sewer for development and master plan on Elgin St also not considered initially. This included a costly headwall and

Project Impacted	Cost Variation	Cost Implication	Comments
			large diameter storm. For compliance with Town Storm CLI ECA, 4 oil-grit separators were required that were not included in initial estimates.
Bay Street Forcemain, Watermain & Storm Sewer	Project Delays	$1,000,000	Design concerns (i.e. one way street) caused over 14 months of impact to the schedule.
Bay Street Forcemain, Watermain & Storm Sewer	Winter Work Premium	$500,000	The work in Phase 1 to be completed in Winter to stay on track for HEWS Funding, due to tender delays.
Bay Street Forcemain, Watermain & Storm Sewer	Additional Forcemain Scope on Russell St unopened ROW	$500,000	To make this connection and convey all of the wastewater to the plant as efficiently as possible, large connection structures with valves were required to facilitate the interconnection between the two forcemains.
Mill Street Sewage Pumping Station	Pumps & Process Equipment	$4,000,000	Increase in estimated pump and associated process equipment costs. Due in part by delay in project due to forcemain routing discussion. Pump quote alone more than doubled in this period.
Mill Street Sewage Pumping Station	Civil Site Works	$2,000,000	Includes additional costs for bypass pumping, dewatering, Town communications conduit, excavation, bracing and shoring, extended access around the entire facility.
Mill Street Sewage Pumping Station	Requirement for Concrete Secant Piles	$1,200,000	Design change required for issues with depth of excavation

Project Impacted	Cost Variation	Cost Implication	Comments
			and native soils. Reduces overall construction footprint.
Mill Street Sewage Pumping Station	Additional Generator	$1,100,000	Unable to reuse existing generator due to the size of the pumps – this cost includes the new generator and upgraded electrical work.
Mill Street Sewage Pumping Station	Increased Construction Costs	$1,100,000	Includes updated wet well/dry well, generator pad, building expansion, foundation, walls roofing reconfiguration for new design and solar panels etc.
Total increases experienced following grant submission		**$17,310,000**	

This information is being highlighted as these changes represent refinement and clarification of scope (given how conceptual much of the work was at the time of submission for the funding) rather than deficiencies in the original design.

The application was developed within a compressed timeframe to align with funding opportunities and emerging development needs within the Town. While this allowed the Town to secure significant external funding, it also meant that some elements of scope and associated costs were not fully defined at the time of application.

As discussed in earlier reports the extent of this evolution was not fully communicated as clearly as it should have been.

However, in relation to the point above, these components have been subject to assessment through the value engineering exercise and are displayed currently to build confidence that the components causing the escalation were not unnecessary.

D. Analysis

1. What We Said the VE Study Would Do

The Value Engineering exercise was intended to:

- Validate whether the current design is fit for purpose;
- Identify opportunities to optimize cost, scope, and constructability;
- Assess lifecycle and operational impacts; and
- Ensure value for money prior to tender.

2. What the VE Study Found

a. Design Validation

The VE exercise confirmed that the current design is fundamentally sound, fit for purpose, and aligned with the Town's long-term servicing requirements. Additionally, it was noted that it was in line with best practices.

b. No Significant Immediate Cost Reduction

No single recommendation was identified that would result in a substantial reduction in capital cost **without impacting functionality** – i.e. Peak Flow requirements are substantially reduced if we choose to move towards other options.

c. Opportunities for Optimization

The VE exercise identified targeted opportunities for refinement, including:

- Revisiting peak flow assumptions;
- Reviewing pump sizing;
- Considering phased implementation;
- Evaluating building and site components; and
- Assessing alternative construction approaches.

These represent options for consideration—not immediate changes.

d. Risk Considerations

The VE exercise highlighted that significant redesign or delay may introduce risks, including:

- Increased construction costs due to market conditions;
- Impacts to project timelines and HEWS funding;
- Increased Engineering and Project Management Costs;
- Deferral of infrastructure needs at greater future cost;
- Reduction of peak flows without additional Inflow and Infiltration reductions will result in continued issues (and costs) with events as experienced in March 2026 (see Staff Report OPS.26.019); and
- Potential challenges with Provincial Approvals (MECP).

Potential delays in allocation of capacity for approved developments withing the Mill Street Pumping station catchment area. **It is really key to understand that any of the value alternatives selected will require further analysis, investigation and detailed estimates. They are indicative and SHOULD NOT be considered conclusive.**

3. What VE Did vs. Did Not Do

VE DID:

- Validate the design;
- Identify risks and assumptions;
- Provide options for refinement – it is important to note that the alternatives provided are not conclusive, they require further analysis and investigation to confirm any cost savings or deferral;
- Improve overall understanding of system performance.

VE DID NOT:

- Identify a single large cost-saving solution – **without reduction of the level of service achieved in the current design**;
- Identify fundamental design flaws;
- Recommend abandoning or restarting the design.

4. Internal Review and Engineering Input

The VM team targeted project functions where value could be increased by optimizing the finalized solution or identifying new opportunities, resulting in greater performance and/or capital or life-cycle cost avoidance/addition while enhancing or maintaining necessary functions and objectives. The result was 51 creative ideas for the HEWS Project across the five value target functions shown in the table below. The abbreviations shown are used in the numbering of creative ideas as presented in Appendix D of Attachment 1 – The VE Report.

CS – Collect Sewage
IC – Increase Capacity
IP – Improve Asset Performance
OS – Operate System
PI – Project Infrastructure

Following the VE exercise, staff and consulting partners reviewed options considering feasibility, cost, operations, and risk. The table below details the information for the key potential cost saving opportunities highlighted by the VE consultants:

VE Option	Option Summary	LINKED OPTIONS / OR OTHER REQUIRED ELEMENTS	COST CLASS ESTIMATE	Potential Cost (Avoidance) or Increases
IC-03 – Revisit Peak Flows at Mill SPS	Redevelop the design flow requirements for the Mill St. SPS, using more accurate	• This is a desktop exercise that will impact the ultimate design flow but it requires TBM to upgrade infrastructure to reduce	Potentially Impacting all designs	Unknown

VE Option	Option Summary	LINKED OPTIONS / OR OTHER REQUIRED ELEMENTS	COST CLASS ESTIMATE	Potential Cost (Avoidance) or Increases
	per capita sewage flows and less I&I for the future build-out	inflow and infiltration. This is a long game goal and requires diligent monitoring of newly installed collection system to ensure the low I&I is achieved. • Reducing the design flows impacts all options, including the existing tender ready design. • We could revisit the peak flows and build out horizon using the existing unit rates, we expect that this would lower the projected peak flow rates and thus could impact all potential options including the current design.	Class D Estimate	
CS - 01 Introduce Caisson Submersible pump for Additional Capacity	A new wet well with submersible pumps with an overflow to the existing wet well. Reuse of the existing pumping arrangement Option includes the pump VFDs, piping and cover and by-pass pumping	Not included in the cost estimate are the following: • Requires existing building, new incoming electrical service, site plan, tie-in to forcemains and metering valve chamber • will require existing building modifications similar to the current design • will require emergency generator/ATS and incoming electrical upgrades • this option is combined with IC-03 • does not include multi-chamber wet well, no dry well • Road around site.	Class D Estimate	($7,996,900)

VE Option	Option Summary	LINKED OPTIONS / OR OTHER REQUIRED ELEMENTS	COST CLASS ESTIMATE	Potential Cost (Avoidance) or Increases
		• Washroom for staff. • New steel roof for existing building. (Shingles are falling off) • It mentions using existing pumps for high flows, these pumps are end of life and will need to be replaced. • New Generator, current generator can only run 1 existing pump. Will need enough power to run 4 pumps, concrete pad and conduit. • Actuators to control switching and draining of force mains. • SS piping in existing dry well will need to be modified to match new 600mm force mains, replaced to accept new and old pumps. • New submersible pumps to be Flygt as per previous staff report. • Access to wet well, the new wet well will require access ladders and landings for access.		
IC-05 Maximize Existing Pump Operation	This evaluation is essentially to re-use the existing pumping station using the new forcemains.	• Does not address the current design flows • This is a deferral of the pumping station upgrade work • The estimate assumes the re-use of the existing station is possible with the new, lower collection sewer • This does not provide for the long term solution, it is	Class D Estimate	($15,779,700) (Cost Deferral)

VE Option	Option Summary	LINKED OPTIONS / OR OTHER REQUIRED ELEMENTS	COST CLASS ESTIMATE	Potential Cost (Avoidance) or Increases
		a deferral, as such the present day cost should be inflated for the duration of the deferral to get the actual costs. • The significant risk in this option is that we wouldn't get MECP approval for increasing the pumping station capacity. • There is also risk to the collection system in that there is no sump volume for the pumps to operate thereby creating a condition of surcharging and sewer back-ups in the collection area. • Could consider but not sure if MECP would approve. Would require future capital cost when capacity is required. • New generator should be included, currently it can only run 1 pump. Electrical upgrades will be required. • Deferring the upgrades is not really an option, Operations has had to haul sewage from the station most recently in March 2026 due to capacity restrictions.		
IP-01 Demolish Mill SPS and build entirely new SPS	This is a combination of IC-03 and an entirely	• This option would require the following: ○ Complete an Environmental Assessment for the new site;	Class D Estimate	($4,535,000)

VE Option	Option Summary	LINKED OPTIONS / OR OTHER REQUIRED ELEMENTS	COST CLASS ESTIMATE	Potential Cost (Avoidance) or Increases
	new electrical building	○ Establish the location of the new site; ○ Complete an all background study for the new site (i.e. Archeological, Geotechnical, etc.; ○ Modify the existing and new collection system to align with the new location; ○ Modify the new Forcemains; ○ Construct a new electrical and controls building; ○ Construct a new wet well / dry well similar or the same to the current design; ○ New main electrical service entrance (may be an issue and require EPCOR to increase the available power – noting that this was an issue identified by EPCOR during the technical review of the current design; ○ Provide new site servicing, emergency power and etc.; ○ The cost avoidance identified assumes that option CS-01 realizes cost		

VE Option	Option Summary	LINKED OPTIONS / OR OTHER REQUIRED ELEMENTS	COST CLASS ESTIMATE	Potential Cost (Avoidance) or Increases
		avoidance identified and the option IC-03 results in actual flow reductions.		

5. Original Design Criteria (Critical Context)

It is important to highlight that the current design was developed based on comprehensive and well-established criteria, including:

- The project RFP;
- The Wastewater Master Plan;
- MECP Design Guidelines for Sewage Pumping Stations;
- Town of The Blue Mountains (TBM) building and sustainability requirements; and
- Opportunities to maximize reuse of existing infrastructure.

Key design principles included:

- Addressing existing deficiencies and planning for long-term capacity;
- Ensuring electrical and structural compliance (including separation of dry well and main floor);
- Designing for both dry and wet weather peak flows in accordance with the Master Plan;
- Meeting MECP requirements for firm capacity, redundancy, and operational reliability;
- Providing for future expansion with minimal modification;
- Incorporating emergency standby power to maintain full operation during outages;
- Designing for long-term durability and constructability (including wet well configuration and pumping systems);
- Integrating municipal net-zero and energy efficiency objectives, including renewable energy (solar);
- Including site design considerations such as safety, accessibility, noise attenuation, and visual screening.

These criteria reflect **not only regulatory compliance but also the Town's broader objectives** related to asset management, sustainability, and long-term operational performance.

6. Key Conclusions from Engineering Review

- There is no clear path to significant cost reduction without impacting the level of service (i.e. the flows);
- The project includes growth, renewal, regulatory, and complementary components;

- Maintaining the integrity of the current design criteria – or identify which criteria as noted in Item 5 above that will be waived and/or modified;
- Targeted refinement is the most appropriate path forward.

7. Recommended Path Forward

Based on the VE findings and subsequent review, staff recommend a focused and practical approach:

a) Revisit Peak Flow Assumptions and Implementation Approach: Align design infrastructure with near- to mid-term growth while allowing future expansion. realistic growth projections.

b) Focused Evaluation of Caisson Option: Undertake a targeted evaluation of the caisson pumping station alternative as the primary option identified through the VE exercise. This approach intentionally narrows the scope of further analysis. A comprehensive evaluation of all VE options is not practical at this stage. Staff are focusing on the option with the greatest potential to add value.

c) Maintain Project Momentum: Avoid further delays that may increase costs and impact timelines. This may include releasing the tender based on current design concurrent to further analysis occurring allowing for understanding of actual costs associated with the current design and anticipating risks in relying on identified alternatives.

d) Reporting Council: Ensure the project is the subject of regular updates respecting risks tied to cost and design.

E. Strategic Priorities

1. Communication and Engagement

We will enhance communications and engagement between Town Staff, Town residents and stakeholders

2. Organizational Excellence

We will continually seek out ways to improve the internal organization of Town Staff and the management of Town assets.

3. Community

We will protect and enhance the community feel and the character of the Town, while ensuring the responsible use of resources and restoration of nature.

4. Quality of Life

We will foster a high quality of life for full-time and part-time residents of all ages and stages, while welcoming visitors.

F. Environmental Impacts

Delays in commencing works at the Mill Street Pumping Station carries with it greater exposure to future bypasses into the natural environment as a result of significant weather events and existing deficiencies at the station.

G. Financial Impacts

The $45,000 requested for additional analysis is anticipated to be covered through the project contingency. As noted within the report, there remains financial risks to delaying construction while pursuing alternatives given an extended timeframe for bypass pumping at the station and uncertainty with respect to changes in external funding requirements, particularly if the alternatives are deemed to be unviable.

H. In Consultation With

Adam Smith, CAO
Alan Pacheco, Director of Operations
Allison Kershaw, Manager of Water & Wastewater Services
Mark Service, Wastewater Supervisor
Mike Humphries, Senior Infrastructure Capital Project Coordinator
Pruthvi Desai, Manager of Capital Projects

I. Public Engagement

The topic of this Staff Report has not been the subject of a Public Meeting and/or a Public Information Centre as neither a Public Meeting nor a Public Information Centre are required. However, any comments regarding this report should be submitted to Monica Quinlan, Director of Corporate & Financial Services directorcfs@thebluemountains.ca.

J. Attached

1. Attachment 1 – Value Management Study Report

Respectfully submitted,

Adam Smith,
CAO

Alan Pacheco,
Director of Operations

Monica Quinlan,
Director of Corporate & Financial Services

For more information, please contact:
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Report Approval Details

Document Title:	CFS.26.022 Value Engineering Exercise Review - Mill Street Pumping Station.docx
Attachments:	- Att 1 - HEWS Final VM Report.pdf
Final Approval Date:	Mar 26, 2026

This report and all of its attachments were approved and signed as outlined below:

Monica Quinlan - Mar 26, 2026 - 2:07 PM

No Signature found

Adam Smith - Mar 26, 2026 - 2:40 PM

THE TOWN OF THE BLUE MOUNTAINS, ONTARIO

HOUSING ENABLING WATER SYSTEMS (HEWS) PROJECT

Value Management Study Report

2026 FEBRUARY 23 - 26

MEMAR Value Strategies Inc.
Calgary, Alberta, Canada

DOCUMENT STATUS			
VERSION	FINAL V.4		
DATE	2026 MARCH 25		
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Figures and Tables

Appendices

1.0 Executive Summary

1.1 General

MEMAR Value Strategies Inc. conducted a Value Management (VM) Study of the final design submittal by WT Infrastructure Solutions Inc. and EVB Engineering for the Housing Enabling Water Systems (HEWS) Project in the Town of The Blue Mountains. The VM Study was supervised by the Town's Corporate and Financial Services. This VM Study was conducted on February 23 – 26, 2026, at the Holiday Inn Express & Suites Collingwood, 500 Hume St, Collingwood, ON L9Y 4H8, in compliance with the VM standard and procedures prescribed by SAVE International, USA, and accredited by Value Analysis Canada.

The overall goal of the VM Study was to identify gaps, omissions, and opportunities to improve value in the completed designs for the Craigleith Main Lift Station, Mill Street Pump Station, and Bay Street Reconstruction. It also evaluated the effectiveness and efficiency of the approaches and solutions, and provided concept level guidance for improving the HEWS projects.

The VM Study was an in-person workshop with selected disciplinary experts over 4.0 days (32.0 hours). The selected independent disciplinary specialists had leading expertise in hydraulics, linear conveyance systems and pump stations design and operations. An independent cost analyst was also part of the panel of experts. Complementing the independent external disciplinary experts were EVB Engineering's project manager and professionals from the Town's Operations Department.

Led by a Certified Value Specialist (CVS®) team leader, the multidisciplinary team of experts analyzed the required functions to improve the HEWS project, identified current challenges, and developed approaches and solutions to address them. The VM Team then generated and evaluated creative ideas with twenty-five-year time horizon considerations, operational and maintenance requirements, and operational efficiencies, balancing total cost. Finalized proposals and value improvement opportunities include overall design and technical solutions with consideration of their implementation.

The VM Study generated 51 creative ideas, which, after evaluation, resulted in 21 VM alternatives, technical solutions, and programmatic/project/design suggestions, developed into business cases presented in this report. The VM Team categorized these business cases into the following broad themes:

1. Efficient Investment of Capital.
2. Improve overall system performance or resilience to meet the Level of Service.
3. Enhance Mill Street Pump Station; and
4. Improve Operational Efficiency.

1.2 Value Management Study Approach

VM Study uses the international "Value Methodology Standard" established by SAVE International®, USA (www.value-eng.org) and accredited by Value Analysis Canada (www.valueanalysis.ca). "Value Methodology" is the general term for the structure and process used to execute the VM Study. It is a structured, six-phase method conducted in a workshop format with a multidisciplinary team to improve the value of a program, project, or process by analyzing functions and identifying opportunities for value improvement. These six phases are:

1. Information Phase
2. Function Analysis Phase
3. Creativity Phase
4. Evaluation Phase
5. Development Phase
6. Presentation Phase

Defining Value
Within the context of VM, Value is expressed by the following relationship:

$$\text{Value} \sim \frac{\text{Function}}{\text{Resources}}$$

In this expression, functions are measured against the customer/owner's performance requirements, such as mission, objectives, scope, and quality improvements. Resources are measured in terms of materials, labour, price, time, and risk reduction, among other factors, required to accomplish the specific function. VM focuses on improving Value by identifying the most resource-efficient way to reliably perform a function that meets the customer/owner's performance expectations. This expression is presented further as:

$$\text{Value} \sim \frac{\text{Function}}{\text{Resources}} = \frac{\text{Performance}}{\text{Cost}} = \frac{\text{Benefits}}{\text{Expenditure}} = \frac{\text{Outcome}}{\text{Investment}} = \frac{\text{Satisfaction of Needs}}{\text{Use of Resources}}$$

Applying this method, the VM Team identifies the essential program/project functions and alternative ways to achieve them. It then selects the best alternatives to develop workable solutions that deliver value. Ideally, the VM Team seeks opportunities to increase functionality while, where applicable, concurrently reducing resource requirements. This will achieve the best value solution. Understanding how 'Value' is affected by changes in function and resources provides the foundation for all Value Management studies.

1.3 HEWS VM Study Context

This VM Study is based on the final design report and a Class A estimate developed by WT Infrastructure Solutions Inc. and EVB Engineering. Based on the awarded tender numbers, and a final design capital cost estimate (Sep. and Oct. 2025) of $50.12 M approx. was used as a baseline cost (Appendix C). A Function Analysis Systems Technique (FAST) Diagram of the HEWS Project is presented in Appendix B. The VM Study participants consisted of disciplinary experts from multiple organizations, as listed in the table below.

Value Management Study Participants		
NAME	DISCIPLINE/ ROLE	ORGANIZATION
Mushtaq Rabbi	CVS/ VM Team Leader	MEMAR Value Strategies Inc.
Alan Pacheco	Director of Operations	Town of The Blue Mountains
Allison Kershaw	Manager of Water and Wastewater Services	Town of The Blue Mountains
Andrew Gould	Water/ Wastewater Technologist	Town of The Blue Mountains
Chris Johnston	Hydraulics	Kerr Wood Leidel
David McPherson	Pipelines & Pump Stations	HDR
Jamie Baker	VP/ Senior Municipal Engineer	EVB Engineering
Jamie Witherspoon	President and CEO	WT Infrastructure Solutions
Mark Service	Wastewater Supervisor	Town of The Blue Mountains
Mike Humphries	Senior Infrastructure Capital Projects Coordinator	Town of The Blue Mountains
Monica Quinlan	Director, Corporate & Financial Services	Town of The Blue Mountains
Ping Pang	Cost Analyst	BTY Group

1.4 Background of HEWS Project

Context

The overall goal of this project is to:

- Unlock more housing opportunities,
- Support the Province's growing population,
- Protect communities, and
- Enhance economic growth.

This project is funded through the Housing-Enabling Water System Fund (HEWSF). This Provincial funding program helps municipalities develop, repair, rehabilitate, and expand critical drinking water, wastewater, and stormwater infrastructure. The funding was specific to the "Craigleith Main Sewage Lift Station, Mill Street Sewage Pumping Station and Bay Street Forcemain" project.

The HEWS projects are a comprehensive upgrade to the Town's wastewater system, which is currently operating near capacity. The Town's Asset Management Plan indicates that the underground infrastructure on Bay Street in this location is in poor to very poor condition and is approaching the end of its useful life. The existing sanitary sewer and water main are both made of asbestos-cement and exhibit significant leakage.

The scope of the project includes:

- Replacement of underground infrastructure on Bay Street that is at the end of its life.
- Upgrades and asset replacement of existing equipment at Craigleith Main Sewage Lift Station, which will increase its service capacity from 5,170 units to 8,168 units.
- Upgrades and asset replacement of existing equipment at Mill Street Sewage Pumping Station, which will increase its service capacity from 2,693 units to 4,942 units.
- Installation of a secondary sanitary sewer forcemain on Bay Street East and Grey Street between the Mill Street Sewage Pumping Station and the Thornbury Wastewater Treatment Plant, along with the installation of a new stormwater management system and upgrading the existing watermain.

It is critical that the full capacity increase at the Mill Street Sewage Pumping Station also depends on the installation of the new secondary sanitary sewer forcemain. The completion of this work will ensure that the watermain, sewers and stormwater systems are adequate for the next 50 – 75 years. Addressing leaking watermains and sewers reduces the burden on both the water and wastewater systems, freeing up needed capacity and allowing more connections to current infrastructure.

1.5 Objectives of the Value Management Study

The Town's baseline expectations from the VM study were:

- Improve overall system performance or resilience.
- Enhances long-term operational efficiency; and
- Not introducing unintended costs or risks to the awarded Bay Street or Craigleith contracts.
- A streamlined system that meets all day-to-day operation and maintenance requirements within the limited resources available.
- a future-focused project, balancing life cycle costs, i.e., maintenance, operational activity, and capital construction costs.
- Address any environmental issues while enhancing the Town's ability to achieve its environmental stewardship.

1.6 Baseline Estimate of Capital Investment

The Town of The Blue Mountains had approved the following information to be used as baseline cost:

Table 1.	Est. Cost in C$ (Oct 2025)
Bay Str. Forcemain, Watermain, WWmain, Storm Sewer (**Awarded**)	20,695,949.0
Mill Street PS (Design Completed)	20,291,962.0
Craigleith Main LS (**Awarded**)	9,135,911.0
TOTAL EST. CONSTRUCTION COST	**50,123,822.0**

Economic Data for Life Cycle Cost Analysis

To express life-cycle costs, the Value Alternatives have been presented using discounted present worth. The economic criteria used by the VM Team were as follows:

Table 2. Economic Data for Life Cycle Cost Analysis	
Year of Analysis	**2026**
Analysis Period	25 years
Gross Discount Rate	5.9% per year
Inflation Rate	3.6 % per year
Net Discount Rate	2.3 % per year ~2.5%

1.7 Value Target Functions

The VM Team targeted project functions where value could be increased by optimizing the finalized solution or identifying new opportunities, resulting in greater performance and/or capital or life-cycle cost avoidance/addition while enhancing or maintaining necessary functions and objectives. The result was 51 creative ideas for the HEWS Project across the five value target functions shown in the table below. The abbreviations shown are used in the numbering of creative ideas as presented in Appendix D.

Value Target Function	Abbreviation
Collect Sewage	**CS**
Increase Capacity	**IC**
Improve Asset Performance	**IP**
Operate System	**OS**
Protect Infrastructure	**PI**

1.8 Functional Attributes or Performance Criteria

The VM Team prioritized the following Functional Attributes or Performance Criteria to evaluate and shortlist various Value Alternatives for developing proposals:

Functional Attributes / Performance Criteria	Definition
Functional Suitability	Effective and efficient for the day-to-day operation of the systems
Financial Viability	Capital investment MUST be justifiable within the acceptable capital budget allocations and provisions.
Technical Feasibility	The practicality and implementation of a proposed solution or system
Ease of O&M	Operations and maintenance functions and activities on the site and within the facilities can be conducted unhindered.
Future Adaptability	Offers flexibility for the expansion and operation of the systems with new infrastructure over time

1.9 Summary of VM Results

After evaluating the 51 ideas, 21 VM Alternatives emerged. An "Alternatives Summary" sheet is presented at the beginning of Section 2 of this report, listing the VM Alternatives along with their description and cost implications (where applicable).

The Town of The Blue Mountains implementation decisions will determine the ultimate cost implications. However, the VM team acknowledges that the Town of The Blue Mountains project team may prefer a different combination of the VM Alternatives upon further analysis. All the VM Alternatives developed during the VM Session are included in Section 2, following the "Summary of Value Alternatives" sheets.

The overall observations and the VM Team's proposed approach (1.9 Table 3) to improving the HEWS project at the end of this study are shown below. Some of these Alternatives are mutually exclusive and/or can be combined with other Alternatives to achieve better results upon implementation.

1.10 Alternatives Accepted by the Town

Following a review of the Final VM Study report, Operations Department personnel of the Town of The Blue Mountains will reach consensus on the VM Study recommendations through internal team analysis and discussions with WT Infrastructure Solutions and EVB Engineering, the consultants of record.

1.11 Acknowledgements

MEMAR Value Strategies Inc. wishes to thank the Town of The Blue Mountains' Corporate and Financial Services for its leadership in this critical initiative. We appreciate the cooperation and support of the Operations Department in preparing for this VM Study, and especially their attendance and participation during the VM Session. The thoughtful reception of the VM Team's proposals during the Presentation Phase by the Corporate and Financial Services and Operations Department team of The Town of The Blue Mountains was much appreciated.

Finally, we thank the disciplinary experts from WT Infrastructure Solutions, EVB Engineering, HDR, Kerr Wood Leidel, and the BTY Group, Operations Department, for their expertise, input, and active participation during the VM Study.

Housing Enabling Water Systems (HEWS) Project VM Study
1.9 Table 3 Summary of Value Alternatives, and Program/ Project/ Design Suggestions

VM TEAM'S OBSERVATIONS AND PROPOSED THEMED APPROACH FOR THE IMPLEMENTATION OF THE HEWS PROJECT (FEBRUARY 26, 2026) (CONCEPT LEVEL DESIGN, ESTIMATE CLASS D: -20% TO +30%, ESTIMATED COST INCL. 29.5% MARK UP, ESCALATION, AND CONTINGENCIES, LIFE CYCLE DURATION: 25 YEARS)											
ENHANCE MILL STREET PUMP STATION		**EST. CAPITAL INVESTMENT**	**EFFICIENT INVESTMENT OF CAPITAL**		**EST. CAPITAL INVESTMENT**	**MEET LEVEL OF SERVICE (LOS)**		**EST. CAPITAL INVESTMENT**	**IMPROVE OPERATIONS**		**EST. CAPITAL INVESTMENT**
CS-01	INTRODUCE CAISSON SUBMERSIBLE PUMP FOR ADDITIONAL CAPACITY	$10,867,300	**CS-05**	UPGRADE THE ELGIN STREET PS	$200,700	**IP-06**	REDUCE I&I IN THORNBURY TO 0.28L/SEC/HA	$7,990,200	**IC-01**	RE-PLUMB TREATMENT PLANT INLET	$118,700
IC-03	REVISIT PEAK FLOW AT MILL STREET	DS	**IC-08**	ADD STORAGE FOR I&I AT CRAIGLEITH	$10,320,900	**IP-09**	CONDUCT CONDITION ASSESSMENT AND REPAIR COLLECTION SYSTEM	$1,942,500	**IC-02**	REVISIT PEAK FLOW AT CRAIGLEITH PS	DS
IC-05	MAXIMIZE EXISTING PUMPING OPERATIONS	$5,265,500	**IC-12**	LINE THE TIMMINS/ LLOYD'S EASEMENT FOR ADDITIONAL CAPACITY AT CRAIGLEITH	$2,590,000	**IP-11**	REDUCE SANITARY LOS TO MATCH DRAINAGE SYSTEM LOS	DS	**PI-01**	MAINTAIN AND UTILIZE CURRENT SURGE TANKS AT MILL STREET	DS
IC-09	ADD STORAGE FOR I&I AT MILL STREET	$17,871,000	**IC-13**	CREATE A STORMWATER UTILITY BILLING STRUCTURE FOR THE SKI INDUSTRY FOR SNOW MAKING	DS						
IP-01	DEMOLISH MILL STREET PS AND BUILD A NEW ONE	$15,491,500	**IP-03**	REMOVE COVER, SIDES AND ROOF OVER THE DRY WELL	$584,700						
PI-02	EXAMINE THE MERIT OF NET ZERO IN PUMP STATION BLDG.	$0	**IP-14**	REVISE/ REVISIT TOWN'S ENGINEERING STANDARDS	DS						
			OS-03	CONSIDER SINGLE PUMP VFD AND FIX THE REMAINDER	$369,300						
			OS-05	CONSIDER IN-LINE PIPE STORAGE	$35,224,000						
			OS-06	INTRODUCE PUMP CONTROL VALVES AT PUMP STATIONS AND NO VFDS	$181,300						

NOTE: Each Value Alternative presented indicates the estimated capital investment at the time of this Value Management Study. Any of these Value Alternatives selected for implementation shall require further analysis, investigation, and a detailed estimate based on market data at the time of implementation**. THEY ARE INDICATIVE and SHOULD NOT BE CONSIDERED CONCLUSIVE.**

DS: Design Suggestion
Can also be considered as a Programmatic or Project Suggestion. No cost calculation is associated with a DS due to insufficient data at the time of the VM Study.

2.0 Value Management Alternatives

A "Summary of Value Alternatives" on the following pages elaborates the results of the Value Management Study workshop. It identifies the Alternative Number, Descriptive Alternative Title, Alternative Category, Mutual Exclusivity, and Potential Impact on First (Capital) Costs (expressed as capital investment/ cost avoidance), Present worth of Future Costs, and the resulting Life Cycle Cost over a 25-year service life, depending on the specifics of a solution proposed.

The 21 VM Alternatives (15 Quantitative and 6 Program/Project/ Design Suggestions) developed as part of the VM Study are presented in their entirety on the pages following the "Summary of Value Alternatives", according to Value Target Functions.

Note: All the developed Value Alternatives are not peer-reviewed, and may not reflect the current design standards, and are meant to be demonstrative concepts - offering value improvement opportunities in this project rather than prescriptive solutions.

Alternatives Cost Summary

Creative and Evaluation Phase Results

Ideas As:	No. of Ideas
Alternative	15
Design Suggestion	6
Estimate Correction	0
Group with Other Alternative	18
Already Being Done	6
Dropped during Development	6
Eliminated by Evaluation	0
Total Creative Ideas	**51**

Value Target Functions
COLLECT SEWAGE (CS)
INCREASE CAPACITY (IC)
IMPROVE PERFORMANCE (IP)
OPERATE SYSTEM (OS)
PROTECT INFRASTRUCTURE (PI)

Summary of Alternatives and Design Suggestions

Alter. No.	Alternative Title	Potential Capital Cost Avoidance/ Deferral or (Increase)	Potential O&M Costs Avoidance/ Deferral or (Increase) (PW)	Potential Life Cycle Costs Avoidance/ Deferral or (Increase)
Alter. No.	(Vetted by Facilitator)	Costs)	Future Costs)	Life Cycle Costs
CS-01	INTRODUCE CAISSON SUBMERSIBLE PUMP FOR ADDITIONAL CAPACITY	$8,874,100	$ (907,200)	$7,966,900
CS-05	UPGRADE THE ELGIN STREET PS	$ (84,100)	$ (110,000)	$ (194,100)
IC-01	RE-PLUMB TREATMENT PLANT INLET	$ (118,700)	$ 5,500	$ (113,200)
IC-02	REVISIT PEAK FLOW AT CRAIGLEITH PS	$ DS -	$ -	$ -
IC-03	REVISIT PEAK FLOW AT MILL STREET	$ DS -	$ -	$ -
IC-05	MAXIMIZE EXISTING PUMPING OPERATIONS	$ 14,475,900	$ 1,303,800	$ 15,779,700
IC-08	ADD STORAGE FOR I&I AT CRAIGLEITH	$ (2,787,900)	$ 276,400	$ (2,511,500)
IC-09	ADD STORAGE FOR I&I AT MILL STREET	$ 1,870,400	$ -	$ 1,870,400
IC-12	LINE THE TIMMINS/ LLOYD'S EASEMENT FOR ADDITIONAL CAPACITY AT CRAIGLEITH	$ (2,590,000)	$ -	$ (2,590,000)
IC-13	CREATE A STORMWATER UTILITY BILLING STRUCTURE FOR THE SKI INDUSTRY FOR SNOW MAKING	$ DS -	$ -	$ -
IP-01	DEMOLISH MILL STREET PS AND BUILD A NEW ONE	$ 4,249,900	$ 285,400	$ 4,535,300
IP-03	REMOVE COVER, SIDES AND ROOF OVER THE DRY WELL	$ 563,400	$ 42,300	$ 605,700
IP-06	REDUCE I&I IN THORNBURY TO 0.28L/SEC/HA	$ (7,990,200)	$ -	$ (7,990,200)
IP-09	CONDUCT CONDITION ASSESSMENT AND REPAIR COLLECTION SYSTEM	$ (1,942,500)	$ -	$ (1,942,500)
IP-11	REDUCE SANITARY LOS TO MATCH DRAINAGE SYSTEM LOS	$ DS -	$ -	$ -
IP-14	REVISE/ REVISIT TOWN'S ENGINEERING STANDARDS	$ DS -	$ -	$ -
OS-03	CONSIDER SINGLE PUMP VFD AND FIX THE REMAINDER	$ 831,200	$ 740,100	$ 1,571,300
OS-05	CONSIDER IN-LINE PIPE STORAGE	$ (15,482,600)	$ 122,100	$ (15,360,500)
OS-06	INTRODUCE PUMP CONTROL VALVES AT PUMP STATIONS AND NO VFDS	$ 595,700	$ 588,700	$ 1,184,400
PI-01	MAINTAIN AND UTILIZE CURRENT SURGE TANKS AT MILL STREET	$ DS -	$ -	$ -
PI-02	EXAMINE THE MERIT OF NET ZERO IN PUMP STATION BLDG.	$ 32,400	$ (22,900)	$ 9,500

NOTE: Each Value Alternative presented indicates the estimated capital and life-cycle cost avoidance or deferral as of the time of this Value Management Study. Any of these Value Alternatives selected for implementation shall require further analysis, investigation, and a detailed estimate based on market data at the time of implementation. **THEY ARE INDICATIVE and SHOULD NOT BE CONSIDERED CONCLUSIVE.**

- **POTENTIAL COST AVOIDANCE/ DEFERRAL IDENTIFIED AGAINST BASELINE ESTIMATE**
- (POTENTIAL COST INCREASE/ ADDITIONAL INVESTMENT REQUIRED AGAINST BASELINE ESTIMATE)

DS: Design Suggestion
Can also be considered as a Programmatic or Project Suggestion. No cost calculation is associated with a DS due to insufficient data at the time of the VM Study.

Appendix A

Value Management Alternatives by Function

FUNCTION:

Collect Sewage (CS)

Quantitative Value Alternative

Title	CS-01

INTRODUCE CAISSON SUBMERSIBLE PUMP FOR ADDITIONAL CAPACITY

Original Concept

Full scale upgrade to Mill Street PS

Alternative Concept

Provide a new caisson wet well with an operating volume of 300 m3 adjacent to Mill Street PS. The Caisson will have an internal diameter of 10 m. Assume a 1-meter wall thickness with a shotcrete lining. Total Diameter 12.0 m The caisson will be set at a level to be able to receive flow from the newly installed inlet sewer. The floor level will be 169 m. Within the casing will be two 135 l/s 150 HP submersible pumps. These pumps will be equipped with VFD drives and will provide primary service. The existing Mill Street PS will be maintained, and the caisson will be tied to the existing Mill Street higher wet well floor level by a 500 mm Concrete Pipe. The existing station will provide wet-weather flows.

Advantages

- Lower capital cost.
- More operational flexibility. (Existing Station used for wet weather flows).
- Redundancy.
- More planning flexibility (Additional Pumps can be added to pace flow needs).

Disadvantages

- Maintenance of submersible pumps more difficult. Estimated two picks per year at $5000 per event.
- Minor schedule delay as this option may require additional review and approval by MECP.

Discussion / Justification

The existing Mill Street wet well is above the new influent flow level. The existing pump(s) will be used for peak wet weather flow events. The new caisson design will be set to allow a new influent sewer level and have a relief pipe to the existing Mill Street wet well. As the need for pump flow capacity increases, additional pumps can be installed in the caisson to meet the demand. The inside diameter of the caisson is 10.0 m, and the perimeter of the inner wall is 31.4 m, providing adequate volume for operational storage.

Cost Summary	Initial Costs	O&M Cost	Life Cycle Cost
Original Concept	$ 19,741,400	$ 5,979,900	$ 25,721,300
Alternative Concept	$ 10,867,300	$ 6,887,100	$ 17,754,400
Difference	**$ 8,874,100**	**$ -907,200**	**$ 7,966,900**

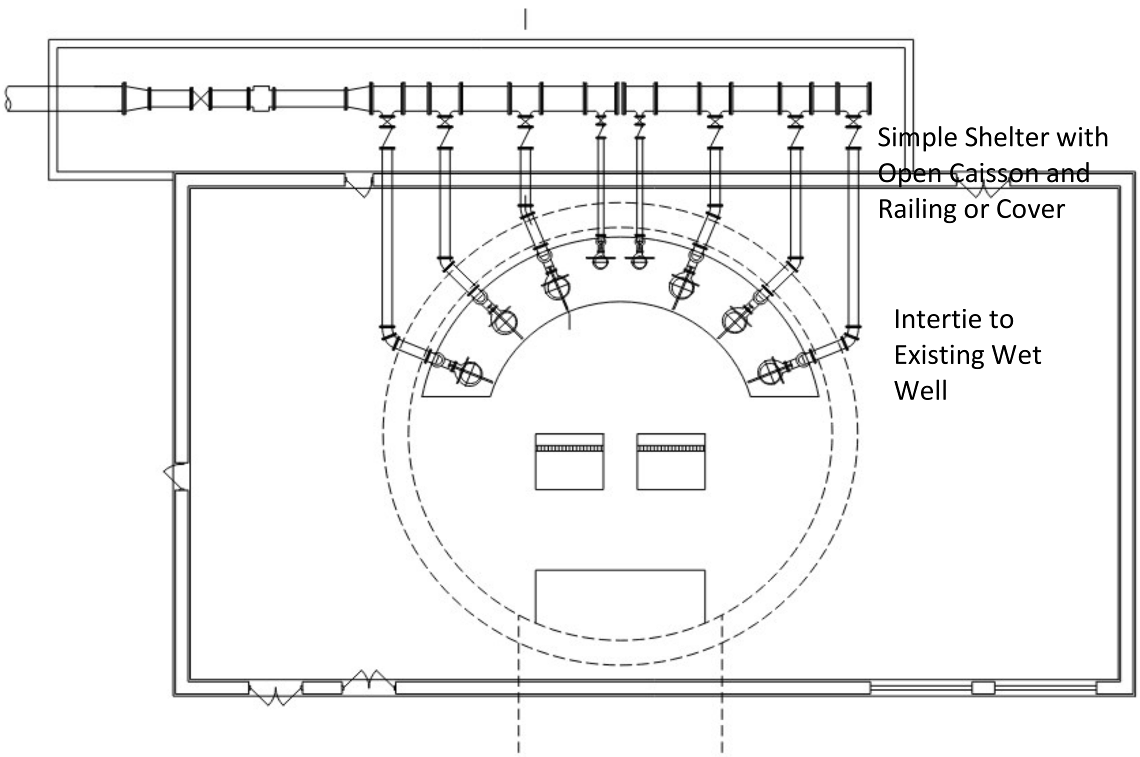
Quantitative Value Alternative

Title	CS-01

INTRODUCE CAISSON SUBMERSIBLE PUMP FOR ADDITIONAL CAPACITY

Exhibits - Alternative Concept

Below is a caisson wet well that has multiple submersible pumps (6). The Mill Street caisson is proposed to be initially designed for 3 x 135 l/s 150 HP pumps installed for a firm capacity of 270 l/s, with the existing Milll Street station providing peak wet weather pumping when flows exceed 270 l/s. However, additional pumps can be introduced to the caisson as flow capacity needs increase towards the 450 l/s. As it may be more functional, the standby pump can be used for wet weather events as well and the existing pumps may not be utilized. The redundancy and operational flexibility of this arrangement is significant.



Quantitative Value Alternative

Title	CS-01

INTRODUCE CAISSON SUBMERSIBLE PUMP FOR ADDITIONAL CAPACITY

Estimated Cost of Original Concept — Page 3 of 4

Description	Unit	Quantity	Unit Cost		Total
Base Cost for Mills Pumping Station Expansion (based on current price)	sum	1	$15,244,289.91		$15,244,290
			Subtotal:	**$**	**15,244,290**
		29.5%	Project Markup:	$	4,497,066
			Total Cost (Rounded):	**$**	**19,741,400**

Estimated Cost of Alternative Concept Proposed

Description	Unit	Quantity	Unit Cost		Total
Caisson (D:12m, H:12m) Wall thickness 1 m and piling/anchor	EA	1	$4,153,365.06		$4,153,365
Submersible Pumps (135 l/s, 71 m, 150 HP) including plug control valves	EA	4	$307,586.67		$1,230,347
VFD System, with switch gear	EA	3	$80,000.00		$240,000
300 mm SS Pipe incl fittings	M	36	$1,000.00		$36,000
500 mm SS Pipe incl. fittings	M	30	$1,500.00		$45,000
500 mm Concrete	M	10	$700.00		$7,000
Caisson Cover and Access Portal including enclosure and electrical	EA	1	$1,580,000.00		$1,580,000
Bypass pumping	sum	1	$900,000.00		$900,000
Temporary Bypass retrofit	sum	1	$200,000.00		$200,000
			Subtotal:	**$**	**8,391,712**
		29.5%	Project Markup:	$	2,475,555
			Total Cost (Rounded):	**$**	**10,867,300**
			Cost Difference:	**$**	**8,874,100**

Quantitative Value Alternative

Title **CS-01**

INTRODUCE CAISSON SUBMERSIBLE PUMP FOR ADDITIONAL CAPACITY

Life Cycle Cost Estimate

Page 4 of 4

Discount Rate 2.50% Net
Life Cycle Period 25 Years

First Costs				Original Concept: Estimated First Costs	Original Concept: Present Worth (PW)	Alternative Concept: Estimated First Costs	Alternative Concept: Present Worth (PW)
Original Concept (from First Costs Worksheet)				19,741,400	19,741,400		
Alternative Concept (from First Costs Worksheet)						10,867,300	10,867,300
Total Initial Costs					**$ 19,741,400**		**$ 10,867,300**
Difference (Compared to Original Concept)							**$ 8,874,100**
Replacement / Salvage Value	**Occurrence Yr - or-Cycle**	**Inflat. Rate**	**PW Factor**	**Estimated Replacement Costs**	**PW Replacement Costs**	**Estimated Replacement Costs**	**PW Replacement Costs**
Maintenance	5		2.966	30,000	88,974	50,000	148,289
Replacement	15		0.690	660,000	455,707		
Replacement sanitary lift pumps	10		1.391			738,208	1,027,194
Total Replacement/Salvage Costs					**$ 544,700**		**$ 1,175,500**
Annual Costs		**Inflat. Rate**	**PWA Factor**	**Estimated Annual Costs**	**PW Annual Costs**	**Estimated Annual Costs**	**PW Annual Costs**
Energy			18.424	280,000	5,158,825	280,000	5,158,825
Annual maintenance			18.424	15,000	276,366	30,000	552,731
Total Annual Costs (Present Worth)					**$ 5,435,200**		**$ 5,711,600**
Life Cycle Cost Summary					**Present Worth (PW)**		**Present Worth (PW)**
Subtotal Replacement / Salvage + Annual Costs					$ 5,979,900		$ 6,887,100
Difference (Compared to Original)							**(907,200)**
Total Life Cycle Costs (Present Worth)					$ 25,721,300		$ 17,754,400
Life Cycle Difference (Compared to Original)							**$ 7,966,900**
Total Life Cycle Costs (Annualized)				**Per Year:**	**$ 1,396,047**	**Per Year:**	**$ 963,636**

Quantitative Value Alternative

Title **CS-05**

UPGRADE THE ELGIN STREET PS

Original Concept

Page 1 of 7

The original concept is to demolish the Elgin St. Pumping Station, lowering the new Gray St. sewer diverting the sanitary flows along Gray St. E/Elgin St. to the Mill St. collection system. The Elgin St. station currently discharges to the Mill St. collection system and effectively double pumping sewage.

Alternative Concept

The alternative concept would be to maintain and upgrade the Elgin St. Pumping Station to discharge directly to the force main conveying sewage to the Thornbury WWTP as well as to increase the capacity, diverting flow from the Mill St. pumping Station.

Advantages

- Reduces flow from the Mill St. Pumping Station
- Discharge directly to the WWTP
- Reduces double pumping of the sewage

Disadvantages

- Requires capital investment, in addition to investment into the Mill St. Station
- Has limited capacity, currently only captures flow from the Bay St. East to Elgin and Elgin South of hwy 26.

Discussion / Justification

Maintaining the Elgin St. pumping station and upgrading the station to discharge to the new FM currently being installed would remove this sewage flow from the Mill St. catchment; however, the catchment area of this station is limited as well as the design flow of the station. The station has physical capacity to be upgrades for higher flows allowing additional catchment areas to be included in this station, reducing the catchment of the Mill St. SPS. Maintaining the Elgin St. station provides redundancy in the pumping system.

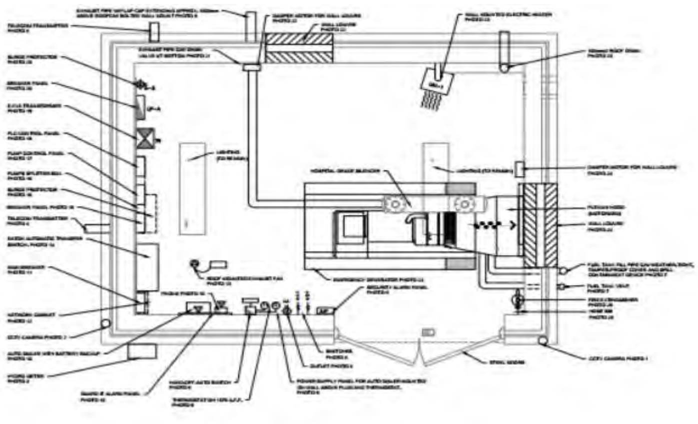
Cost Summary	Initial Costs	O&M Cost	Life Cycle Cost
Original Concept	$ 116,600	$	$ 116,600
Alternative Concept	$ 200,700	$ 110,000	$ 310,700
Difference	**$ -84,100**	**$ -110,000**	**$ -194,100**

Quantitative Value Alternative

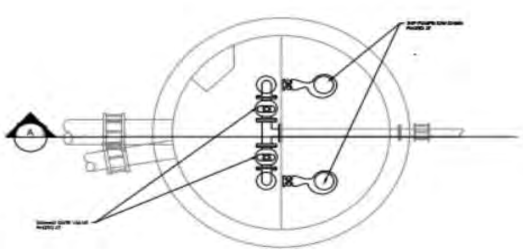
Title	CS-05

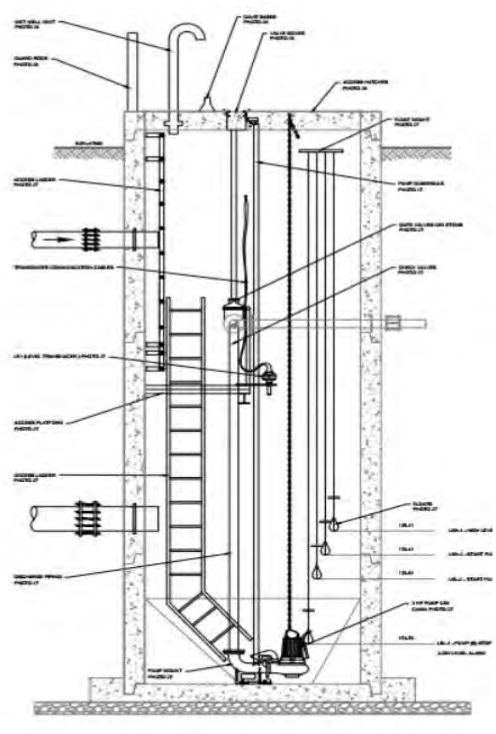
UPGRADE THE ELGIN STREET PS

Exhibits	Page 2 of 7



PLAN VIEW (CONTROL BUILDING)
SCALE: 1:20





SECTION A-A REMOVALS

Quantitative Value Alternative

Title	CS-05

UPGRADE THE ELGIN STREET PS

Discussion / Justification

The scope of the project would include:
- Install a new 6" force main, tie in to the new FM
- There have been some minor electrical, generator, PLC recent upgrades
- Increase the pumping capacity from approximately 9 L/s at new discharge head in coordination with the operating pressure for the new force main.

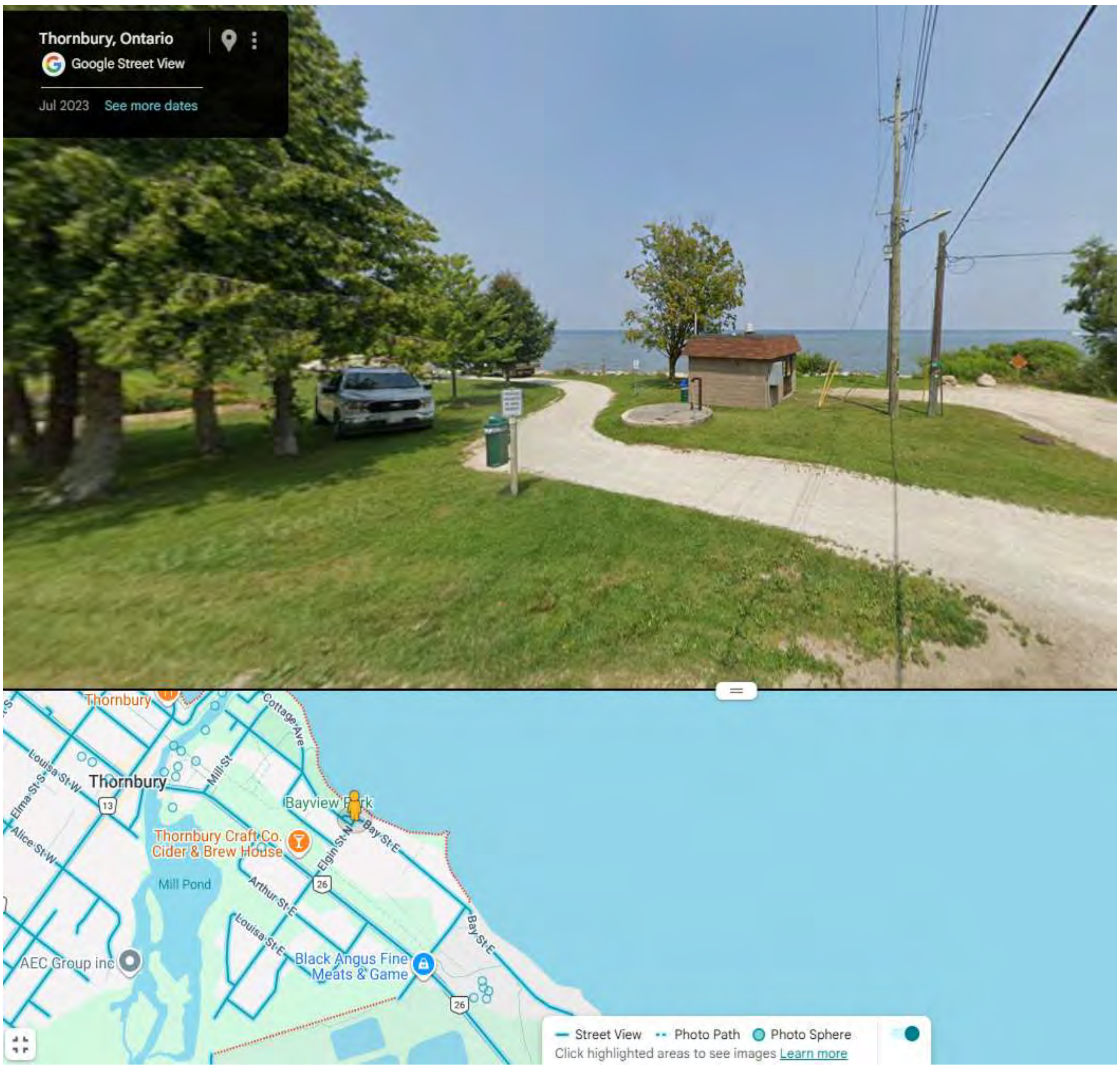
NOTE: THIS SCOPE NEEDS TO TIE INTO RETAINING MILLS STREET PUMP STATION for complete cost saving

Quantitative Value Alternative

Title	CS-05

UPGRADE THE ELGIN STREET PS

Exhibits	Page 4 of 7

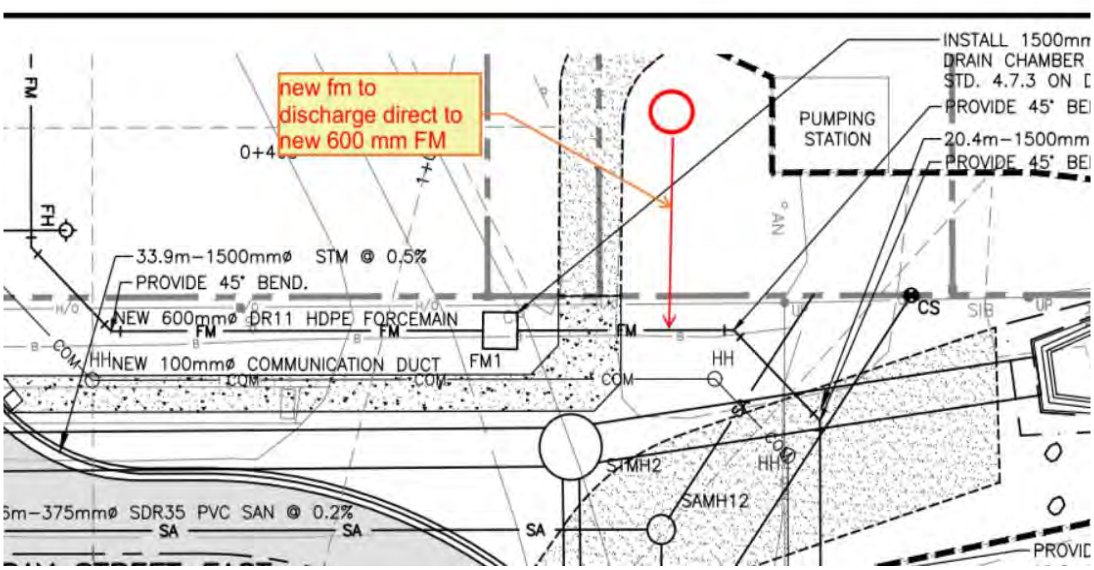


Quantitative Value Alternative

Title	**CS-05**

UPGRADE THE ELGIN STREET PS

Exhibits	**Page 6 of 7**



Quantitative Value Alternative

Title	CS-05

UPGRADE THE ELGIN STREET PS

Estimated Cost of Original Concept — Page 6 of 7

Description	Unit	Quantity	Unit Cost	Total
Demolition of Existing Station (awarded contract)	sum	1	$100,000.00	$100,000
Retained profit	sum	-1	$10,000.00	-$10,000

	Subtotal:	**$**	**90,000**
29.5%	Project Markup:	$	26,550
	Total Cost (Rounded):	**$**	**116,600**

Estimated Cost of Alternative Concept Proposed

Description	Unit	Quantity	Unit Cost	Total
6" PVC SDR 26 FM	LS	1	$5,000.00	$5,000
6" SS 304L Header and Pumps	LS	1	$100,000.00	$100,000
Electrical Upgrades	LS	1	$50,000.00	$50,000

	Subtotal:	**$**	**155,000**
29.5%	Project Markup:	$	45,725
	Total Cost (Rounded):	**$**	**200,700**
	Cost Difference:	**$**	**-84,100**

Quantitative Value Alternative

Title	CS-05

UPGRADE THE ELGIN STREET PS

Life Cycle Cost Estimate

Page 7 of 7

Discount Rate 2.50% Net
Life Cycle Period 25 Years

	Occurrence Yr - or-Cycle	Inflat. Rate	PW Factor	Original Concept		Alternative Concept	
First Costs				**Estimated First Costs**	**Present Worth (PW)**	**Estimated First Costs**	**Present Worth (PW)**
Original Concept (from First Costs Worksheet)				116,600	116,600		
Alternative Concept (from First Costs Worksheet)						200,700	200,700
Total Initial Costs					**$ 116,600**		**$ 200,700**
Difference (Compared to Original Concept)							**-$ 84,100**
Replacement / Salvage Value	**Occurrence Yr - or-Cycle**	**Inflat. Rate**	**PW Factor**	**Estimated Replacement Costs**	**PW Replacement Costs**	**Estimated Replacement Costs**	**PW Replacement Costs**
Replacement	24		0.553			100,000	55,288
Maintenance	1		17.885			1,000	17,885
Total Replacement/Salvage Costs					**$ -**		**$ 73,200**
Annual Costs		**Inflat. Rate**	**PWA Factor**	**Estimated Annual Costs**	**PW Annual Costs**	**Estimated Annual Costs**	**PW Annual Costs**
Energy cost			18.424			2,000	36,849
Total Annual Costs (Present Worth)					**$ -**		**$ 36,800**
Life Cycle Cost Summary					**Present Worth (PW)**		**Present Worth (PW)**
Subtotal Replacement / Salvage + Annual Costs					$ -		$ 110,000
Difference (Compared to Original)							**(110,000)**
Total Life Cycle Costs (Present Worth)					$ 116,600		$ 310,700
Life Cycle Difference (Compared to Original)							**-$ 194,100**
Total Life Cycle Costs (Annualized)				**Per Year:**	**$ 6,329**	**Per Year:**	**$ 16,864**

FUNCTION:

Increase Capacity (IC)

Quantitative Value Alternative

Title	IC-01

RE-PLUMB TREATMENT PLANT INLET

Original Concept

Presently, the layout accommodates redundant flow metering, an elevated segment with a combination air valve and additional vertical and horizontal fittings to feed the box screens. This alignment with the various TEEs, Vertical and Horizontal 90-degree fittings, results in a summation of minor/local losses of K=7.6 for the 300 mm piping and K=11.7 for the 400 mm piping. At higher flow rates and flow velocity, the total Head loss is significantly high.

Alternative Concept

Revise the inlet works to streamline the local losses by eliminating the redundant flow metering and elevated segment for combination air valve. This will allow to reduce the local loss coefficients to K=11.7 to 2.6 for the 400 mm pipe and reduce the lay length from 11.5 m to 7.5 m. This will reduce the total loss from 4.5 m at 450 l/s and 3.0 m at 265 l/s. This reduction in head loss will allow the existing pumps at Hill Street to produce more flow.

Advantages

- Reduce head loss and increase existing flow capacity
- Regain space on box screen level in the headworks.
- Streamline flow into the box screens.

Disadvantages

- Minor additional cost.

Discussion / Justification

Below is a chart (Exhibit 1) showing the head loss over the range of flows. The highest head assumes the parallel pipe train is not installed. The second highest head is to utilize the existing pipe alignment and features. The proposed alignment is shown in Exhibit 2.

Cost Summary

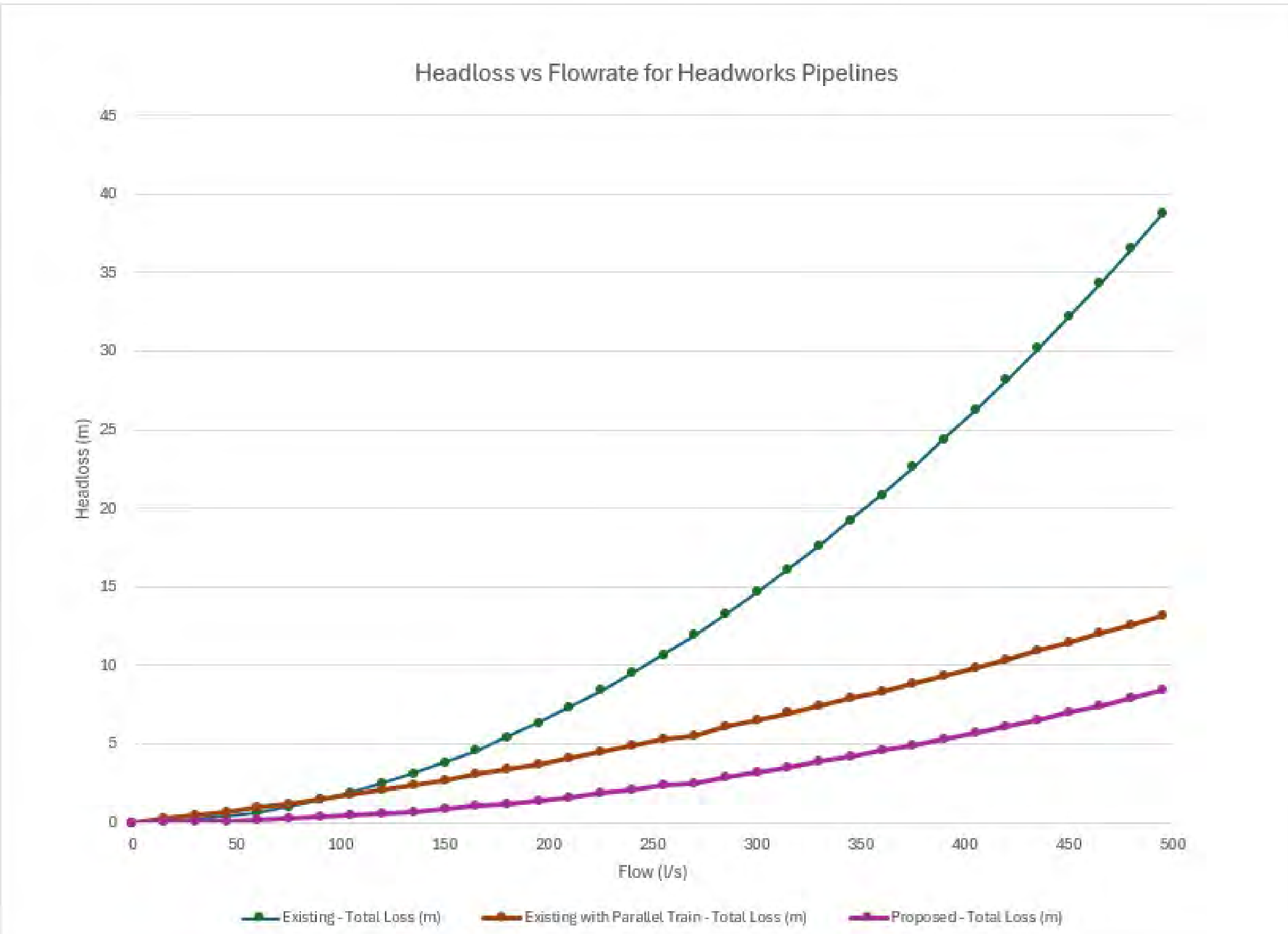
	Initial Costs	O&M Cost	Life Cycle Cost
Original Concept	$ N/A	$ N/A	$ N/A
Alternative Concept	$ 118,700	$ -5,500	$ 113,200
Difference	**$ -118,700**	**$ 5,500**	**$ -113,200**

Quantitative Value Alternative

Title	IC-01

RE-PLUMB TREATMENT PLANT INLET

Exhibits



Quantitative Value Alternative

Title	IC-01

RE-PLUMB TREATMENT PLANT INLET

Exhibits

Page 3 of 6

D.S. Miller - Internal Flow Systems Reference for Form (Local) Losses.

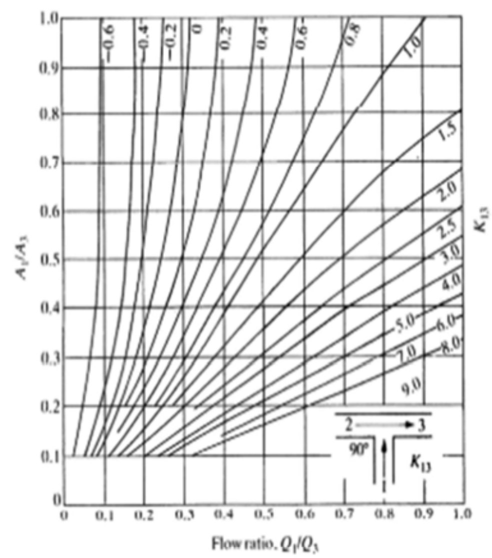


Fig. 13.10†. Combining flow: branch angle 90°, loss coefficient K_{13}

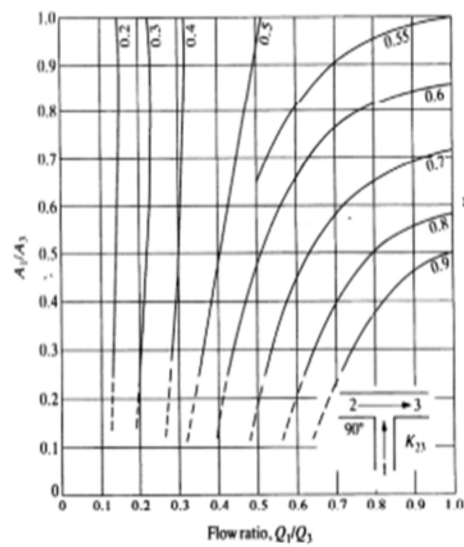


Fig. 13.11. Combining flow: branch angle 90°, loss coefficient K_{23}

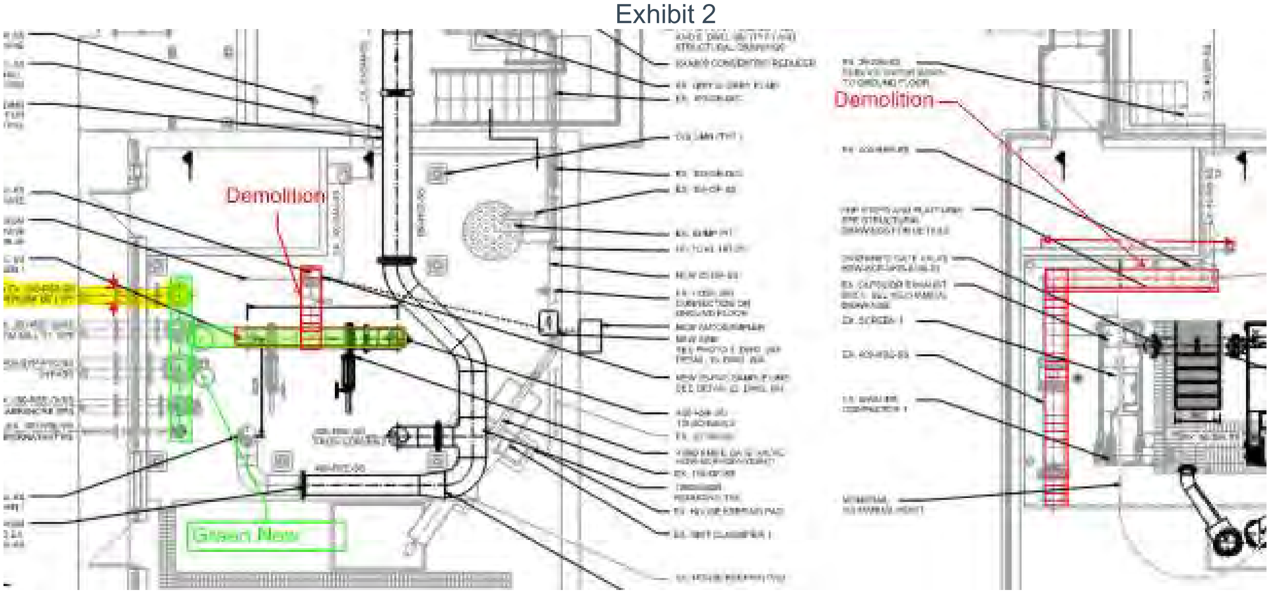
Quantitative Value Alternative

Title	IC-01

RE-PLUMB TREATMENT PLANT INLET

Exhibits

Exhibit 2



Quantitative Value Alternative

Title	IC-01

RE-PLUMB TREATMENT PLANT INLET

Estimated Cost of Original Concept — Page 5 of 6

Description	Unit	Quantity	Unit Cost	Total
No Change				
			Subtotal:	**$**
		29.5%	Project Markup:	$
			Total Cost (Rounded):	**$**

Estimated Cost of Alternative Concept Proposed

Description	Unit	Quantity	Unit Cost	Total
Demo 400 mm SS	sum	1	$15,000.00	$15,000
Install 400 mm SS	kg	450	$125.86	$56,637
Miscellaneous making good	sum	1	$20,000.00	$20,000
			Subtotal:	**$ 91,637**
		29.5%	Project Markup:	$ 27,033
			Total Cost (Rounded):	**$ 118,700**
			Cost Difference:	**$ -118,700**

Quantitative Value Alternative

Title	**IC-01**

RE-PLUMB TREATMENT PLANT INLET

Life Cycle Cost Estimate

Page 6 of 6

				Original Concept		Alternative Concept	
Discount Rate 2.50% Net **Life Cycle Period** 25 Years							
First Costs				**Estimated First Costs**	**Present Worth (PW)**	**Estimated First Costs**	**Present Worth (PW)**
Original Concept (from First Costs Worksheet)							
Alternative Concept (from First Costs Worksheet)						118,700	118,700
Total Initial Costs					**$ -**		**$ 118,700**
Difference (Compared to Original Concept)							**-$ 118,700**
Replacement / Salvage Value	**Occurrence Yr - or-Cycle**	**Inflat. Rate**	**PW Factor**	**Estimated Replacement Costs**	**PW Replacement Costs**	**Estimated Replacement Costs**	**PW Replacement Costs**
Total Replacement/Salvage Costs					**$ -**		**$ -**
Annual Costs		**Inflat. Rate**	**PWA Factor**	**Estimated Annual Costs**	**PW Annual Costs**	**Estimated Annual Costs**	**PW Annual Costs**
Energy saving			18.424			-300	-5,527
Total Annual Costs (Present Worth)					**$ -**		**-$ 5,500**
Life Cycle Cost Summary					**Present Worth (PW)**		**Present Worth (PW)**
Subtotal Replacement / Salvage + Annual Costs					$ -		-$ 5,500
Difference (Compared to Original)							**5,500**
Total Life Cycle Costs (Present Worth)					$ -		$ 113,200
Life Cycle Difference (Compared to Original)							**-$ 113,200**
Total Life Cycle Costs (Annualized)				**Per Year:**	**$ -**	**Per Year:**	**$ 6,144**

Design Suggestion

Title	IC-02

REVISIT PEAK FLOW AT CRAIGLEITH PS

Original Concept

Page 1 of 9

The original concept uses design flows based on the Town's design criteria and development build-out (2050-2075). Existing dry-weather flow unit rates for existing and future populations both use 350 L/ha/d. Existing I&I rates are based on return-period predictions from calibrated PC-SWMM computer models. Future I&I rates are based on the Town's 0.28 L/s/ha criteria. The proposed Craigleith Pump Station design is based on these flows for the ultimate build-out.

Alternative Concept

The alternative concept uses a flow analysis that breaks down the individual flow components. The alternative concept removes the "Factor-of-Safety" (FOS) in the City's design criteria for the early years and develops interim design flows at various planning-year horizons. This helps to accurately match design flows with *design life* since there are multiple design lives of various facility and collection system components (i.e. mechanical/pumps = 20 to 25 years, gravity sewers = 100 to 125 years, etc.).

Advantages

- Allows a more reasonable 20-year design flow to be estimated

Disadvantages

- None

Discussion / Justification

This option requires additional analysis and evaluation.

Design Suggestion

Original Concept	$	$	$
Alternative Concept	$	$	$
Difference	**$**	**$**	**$**

Design Suggestion

Title	**IC-02**

REVISIT PEAK FLOW AT CRAIGLEITH PS

Discussion / Justification

Assumptions / Table 1 discussion:

Summary: The Alternative Concept for the 20-year design flow for the Craigleith PS is calculated as 313.1 L/s

I&I:

Existing I&I is based on the design value in the Wastewater Master Plan:

Estimated Craigleith PS Q10 from report: 270.8 L/s

therefore, existing I&I can be calculated by subtracting peak dry weather flow:

270.8 - 5,588*2.15*350*3.2/86400 = 156 L/s
where 2.15 is the people/unit
350 is the Towns design unit rate in L/c/d
and 3.2 is the Harmen peaking factor

Future I&I will start off low (likely 0.07 L/s/ha) then increase too 0.28 L/s/ha in 50 years of service.

Domestic Flows

Domestic flows are comprised of residential and ICI sewage and groundwater (GWI) likely totalling to 350 L/c/d. By separating the GWI out from the total, the actual sewage flows can be scaled with population growth more accurately. Further, new units built in 2026 will likely use generate less sewage than older units due to different plumbing and building standards (i.e. in the 1970's toilets were 23 L/flush. Today they could be as low as 4.8 to 6.0 L/flush). Appliance standards for energy and water use have also changed dramatically.

It is likely that existing flows will decrease as the housing stock is renovated.

An assumption based on experience in other cities is as follows:
New population: 160 L/c/d. Existing Population: 250 L/c/d. Existing pop retrofit rate: 1.0% / year

Design Suggestion

Title	**IC-02**

REVISIT PEAK FLOW AT CRAIGLEITH PS

Exhibits

Table 1			New Area I&I @ 50yrs:	0.28		Existing Q10 I&I:	156	L/s				
			New Area Starting I&I:	0.07		Existing GWI:	8.2	L/s				
			Increase in New I&I/yr:	0.0042		New Unit Growth:	2.8%					
			New Area/Unit:	0.032	Ha/unit							
			Starting Unit Rate:	250		Climate change on existing and future I&I built into new area calculation						
			New Pop. Unit Rate:	160								
			Retrofit Rate:	1.0%						New Area		
								Existing		Q10		
Year	Mill St. PS Units	Addition Units	Eq. Population		ADF	Harmen	PDF	GWI	New Area	I&I	Cum. I&I	PWWF
2024	5,588	0	12,014	250	34.8	2.9	99.9	8.2	0.00	0.00	0.00	264.15
2025	5,744	156	12,351	248	35.0	2.9	100.3	8.2	5.01	0.35	0.35	264.87
2026	5,905	161	12,696	248	35.7	2.9	101.7	8.2	10.15	0.72	1.07	266.64
2027	6,071	165	13,052	248	36.3	2.8	103.2	8.2	15.45	1.09	2.17	268.46
2028	6,241	170	13,417	248	37.0	2.8	104.6	8.2	20.88	1.48	3.65	270.32
2029	6,415	175	13,793	248	37.7	2.8	106.1	8.2	26.48	1.87	5.52	272.22
2030	6,595	180	14,179	248	38.4	2.8	107.7	8.2	32.22	2.28	7.80	274.18
2031	6,780	185	14,576	248	39.2	2.8	109.3	8.2	38.13	2.70	10.50	276.19
2032	6,969	190	14,984	248	39.9	2.8	110.9	8.2	44.21	3.13	13.63	278.24
2033	7,165	195	15,404	248	40.7	2.8	112.6	8.2	50.45	3.57	17.20	280.35
2034	7,365	201	15,835	248	41.5	2.8	114.3	8.2	56.87	4.02	21.22	282.51
2035	7,571	206	16,279	248	42.3	2.7	116.0	8.2	63.47	4.49	25.71	284.73
2036	7,783	212	16,734	248	43.2	2.7	117.8	8.2	70.26	4.97	30.68	287.00
2037	8,001	218	17,203	248	44.0	2.7	119.7	8.2	77.23	5.46	36.14	289.33
2038	8,225	224	17,685	248	44.9	2.7	121.6	8.2	84.40	5.97	42.11	291.72
2039	8,456	230	18,180	248	45.8	2.7	123.5	8.2	91.77	6.49	48.59	294.17
2040	8,693	237	18,689	248	46.8	2.7	125.5	8.2	99.34	7.02	55.61	296.68
2041	8,936	243	19,212	248	47.7	2.7	127.5	8.2	107.13	7.57	63.18	299.25
2042	9,186	250	19,750	248	48.7	2.7	129.6	8.2	115.14	8.14	71.32	301.89
2043	9,443	257	20,303	248	49.8	2.6	131.7	8.2	123.37	8.72	80.04	304.59
2044	9,708	264	20,872	248	50.8	2.6	133.8	8.2	131.83	9.31	89.35	307.36
2045	9,980	272	21,456	248	51.9	2.6	136.1	8.2	140.53	9.93	99.27	310.20
2046	10,259	279	22,057	248	53.0	2.6	138.4	8.2	149.47	10.56	109.83	313.11
2047	10,546	287	22,674	248	54.2	2.6	140.7	8.2	158.66	11.20	121.03	316.09
2048	10,842	295	23,309	248	55.3	2.6	143.1	8.2	168.11	11.87	132.90	319.15
2049	11,145	304	23,962	248	56.5	2.6	145.5	8.2	177.83	12.55	145.45	322.28
2050	11,457	312	24,633	248	57.8	2.6	148.0	8.2	187.81	13.26	158.71	325.50
2051	11,778	321	25,323	248	59.1	2.6	150.6	8.2	198.08	13.98	172.69	328.79
2052	12,108	330	26,032	248	60.4	2.5	153.2	8.2	208.63	14.72	187.41	332.16
2053	12,447	339	26,761	248	61.7	2.5	155.9	8.2	219.48	15.49	202.90	335.61
2054	12,795	349	27,510	248	63.1	2.5	158.7	8.2	230.63	16.27	219.17	339.15
2055	13,154	358	28,280	248	64.5	2.5	161.5	8.2	242.10	17.08	236.24	342.78
build out	12718		27,344									
	not including Castle Glen											

Design Suggestion

Title	**IC-02**

REVISIT PEAK FLOW AT CRAIGLEITH PS

Exhibits

Table 20: Craigleith Service Area Pump Station Peak Flows – Future Conditions

Pump Station	Firm Capacity (L/s)	Station Capacity (L/s)	10-Year Storm Flows (L/s)	25-Year Storm Flows (L/s)	100-Year Storm Flows (L/s)
Alta	6	12	20.0	21.0	22.5
Craigleith	180	360	507.7	552.6	620.7
Margaret	60	120	50.2	52.0	55.9
Summit Green	4.5	9	7.9	9.2	11.3

Design Suggestion

Title	IC-02

REVISIT PEAK FLOW AT CRAIGLEITH PS

Exhibits	Page 5 of 9

Table 18: Craigleith Service Area Pump Station Peak Flows – Existing Conditions

Pump Station	Firm Capacity (L/s)	Station Capacity (L/s)	10-Year Storm Flows (L/s)	25-Year Storm Flows (L/s)	100-Year Storm Flows (L/s)
Alta	6	12	8.6	10.0	12.2
Craigleith Main	180	360	270.8	311.2	375.2
Margaret	60	120	21.7	24.8	28.8
Summit Green	4.5	9	7.9	9.2	11.3

Design Suggestion

Title	**IC-02**

REVISIT PEAK FLOW AT CRAIGLEITH PS

Exhibits	**Page 6 of 9**

Project File Report
Town of The Blue Mountains Wastewater Master Plan

Table 4: Existing Sanitary Connection Status and Projected Future Connections by Service Area – Equivalent Units

Category	**Thornbury Service Area**					**Craigleith Service Area**					**Grand Total**
	Camperdown	**Clarksburg**	**Lora Bay**[1]	**Thornbury**	**Thornbury Service Area Sub-total**	**Castle Glen**	**Craigleith**	**Osler Bluff**	**Swiss Meadows**	**Craigleith Service Area Sub-total**	
Existing											
Residential - Connected	565	23	598	1,475	2,661	0	3,313	0	0	3,313	**5,974**
Non-Residential - Connected (EU)	110	2	22	478	612	0	2,275	0	0	2,275	**2,887**
Existing Sub-total	**675**	**25**	**620**	**1,953**	**3,273**	**0**	**5,588**	**0**	**0**	**5,588**	**8,861**
Future Allocated & Reserved											
Residential - Can Connect	145	1	151	54	351	0	253	0	0	253	**604**
Non-Residential - Can Connect (EU)	2	0	0	19	21	0	38	0	0	38	**59**
Residential – Not Fronting	164	346	240	97	847	86[3]	472	0	129	687	**1,534**
Non-Residential – Not Fronting (EU)	54	71	4	8	137	1[3]	194	174[6]	2	371	**508**
Reserved	65	0	35	87	187	0	1,673	0	0	1,673	**1,860**
Designated (With Proposal)	300	0	0	419	719	0	717[4]	0	0	717	**1,436**
Designated (No Proposal)	230	840	1,065	806	2,941	1,900[3]	1,475[5]	0	0	3,375	**6,316**
Outside of Town Boundary	0	0	0	0	0	0	0	0	0	0	**0**
Future Allocated & Reserved Sub-total	**960**	**1,258**	**1,495**	**1,490**	**5,203**	**1,987**	**4,822**	**174**	**131**	**7,114**	**12,317**
Future Secondary Plan Areas											
Future Secondary Plan Areas - Included in MP	0	0	9[2]	1,433[2]	1,442	0	0	0	0	0	**1,442**
Future Secondary Plan Areas - Excluded from MP	98	0	330	632	1,060	0	2,003	0	0	2,003	**3,063**
Total Existing and Future Demand for MP[7]	**1,635**	**1,283**	**2,124**	**4,876**	**9,918**	**1,987**	**10,410**	**174**	**131**	**12,702**	**22,620**
Grand Total	**1,733**	**1,283**	**2,454**	**5,508**	**10,978**	**1,987**	**12,413**	**174**	**131**	**14,705**	**25,683**

Design Suggestion

Title	IC-02

REVISIT PEAK FLOW AT CRAIGLEITH PS

Discussion / Justification (Continued)	Page 7 of 9

Other Explanations:

Craigleith PS excludes Castle Glen in the ultimate build-out.
It is assumed that a growth rate similar to Thornbury's, 2.8%, is reasonable.

The area/new unit was back-calculated using the future Q10 design flow, less the peak dry-weather flow, with 350 L/c/d and a Harmen PF of 2.8. This yields 0.089 ha/unit. Since the future I&I rate in the wastewater master plan has climate change built in, the increase in climate change is built into the Alternative concept calculation by increasing the number of new units.

((507.7 - 270.8) - (14,705-1,987-5,588) * 2.15 PE/unit * 350L/c/d * 2.8 PF / 86,400) / 0.28 L/s/ha = 225 Ha
225 Ha / (14,705-1,987-5,588) = 0.032 Ha/ new unit

Existing area GWI was calculated by averaging the GWI recorded in the 2014 I&I report (1.78 L/s) with the GWI recorded in the 2024 I&I report (12.8+1.8 = 14.6 L/s). (1.78 + 14.6)/2 = 8.2 L/s. It was assumed that this will remain constant. Future GWI is included in the 0.28 L/s/ha ultimate I&I rate.

Design Suggestion

Title	**IC-02**

REVISIT PEAK FLOW AT CRAIGLEITH PS

Exhibits	**Page 8 of 9**

Table 3.8 – DWF and Population Estimates

Flow Monitor	Average Population DWF (L/s)	Calculated Population	GWI (L/s)	GWI (L/day/ha)
FM 01 - MH 10458	11.9	2285	12.8	4215
FM 02 - MH 10379	7.3	1394	1.8	636
FM 03 - MH 10204	5.4	1031	1.6	1977
FM 04 - MH 80021	22.4	4301	16.4	3755
FM 05 - Lakeshore	1.5	284	0.8	343
FM 06 - MH 50087	2.6	501	1.0	428
FM 07 - MH 80024	5.1	985	0.7	2097
FM 08 - MH 10231	10.2	1958	5.4	2120
FM 09 - MH 10205	4.0	774	0.7	1195
FM 10 - MH 90066	3.7	716	1.8	4084
FM 11 - MH 90029	4.6	889	2.1	650
FM 12 - MH 90074	1.5	280	1.2	3520
FM 13 - MH 90069	0.3	67	0.3	1891
FM 14 - MH 90083	1.3	246	0.0	128
FM 15 - MH 90054	0.5	92	0.2	592

Note: The values are cumulative for the entire drainage area upstream of each flow monitor.

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Design Suggestion

Title **IC-02**

REVISIT PEAK FLOW AT CRAIGLEITH PS

Exhibits **Page 9 of 9**

The Blue Mountains
Final Flow and Rainfall Monitoring Report
August 19, 2025

Table 3-4: Summary of DWF Results

Station Name	Average Dry Weather Flow (L/s)	Average Dry Weather Flow (L/c/d)	Average Daily Max Dry Weather Flow (L/s)	Average Daily Min Dry Weather Flow (L/s)	Dry-Weather Groundwater Infiltration (L/s)	Dry-Weather Groundwater Infiltration (L/h/d)	% of GWI in Average DWF
WWST7	0.86	252.76	2.33	0.13	0.12	453.17	13.49%
WWST27	0.29	249.51	0.91	0.13	0.12	2,127.35	39.67%
WWST2923	2.05	1,582.70	4.25	1.30	1.11	12,013.00	54.21%
WWST18	2.96	422.61	5.35	0.34	0.29	2,354.13	9.74%
WWST65	5.54	497.91	15.01	0.14	0.12	400.85	2.19%
WWST124	14.38	447.35	19.91	9.01	7.73	8,201.38	53.72%
WWST235	4.03	970.34	5.2	3.43	2.92	7,687.73	72.38%
WWST251	4.94	1,714.47	6.41	4.07	3.47	17,107.76	70.13%
WWST1097	0.62	383.81	1.42	0.28	0.24	1,993.91	38.59%
WWST875	2.64	261.00	6.86	0.56	0.48	887.70	18.27%
WWST832	7.40	245.03	19.93	2.09	1.78	2,364.73	24.03%
WWST837	1.70	144.28	13.56	0.44	0.37	340.14	22.23%
WWST709	2.33	187.93	6.85	0.62	0.53	855.62	22.65%
WWST601	3.06	392.56	4.56	2.17	1.84	5,796.44	60.35%
WWST605	3.44	114.16	17.26	0.54	0.46	1,447.93	13.23%
WWST621	2.78	170.63	15.38	0.51	0.44	1,338.54	15.89%
WWST506	1.88	149.07	4.91	0.21	0.18	344.12	9.74%

Design Suggestion

Title	IC-03

REVISIT PEAK FLOW AT MILL STREET

Original Concept

The original concept uses design flows based on the Town's design criteria and development build-out (2050-2075). Existing dry-weather flow unit rates for existing and future populations both use 350 L/ha/d. Existing I&I rates are based on return-period predictions from calibrated PC-SWMM computer models. Future I&I rates are based on the Town's 0.28 L/s/ha criteria. The proposed Mill Street Pump Station design is based on these flows for the ultimate build-out.

Alternative Concept

The alternative concept uses a flow analysis that breaks down the individual flow components. The alternative concept removes the "Factor-of-Safety" (FOS) in the City's design criteria for the early years and develops interim design flows at various planning-year horizons. This helps to accurately match design flows with *design life* since there are multiple design lives of various facility and collection system components (i.e. mechanical/pumps = 20 to 25 years, gravity sewers = 100 to 125 years, etc.). The alternative component allows the existing Mill Street PS to remain in operation for another 20-years with some moderate improvements. **This Value alternative is matched with either the IC-05 Expand Existing Wet-Well or CS-01 Construct New Wet well for the cost and benefit analysis.**

Advantages

- Defers the construction of the proposed Mill Street PS for at least 20 years.
- Allows sufficient time for an Inflow and Infiltration Program to be implemented in the Thornbury sewer collection system.

Disadvantages

- Defers several of the operational improvements associated with the proposed pump station
- Includes the additional disadvantages included with IC-05 and CS-01

Discussion / Justification

The Inflow and Infiltration response in several of the Thornbury sewer catchments is considerable (see IP-06). Allowing time to reduce I&I in those catchments will ultimately save the Town in both capital and O&M costs in the collection system and treatment plant. This value alternative must be paired with either IC-05 (expand the existing wet well) or CS-01 (build a new wet well) to understand the concept's cost savings. This option requires additional analysis and evaluation.

Design Suggestion

Original Concept	$	$	$
Alternative Concept	$	$	$
Difference	**$**	**$**	**$**

Design Suggestion

Title	IC-03

REVISIT PEAK FLOW AT MILL STREET

Discussion / Justification	Page 2 of 9

Assumptions / Table 1 discussion:

Summary: The Alternative Concept for the 20-year design flow for the Mill Street PS is calculated as 268.5 L/s

<u>**I&I:**</u>

Existing I&I is based on the design value in the Wastewater Master Plan:

Estimated Mill Street PS Q10 from report: 240.2 L/s

therefore, existing I&I can be calculated by subtracting peak dry weather flow:

240.2-(3273-675)*2.15*350*3.2/86400 = 168 L/s
where 2.15 is the people/unit
350 is the Towns design unit rate in L/c/d
and 3.2 is the Harmen peaking factor

Future I&I will start off low (likely 0.07 L/s/ha) then increase too 0.28 L/s/ha in 50 years of service.

<u>**Domestic Flows**</u>

Domestic flows are comprised of residential and ICI sewage and groundwater (GWI) likely totalling to 350 L/c/d. By separating the GWI out from the total, the actual sewage flows can be scaled with population growth more accurately. Further, new units built in 2026 will likely use generate less sewage than older units due to different plumbing and building standards (i.e. in the 1970's toilets were 23 L/flush. Today they could be as low as 4.8 to 6.0 L/flush). Appliance standards for energy and water use have also changed dramatically.

It is likely that existing flows will decrease as the housing stock is renovated.

An assumption based on experience in other cities is as follows:
New population: 160 L/c/d. Existing Population: 250 L/c/d. Existing pop retrofit rate: 1.0% / year

Design Suggestion

Title	**IC-03**

REVISIT PEAK FLOW AT MILL STREET

Exhibits

Table 1			New Area I&I @ 50yrs:	0.28		Existing Q10 I&I:	167.8	L/s				
			New Area Starting I&I:	0.07		Existing GWI:	12	L/s				
			Increase in New II&/yr:	0.0042		New Unit Growth:	2.8%					
			New Area/Unit:	0.089								
			Starting Unit Rate:	250		Climate change on existing and future I&I built into new area calculation						
			New Pop. Unit Rate:	160								
			Retrofit Rate:	1.0%						New Area		
								Existing		Q10		
Year	Mill St.	Addition	Eq. Population		ADF	Harmen	PDF	GWI	New Area	I&I	Cum. I&I	PWWF
	PS Units	Units										
2024	2,686	17	5,775	250	16.7	3.2	53.2	12	0.00	0.00	0.00	233.04
2025	2,761	75	5,937	248	16.8	3.2	53.5	12	6.69	0.47	0.47	233.75
2026	2,839	77	6,103	248	17.1	3.2	54.3	12	13.57	0.96	1.43	235.02
2027	2,918	79	6,274	248	17.5	3.2	55.1	12	20.65	1.46	2.89	236.32
2028	3,000	82	6,449	248	17.8	3.1	55.9	12	27.92	1.97	4.86	237.65
2029	3,084	84	6,630	248	18.1	3.1	56.7	12	35.39	2.50	7.36	239.02
2030	3,170	86	6,816	248	18.5	3.1	57.6	12	43.08	3.04	10.40	240.43
2031	3,259	89	7,006	248	18.8	3.1	58.5	12	50.98	3.60	14.00	241.87
2032	3,350	91	7,203	248	19.2	3.1	59.4	12	59.10	4.17	18.17	243.35
2033	3,444	94	7,404	248	19.6	3.1	60.3	12	67.45	4.76	22.93	244.86
2034	3,540	96	7,612	248	19.9	3.1	61.3	12	76.03	5.36	28.29	246.42
2035	3,639	99	7,825	248	20.3	3.1	62.2	12	84.85	5.99	34.28	248.02
2036	3,741	102	8,044	248	20.7	3.0	63.2	12	93.92	6.62	40.90	249.65
2037	3,846	105	8,269	248	21.2	3.0	64.3	12	103.25	7.28	48.18	251.33
2038	3,954	108	8,501	248	21.6	3.0	65.3	12	112.83	7.96	56.14	253.05
2039	4,064	111	8,739	248	22.0	3.0	66.4	12	122.68	8.65	64.79	254.82
2040	4,178	114	8,983	248	22.5	3.0	67.5	12	132.81	9.36	74.16	256.63
2041	4,295	117	9,235	248	22.9	3.0	68.6	12	143.22	10.10	84.25	258.49
2042	4,416	120	9,493	248	23.4	3.0	69.7	12	153.93	10.85	95.10	260.40
2043	4,539	124	9,759	248	23.9	3.0	70.9	12	164.93	11.62	106.73	262.36
2044	4,666	127	10,032	248	24.4	3.0	72.1	12	176.24	12.42	119.15	264.36
2045	4,797	131	10,313	248	24.9	2.9	73.4	12	187.87	13.24	132.39	266.42
2046	4,931	134	10,602	248	25.5	2.9	74.6	12	199.82	14.08	146.47	268.53
2047	5,069	138	10,899	248	26.0	2.9	75.9	12	212.11	14.94	161.41	270.69
2048	5,211	142	11,204	248	26.6	2.9	77.3	12	224.75	15.83	177.25	272.91
2049	5,357	146	11,518	248	27.2	2.9	78.6	12	237.73	16.75	193.99	275.18
2050	5,507	150	11,840	248	27.8	2.9	80.0	12	251.08	17.68	211.68	277.52
2051	5,661	154	12,172	248	28.4	2.9	81.5	12	264.81	18.65	230.33	279.91
2052	5,820	159	12,513	248	29.0	2.9	82.9	12	278.91	19.64	249.97	282.36
2053	5,983	163	12,863	248	29.7	2.8	84.4	12	293.42	20.66	270.63	284.88
2054	6,150	168	13,223	248	30.3	2.8	86.0	12	308.33	21.71	292.34	287.46
2055	6,323	172	13,593	248	31.0	2.8	87.5	12	323.65	22.79	315.13	290.11
2056	6,500	177	13,974	248	31.7	2.8	89.1	12	339.41	23.89	339.02	292.82
2057	6,682	182	14,365	248	32.5	2.8	90.8	12	355.61	25.03	364.05	295.60
2058	6,869	187	14,768	248	33.2	2.8	92.5	12	372.26	26.20	390.25	298.45
2059	7,061	192	15,181	248	34.0	2.8	94.2	12	389.37	27.40	417.65	301.38
2060	7,259	198	15,606	248	34.7	2.8	95.9	12	406.97	28.64	446.29	304.38
2061	7,462	203	16,043	248	35.6	2.7	97.7	12	425.06	29.91	476.20	307.45
2062	7,671	209	16,492	248	36.4	2.7	99.6	12	443.65	31.22	507.42	310.60
2063	7,886	215	16,954	248	37.2	2.7	101.5	12	462.77	32.56	539.97	313.84
2064	8,106	221	17,429	248	38.1	2.7	103.4	12	482.42	33.94	573.91	317.15
build out	7962		17,118									
	less Clarksburg. Gravity to plant											

Design Suggestion

Title **IC-03**

REVISIT PEAK FLOW AT MILL STREET

Exhibits

Table 17: Thornbury Service Area Pump Station Peak Flows – Future Conditions

Pump Station	Firm Capacity (L/s)	Station Capacity (L/s)	10-Year Storm Flows (L/s)	25-Year Storm Flows (L/s)	100-Year Storm Flows (L/s)
Delphi	42	84	39.5	42.0	45.9
Elgin	9	18	15.9	18.6	22.7
Lakeshore	82	164	88.4	93.0	96.1
Mill St	140	280	464.3	495.8	570.0
Moore	13	26	20.3	23.7	29.0
Peel	38	76	25.0	26.6	28.9
Shore Acres	10	20	3.0	3.3	3.6
Sunset	73	146	75.2	80.7	89.3

Design Suggestion

Title **IC-03**

REVISIT PEAK FLOW AT MILL STREET

Exhibits

Table 15: Thornbury Service Area Pump Station Peak Flows – Existing Conditions

Pump Station	Firm Capacity (L/s)	Station Capacity (L/s)	10-Year Storm Flows (L/s)	25-Year Storm Flows (L/s)	100-Year Storm Flows (L/s)
Delphi	42	84	18.5	21.1	25.0
Elgin	9	18	15.9	18.5	22.7
Lakeshore	82	164	28.2	32.5	39.8
Mill St	140	280	240.2	269.3	303.7
Moore	13	26	20.1	23.5	28.8
Peel	38	76	11.6	13.2	15.3
Shore Acres	10	20	1.8	2.0	2.4
Sunset	73	146	32.9	38.3	46.8

Design Suggestion

Title	IC-03

REVISIT PEAK FLOW AT MILL STREET

Exhibits

Project File Report
Town of The Blue Mountains Wastewater Master Plan

Table 4: Existing Sanitary Connection Status and Projected Future Connections by Service Area – Equivalent Units

Category	Thornbury Service Area					Craigleith Service Area					Grand Total
	Camperdown	Clarksburg	Lora Bay[1]	Thornbury	Thornbury Service Area Sub-total	Castle Glen	Craigleith	Osler Bluff	Swiss Meadows	Craigleith Service Area Sub-total	
Existing											
Residential - Connected	565	23	598	1,475	2,661	0	3,313	0	0	3,313	**5,974**
Non-Residential - Connected (EU)	110	2	22	478	612	0	2,275	0	0	2,275	**2,887**
Existing Sub-total	**675**	**25**	**620**	**1,953**	**3,273**	**0**	**5,588**	**0**	**0**	**5,588**	**8,861**
Future Allocated & Reserved											
Residential - Can Connect	145	1	151	54	351	0	253	0	0	253	**604**
Non-Residential - Can Connect (EU)	2	0	0	19	21	0	38	0	0	38	**59**
Residential – Not Fronting	164	346	240	97	847	86[3]	472	0	129	687	**1,534**
Non-Residential – Not Fronting (EU)	54	71	4	8	137	1[3]	194	174[6]	2	371	**508**
Reserved	65	0	35	87	187	0	1,673	0	0	1,673	**1,860**
Designated (With Proposal)	300	0	0	419	719	0	717[4]	0	0	717	**1,436**
Designated (No Proposal)	230	840	1,065	806	2,941	1,900[3]	1,475[5]	0	0	3,375	**6,316**
Outside of Town Boundary	0	0	0	0	0	0	0	0	0	0	**0**
Future Allocated & Reserved Sub-total	**960**	**1,258**	**1,495**	**1,490**	**5,203**	**1,987**	**4,822**	**174**	**131**	**7,114**	**12,317**
Future Secondary Plan Areas											
Future Secondary Plan Areas - Included in MP	0	0	9[2]	1,433[2]	1,442	0	0	0	0	0	**1,442**
Future Secondary Plan Areas - Excluded from MP	98	0	330	632	1,060	0	2,003	0	0	2,003	**3,063**
Total Existing and Future Demand for MP[7]	**1,635**	**1,283**	**2,124**	**4,876**	**9,918**	**1,987**	**10,410**	**174**	**131**	**12,702**	**22,620**
Grand Total	**1,733**	**1,283**	**2,454**	**5,508**	**10,978**	**1,987**	**12,413**	**174**	**131**	**14,705**	**25,683**

Design Suggestion

Title	IC-03

REVISIT PEAK FLOW AT MILL STREET

Discussion / Justification (Continued)

Other Explanations:

Mill Street PS includes Thornbury, Lora Bay, and Clarksburg in 2025, but Clarksburg is diverted from Mill Street PS for the ultimate condition.

The growth rate 2.8% is based on the new units added over the past 10 years in the Thornbury WWTP collection area.

The area / new unit was back calculated using the future Q10 design flow less the peak dry weather flow using 350 L/c/d and a Harmen PF of 2.8. This yields 0.089 ha / unit. Since the future I&I rate in the wastewater master plan has climate change build in, the increase in climate change is built to the Alternative concept calculation using the increase in new units.

((464.3 - 240.2) - (7962-3416) * 2.15 PE/unit * 350L/c/d * 2.8 PF / 86,400) / 0.28 L/s/ha = 404.2 Ha
404.2 / (7962-3416) = 0.089 units/Ha

Existing area GWI was calculated by averaging the GWI recorded in the 2014 I&I report (7.73L/s) with the GWI recorded in the 2024 I&I report (16.4L/s). (7.73 + 16.4)/2 = 12 L/s. It was assumed that this will remain constant. Future GWI is included in the 0.28 L/s/ha ultimate I&I rate.

Design Suggestion

Title	IC-03

REVISIT PEAK FLOW AT MILL STREET

Exhibits

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Table 3.8 – DWF and Population Estimates

Flow Monitor	Average Population DWF (L/s)	Calculated Population	GWI (L/s)	GWI (L/day/ha)
FM 01 - MH 10458	11.9	2285	12.8	4215
FM 02 - MH 10379	7.3	1394	1.8	636
FM 03 - MH 10204	5.4	1031	1.6	1977
FM 04 - MH 80021	22.4	4301	16.4	3755
FM 05 - Lakeshore	1.5	284	0.8	343
FM 06 - MH 50087	2.6	501	1.0	428
FM 07 - MH 80024	5.1	985	0.7	2097
FM 08 - MH 10231	10.2	1958	5.4	2120
FM 09 - MH 10205	4.0	774	0.7	1195
FM 10 - MH 90066	3.7	716	1.8	4084
FM 11 - MH 90029	4.6	889	2.1	650
FM 12 - MH 90074	1.5	280	1.2	3520
FM 13 - MH 90069	0.3	67	0.3	1891
FM 14 - MH 90083	1.3	246	0.0	128
FM 15 - MH 90054	0.5	92	0.2	592

Note: The values are cumulative for the entire drainage area upstream of each flow monitor.

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Design Suggestion

Title	IC-03

REVISIT PEAK FLOW AT MILL STREET

Exhibits

The Blue Mountains
Final Flow and Rainfall Monitoring Report
August 19, 2025

Table 3-4: Summary of DWF Results

Station Name	Average Dry Weather Flow (L/s)	Average Dry Weather Flow (L/c/d)	Average Daily Max Dry Weather Flow (L/s)	Average Daily Min Dry Weather Flow (L/s)	Dry-Weather Groundwater Infiltration (L/s)	Dry-Weather Groundwater Infiltration (L/h/d)	% of GWI in Average DWF
WWST7	0.86	252.76	2.33	0.13	0.12	453.17	13.49%
WWST27	0.29	249.51	0.91	0.13	0.12	2,127.35	39.67%
WWST2923	2.05	1,582.70	4.25	1.30	1.11	12,013.00	54.21%
WWST18	2.96	422.61	5.35	0.34	0.29	2,354.13	9.74%
WWST65	5.54	497.91	15.01	0.14	0.12	400.85	2.19%
WWST124	14.38	447.35	19.91	9.01	7.73	8,201.38	53.72%
WWST235	4.03	970.34	5.2	3.43	2.92	7,687.73	72.38%
WWST251	4.94	1,714.47	6.41	4.07	3.47	17,107.76	70.13%
WWST1097	0.62	383.81	1.42	0.28	0.24	1,993.91	38.59%
WWST875	2.64	261.00	6.86	0.56	0.48	887.70	18.27%
WWST832	7.40	245.03	19.93	2.09	1.78	2,364.73	24.03%
WWST837	1.70	144.28	13.56	0.44	0.37	340.14	22.23%
WWST709	2.33	187.93	6.85	0.62	0.53	855.62	22.65%
WWST601	3.06	392.56	4.56	2.17	1.84	5,796.44	60.35%
WWST605	3.44	114.16	17.26	0.54	0.46	1,447.93	13.23%
WWST621	2.78	170.63	15.38	0.51	0.44	1,338.54	15.89%
WWST506	1.88	149.07	4.91	0.21	0.18	344.12	9.74%

Quantitative Value Alternative

Title	IC-05

MAXIMIZE EXISTING PUMPING OPERATIONS

Original Concept

The original concept essentially removed the existing wet well from service, created a new deeper wet well, and removed the existing pumps from service.

Alternative Concept

The alternative concept would be to create additional wet well capacity, in combination with the new 600 FM and upgrades 300 mm FM to maximize the output/capacity of the existing pumps. This option would add additional wet well capacity through the use of secant pile construction and deep piping connection to the existing wet well (we are not suggesting to deepen the existing wet well but rather expand the wet well providing additional buffer capacity).

Advantages

- Reuse of the existing pumping and electrical infrastructure.
- Reuse of the existing wet well.
- Significant capital investment deferral for 15-20 years.

Disadvantages

- Due to the deepening of the inlet sewer there is limited capacity to reuse the existing inlet and wet well.
- Lowering the existing wet well would not be useful without lowering the dry well as the existing pumps require submergence.
- This uses the new sewer as the active wet well volume, these is no capacity at the pumping station.
- Not likely to be approved by the MECP, or would require signification modelling to justify the lack of wet well.
  Does not address the rating issues of the electrical room/operational issues/washroom/pump maintenance and access

Discussion / Justification

The existing 600 mm inlet sewer enters the pumping station at an invert elevation of 175.065m The available depth within the wet well is limited, currently the active operating volume is approximately 12.6 m3. With the new invert elevation of 173.70m which is lower that the minimum submergence elevation of the existing pumps which would then require surcharging of the inlet sewer to provide operating volume for the pumps. The option would need to be combined with a scenario the utilizes the inlet sewer as the storage/operating volume for the pumping operation.

Cost Summary	Initial Costs	O&M Cost	Life Cycle Cost
Original Concept	$ 19,741,400	$ 3,882,100	$ 23,623,500
Alternative Concept	$ 5,265,500	$ 2,578,300	$ 7,843,800
Difference	**$ 14,475,900**	**$ 1,303,800**	**$ 15,779,700**

Quantitative Value Alternative

Title	IC-05

MAXIMIZE EXISTING PUMPING OPERATIONS

Discussion / Justification

New Wet Well Design Criteria

Existing Inlet elevation = 175.065m
New Inlet elevation = 173.70m
Existing Pumps Minimum submergence elevation= 173.83m
WW Floor elevation 172.05m, Pump Stop elev. 173.83m,HL Alarm = 175.85m

The scope of this option would include the upgrading of the sanitary forcemain (Grey St. sewer/FM project which is currently underway). Given the above items, we would essentially retain the existing Mill St. mechanical/electrical structures, extend the new 750 mm sewer to the existing wet well inlet, operating the existing pumps (1+1) current arrangement. With reference to the attached System Curve, the existing pumps can produce approximately 200 L/s (single pump operation), two pump operation would produce about =/-250 L/s.

The changes to the current arrangement would include modifications to the inlet sewer arrangement (750mm re-configuration), removal or portions of the existing 600mm inlet sewer, breakout of the wet well inlet channel.

Quantitative Value Alternative

Title	IC-05

MAXIMIZE EXISTING PUMPING OPERATIONS

Exhibits	Page 3 of 7

Quantitative Value Alternative

Title	IC-05

MAXIMIZE EXISTING PUMPING OPERATIONS

Discussion / Justification (Continued)

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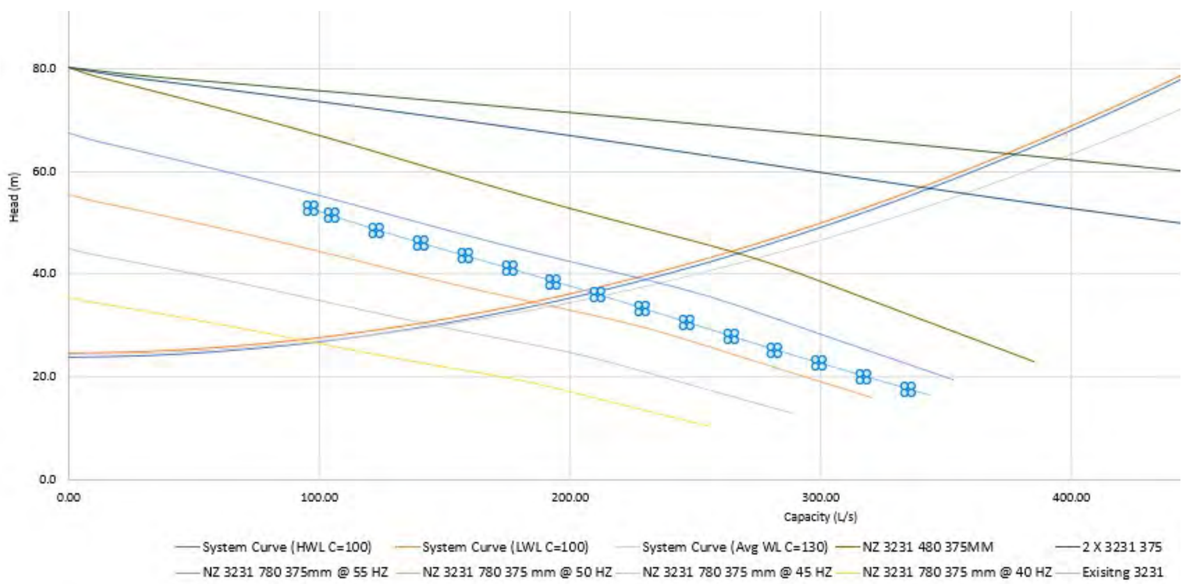

Quantitative Value Alternative

Title	IC-05

MAXIMIZE EXISTING PUMPING OPERATIONS

Exhibits

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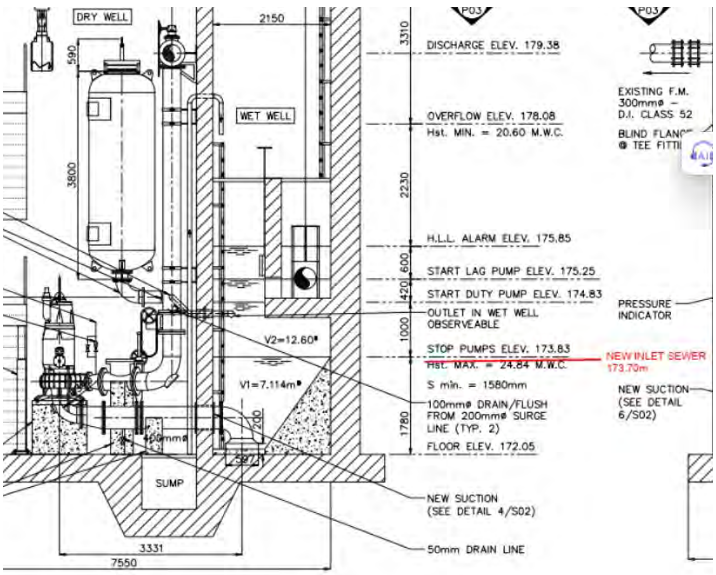
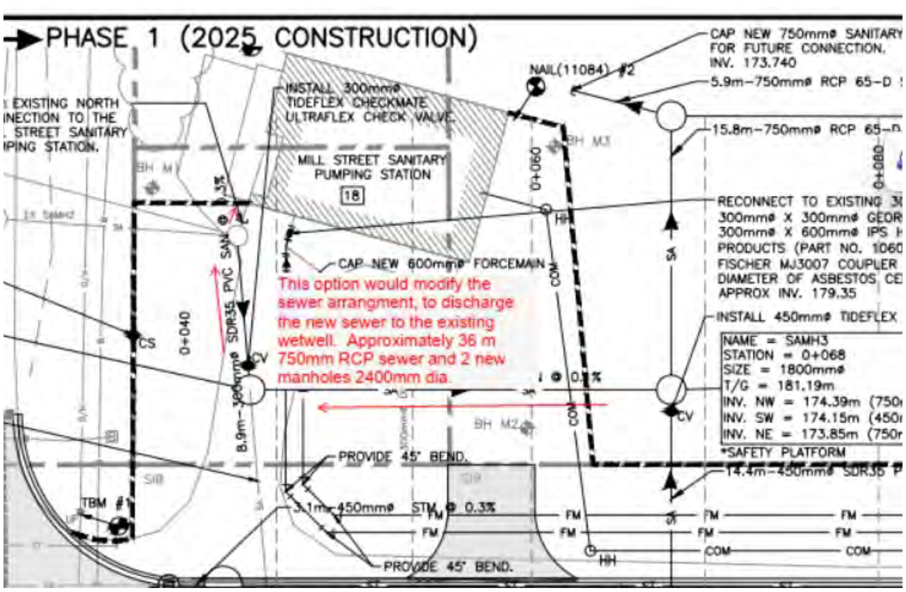




Quantitative Value Alternative

Title	IC-05

MAXIMIZE EXISTING PUMPING OPERATIONS

Estimated Cost of Original Concept — Page 6 of 7

Description	Unit	Quantity	Unit Cost		Total
New pumping station	sum	1	$15,244,289.91		$15,244,290
			Subtotal:	**$**	**15,244,290**
		29.5%	Project Markup:	$	4,497,066
			Total Cost (Rounded):	**$**	**19,741,400**

Estimated Cost of Alternative Concept Proposed

Description	Unit	Quantity	Unit Cost		Total
750 RCP Sewer	m	40	$1,100.00		$44,000
2400 mm dia. Manhole	#	2	$30,000.00		$60,000
Miscellaneous reconfiguration of existing services to address interference issues.	LS	1	$100,000.00		$100,000
Bypass pumping	day	126	$2,000.00		$252,000
Reinstatement	sum	1	$10,000.00		$10,000
Upgrade pump	sum	1	$900,000.00		$900,000
Upgrade electrical system	sum	1	$1,200,000.00		$1,200,000
Expand building for washroom and electrical room	sum	1	$1,500,000.00		$1,500,000
			Subtotal:	**$**	**4,066,000**
		29.5%	Project Markup:	$	1,199,470
			Total Cost (Rounded):	**$**	**5,265,500**
			Cost Difference:	**$**	**14,475,900**

Quantitative Value Alternative

Title	IC-05

MAXIMIZE EXISTING PUMPING OPERATIONS

Life Cycle Cost Estimate

Page 7 of 7

Discount Rate 2.50% Net
Life Cycle Period 25 Years

First Costs				Original Concept: Estimated First Costs	Original Concept: Present Worth (PW)	Alternative Concept: Estimated First Costs	Alternative Concept: Present Worth (PW)
Original Concept (from First Costs Worksheet)				19,741,400	19,741,400		
Alternative Concept (from First Costs Worksheet)						5,265,500	5,265,500
Total Initial Costs					**$ 19,741,400**		**$ 5,265,500**
Difference (Compared to Original Concept)							**$ 14,475,900**
Replacement / Salvage Value	**Occurrence Yr - or-Cycle**	**Inflat. Rate**	**PW Factor**	**Estimated Replacement Costs**	**PW Replacement Costs**	**Estimated Replacement Costs**	**PW Replacement Costs**
Pump replacement	5		2.966	150,000	444,868		
New pump replacement	20		0.610	500,000	305,135	300,000	183,081
Total Replacement/Salvage Costs					**$ 750,000**		**$ 183,100**
Annual Costs		**Inflat. Rate**	**PWA Factor**	**Estimated Annual Costs**	**PW Annual Costs**	**Estimated Annual Costs**	**PW Annual Costs**
Energy			18.424	150,000	2,763,656	120,000	2,210,925
Maintenance			18.424	20,000	368,488	10,000	184,244
Total Annual Costs (Present Worth)					**$ 3,132,100**		**$ 2,395,200**
Life Cycle Cost Summary					**Present Worth (PW)**		**Present Worth (PW)**
Subtotal Replacement / Salvage + Annual Costs					$ 3,882,100		$ 2,578,300
Difference (Compared to Original)							**1,303,800**
Total Life Cycle Costs (Present Worth)					$ 23,623,500		$ 7,843,800
Life Cycle Difference (Compared to Original)							**$ 15,779,700**
Total Life Cycle Costs (Annualized)				**Per Year:**	**$ 1,282,187**	**Per Year:**	**$ 425,729**

Quantitative Value Alternative

Title **IC-08**

ADD STORAGE FOR I&I AT CRAIGLEITH

Original Concept

Page 1 of 3

Reduce the pumping needs by installing a storage facility to reduce the required pump size

Alternative Concept

Currently, the flows into the Craigleith Main Lift Station are between 20 and 50 l/s 85% of the time. 0.3% of the time, the flow to the station exceeds 120l/s. Installing pumps to meet the demand required only 0.3% of the time appears excessive. Utilizing a storage facility to curb the peak flows may be an efficient and cost-effective solution.
The estimated size of the required storage is 6,000m3

Advantages

- Install smaller pumps - reduce initial cost of pumps
- Reduce the power and back-up power requirements
- slower feed to the treatment plant

Disadvantages

- Not sure if there is sufficient real estate
- Only estimated for a 24 hr period.
- Potential odour issues

Discussion / Justification

Providing storage at the site curbs the peak flows and reduces the power needs. It also reduces the cost of the pumps, because smaller pumps will be able to meet the needs of the flows. The determination of the size of the storage required is based on 70 l/s for a 24 hour period.

Cost Summary

	Initial Costs	O&M Cost	Life Cycle Cost
Original Concept	$ 7,533,000	$ 2,763,700	$ 10,296,700
Alternative Concept	$ 10,320,900	$ 2,487,300	$ 12,808,200
Difference	**$ -2,787,900**	**$ 276,400**	**$ -2,511,500**

Quantitative Value Alternative

Title	IC-08

ADD STORAGE FOR I&I AT CRAIGLEITH

Estimated Cost of Original Concept — Page 2 of 3

Description	Unit	Quantity	Unit Cost	Total
Craigleith Contract	sum	1	$5,817,000.00	$5,817,000

	Subtotal:	**$**	**5,817,000**
29.5%	Project Markup:	$	1,716,015
	Total Cost (Rounded):	**$**	**7,533,000**

Estimated Cost of Alternative Concept Proposed

Description	Unit	Quantity	Unit Cost	Total
Scope of work still required in the base contract and work already been done	sum	1	$1,809,000.00	$1,809,000
contractor's profit for descope	sum	1	$400,800.00	$400,800
Add underground storage tank	sum	1	$5,760,000.00	$5,760,000
Land cost - excluded				

	Subtotal:	**$**	**7,969,800**
29.5%	Project Markup:	$	2,351,091
	Total Cost (Rounded):	**$**	**10,320,900**
	Cost Difference:	**$**	**-2,787,900**

Quantitative Value Alternative

Title	IC-08

ADD STORAGE FOR I&I AT CRAIGLEITH

Life Cycle Cost Estimate

Page 3 of 3

Discount Rate 2.50% Net
Life Cycle Period 25 Years

First Costs				Original Concept: Estimated First Costs	Original Concept: Present Worth (PW)	Alternative Concept: Estimated First Costs	Alternative Concept: Present Worth (PW)
Original Concept (from First Costs Worksheet)				7,533,000	7,533,000		
Alternative Concept (from First Costs Worksheet)						10,320,900	10,320,900
Total Initial Costs					**$ 7,533,000**		**$ 10,320,900**
Difference (Compared to Original Concept)							**-$ 2,787,900**
Replacement / Salvage Value	**Occurrence Yr - or-Cycle**	**Inflat. Rate**	**PW Factor**	**Estimated Replacement Costs**	**PW Replacement Costs**	**Estimated Replacement Costs**	**PW Replacement Costs**
	15		0.690				
Total Replacement/Salvage Costs					**$ -**		**$ -**
Annual Costs		**Inflat. Rate**	**PWA Factor**	**Estimated Annual Costs**	**PW Annual Costs**	**Estimated Annual Costs**	**PW Annual Costs**
Allow 10% less energy			18.424	150,000	2,763,656	135,000	2,487,291
Total Annual Costs (Present Worth)					**$ 2,763,700**		**$ 2,487,300**
Life Cycle Cost Summary					**Present Worth (PW)**		**Present Worth (PW)**
Subtotal Replacement / Salvage + Annual Costs					$ 2,763,700		$ 2,487,300
Difference (Compared to Original)							**276,400**
Total Life Cycle Costs (Present Worth)					$ 10,296,700		$ 12,808,200
Life Cycle Difference (Compared to Original)							**-$ 2,511,500**
Total Life Cycle Costs (Annualized)				**Per Year:**	**$ 558,863**	**Per Year:**	**$ 695,177**

Quantitative Value Alternative

Title	IC-09

ADD STORAGE FOR I&I AT MILL STREET

Original Concept

Page 1 of 4

Add storage at the Mill Street pumping station to reduce the peak flow pumping required at the station. The storage will also reduce peak flows at the treatment plant and reduce the risk of washout to the plant.

Alternative Concept

The alternative concept includes not increasing the capacity of the station and utilize the a storage tank that can be feed slowly into the system once the peak flow has subsided.

Advantages

- Reduces the size of the pumps required to pump to the station
- reduces the risk of the washout at the WWTP
- Reduces the need for additional power, both mainline and back-up power
- Reduces the overall operating energy needs

Disadvantages

- Risk of overflow if there is a prolonged rain event
- Potential source of odours - will require additional operational time, perhaps an additional pump
- Will take up real estate at the station or in other areas in the collection system.
- There are a limited number of storage tanks that can be installed in the system and be drained back into the system have the rain event.

Discussion / Justification

The cost to install the storage facility , challenges with land available and significant public consultation requirements.

Cost Summary

	Initial Costs	O&M Cost	Life Cycle Cost
Original Concept	$ 19,741,400	$	$ 19,741,400
Alternative Concept	$ 17,871,000	$	$ 17,871,000
Difference	**$ 1,870,400**	**$**	**$ 1,870,400**

Quantitative Value Alternative

Title	IC-09

ADD STORAGE FOR I&I AT MILL STREET

Discussion / Justification

Based the Mill Street Pumping Station Assessment:

Table 5. Existing and Future Mill Street SPS Peak Flows

	Peak Flows (L/s)		
	10-Year Storm	25-Year Storm	100-Year Storm
Existing Conditions	230	258	300
Future Conditions	440	464	527

Based on the 100-year storm for the existing conditions, with consideration that the current pumping capacity of 130l/s the storage would need to provide capacity for 14,700m3.

For the future conditions, based on a 100-year storm, with the same consideration that the pumping capacity is 130l/s, the storage required is roughly 34,300m3.

These numbers are based on a holding time of 24 hours. If the event is longer than 24 hrs, or if there are back to back storms, the storage volume would not be sufficient.

The real estate to house this facility will have to be sourced, potentially the Bayview Park could be considered. Considering the public perception of the this project, and the sensitivities around the conveyance of sewage, this will require intensive public consultation.

Quantitative Value Alternative

Title	IC-09

ADD STORAGE FOR I&I AT MILL STREET

Estimated Cost of Original Concept

Page 3 of 4

Description	Unit	Quantity	Unit Cost	Total
Base Cost for Mills Pumping Station Expansion (based on current price)	sum	1	$15,244,289.91	$15,244,290
			Subtotal:	**$ 15,244,290**
		29.5%	Project Markup:	$ 4,497,066
			Total Cost (Rounded):	**$ 19,741,400**

Estimated Cost of Alternative Concept Proposed

Description	Unit	Quantity	Unit Cost	Total
Add 14,300 underground storage tank includes bypass retrofit	sum	1	$13,070,000.00	$13,070,000
Bypass pumping - assume 1 extra year	sum	1	$730,000.00	$730,000
Land cost - by others				
			Subtotal:	**$ 13,800,000**
		29.5%	Project Markup:	$ 4,071,000
			Total Cost (Rounded):	**$ 17,871,000**
			Cost Difference:	**$ 1,870,400**

Quantitative Value Alternative

Title	IC-09

ADD STORAGE FOR I&I AT MILL STREET

Life Cycle Cost Estimate

Page 4 of 4

Discount Rate 2.50% Net
Life Cycle Period 25 Years

				Original Concept		Alternative Concept	
First Costs				**Estimated First Costs**	**Present Worth (PW)**	**Estimated First Costs**	**Present Worth (PW)**
Original Concept (from First Costs Worksheet)				19,741,400	19,741,400		
Alternative Concept (from First Costs Worksheet)						17,871,000	17,871,000
Total Initial Costs					**$ 19,741,400**		**$ 17,871,000**
Difference (Compared to Original Concept)							**$ 1,870,400**
Replacement / Salvage Value	**Occurrence Yr - or-Cycle**	**Inflat. Rate**	**PW Factor**	**Estimated Replacement Costs**	**PW Replacement Costs**	**Estimated Replacement Costs**	**PW Replacement Costs**
Total Replacement/Salvage Costs					**$ -**		**$ -**
Annual Costs		**Inflat. Rate**	**PWA Factor**	**Estimated Annual Costs**	**PW Annual Costs**	**Estimated Annual Costs**	**PW Annual Costs**
Total Annual Costs (Present Worth)					**$ -**		**$ -**
Life Cycle Cost Summary					**Present Worth (PW)**		**Present Worth (PW)**
Subtotal Replacement / Salvage + Annual Costs					$ -		$ -
Difference (Compared to Original)							**-**
Total Life Cycle Costs (Present Worth)					$ 19,741,400		$ 17,871,000
Life Cycle Difference (Compared to Original)							**$ 1,870,400**
Total Life Cycle Costs (Annualized)				**Per Year:**	**$ 1,071,483**	**Per Year:**	**$ 969,965**

Quantitative Value Alternative

Title	IC-12

LINE THE TIMMINS/ LLOYD'S EASEMENT FOR ADDITIONAL CAPACITY AT CRAIGLEITH

Original Concept

Install liner inside of sanitary sewer that passes through the Timmins / Lloyds easement to reduce I&I. Easement is approxiately 1 km long (exact TBD). Existing project budget has been allocated, but has not progressed.

Alternative Concept

1) Excavate and replace the failed sections of pipe through this easement. (Cost unknown)
2) Remove sewer and water from this easement and realign to another path to WWTP (would need a PS and forcemain), Cost Unknown - requires new PS and pipe installed.

Advantages

- Will reduce the impacts of I&I on this section of the collection system
- Will improve the structural competency of sewer, extending the life
- More cost effective than digging up and replacing.

Disadvantages

- Easement passes through wetland and difficult terrian.
- Ongoing O&M difficult and hard to access

Discussion / Justification

This section of the sewage collection system has been identified as a source of I&I. Preventing I&I will improve the capacity of the collection system and WWT plant.
Original cost to construct - unknown
Cost to Line: $2M

Cost Summary

	Initial Costs	O&M Cost	Life Cycle Cost
Original Concept	$ N/A	$	$ N/A
Alternative Concept	$ 2,590,000	$	$ 2,590,000
Difference	**$ -2,590,000**	**$**	**$ -2,590,000**

Quantitative Value Alternative

Title	IC-12

LINE THE TIMMINS/ LLOYD'S EASEMENT FOR ADDITIONAL CAPACITY AT CRAIGLEITH

Discussion / Justification	Page 2 of 4

Quantitative Value Alternative

Title	IC-12

LINE THE TIMMINS/ LLOYD'S EASEMENT FOR ADDITIONAL CAPACITY AT CRAIGLEITH

Estimated Cost of Original Concept Page 3 of 4

Description	Unit	Quantity	Unit Cost		Total
			Subtotal:	**$**	
		29.5%	Project Markup:	$	
			Total Cost (Rounded):	**$**	

Estimated Cost of Alternative Concept Proposed

Description	Unit	Quantity	Unit Cost		Total
$2M budget already established	each	1	$2,000,000.00		$2,000,000
			Subtotal:	**$**	**2,000,000**
		29.5%	Project Markup:	$	590,000
			Total Cost (Rounded):	**$**	**2,590,000**
			Cost Difference:	**$**	**-2,590,000**

Quantitative Value Alternative

Title	IC-12

LINE THE TIMMINS/ LLOYD'S EASEMENT FOR ADDITIONAL CAPACITY AT CRAIGLEITH

Life Cycle Cost Estimate — Page 4 of 4

Discount Rate 2.50% Net Life Cycle Period 25 Years				Original Concept		Alternative Concept	
First Costs				**Estimated First Costs**	**Present Worth (PW)**	**Estimated First Costs**	**Present Worth (PW)**
Original Concept (from First Costs Worksheet)							
Alternative Concept (from First Costs Worksheet)						2,590,000	2,590,000
Total Initial Costs					$ -		$ 2,590,000
Difference (Compared to Original Concept)							-$ 2,590,000
Replacement / Salvage Value	**Occurrence Yr - or-Cycle**	**Inflat. Rate**	**PW Factor**	**Estimated Replacement Costs**	**PW Replacement Costs**	**Estimated Replacement Costs**	**PW Replacement Costs**
Total Replacement/Salvage Costs					$ -		$ -
Annual Costs		**Inflat. Rate**	**PWA Factor**	**Estimated Annual Costs**	**PW Annual Costs**	**Estimated Annual Costs**	**PW Annual Costs**
Total Annual Costs (Present Worth)					$ -		$ -
Life Cycle Cost Summary					**Present Worth (PW)**		**Present Worth (PW)**
Subtotal Replacement / Salvage + Annual Costs					$ -		$ -
Difference (Compared to Original)							-
Total Life Cycle Costs (Present Worth)					$ -		$ 2,590,000
Life Cycle Difference (Compared to Original)							-$ 2,590,000
Total Life Cycle Costs (Annualized)				**Per Year:**	$ -	**Per Year:**	$ 140,575

Design Suggestion

Title	IC-13

CREATE A STORMWATER UTILITY BILLING STRUCTURE FOR THE SKI INDUSTRY FOR SNOW MAKING

Original Concept

Page 1 of 2

Undersized and underperforming stormwater collection systems may impose a potential risk to the sanitary system. The development of a stormwater utility is a potential means to acquire the funds needed to fully construct and maintain the stormwater system.

Alternative Concept

The stormwater utility will be a means to collect funds required to develop, construct and maintain the stormwater collection system. This may include the review of the Town's current stormwater system, upgrading or installing the required infrastructure to meet up to the 10-year event, and purchase of lands needed for the stormwater to be able to return to the bay for events larger than the 10-year storm.

Advantages

- Upgrading the stormwater system may reduce the impact of heavy storms on the wastewater collection system
- Protecting the public from overland flow during the significant events
- Developing a structure that is fair - recognizing that the ski industry with snow matching have a significant impact to the volume of stormwater trying to return to the bay.

Disadvantages

- This creates an additional burden on the one tax payer
- Push back from the ski industry
- The workload to assess properties, rehabilitate the existing the stormwater system, and procurement of land

Discussion / Justification

This project is to develop a storm utility that will provide the funds needed to rehabilitate the existing system, purchase the lands required for returning flow to the bay, and support the on-going maintenance of the system.

Design Suggestion

Original Concept	$	$	$
Alternative Concept	$	$	$
Difference	**$**	**$**	**$**

Design Suggestion

Title	IC-13

CREATE A STORMWATER UTILITY BILLING STRUCTURE FOR THE SKI INDUSTRY FOR SNOW MAKING

Discussion / Justification

The justification of this project is based on the opinion that the stormwater will take the route of least resistance to return to the Bay. If the stormwater conveyance system is deficient in areas where the sanitary system is, there is a significant possibility that the stormwater will make it's way in to the sanitary collection system during heavy rain events. The asset condition of the sanitary will be reliant on the asset condition of the stormwater system.

A stormwater utility can be imposed on both property owners and the ski industry. The residential properties within the urban boundaries can be assessed a stormwater rate based on the square meters of non-permeable surfaces. The City of Mississauga has implemented a similar utility.

Here is a copy of the their fee rate:

How are Billing Units Determined?

Properties in Mississauga fall into one of the following categories: residential, multi-residential or non-residential. The number of billing units is determined in two ways using the best available information including aerial images. For multi-residential and non-residential, the total hard surface area of each property is individally assessed. For residential properties, each house is assigned to one of five tiers based on the rooftop area which is used as a predictor of the total hard surface area on the property. This is illustrated below.

Residential properties are categorized into one of five tiers based on the size of their rooftop

Smallest (XSM) – 0.5 billing unit
Small (SML) – 0.7 billing unit
Medium (MED) – 1.0 billing unit
Large (LRG) – 1.2 billing units
Largest (XLG) – 1.7 billing units

	Property Size and Type	Rooftop Area in m^2	Estimated Fees Per Year
XSM	Freehold townhomes and row houses	26.7 – 99.0	$60.15
SML	Semi-detached homes, linked homes and small single detached homes	99.1 – 151.0	$84.21
MED	Medium single detached homes	151.1 – 194.0	$120.30
LRG	Large single detached homes	194.1 – 242.0	$144.36
XLG	Very large single detached homes	242.1 and above	$204.51

* Rooftops under 26.7 m^2: no charge

The ski industry will be assessed a stormwater rate based on the volume of water taken from the bay utilized for snowmaking. The snowmaking activities include a permit to take water, which require yearly reporting on total volume of water taking. A utility rate should be based on $$/m3 of water taking.

Based on the Mississauga fee striction, and the assumption of 10,000 medium detached homes in the urban center, that would generate $1,200,000/year from the residential properties. The ski industry tax the stormwater systems much more significantly then the residential properties, so a rough estimation of billing for ski industry would be at 1.5 times the total revenue for the urban properties which represents $1.8M. The total utility could potential generate $3M in revenues.

FUNCTION:

Improve Asset Performance (IP)

Quantitative Value Alternative

Title **IP-01**

DEMOLISH MILL STREET PS AND BUILD A NEW ONE

Original Concept

The current design includes the reuse of the existing Mill St. Pumping Station for the electrical/maintenance/storage/washroom spaces as well as the existing dry well for the metering and forcemain controls spaces.

Alternative Concept

This alternative would be to construct an entirely new pumping station that would include many/all of the same features as the existing design in a more efficient arrangement as we are not requiring to interfere with the exisitng operations/facilities/existing access to the basement dry well and would reduce the overall by-pass pumping requirements. This could include the Caisson wet well construction methodology (no dry well) or we maintain a similar constuction to the existing method (dry well/wet well) with a new control building.

Advantages

- Significantly reduces the by-pass pumping requirements
- Improves the layout of the new works
- Removes the constraints of dealing with the existing system
- Ability to situate the pumping station in a location

Disadvantages

- No Reuse of existing infrastructure
- Requires to new design to build access to depth in the basement
- Adds unnecessary costs to the new build for a new control station and inlet sewers

Discussion / Justification

Cost Summary

	Initial Costs	O&M Cost	Life Cycle Cost
Original Concept	$ 19,741,400	$ 3,694,700	$ 23,436,100
Alternative Concept	$ 15,491,500	$ 3,409,300	$ 18,900,800
Difference	**$ 4,249,900**	**$ 285,400**	**$ 4,535,300**

Quantitative Value Alternative

Title	IP-01

DEMOLISH MILL STREET PS AND BUILD A NEW ONE

Discussion / Justification

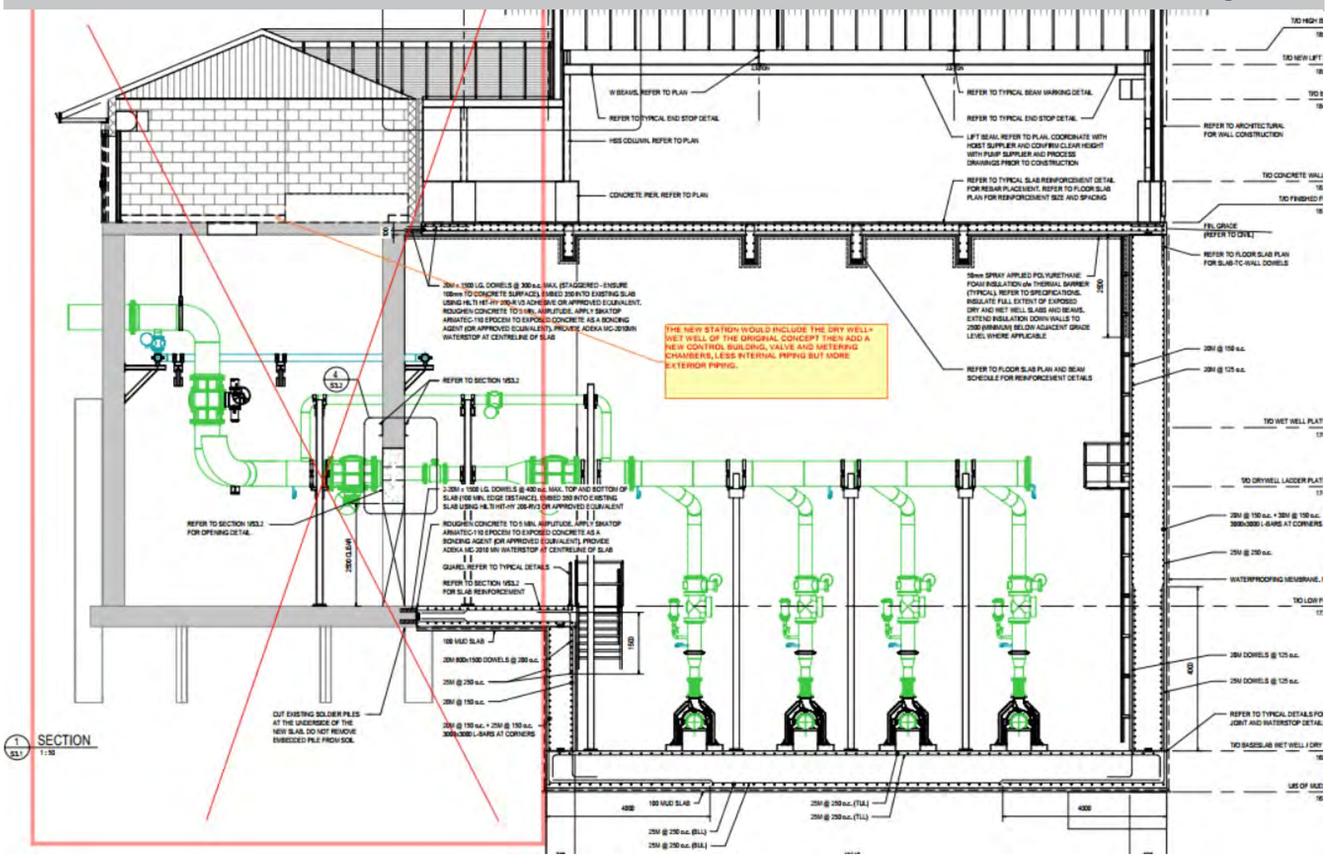
The key items included in the this option that differ from the Original concept include the following:
- Modifications to the existing/new inlet sewer to convey the sewage to the new station
- Construction of a new control building to include electrical/mechanical maintenance space as well as the new washroom. This is a building and stair well to access the new dry well/wet well.
- We would also include the demolition of the existing station within this scope.
- New Control Building floor area ~1,800 ft2
- New Stair well to access the dry well area (Depth ~12.9 m, 3 landings)
- Add a valve chamber for the drain valves on the forcemains
-Add a metering chamber for the FM flow meter

Quantitative Value Alternative

Title	**IP-01**

DEMOLISH MILL STREET PS AND BUILD A NEW ONE

Exhibits	**Page 3 of 5**



Quantitative Value Alternative

Title	IP-01

DEMOLISH MILL STREET PS AND BUILD A NEW ONE

Estimated Cost of Original Concept — Page 4 of 5

Description	Unit	Quantity	Unit Cost	Total
Base Cost for Mills Pumping Station Expansion (based on current price)	sum	1	$15,244,289.91	$15,244,290
			Subtotal:	**$ 15,244,290**
		29.5%	Project Markup:	$ 4,497,066
			Total Cost (Rounded):	**$ 19,741,400**

Estimated Cost of Alternative Concept Proposed

Description	Unit	Quantity	Unit Cost	Total
Construct Control Building (1,800sf) including a washroom	sum	1	$940,643.32	$940,643
1 metering and valve chamber	sum	1	$450,000.00	$450,000
Conveyance	sum	1	$422,500.00	$422,500
add Deferred maintenance to existing Mills	sum	1	$899,413.10	$899,413
+the original concept, potentially modified with the Caisson+submersible pump option.	sum	1	$4,500,000.00	$4,500,000
Electrical upgrade	sum	1	$1,800,000.00	$1,800,000
Demolition of existing Mills Station	sum	1	$250,000.00	$250,000
New Stair well to access the dry well area (Depth ~12.9 m, 3 landings)	sum	1	$2,700,000.00	$2,700,000
			Subtotal:	**$ 11,962,556**
		29.5%	Project Markup:	$ 3,528,954
			Total Cost (Rounded):	**$ 15,491,500**
			Cost Difference:	**$ 4,249,900**

Quantitative Value Alternative

Title	IP-01

DEMOLISH MILL STREET PS AND BUILD A NEW ONE

Life Cycle Cost Estimate

Page 5 of 5

Discount Rate 2.50% Net
Life Cycle Period 25 Years

First Costs	Original Concept: Estimated First Costs	Original Concept: Present Worth (PW)	Alternative Concept: Estimated First Costs	Alternative Concept: Present Worth (PW)
Original Concept (from First Costs Worksheet)	19,741,400	19,741,400		
Alternative Concept (from First Costs Worksheet)			15,491,500	15,491,500
Total Initial Costs		**$ 19,741,400**		**$ 15,491,500**
Difference (Compared to Original Concept)				**$ 4,249,900**

Replacement / Salvage Value	Occurrence Yr - or-Cycle	Inflat. Rate	PW Factor	Original: Estimated Replacement Costs	Original: PW Replacement Costs	Alternative: Estimated Replacement Costs	Alternative: PW Replacement Costs
Pump replacement	5		2.966	50,000	148,289	30,000	88,974
New pump replacement	15		0.690	600,000	414,279		
Submersible pumps	10		1.391			400,000	556,588
Total Replacement/Salvage Costs					**$ 562,600**		**$ 645,600**

Annual Costs	Inflat. Rate	PWA Factor	Original: Estimated Annual Costs	Original: PW Annual Costs	Alternative: Estimated Annual Costs	Alternative: PW Annual Costs
Energy		18.424	150,000	2,763,656	120,000	2,210,925
Maintenance		18.424	20,000	368,488	30,000	552,731
Total Annual Costs (Present Worth)				**$ 3,132,100**		**$ 2,763,700**

Life Cycle Cost Summary		Original: Present Worth (PW)		Alternative: Present Worth (PW)
Subtotal Replacement / Salvage + Annual Costs		$ 3,694,700		$ 3,409,300
Difference (Compared to Original)				**285,400**
Total Life Cycle Costs (Present Worth)		$ 23,436,100		$ 18,900,800
Life Cycle Difference (Compared to Original)				**$ 4,535,300**
Total Life Cycle Costs (Annualized)	**Per Year:**	**$ 1,272,016**	**Per Year:**	**$ 1,025,858**

Quantitative Value Alternative

Title	IP-03

REMOVE COVER, SIDES AND ROOF OVER THE DRY WELL

Original Concept

There is a roof and 2 sided wall designed over the wet well for public appearance and to protect operators while working on equipment. This also houses and protects an overhead crane used for pump removal.

Alternative Concept

Supply a smaller building that could house a portable gantry with electric hoist for removing pumps.

Advantages

- Lower capital Investment required.

Disadvantages

- Neighbours will see wet well and any work. Very opinionated and noisy.
- Operators will be unprotected to the environment while working on equipment.

Discussion / Justification

Removing majority of new roof system and monorail, keep a small building to house a new gantry and electric hoist.

Cost Summary

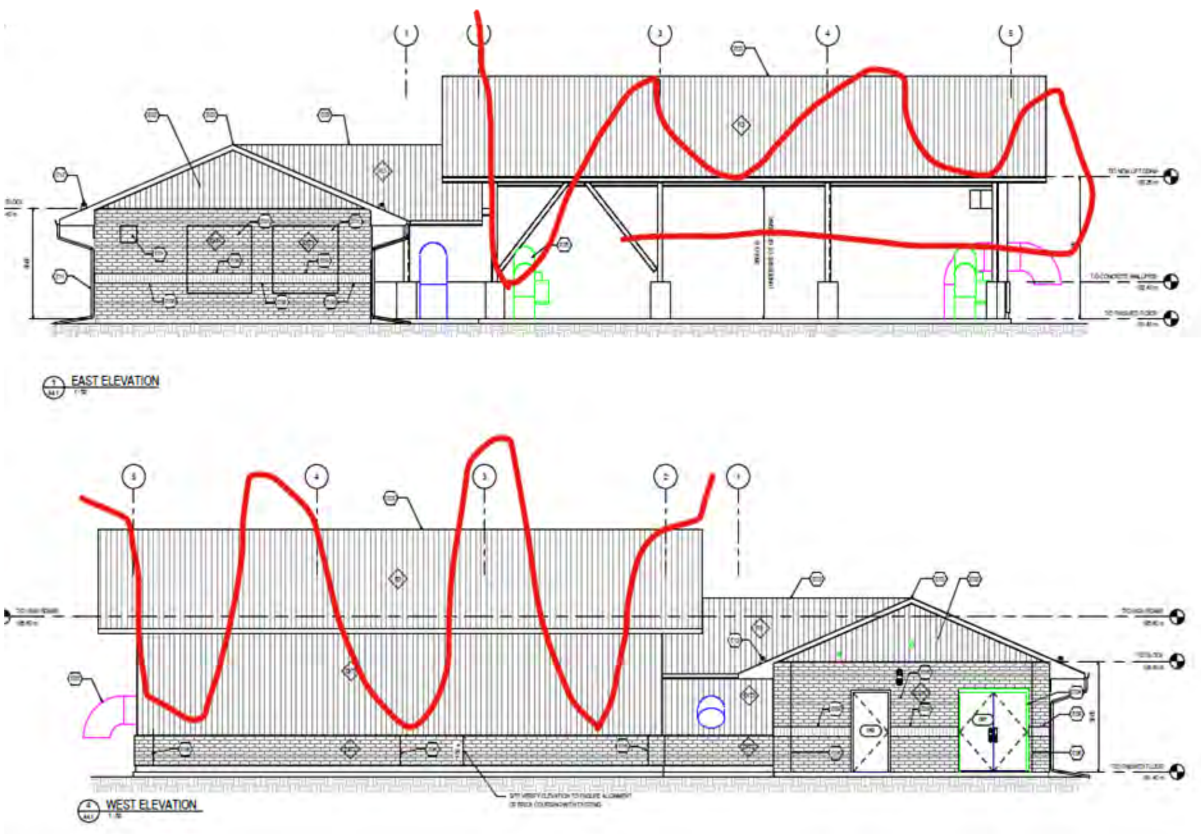
	Initial Costs	O&M Cost	Life Cycle Cost
Original Concept	$ 1,148,100	$ 61,300	$ 1,209,400
Alternative Concept	$ 584,700	$ 19,000	$ 603,700
Difference	**$ 563,400**	**$ 42,300**	**$ 605,700**

Quantitative Value Alternative

Title	**IP-03**

REMOVE COVER, SIDES AND ROOF OVER THE DRY WELL

Exhibits - Alternative Concept

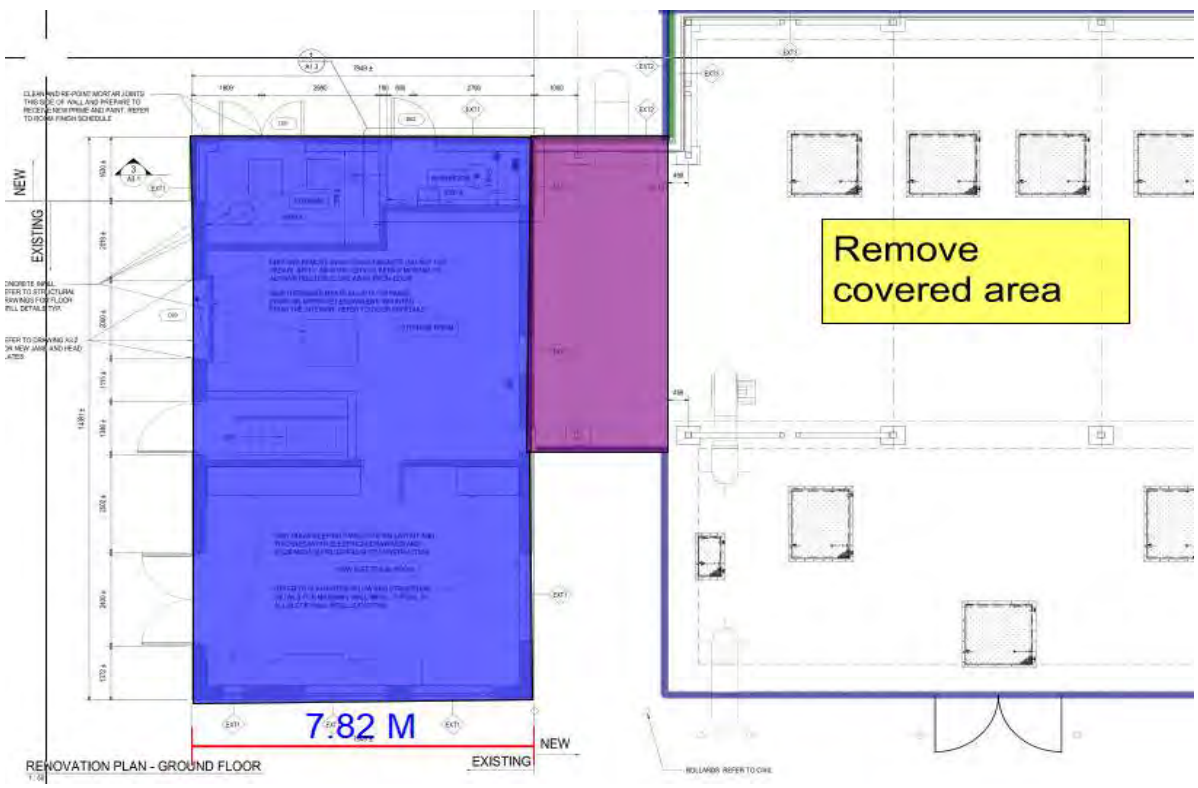


Quantitative Value Alternative

Title	IP-03

REMOVE COVER, SIDES AND ROOF OVER THE DRY WELL

Exhibits - Alternative Concept



Quantitative Value Alternative

Title	IP-03

REMOVE COVER, SIDES AND ROOF OVER THE DRY WELL

Estimated Cost of Original Concept

Page 4 of 5

Description	Unit	Quantity	Unit Cost		Total
Div 4 Masonry	sum	1	$25,000.00		$25,000
Div 5 Metals	sum	1	$97,000.00		$97,000
Div 6 Wood	sum	1	$122,000.00		$122,000
Div 7 Thermal	sum	1	$229,050.00		$229,050
Div 8 Doors	sum	1	$67,500.00		$67,500
Div 9 Finishes	sum	1	$30,000.00		$30,000
Div10 Lifting Equipment	sum	1	$100,000.00		$100,000
Building services	sum	1	$216,000.00		$216,000
			Subtotal:	**$**	**886,550**
		29.5%	Project Markup:	$	261,532
			Total Cost (Rounded):	**$**	**1,148,100**

Estimated Cost of Alternative Concept Proposed

Description	Unit	Quantity	Unit Cost		Total
Div 4 Masonry	sum	1	$10,000.00		$10,000
Div 5 Metals	sum	1	$39,600.00		$39,600
Div 6 Wood	sum	1	$49,700.00		$49,700
Div 7 Thermal	sum	1	$93,400.00		$93,400
Div 8 Doors	sum	1	$65,000.00		$65,000
Div 9 Finishes	sum	1	$12,200.00		$12,200
Div10 Portable lift hoist	sum	1	$30,000.00		$30,000
Building services	sum	1	$88,100.00		$88,100
Fencing to the perimeter + architectural element to shield the look	sum	1	$63,500.00		$63,500
			Subtotal:	**$**	**451,500**
		29.5%	Project Markup:	$	133,193
			Total Cost (Rounded):	**$**	**584,700**
			Cost Difference:	**$**	**563,400**

Quantitative Value Alternative

Title	IP-03

REMOVE COVER, SIDES AND ROOF OVER THE DRY WELL

Life Cycle Cost Estimate

Page 5 of 5

Discount Rate 2.50% Net
Life Cycle Period 25 Years

First Costs				Original Concept: Estimated First Costs	Original Concept: Present Worth (PW)	Alternative Concept: Estimated First Costs	Alternative Concept: Present Worth (PW)
Original Concept (from First Costs Worksheet)				1,148,100	1,148,100		
Alternative Concept (from First Costs Worksheet)						584,700	584,700
Total Initial Costs					**$ 1,148,100**		**$ 584,700**
Difference (Compared to Original Concept)							**$ 563,400**
Replacement / Salvage Value	**Occurrence Yr - or-Cycle**	**Inflat. Rate**	**PW Factor**	**Estimated Replacement Costs**	**PW Replacement Costs**	**Estimated Replacement Costs**	**PW Replacement Costs**
Maintenance	5		2.966	6,000	17,795	2,500	7,414
Replacement	20		0.610	35,000	21,359	10,000	6,103
Total Replacement/Salvage Costs					**$ 39,200**		**$ 13,500**
Annual Costs		**Inflat. Rate**	**PWA Factor**	**Estimated Annual Costs**	**PW Annual Costs**	**Estimated Annual Costs**	**PW Annual Costs**
Electricity			18.424	1,200	22,109	300	5,527
Total Annual Costs (Present Worth)					**$ 22,100**		**$ 5,500**
Life Cycle Cost Summary					**Present Worth (PW)**		**Present Worth (PW)**
Subtotal Replacement / Salvage + Annual Costs					$ 61,300		$ 19,000
Difference (Compared to Original)							**42,300**
Total Life Cycle Costs (Present Worth)					$ 1,209,400		$ 603,700
Life Cycle Difference (Compared to Original)							**$ 605,700**
Total Life Cycle Costs (Annualized)				**Per Year:**	**$ 65,641**	**Per Year:**	**$ 32,766**

Quantitative Value Alternative

Title	IP-06

REDUCE I&I IN THORNBURY TO 0.28L/SEC/HA

Original Concept

NOT considered as part of this project.

Alternative Concept

Create an annual investment program to reduce I&I across the WWC system in order to reach the target of (0.28L/s/ha). Includes inspection of infrastructure, assessing asset conditions, prioritizing repairs and capital projects. Will also include resident incentive programs (e.g., toilet rebates) to reduce sewer use. Inspection includes CCTV on an annual basis, rotating over 4 years. Can include smoke testing on target areas.

Advantages

- Pinpointing areas for repairs and replacement on an annual basis.
- Reducing I&I increases available capacity of the WWC and WWT systems, which takes pressure off the long-term design / planning requirements.
- Deferral of major capital expenditure.

Disadvantages

Discussion / Justification

Reduction in I&I should be a priority to reduce the impacts of extra water (runoff, groundwater, etc) from undering the WWC system, and processed by the WWT systems. This helps provide a buffer when forecasting future capacity requrements. Current budgets for capital repairs ($100k) and operations ($160k) have been allocated. CCTV assessment being done annually. Typical costs for MH repairs is $2.5 to 5K each, with some of the more severe MHs at $10 to 12k.)

Cost Summary

	Initial Costs	O&M Cost	Life Cycle Cost
Original Concept	$	$	$
Alternative Concept	$ 7,990,200	$	$ 7,990,200
Difference	**$ -7,990,200**	**$**	**$ -7,990,200**

Quantitative Value Alternative

Title	IP-06

REDUCE I&I IN THORNBURY TO 0.28L/SEC/HA

Discussion / Justification (Continued)

MH - Budget exisiting for approximately $50,000 from capital and $100,000 per yearfrom Ops that can be allocated to MH repairs. At a theoretical $5000 / repair, approx. 30 MH could be repaired each year. Estimated 200 MHs needing repairs, at least 100 are immediate need. Est. 7 years to complete all repairs to MHs.

Piping - Theoretical 5000 meters of piping needs to be repaired - either lined, excavated and replaced. Est. costing at $1,000 per meter. Replace all AC piping? (15,000m / 500m/yr = **30 yrs**). 500m per year acheiveable? See current 10-yr forecast in the WW Collection Master Plan.

Inspection and Condition Assessment - CCTV currently $250k per year over 7 years. Bump up to $300k. Consider adding smoke testing or orther methods - $100k.year? Potential to reduce need for CCTV work with doing Rapid Accoutical Testing (RAT).

Introduction

The Town owns and operates 99,269 meters of wastewater pipes with a replacement cost of $46,215,000. The Town has different material types of wastewater pipes, which are asbestos cement, concrete pipe, ductile iron, high density poly ethylene, polyvinyl chloride and vitrified clay. The pipes are being replacement with polyvinyl chloride DR35. Staff has created a condition rate index that focuses on Close Circuit Television (CCTV) inspections scores where available, age and material type to score the pipes.

Table 1
Useful Lives by Material Type

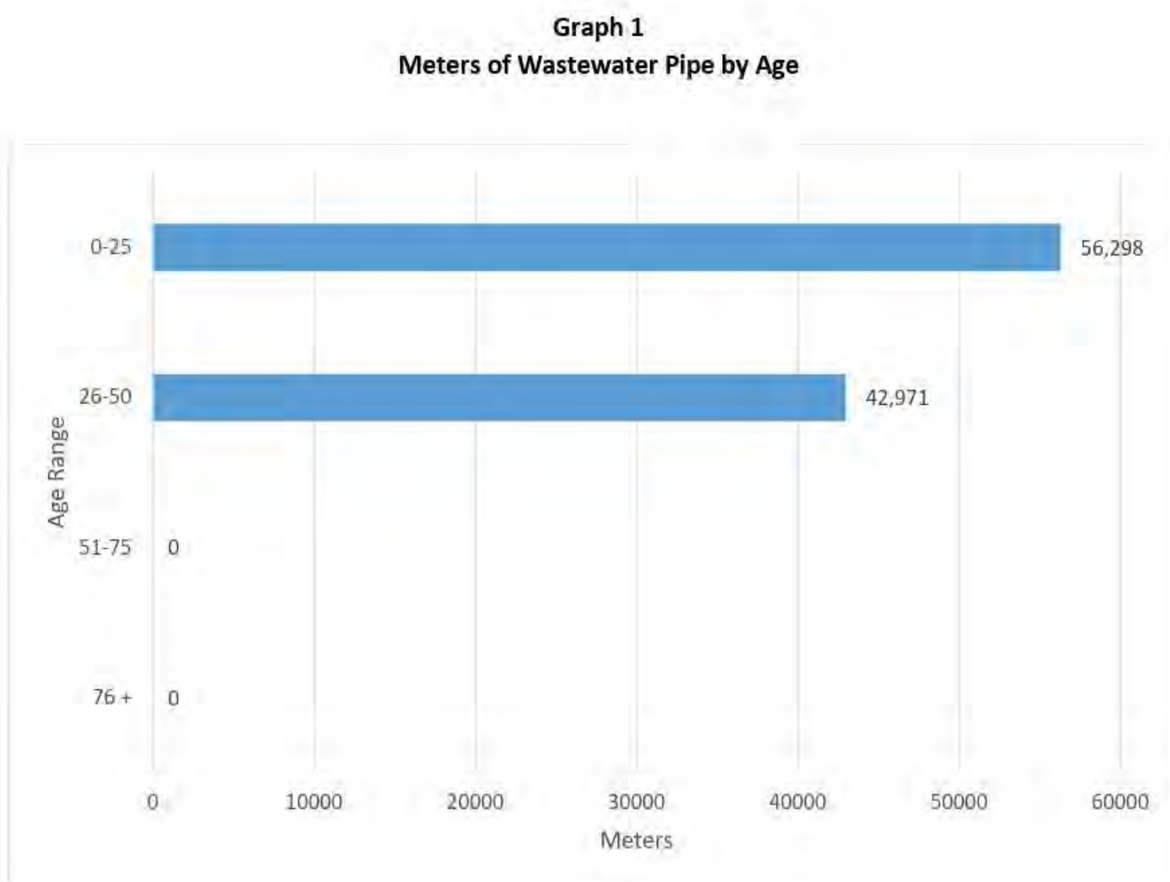
Material Type	Meters	Useful Life (years)
Asbestos Cement	14,561	60
Concrete	5,270	80
Ductile Iron	743	90
High Density Poly Ethylene	13,925	75
Polyvinyl Chloride	64,151	100
Vitrified Clay	619	50

Quantitative Value Alternative

Title	IP-06

REDUCE I&I IN THORNBURY TO 0.28L/SEC/HA

Exhibits - Alternative Concept	Page 3 of 12



Quantitative Value Alternative

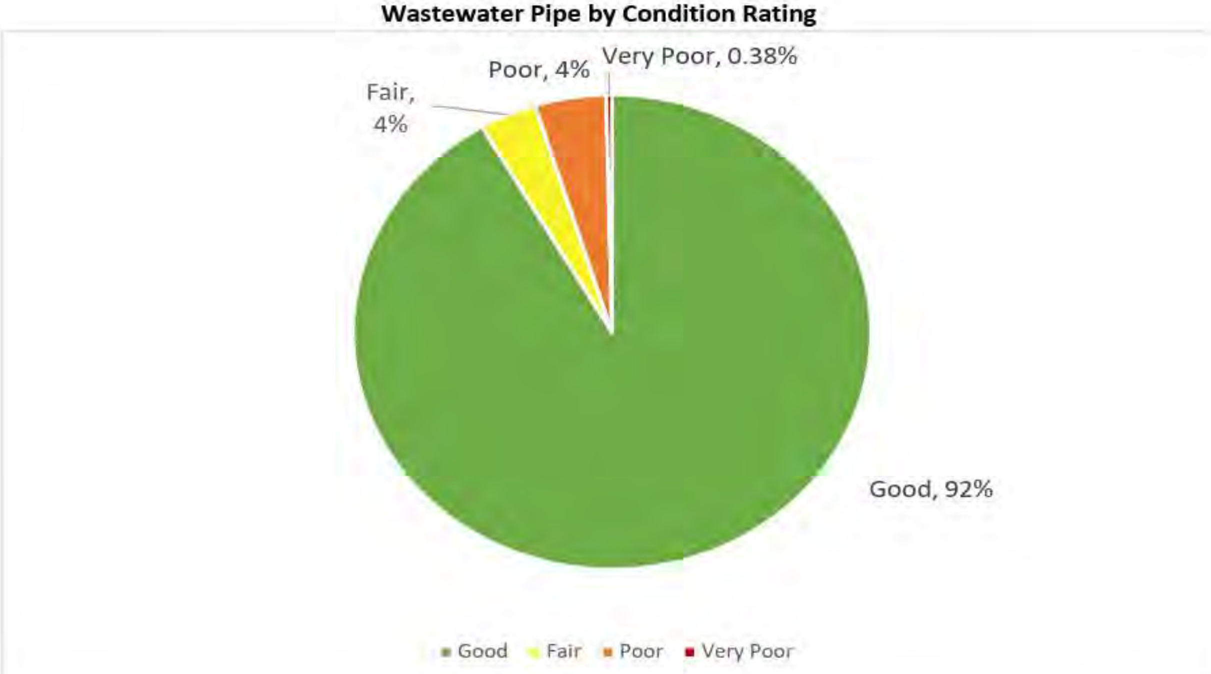
Title	IP-06

REDUCE I&I IN THORNBURY TO 0.28L/SEC/HA

Exhibits - Alternative Concept

There is only .38% of Very Poor condition wastewater pipes that represents 373 meters of asbestos cement pipe. The Town is replacing all the different material types of pipe with polyvinyl chloride DR 35. The overall condition rate of the wastewater pipes is 85% or Good.

Graph 2
Wastewater Pipe by Condition Rating



Quantitative Value Alternative

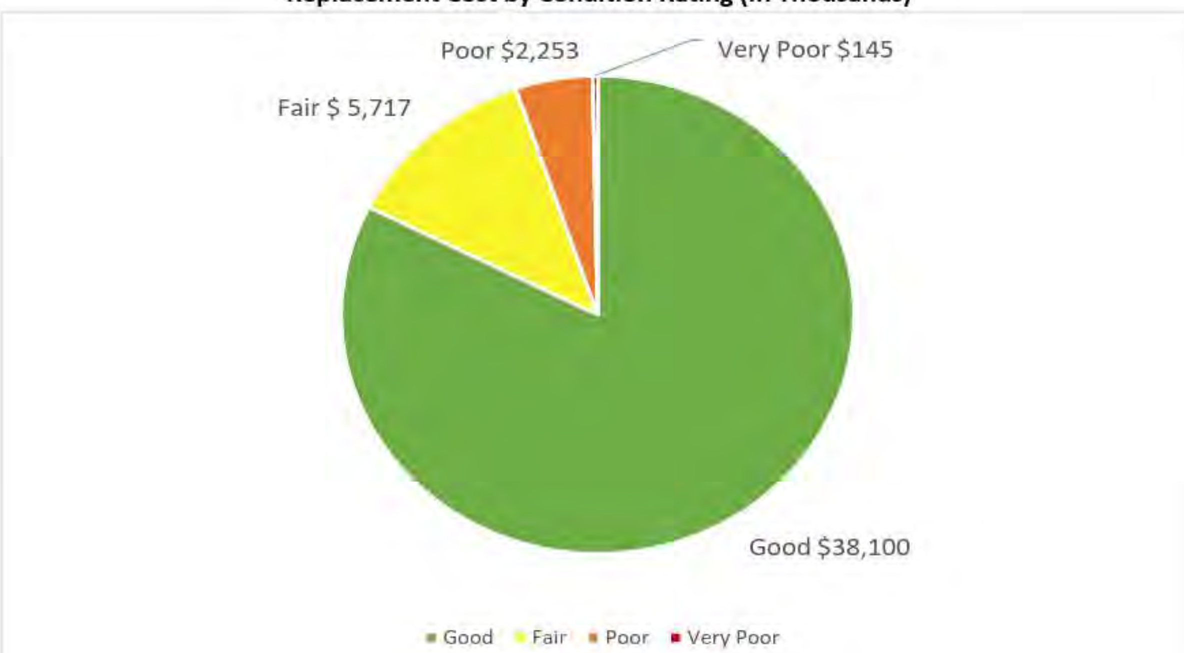
Title	IP-06

REDUCE I&I IN THORNBURY TO 0.28L/SEC/HA

Exhibits - Alternative Concept

Graph 3 shows that the replacement cost of the very poor is $145,000 and compared to condition rating of Good at $38,100,000. The total 2020 replacement cost of wastewater pipes is $46,215,000.

Graph 3
Replacement Cost by Condition Rating (In Thousands)



Quantitative Value Alternative

Title	IP-06

REDUCE I&I IN THORNBURY TO 0.28L/SEC/HA

Exhibits - Alternative Concept

5% of 100,000 m of pipe = 5,000 m

kwl

METRO VANCOUVER
Inflow and Infiltration Management Plan Template
Final Report
December 2, 2022

Archetype F – Targeted I&I Reduction and Structural Repairs

Description

- Greater than 75 years old, less than 150 years old
- Above the I&I-Age Curve
- Primarily VC and AC systems

Actions

- CCTV 100% of catchment (if not already done)
- Smoke & dye testing
- Identify and eliminate cross-connections
- Use a summertime flow monitoring program to identify extent and tributary area of cross-connections
- Storm sewer improvements
- Lateral rehabilitation & replacement (if proceeding ahead of bylaw)
- Maintenance hole rehabilitation & replacement
- Mainline rehabilitation & replacement

I&I Reduction Impact

- 'Back to the Line'
- Reduce effective age of catchment

Timeline

2022 › 2025 › 2030 › 2035 › 2040

Costs

Work Component	% of Catchment	Component Cost ($/m)
CCTV	100	10
Condition Assessment	100	2
Program Development	100	5
Smoke Testing	100	4
Dye Testing	20	4
Pipe Relining	20	900
Pipe Bursting	5	1,500
Pipe Grouting	74	150
Maintenance Hole Rehab	10	80
Maintenance Hole Replacement	5	320
Point Repairs	0.5	18,500
Pipe Replacement	1	1,300
Lateral Relining	40	410
Lateral Pipe Bursting	20	410
Lateral Grouting	40	160
Storm Sewer Improvements	5	3,800
Average Cost (Approx.)		**$1,000/m**
Range (-50% / +100%)		**$500-2,000/m**
+ Flow Monitoring and Analysis (all year – summer and winter)		$36,000/Catchment

Quantitative Value Alternative

Title	IP-06

REDUCE I&I IN THORNBURY TO 0.28L/SEC/HA

Exhibits - Alternative Concept

Based on KWL table: 5,000 m x $1,000/m = $5M avg. (range: -50% to +100%) for the poor and very poor piping

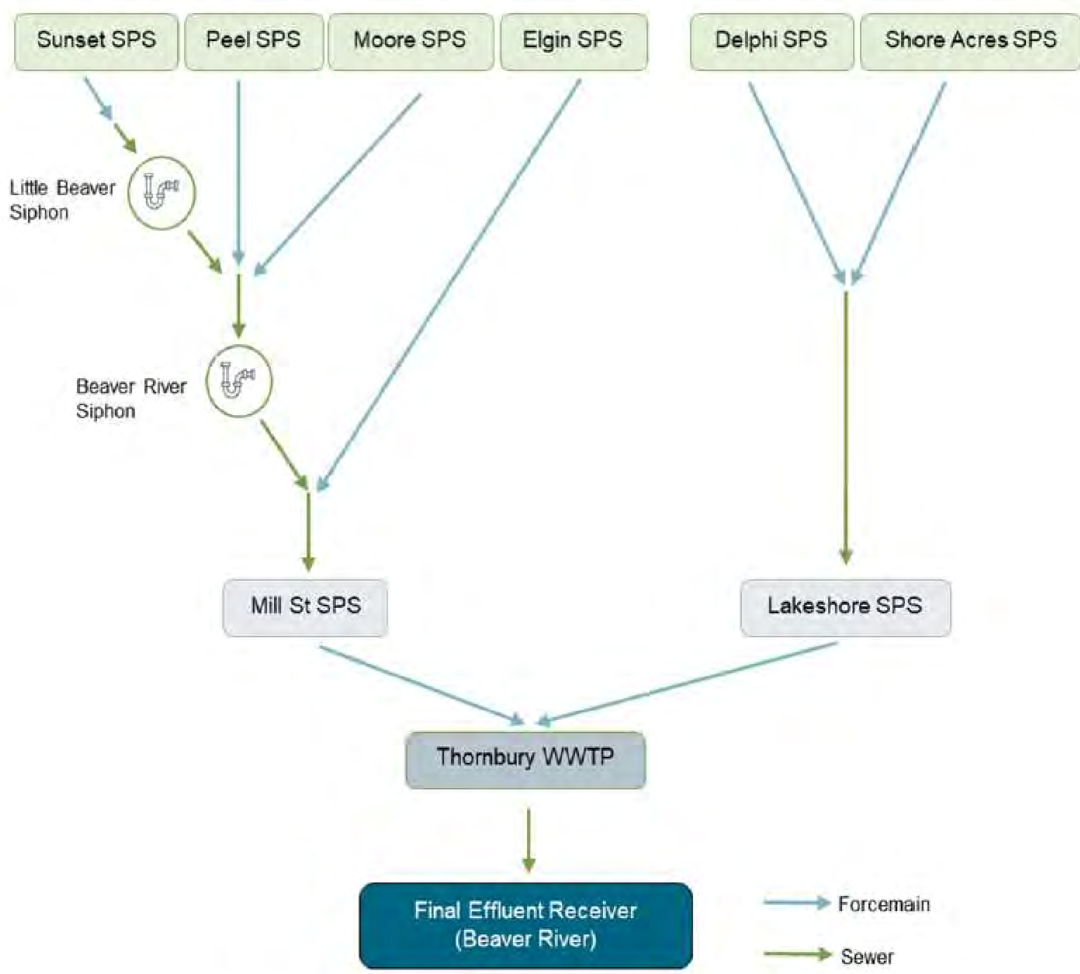


Figure 1. Thornbury WWTP Service Area

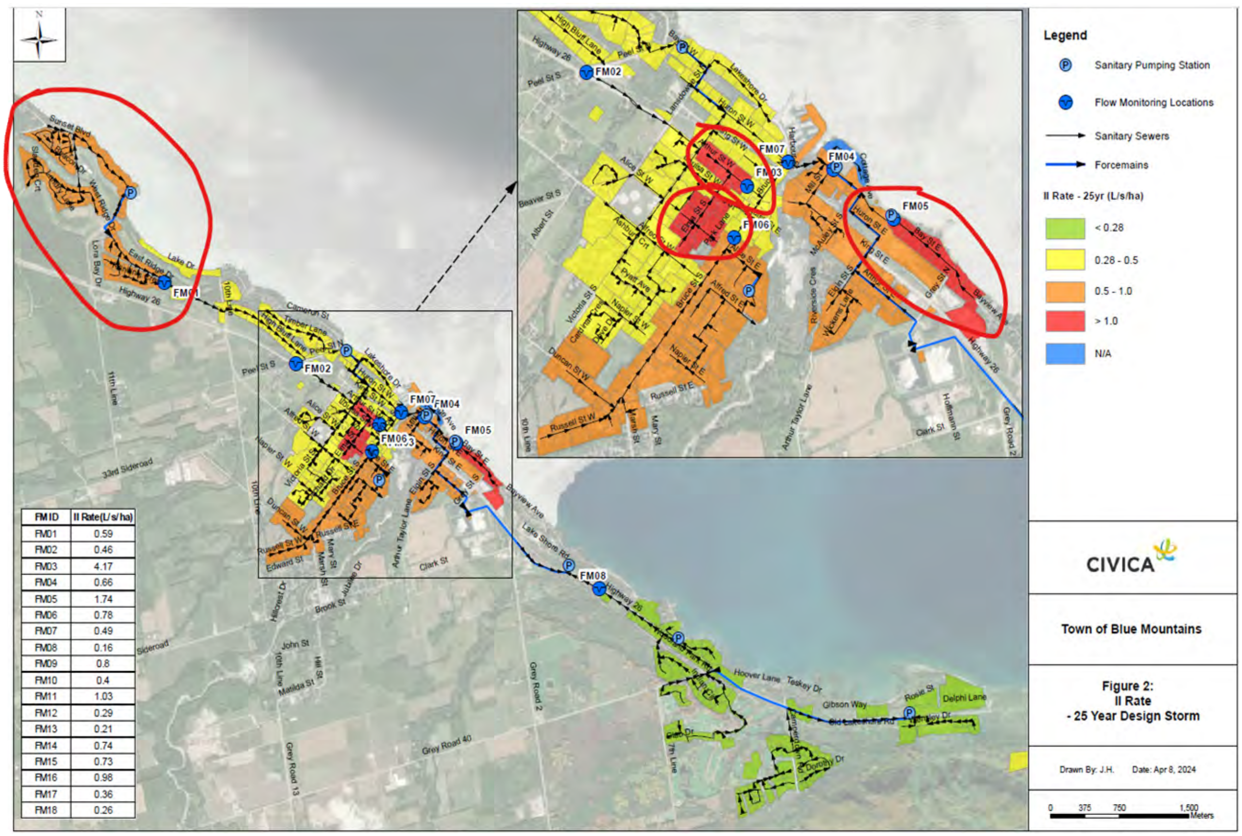
Quantitative Value Alternative

Title	**IP-06**

REDUCE I&I IN THORNBURY TO 0.28L/SEC/HA

Exhibits - Alternative Concept

Modelling done by Civica - collected flow data from multiple locations and Town weather stations for a year; Data below shows results for modelled I&L rates for 25-year storm event.
Additional review of hydrograph data required for actual I&I rates.



Quantitative Value Alternative

Title	IP-06

REDUCE I&I IN THORNBURY TO 0.28L/SEC/HA

Exhibits - Alternative Concept

*Projected I&I Rates from 25-yr event, model callibration data

Table 1: DWF Parameters used in the model.

FM Station	Area (ha)	Population	DWF(L/c/d)	GWI (L/s/ha)
FM01	71.67	961	350	0.0109
FM02	97.38	1,281	348	0.0040
FM03	11.75	204	48	0.0011
FM04	317.74	5,519	446	0.0320
FM05	9.76	114	615	0.0002
FM06	59.07	894	258	0.0211
FM07	270.39	4,827	397	0.0407
FM08	155.08	1,484	266	0.0058
FM09	211.72	7,127	142	0.0210
FM10	48.71	1,511	114	0.0026
FM11	300.48	9,144	305	0.0474
FM12	225.25	2,763	259	0.0063

FM ID	*L/s/ha	Allowable	Delta	ha	L/s	FM Location
FM 01	0.59	0.28	0.31	71.67	22.22	**Lora Bay**
FM 02	0.46	0.28	0.18	97.38	17.53	Peel ST
FM 03	4.17	0.28	3.89	11.75	45.71	**Arthur ST W**
FM 04	**0.66**	**0.28**	**0.38**	**317.74**	**120.74**	**Mill ST**
FM 05	1.74	0.28	1.46	9.76	14.25	Bay ST
FM 06	0.49	0.28	0.21	59.07	12.40	Alice / Bruce ST
FM 07	0.16	0.28	-0.12	270.39	-32.45	Huron ST
FM 08	0.18	0.28	-0.1	155.08	-15.51	HWY 26 / Woodlawn

*I&I Rates - 25 yr

* Assumes that Mill ST FM

FM 07 covers all of Thornbury West

FM 04 cover all of Thornbury East + West

FM ID	II Rate(L/s/ha)
FM01	0.59
FM02	0.46
FM03	4.17
FM04	0.66
FM05	1.74
FM06	0.78
FM07	0.49
FM08	0.16

Quantitative Value Alternative

Title	IP-06

REDUCE I&I IN THORNBURY TO 0.28L/SEC/HA

Exhibits - Alternative Concept

For the purposes of this exercise, it is demonstrated that there is a significant amount of I&I that affects the Mill ST pumping station. By reducing I&I across the catchment area(s), capacity can be gained at the pump station. An exact number for recovery of capacity can not be derived from the 25-yr Design storm modelling data, however, it is useful to point out where to start looking.

Main Areas to Focus:
- Lora Bay
- Elma, Arthur, BruceClonsider
- Mill, Bay, and surrounding STRs
- A number of areas to consider for the Craigleith catchment, but not looked at here.

Suggested Actions:
- Continue Inspection work, adding new technologies to help with the assessment
- Consider adding flow monitoring and smoke testing, etcReapwhen looking at the problem areas - likely to take 3 years for each area to fully find and repair all I&I and reduce towards the design 0.28L/s/ha.
- MH repair program is fairly easy to implement
- Pipe repair and replacement needs further consideration

Est. Timelines:

MH Repair: 7 years for 200 repairs, at current budget levels
Pipe Repairs - 5% (5000m) Poor to Very Poor - 30 yrs at 500m/yr (should be higher)
Focused I&I Study / Reduction Areas - Choose 3 to 5 areas to target, each area will take 3 years +/- to thoroughly work through

Quantitative Value Alternative

Title	IP-06

REDUCE I&I IN THORNBURY TO 0.28L/SEC/HA

Description	Unit	Quantity	Unit Cost		Total
NOT part of this project					
			Subtotal:	**$**	
		29.5%	Project Markup:	$	
			Total Cost (Rounded):	**$**	

Estimated Cost of Alternative Concept Proposed

Description	Unit	Quantity	Unit Cost		Total
Repair MHs (Contract Work)	each	200	$3,000.00		$600,000
Repair pipes (various methods)	/m	5000	$1,000.00		$5,000,000
Catchment Monitoring - annual (5 x 3 yrs)	each	15	$38,000.00		$570,000
			Subtotal:	**$**	**6,170,000**
		29.5%	Project Markup:	$	1,820,150
			Total Cost (Rounded):	**$**	**7,990,200**
			Cost Difference:	**$**	**-7,990,200**

Quantitative Value Alternative

Title	IP-06

REDUCE I&I IN THORNBURY TO 0.28L/SEC/HA

Life Cycle Cost Estimate

Page 12 of 12

Discount Rate 2.50% Net
Life Cycle Period 25 Years

First Costs	Original Concept: Estimated First Costs	Original Concept: Present Worth (PW)	Alternative Concept: Estimated First Costs	Alternative Concept: Present Worth (PW)
Original Concept (from First Costs Worksheet)				
Alternative Concept (from First Costs Worksheet)			7,990,200	7,990,200
Total Initial Costs		**$ -**		**$ 7,990,200**
Difference (Compared to Original Concept)				**-$ 7,990,200**

Replacement / Salvage Value	Occurrence Yr - or-Cycle	Inflat. Rate	PW Factor	Original: Estimated Replacement Costs	Original: PW Replacement Costs	Alternative: Estimated Replacement Costs	Alternative: PW Replacement Costs
Total Replacement/Salvage Costs					**$ -**		**$ -**

Annual Costs	Inflat. Rate	PWA Factor	Original: Estimated Annual Costs	Original: PW Annual Costs	Alternative: Estimated Annual Costs	Alternative: PW Annual Costs
Total Annual Costs (Present Worth)				**$ -**		**$ -**

Life Cycle Cost Summary		Original: Present Worth (PW)		Alternative: Present Worth (PW)
Subtotal Replacement / Salvage + Annual Costs		$ -		$ -
Difference (Compared to Original)				**-**
Total Life Cycle Costs (Present Worth)		$ -		$ 7,990,200
Life Cycle Difference (Compared to Original)				**-$ 7,990,200**
Total Life Cycle Costs (Annualized)	**Per Year:**	**$ -**	**Per Year:**	**$ 433,675**

Quantitative Value Alternative

Title	IP-09

CONDUCT CONDITION ASSESSMENT AND REPAIR COLLECTION SYSTEM

Original Concept

Page 1 of 3

NOT part of this project.

Alternative Concept

Conduct CCTV inspections and obtain condition ratings for all sanitary sewers to implement a program for repairs.

Advantages

- Proactive approach to identify problem areas and reduce infiltration in the collection system.
- Identifying problem areas and performing repairs will reduce infiltration and potentially create more capicity in the collection system, pumping stations and wastewater plants.
- Identifying pipe defects allows for targeted repairs to extend service life and minimize capital costs.
- Reduces long term treatment costs by not treating groundwater or rainwater.

Disadvantages

- Very expensive to complete asessments or entire Town.
- Could take several years to complete the condition assessments.

Discussion / Justification

Identifying the pipes with major structural issues/infiltration will allow the Town to proactively focus on these areas to repair and reduce infiltration as well as extending the service life of the pipe and reduce capital and operating costs long term. The Town currently has approx 107,500m (107.5km) of wastewater pipe. Over the last 7 years all of the Towns collection system was inspected and 2070 metres (2km) of pipe were rated with major structural defects including failure and infiltration. Maintenance holes and laterals should also be considered for inspection. CCTV and condition assessment for sewer only is approx $5/m or $537,500. Relining or spot repairs for $2000m of pipe could approach $1 million.

Cost Summary	Initial Costs	O&M Cost	Life Cycle Cost
Original Concept	$	$	$
Alternative Concept	$ 1,942,500	$	$ 1,942,500
Difference	**$ -1,942,500**	**$**	**$ -1,942,500**

Quantitative Value Alternative

Title	IP-09

CONDUCT CONDITION ASSESSMENT AND REPAIR COLLECTION SYSTEM

Estimated Cost of Original Concept — Page 2 of 3

Description	Unit	Quantity	Unit Cost	Total

	Subtotal:	**$**
29.5%	Project Markup:	$
	Total Cost (Rounded):	**$**

Estimated Cost of Alternative Concept Proposed

Description	Unit	Quantity	Unit Cost	Total
Conduct CCTV condition inspection	sum	1	$1,500,000.00	$1,500,000

	Subtotal:	**$**	**1,500,000**
29.5%	Project Markup:	$	442,500
	Total Cost (Rounded):	**$**	**1,942,500**
	Cost Difference:	**$**	**-1,942,500**

Quantitative Value Alternative

Title	IP-09

CONDUCT CONDITION ASSESSMENT AND REPAIR COLLECTION SYSTEM

Life Cycle Cost Estimate

Page 3 of 3

Discount Rate 2.50% Net
Life Cycle Period 25 Years

First Costs				Original Concept: Estimated First Costs	Original Concept: Present Worth (PW)	Alternative Concept: Estimated First Costs	Alternative Concept: Present Worth (PW)
Original Concept (from First Costs Worksheet)							
Alternative Concept (from First Costs Worksheet)						1,942,500	1,942,500
Total Initial Costs					**$ -**		**$ 1,942,500**
Difference (Compared to Original Concept)							**-$ 1,942,500**
Replacement / Salvage Value	**Occurrence Yr - or-Cycle**	**Inflat. Rate**	**PW Factor**	**Estimated Replacement Costs**	**PW Replacement Costs**	**Estimated Replacement Costs**	**PW Replacement Costs**
Total Replacement/Salvage Costs					**$ -**		**$ -**
Annual Costs		**Inflat. Rate**	**PWA Factor**	**Estimated Annual Costs**	**PW Annual Costs**	**Estimated Annual Costs**	**PW Annual Costs**
Total Annual Costs (Present Worth)					**$ -**		**$ -**
Life Cycle Cost Summary					**Present Worth (PW)**		**Present Worth (PW)**
Subtotal Replacement / Salvage + Annual Costs					$ -		$ -
Difference (Compared to Original)							**-**
Total Life Cycle Costs (Present Worth)					$ -		$ 1,942,500
Life Cycle Difference (Compared to Original)							**-$ 1,942,500**
Total Life Cycle Costs (Annualized)				**Per Year:**	**$ -**	**Per Year:**	**$ 105,431**

Design Suggestion

Title	IP-11

REDUCE SANITARY LOS TO MATCH DRAINAGE SYSTEM LOS

Original Concept

The original concept raises the level of service (LOS) in the sanitary sewer system from roughly a 2-year storm to a 10-year storm with firm capacity (standby pumps, redundancy), and a 100-year storm with station capacity (no redundancy).

Alternative Concept

The alternative concept is to not push the LOS of the sanitary system too far ahead of the LOS of the drainage system. Otherwise, flow from deficiencies in the drainage system may find its way into the sanitary system. As additional sanitary capacity is created, additional storm flows may find their way into the sanitary sewer and show as increased I&I.

Advantages

- By increasing the LOS of both the storm and sanitary sewer systems at the same time, predictions of future flows become more reliable.

Disadvantages

Discussion / Justification

The LOS of the storm sewer system in the Thornbury and Craigleith service areas is variable, but a majority of the area appears to be able to handle minor storms (i.e., 5-year return period). There are pockets where this isn't true (i.e., Blue Mtn. Village). In contrast, the LOS for the major storm in many areas is below the 100 year storm. As a result, major storms will produce service flooding and these flows may find there way to the sanitary sewer. It is recommended that the deficiencies in the minor and major drainage systems be addressed over the longer term to increase confidence in the prediction of the 100-year sanitary sewer design flow to be achieved.

Design Suggestion

Original Concept	$	$	$
Alternative Concept	$	$	$
Difference	**$**	**$**	**$**

Design Suggestion

Title	**IP-11**

REDUCE SANITARY LOS TO MATCH DRAINAGE SYSTEM LOS

Exhibits	**Page 2 of 4**

Design Suggestion

Title	**IP-11**

REDUCE SANITARY LOS TO MATCH DRAINAGE SYSTEM LOS

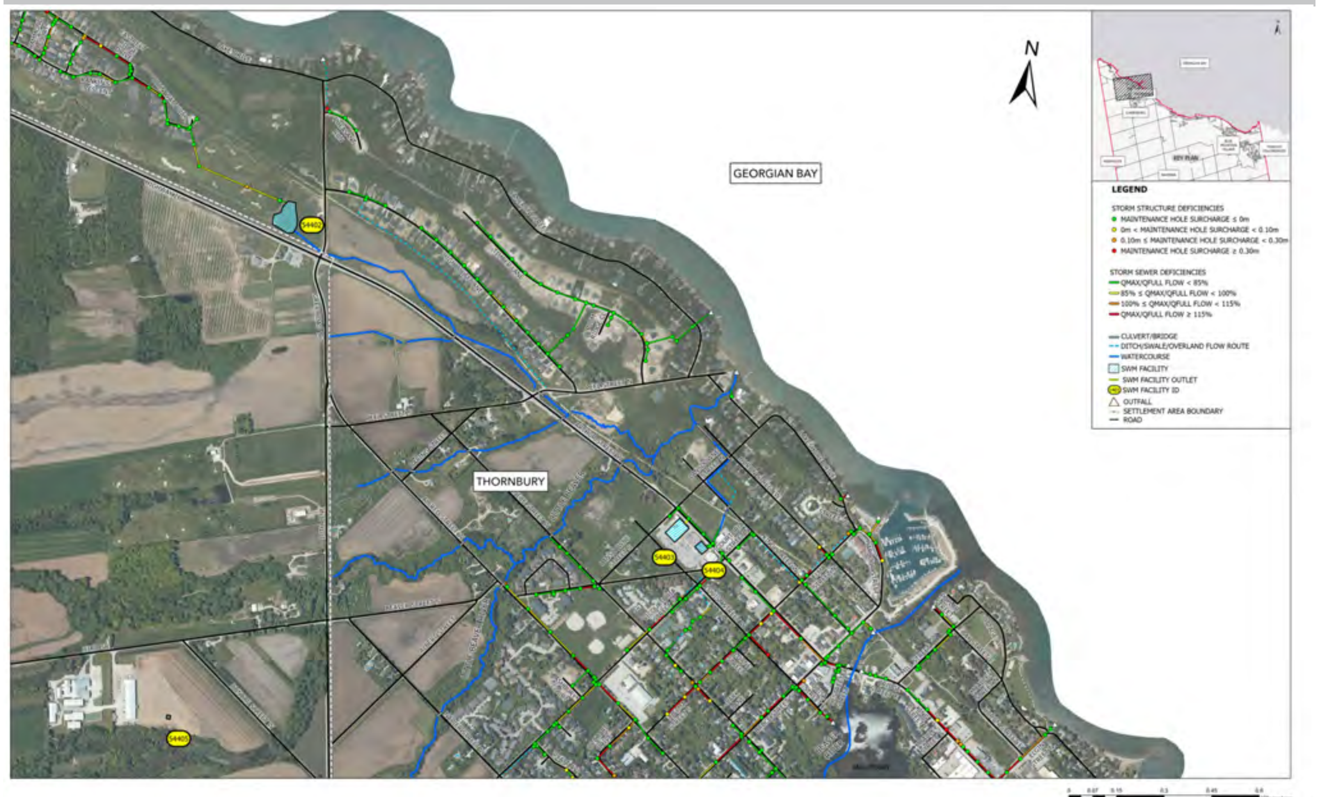
Exhibits	**Page 3 of 4**

Design Suggestion

Title	IP-11

REDUCE SANITARY LOS TO MATCH DRAINAGE SYSTEM LOS

Exhibits	Page 4 of 4



Design Suggestion

Title	IP-14

REVISE/ REVISIT TOWN'S ENGINEERING STANDARDS

Original Concept

The current engineering standards include named manufacturers within the approved vendor list, some of which are single suppliers.

Alternative Concept

Extending the single suppliers (i.e. Sewage pumps and main electrical vendor list) to include a minimum of 2-3 approved vendors would create savings for the equipment purchase.

Advantages

- Capital savings resulting from competitive bidding for the major equipment.

Disadvantages

- Creates a variety of equipment within the Town's asset database requiring addition spare parts and additional maintenance and repair resources.
- The design needs to be more general and/or require multiple design options.
- May require equipment preselection and/or pre-purchase procurement methods to evaluate the various equipment offerings.

Discussion / Justification

Generally this could create equipment specific savings in the range of 10 - 20%, design, installation and maintenance costs vary.

Design Suggestion

Original Concept	$	$	$
Alternative Concept	$	$	$
Difference	**$**	**$**	**$**

FUNCTION:

Operate System (OS)

Quantitative Value Alternative

Title **OS-03**

CONSIDER SINGLE PUMP VFD AND FIX THE REMAINDER

Original Concept

Replace all VFD drives with 'newer' VFD drives at both stations. The Mill Street PS VFDs are being replaced to 'right' fit the drives to the motor units to allow for a larger operating range. The Craigleigh PS VFDs are at the end of their service life.

Alternative Concept

Rather than replace all VFDs, it is proposed to introduce a singel VFD unit with crossover switch gear to allow multiple pumps to operate, with one select pump, using the VFD

Advantages

- Reduced Capital and Drive Maintenance Cost while maintaining operational flexibility.
- Reduce Drive Footprint.
- Reduce HVAC requirements for cooling.

Disadvantages

- Some minor loss of operating range.

Discussion / Justification

The use of one VFD and switch gear will provide adequate operating flexibility and resolve the capital and on-going mainteance cost of additional VFD drives. Also the condtioned space and HVAC requirements can be reduced do to cooling of one drive is less.The control logic and direct power bypass will needs to be evaluated to manage the switching process safely and efficiently.

Cost Summary

	Initial Costs	O&M Cost	Life Cycle Cost
Original Concept	$ 1,200,500	$ 1,015,600	$ 2,216,100
Alternative Concept	$ 369,300	$ 275,500	$ 644,800
Difference	**$ 831,200**	**$ 740,100**	**$ 1,571,300**

Quantitative Value Alternative

Title **OS-03**

CONSIDER SINGLE PUMP VFD AND FIX THE REMAINDER

Discussion / Justification

Variable Frequency Drives (VFD) with Crossover Switch Gear

A Variable Frequency Drive (VFD) controls the speed and torque of an electric motor by varying the frequency and voltage of the power supplied. This allows for energy savings and improved performance in applications where load requirements fluctuate.

Crossover switch gear enables the connection of multiple pumps to a single VFD. This setup allows operators to select which pump is powered by the VFD, providing flexibility in managing pump operations.

Using Crossover Switch Gear has the following benefits. 1. Cost Efficiency: Reduces the need for multiple VFDs, lowering initial investment and maintenance costs.2. Operational Flexibility: Allows for easy switching between pumps based on demand or operational needs. 3. Space Saving: Minimizes the physical footprint required for VFD installations.

The control logic and direct power bypass will needs to be evaluated to manage the switching process safely and efficiently.

Quantitative Value Alternative

Title	OS-03

CONSIDER SINGLE PUMP VFD AND FIX THE REMAINDER

Estimated Cost of Original Concept

Page 3 of 4

Description	Unit	Quantity	Unit Cost	Total
VFD Drive Craigleif 200HP	EA	3	$42,300.00	$126,900
Harmonic Filters	EA	3	$ 27,200.00	$81,600
Switchboards	EA	3	$ 33,000.00	$99,000
Disconnect Switches Fused & Non-Fused	EA	3	$ 6,500.00	$19,500
VFD Drive Mill Street 250hp including harmonic filters, switchboards and disconnect switch	EA	4	$150,000.00	$600,000

	Subtotal:	**$**	**927,000**
29.5%	Project Markup:	$	273,465
	Total Cost (Rounded):	**$**	**1,200,500**

Estimated Cost of Alternative Concept Proposed

Description	Unit	Quantity	Unit Cost	Total
VFD Craigleith	EA	1	$109,000.00	$109,000
VFD Mill Street	EA	1	$150,000.00	$150,000
Awarded contract profit adjustment	EA	1	$26,160.00	$26,160

	Subtotal:	**$**	**285,160**
29.5%	Project Markup:	$	84,122
	Total Cost (Rounded):	**$**	**369,300**
	Cost Difference:	**$**	**831,200**

Quantitative Value Alternative

Title	OS-03

CONSIDER SINGLE PUMP VFD AND FIX THE REMAINDER

Life Cycle Cost Estimate

Page 4 of 4

Discount Rate 2.50% Net
Life Cycle Period 25 Years

First Costs				Original Concept: Estimated First Costs	Original Concept: Present Worth (PW)	Alternative Concept: Estimated First Costs	Alternative Concept: Present Worth (PW)
Original Concept (from First Costs Worksheet)				1,200,500	1,200,500		
Alternative Concept (from First Costs Worksheet)						369,300	369,300
Total Initial Costs					**$ 1,200,500**		**$ 369,300**
Difference (Compared to Original Concept)							**$ 831,200**
Replacement / Salvage Value	**Occurrence Yr - or-Cycle**	**Inflat. Rate**	**PW Factor**	**Estimated Replacement Costs**	**PW Replacement Costs**	**Estimated Replacement Costs**	**PW Replacement Costs**
Maintenance	5		2.966	35,000	103,803	10,000	29,658
Replacement	15		0.690	1,320,550	911,794	356,125	245,892
Total Replacement/Salvage Costs					**$ 1,015,600**		**$ 275,500**
Annual Costs		**Inflat. Rate**	**PWA Factor**	**Estimated Annual Costs**	**PW Annual Costs**	**Estimated Annual Costs**	**PW Annual Costs**
Marginal energy saving			18.424				
Total Annual Costs (Present Worth)					**$ -**		**$ -**
Life Cycle Cost Summary					**Present Worth (PW)**		**Present Worth (PW)**
Subtotal Replacement / Salvage + Annual Costs					$ 1,015,600		$ 275,500
Difference (Compared to Original)							**740,100**
Total Life Cycle Costs (Present Worth)					$ 2,216,100		$ 644,800
Life Cycle Difference (Compared to Original)							**$ 1,571,300**
Total Life Cycle Costs (Annualized)				**Per Year:**	**$ 120,281**	**Per Year:**	**$ 34,997**

Quantitative Value Alternative

Title	OS-05

CONSIDER IN-LINE PIPE STORAGE

Original Concept

Providing pumping capacity in an appropriately sized wet well. This is the current design.

Alternative Concept

Same concept as IC-09, and would need to work with IC-05. This concept would include the use of the new inlet sewer as the operating volume of the wet well and providing in-line storage to buffer the incoming flow allowing for the existing capacity of the SPS to continue in it's current operation.

Advantages

- Reduces the requirement for a deep wet well and/or any substantive wet well.

  Combines infrastructure (i.e.. Sewer and storage volume so a single installation to achieve 2 functions).

Disadvantages

- Encourages sedimentation in the sewer.
- Potential for sewer back up, higher risk operation.
- Reduces safety factor on the overall system operation.

Discussion / Justification

The required storage volume should match alternative IC-09. The new inlet sewer is a 750mm RCP. The internal area of the new sewer is 0.44 m2, the length of 750 inlet sewer is 56.5m which provides about 25m3 of storage. There is 450 mm sanitary sewer in the collection system, providing 0.16m3/m of storage volume. In order to match the storage volume of IC-09 (15,000 m3) would require 34 km of 750 mm dia. sewer.

Cost Summary	Initial Costs	O&M Cost	Life Cycle Cost
Original Concept	$ 19,741,400	$ 514,500	$ 20,255,900
Alternative Concept	$ 35,224,000	$ 392,400	$ 35,616,400
Difference	**$ -15,482,600**	**$ 122,100**	**$ -15,360,500**

Quantitative Value Alternative

Title	OS-05

CONSIDER IN-LINE PIPE STORAGE

Estimated Cost of Original Concept — **Page 2 of 3**

Description	Unit	Quantity	Unit Cost	Total
Base Cost for Mills Pumping Station Expansion (based on current price)	sum	1	$15,244,289.91	$15,244,290

	Subtotal:	**$**	**15,244,290**
29.5%	Project Markup:	$	4,497,066
	Total Cost (Rounded):	**$**	**19,741,400**

Estimated Cost of Alternative Concept Proposed

Description	Unit	Quantity	Unit Cost	Total
750 mm dia. RCP Sewer	m	34,000	$800.00	$27,200,000

	Subtotal:	**$**	**27,200,000**
29.5%	Project Markup:	$	8,024,000
	Total Cost (Rounded):	**$**	**35,224,000**
	Cost Difference:	**$**	**-15,482,600**

Quantitative Value Alternative

Title	**OS-05**

CONSIDER IN-LINE PIPE STORAGE

Life Cycle Cost Estimate

Page 3 of 3

Discount Rate 2.50% Net
Life Cycle Period 25 Years

First Costs				Original Concept: Estimated First Costs	Original Concept: Present Worth (PW)	Alternative Concept: Estimated First Costs	Alternative Concept: Present Worth (PW)
Original Concept (from First Costs Worksheet)				19,741,400	19,741,400		
Alternative Concept (from First Costs Worksheet)						35,224,000	35,224,000
Total Initial Costs					**$ 19,741,400**		**$ 35,224,000**
Difference (Compared to Original Concept)							**-$ 15,482,600**
Replacement / Salvage Value	**Occurrence Yr - or-Cycle**	**Inflat. Rate**	**PW Factor**	**Estimated Replacement Costs**	**PW Replacement Costs**	**Estimated Replacement Costs**	**PW Replacement Costs**
Pump maintenance	5		2.966	50,000	148,289	50,000	148,289
Pump replacement	20		0.610	600,000	366,163	400,000	244,108
Total Replacement/Salvage Costs					**$ 514,500**		**$ 392,400**
Annual Costs		**Inflat. Rate**	**PWA Factor**	**Estimated Annual Costs**	**PW Annual Costs**	**Estimated Annual Costs**	**PW Annual Costs**
No energy variance as the amount			18.424				
Total Annual Costs (Present Worth)					**$ -**		**$ -**
Life Cycle Cost Summary					**Present Worth (PW)**		**Present Worth (PW)**
Subtotal Replacement / Salvage + Annual Costs					$ 514,500		$ 392,400
Difference (Compared to Original)							**122,100**
Total Life Cycle Costs (Present Worth)					$ 20,255,900		$ 35,616,400
Life Cycle Difference (Compared to Original)							**-$ 15,360,500**
Total Life Cycle Costs (Annualized)				**Per Year:**	**$ 1,099,408**	**Per Year:**	**$ 1,933,113**

Quantitative Value Alternative

Title	OS-06

INTRODUCE PUMP CONTROL VALVES AT PUMP STATIONS AND NO VFDS

Original Concept

Each Pump Station (Mill Street, Craigleith) has Variable Frequency Drives (VFDs) to help control the flow rate, considering the wet well volume. The VFDs will allow for a wide range of flow conditions and help maintain the pumps within their Preferred Operating Ranges (PORs). This setup requires a dynamic programmable logic controller to sync the pumps to operate in parallel at the desired head/flow condition.

Alternative Concept

In lieu of using VFDs a more direct flow management can be made by using pump control valves. For waste water service the preferred pump control valve is a plug valve. The pump can start directly across the line against a closed valve. The valve will then open slow and modulate to via actuation to sustain a flow rate that is established based on wet well rise/fall rate. As the required flow rate increases the valve modulates open and modulates closed to reduce flow rate. By doing this the valves can behave similar to the more advanced VFD. This control is mechanically direct and is less reliantly on electronic controls. The actuation can be controlled by local level sensors and pressure transducers to modulate.

Advantages

- Easier to maintain
- Lower capital cost
- Higher reliability
- Reduced conditioned space that is required for VFD drives.

Disadvantages

- Less refined operating envelope (more staggered) to maintain pump efficiency and wet well level.
- Assume use of 10% more energy.

Discussion / Justification

The use of actuated pump control plug valves in lieu of VFDs will provide required rangeability of flow from the station while reducing capital and maintenance cost of VFD drives. This will also allow a reduction in the condition space that will be required for the VFD drives.

Cost Summary

	Initial Costs	O&M Cost	Life Cycle Cost
Original Concept	$ 777,000	$ 5,058,800	$ 5,835,800
Alternative Concept	$ 181,300	$ 4,470,100	$ 4,651,400
Difference	**$ 595,700**	**$ 588,700**	**$ 1,184,400**

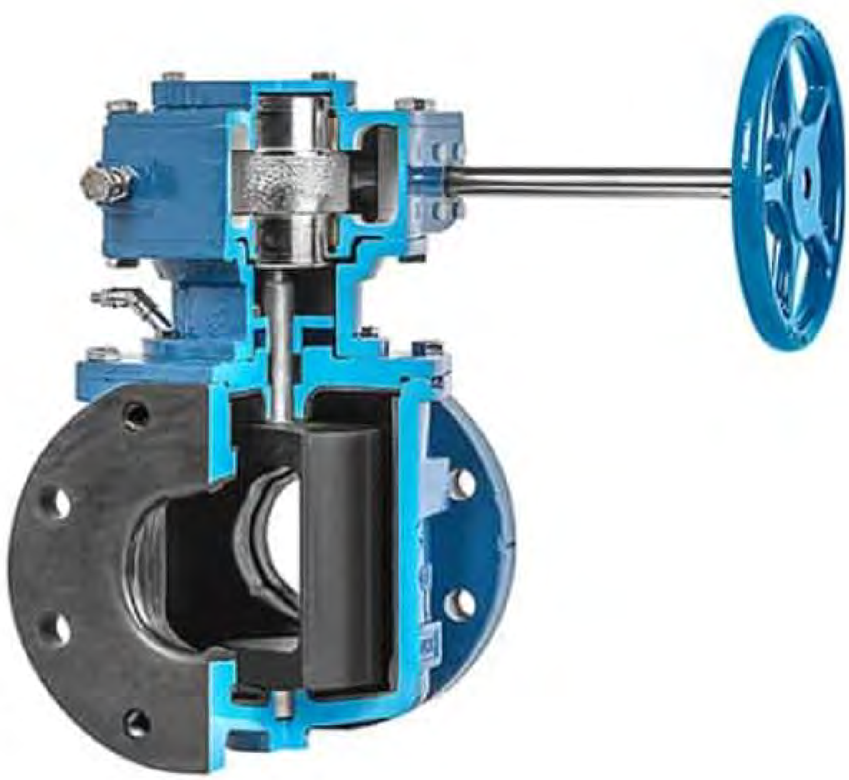
Quantitative Value Alternative

Title	OS-06

INTRODUCE PUMP CONTROL VALVES AT PUMP STATIONS AND NO VFDS

Exhibits	Page 2 of 4

Pump Control Plug Valve - Actuator required (not shown)



Quantitative Value Alternative

Title	OS-06

INTRODUCE PUMP CONTROL VALVES AT PUMP STATIONS AND NO VFDS

Estimated Cost of Original Concept — Page 3 of 4

Description	Unit	Quantity	Unit Cost	Total
VFD Drive Mill Street 250hp including harmonic filters, switchboards and disconnect switch	EA	4	$150,000.00	$600,000

	Subtotal:	**$**	**600,000**
29.5%	Project Markup:	$	177,000
	Total Cost (Rounded):	**$**	**777,000**

Estimated Cost of Alternative Concept Proposed

Description	Unit	Quantity	Unit Cost	Total
300 mm pump control valves	EA	4	$20,000.00	$80,000
Electric Actuators	EA	4	$15,000.00	$60,000

	Subtotal:	**$**	**140,000**
29.5%	Project Markup:	$	41,300
	Total Cost (Rounded):	**$**	**181,300**
	Cost Difference:	**$**	**595,700**

Quantitative Value Alternative

Title	OS-06

INTRODUCE PUMP CONTROL VALVES AT PUMP STATIONS AND NO VFDS

Life Cycle Cost Estimate

Page 4 of 4

Discount Rate 2.50% Net
Life Cycle Period 25 Years

First Costs				Original Concept: Estimated First Costs	Original Concept: Present Worth (PW)	Alternative Concept: Estimated First Costs	Alternative Concept: Present Worth (PW)
Original Concept (from First Costs Worksheet)				777,000	777,000		
Alternative Concept (from First Costs Worksheet)						181,300	181,300
Total Initial Costs					**$ 777,000**		**$ 181,300**
Difference (Compared to Original Concept)							**$ 595,700**
Replacement / Salvage Value	**Occurrence Yr - or-Cycle**	**Inflate. Rate**	**PW Factor**	**Estimated Replacement Costs**	**PW Replacement Costs**	**Estimated Replacement Costs**	**PW Replacement Costs**
Maintenance	5		2.966	140,000	415,210		
Replacement	15		0.690	854,700	590,141	16,500	11,393
Total Replacement/Salvage Costs					**$ 1,005,400**		**$ 11,400**
Annual Costs		**Inflate. Rate**	**PWA Factor**	**Estimated Annual Costs**	**PW Annual Costs**	**Estimated Annual Costs**	**PW Annual Costs**
Energy			18.424	220,000	4,053,363	242,000	4,458,699
Total Annual Costs (Present Worth)					**$ 4,053,400**		**$ 4,458,700**
Life Cycle Cost Summary					**Present Worth (PW)**		**Present Worth (PW)**
Subtotal Replacement / Salvage + Annual Costs					$ 5,058,800		$ 4,470,100
Difference (Compared to Original)							**588,700**
Total Life Cycle Costs (Present Worth)					$ 5,835,800		$ 4,651,400
Life Cycle Difference (Compared to Original)							**$ 1,184,400**
Total Life Cycle Costs (Annualized)				**Per Year:**	**$ 316,743**	**Per Year:**	**$ 252,459**

FUNCTION:

Protect Infrastructure (PI)

Design Suggestion

Title	PI-01

MAINTAIN AND UTILIZE CURRENT SURGE TANKS AT MILL STREET

Original Concept

Presently there are two 3000 Liter Charlatte bladder style hydropneumatics tanks located at the Mill Street pump station that are not being utilized (isolation valve(s) are closed). The tanks were designed to limit the adverse transient pressures for 153L / sec flow, through 1450m long Ø300mm force main. The tank operating volume is established by a 15psi bladder precharge. The tanks were manufactured in June 2006, and put in service summer 2008.

Alternative Concept

Evaluate the condition of the tank bladders. If degraded, replace bladders and utilize the tanks to protect the pump and aging pipe system from adverse hydraulic transient conditions.

Advantages

- Protection of the pipe system from adverse hydraulic transient pressures resulting from a power outage.
- Protection of the process pipe, pumps, valves from any flow changes (normal or abnormal)
- All for more rapid starts and stops and VFD ramps to maintain level in wet well

Disadvantages

- Periodic evaluation and maintenance of the bladder.

Discussion / Justification

The analysis performed by the tank manufacturer shows that the transient pressures following a power outage sustain positive pressure throughout the forcemain, and the upsurge or high transient pressure does not exceed the normal operating pressure. This is a very good control for transients and will help resolve significant pressure loads along the pipe. This is ideal for aging infrastructure that may be approaching the end of its useful life. This option shall require further analysis and evaluation.

Design Suggestion

Original Concept	$	$	$
Alternative Concept	$	$	$
Difference	**$**	**$**	**$**

Design Suggestion

Title	**PI-01**

MAINTAIN AND UTILIZE CURRENT SURGE TANKS AT MILLL STREET

Exhibits	**Page 2 of 3**

The Transient analysis performed by the tank manufacturer (Charlatte) resulted in the following transient hydraulic envelope.

Design Suggestion

Title	PI-01

MAINTAIN AND UTILIZE CURRENT SURGE TANKS AT MILLL STREET

Discussion / Justification

Page 3 of 3

Utilize a Hydropneumatics Pressure Vessel (Bladder). Hydropneumatics pressure vessels are normally connected to the pump station discharge header, and each pump is normally equipped with a check valve. The upper portion of the pressurized tank is filled with a volume of compressed air, designed to balance the pump head. In lieu of the compressed air and water interface, a bladder surge tank can be used in this system. A bladder tank maintains the compressed air charge for a very long time negating the need for a compressor and level control PLC that is required for a conventional surge tank. For very low lift pump stations, the pressurized tank can be replaced by an open tank or by a standpipe. Upon power failure, pump forward rotation will stop rapidly, normally in a matter of a few seconds. The sudden cessation of water flow will cause the head downstream of the pump station to decrease sharply. Consequently, flow will be supplied by the surge tank to the discharge header, shutting off the check valves to the pump and flowing into the system. The flow supplied by the surge tank will continue, decreasing slowly as the pressurized air in the tank expands. The surge tank is intended to provide sufficient pressure so that a positive head condition is maintained throughout the entire length of the pipeline and so that no air enters the pipeline. As the pressure in the surge tank decreases, the forward flow of water decreases, and the water flow eventually reverses direction, based on the static head in the pipe. This flow will then enter the surge tank, re-compressing the air in the tank. This process will repeat itself in cycles until the motion of the water is dampened out to an equilibrium situation by system friction.

Quantitative Value Alternative

Title	PI-02

EXAMINE THE MERIT OF NET ZERO IN PUMP STATION BLDG.

Original Concept

Page 1 of 3

The Town of The Blue Mountains has a Municipal Net Zero Emissions Buildings Policy, requiring that a building constructed and/or renovated be highly energy-efficient, with any remaining energy demand satisfied by on-site renewable energy. This project has included solar panels and an inverter to offset the building envelope's carbon footprint.

Alternative Concept

The proposed alternative concept includes the removal of the solar panels from this project as a cost saving measure.

Advantages

- Removal of the solar panels and the inverter from the tender package.
- There is only one roof aspect that can support the solar panels.
- If the overhead carport structure is removed, then there won't be an opportunity to install the panels.

Disadvantages

- The station will not provide any carbon offset.

Discussion / Justification

Removing the solar panels and the inverter will reduce the initial construction costs. The panels and the inverter could be added at a later date. As the pumping station is not a Town facility with regular human occupancy, it primarily protects the infrastructure and the system it supports. Further analysis and evaluation required to arrive at a clear cost avoidance.

Cost Summary

	Initial Costs	O&M Cost	Life Cycle Cost
Original Concept	$ 32,400	$ -22,900	$ 9,500
Alternative Concept	$ N/A	$ N/A	$ N/A
Difference	**$ 32,400**	**$ -22,900**	**$ 9,500**

Quantitative Value Alternative

Title

EXAMINE THE MERIT OF NET ZERO IN PUMP STATION BLDG.

Estimated Cost of Original Concept — Page 2 of 3

Description	Unit	Quantity	Unit Cost	Total
Solar panel	sum	1	$25,000.00	$25,000
			Subtotal:	**$ 25,000**
		29.5%	Project Markup:	$ 7,375
			Total Cost (Rounded):	**$ 32,400**

Estimated Cost of Alternative Concept Proposed

Description	Unit	Quantity	Unit Cost	Total
No solar panel	sum	1		
			Subtotal:	**$**
		29.5%	Project Markup:	$
			Total Cost (Rounded):	**$**
			Cost Difference:	**$ 32,400**

Quantitative Value Alternative

Title	PI-02

EXAMINE THE MERIT OF NET ZERO IN PUMP STATION BLDG.

Life Cycle Cost Estimate

Page 3 of 3

Discount Rate 2.50% Net
Life Cycle Period 25 Years

				Original Concept		Alternative Concept	
First Costs				**Estimated First Costs**	**Present Worth (PW)**	**Estimated First Costs**	**Present Worth (PW)**
Original Concept (from First Costs Worksheet)				32,400	32,400		
Alternative Concept (from First Costs Worksheet)							
Total Initial Costs					**$ 32,400**		**$ -**
Difference (Compared to Original Concept)							**$ 32,400**
Replacement / Salvage Value	**Occurrence Yr - or-Cycle**	**Inflat. Rate**	**PW Factor**	**Estimated Replacement Costs**	**PW Replacement Costs**	**Estimated Replacement Costs**	**PW Replacement Costs**
Maintenance	5		2.966	500	1,483		
Inverter replacement	15		0.690	3,500	2,417		
Total Replacement/Salvage Costs					**$ 3,900**		**$ -**
Annual Costs		**Inflat. Rate**	**PWA Factor**	**Estimated Annual Costs**	**PW Annual Costs**	**Estimated Annual Costs**	**PW Annual Costs**
Electricity			18.424	-1,455	-26,799		
Total Annual Costs (Present Worth)					**-$ 26,800**		**$ -**
Life Cycle Cost Summary					**Present Worth (PW)**		**Present Worth (PW)**
Subtotal Replacement / Salvage + Annual Costs					-$ 22,900		$ -
Difference (Compared to Original)							**(22,900)**
Total Life Cycle Costs (Present Worth)					$ 9,500		$ -
Life Cycle Difference (Compared to Original)							**$ 9,500**
Total Life Cycle Costs (Annualized)				**Per Year:**	**$ 516**	**Per Year:**	**$ -**

Appendix B

Function Analysis Systems Technique (FAST) Diagram

Appendix B: FAST Diagram

The Function Analysis Systems Technique (FAST) Diagram that follows documents the results of the function analysis performed for the HEWS Project. Function analysis helps the VM Team understand the relationships among functions and how they work together to satisfy the requirements of the Program/Project. A FAST diagram graphically illustrates the interrelationships of the Program functions and is often invaluable in accomplishing this understanding.

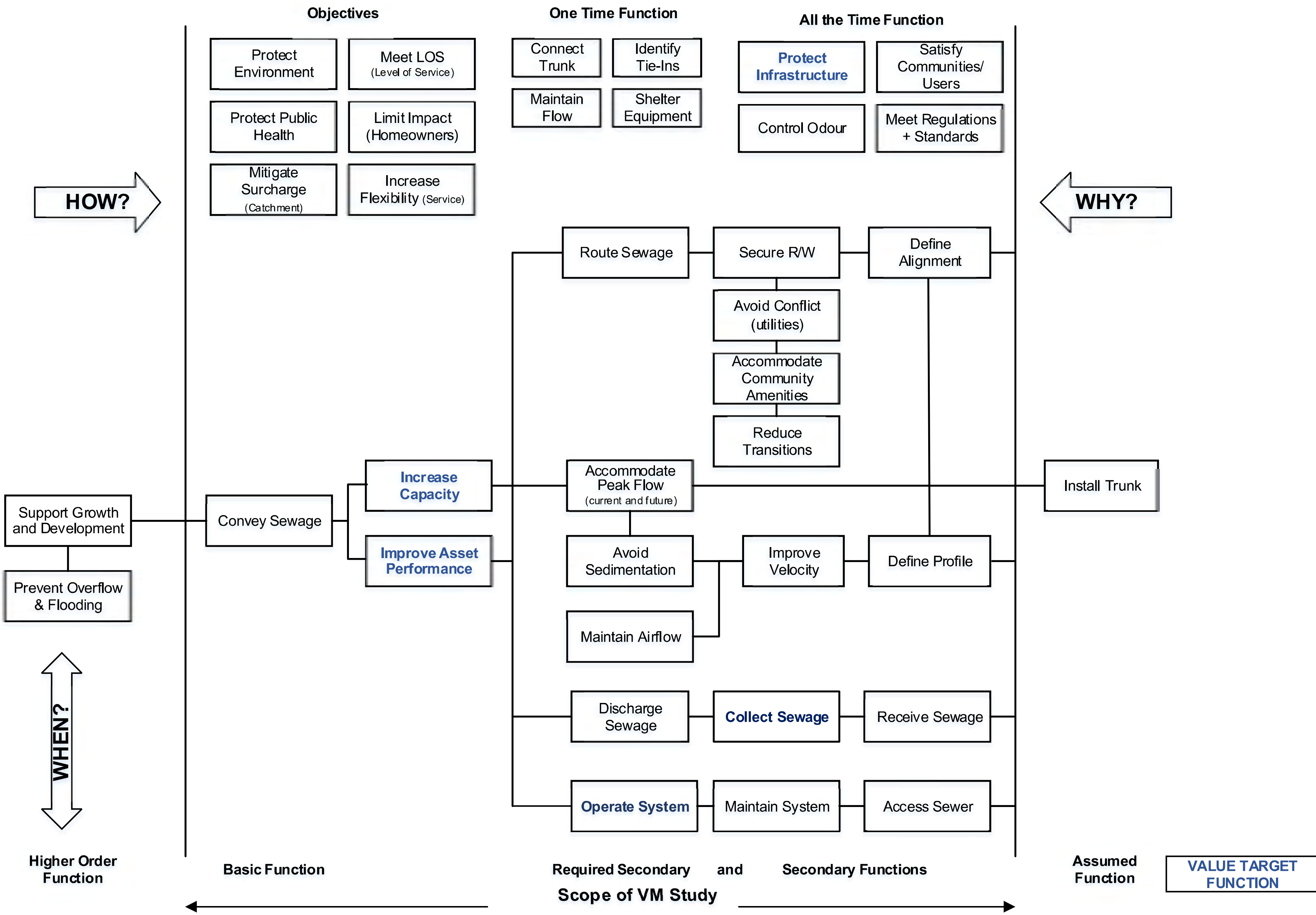
Guidelines for logically arranging functions in a FAST diagram are included below to assist the reader in understanding the diagram that follows.

1. Two vertical dashed lines, known as Scope Lines, define the scope of the initiative and the VM Study. The scope lines are usually near the left and right margins.
2. The FAST diagram has a "critical path of functions" going from left to right across the scope lines. A bold line represents the critical path.
3. The critical path contains only the basic function(s) (immediately to the right of the left scope line) and required secondary functions. Higher-order functions (related goals beyond the scope of the VM Study) are sometimes included on the critical path, left of the basic function(s). The critical path can have parallel branches.
4. Required secondary functions are to the right of the basic function.
5. All other secondary functions, which can be supporting functions, aesthetic functions or unwanted functions, are either above or below the critical path.
6. Functions that "happen at the same time" and/or "are caused by" a function on the critical path are placed below the related critical path function.
7. Functions which happen "all the time", such as an aesthetic function, are placed above the critical path function to the extreme right of the diagram.
8. Specific "design objectives" are placed above the basic function to the extreme left.
9. Proper arrangement and relationships of the functions in the FAST diagram can be confirmed with the how-why logic test as follows:
    a. Ask the question of any function, "How do I verb-noun?" The answer should be the function to the immediate right.
    b. Ask the question "Why do I verb-noun?" The answer should be the function to the immediate left i.e., "So that I can verb-noun."
    c. A function that does not pass the how-why test is either described improperly or is in the wrong place. The answer must make sense.
10. Our prime concern when constructing a FAST diagram is the essential functions. All functions on the critical path must occur for the basic function to be accomplished. All other functions on the FAST diagram are subordinate to the critical path function and may or may not be required to accomplish the basic functions. These functions are often the source for VM targets, resulting in cost avoidance or deferral.

The FAST diagram for the HEWS Project, the Town of The Blue Mountains, ON, is presented on the following page.

HEWS (HOUSING ENABLING WATER SYSTEMS) PROJECT (Feb 2026)

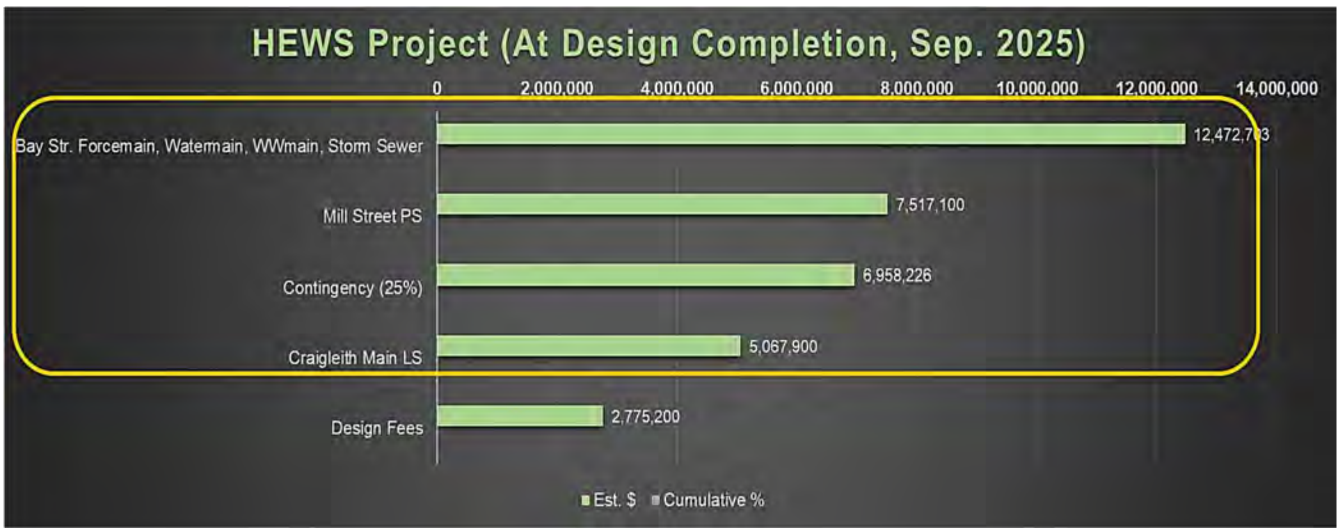
Function Analysis System Technique (FAST) Diagram (Final Design)



Appendix C

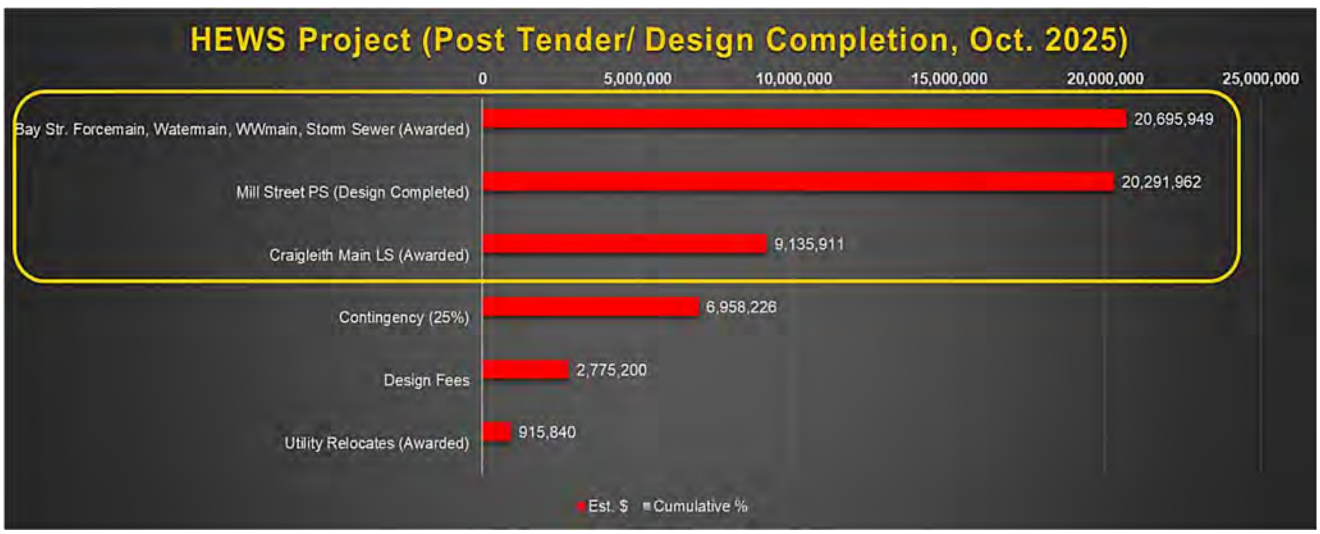
Pareto Distribution of Capital Investments

HEWS Project Component (At Design Completion)	Est. $	Cumulative %
Bay Str. Forcemain, Watermain, WWmain, Storm Sewer	12,472,703	35.85%
Mill Street PS	7,517,100	57.46%
Contingency (25%)	6,958,226	77.46%
Craigleith Main LS	5,067,900	92.02%
Design Fees	2,775,200	100.00%
TOTAL	**34,791,129**	



Value Target Functions Focused on Components at VM Study

HEWS Project (Post Tender)	Est. $	Cumulative %
Bay Str. Forcemain, Watermain, WWmain, Storm Sewer (Awarded)	20,695,949	34.05%
Mill Street PS (Design Completed)	20,291,962	67.44%
Craigleith Main LS (Awarded)	9,135,911	82.48%
Contingency (25%)	6,958,226	93.93%
Design Fees	2,775,200	98.49%
Utility Relocates (Awarded)	915,840	100.00%
TOTAL	**60,773,088**	



Appendix D

List of Creative Ideas with Evaluation Score and Action

List of Creative Ideas

Alter. No.	Creative Idea Description	Rank	Action	Grouped With	Comments / Notes
CS-00	**COLLECT SEWAGE**				
CS-01	INTRODUCE CAISSON SUBMERSIBLE PUMP FOR ADDITIONAL CAPACITY	8	A		FOR MILL STREET PS
CS-02	INITIATE HOME INSPECTION TO ELIMINATE STORM CONNECTIONS	8	G	IP-06	
CS-03	PROVIDE INCENTIVES TO HOMEOWNERS TO DISCONNECT STORMWATER CONNECTIONS	8	G	CS-02	
CS-04	CREATE GRAVITY FLOW AT THE PLANT SITE TO ALLOW FOR GRAVITY DRAINAGE	6	X		
CS-05	UPGRADE THE ELGIN STREET PS	8	A		
CS-06	IDENTIFY OTHER PS TO BYPASS MILL STREET PS	8	G	CS-05	
CS-07	IDENTIFY OTHER PS TO BYPASS CRAIGLEITH PS	8	G	CS-05	
IC-00	**INCREASE CAPACITY**	#T	#T		
IC-01	RE-PLUMB TREATMENT PLANT INLET	9	A		
IC-02	REVISIT PEAK FLOW AT CRAIGLEITH	9	A		
IC-03	REVISIT PEAK FLOW AT MILL STREET	9	A		
IC-04	MAITAIN MILL STREET PS	9	G	IC-03	RELATED TO IMPLEMENTING THE CURRENT FORCEMAIN DESIGN
IC-05	EXPAND AND LOWER EXISTING WET WELL AND MAXIMIZE EXISTING PUMPS	9	A		CONTINGENT ON IC-04
IC-06	EXPAND AND LOWER WET WELL	9	G	IC-05	
IC-07	DESIGN PUMPS FOR HIGHER CAPACITY	9	G	IC-05	
IC-08	ADD STORAGE FOR I&I AT CRAIGLEITH	9	A		
IC-09	ADD STORAGE FOR I&I AT MILL STREET	9	A		
IC-10	INCREASE FORCEMAIN SIZE AT CRAIGLEITH	7	X		
IC-11	PROCEED WITH LONGPOINT PROJECT TO REDUCE PRESSURE ON CRAIGLEITH	8	ABD		
IC-12	LINE THE TIMMINS/ LLOYD'S EASEMENT FOR ADDITIONAL CAPACITY AT CRAIGLEITH	8	A		
IC-13	CREATE A STORMWATER UTILITY BILLING STRUCTURE FOR THE SKI INDUSTRY FOR SNOW MAKING	8	DS		REVENUE SOURCE
IC-14	SEPARATE CAPITAL IMPROVEMENT FROM CAPITAL MAINTENANCE AND INTRODUCE DIFFERENT RATE STRUCTURE	10	ABD		TWO SEPARATE PROGRAMS
IC-15	REDUCE PROJECTION PERIOD TO 10 YEARS	8	G	IC-03	

List of Creative Ideas

Alter. No.	Creative Idea Description	Rank	Action	Grouped With	Comments / Notes
IC-16	ALIGN THE DESIGN LIFE WITH THE REVISED DESIGN FLOWS	8	G	IC-03	
IC-17	INSTALL INFLITRATION CHAMBERS UNDER THE PARK AT MILL STREET	1	X		
IP-00	**IMPROVE PERFORMANCE**	#T	#T		
IP-01	DEMOLISH MILL STREET PS AND BUILD A NEW ONE	8	A		COULD BE A NEW LOCATION OR ADJACENT TO THE CURRENT ONE
IP-02	MAINTAIN MILL STREET PS AND BUILD A NEW ONE	8	G	CS-01	FOR ADDITIONAL CAPACITY
IP-03	REMOVE COVER, SIDES AND ROOF OVER THE DRY WELL	8	A		
IP-04	REVISIT THE NEED FOR ODOUR CONTROL	7	ABD		INCLUDED IN THE CURRENT DESIGN; PROVISIONAL ITEM
IP-05	SEAL WASTEWATER MANHOLES	8	G	IP-06	
IP-06	REDUCE I&I IN THORNBURY TO 0.28L/SEC/HA	8	A		
IP-07	REDUCE I&I IN CRAIGLEITH TO 0.28L/SEC/HA	7	X		
IP-08	REPLUMB ALL THE FORCEMAIN COMING INTO TWWTP	8	G	IC-01	
IP-09	CONDUCT CONDITION ASSESSMENT AND REPAIR COLLECTION SYSTEM	8	DS		ASSET MANAGEMENT PROGRAM
IP-10	REPLACE ALL ASBESTOS CONCRETE (AC) FORCEMAINS	7	ABD		
IP-11	REDUCE SANITARY LOS TO MATCH DRAINAGE SYSTEM LOS	8	DS		
IP-12	MAINTAIN EXISTING ELECTRICAL INFRASTRUCTURE AT MILL STREET PS	8	G	IC-03	
IP-13	UTILIZE DUCTILE IRON PIPE IN-LIEU STAINLESS STEEL FOR NON-BURIED ASSETS	8	X		
IP-14	REVISE/ REVISIT TOWN'S ENGINEERING STANDARDS	8	DS		WATER AND WASTEWATER
IP-15	INTRODUCE FLOW MONSTER ON THE INFLUENT SIDE OF THE PUMPS	4	ABD		EXPENSIVE TO MAINTAIN
OS-00	**OPERATE SYSTEM**	#T	#T		
OS-01	REVISIT PUMP SIZING	8	G	IC-03	
OS-02	REVISIT THE GENERATOR SIZE	8	G	IC-03	RELATED TO POWER NEED
OS-03	CONSIDER SINGLE PUMP VFD AND FIX THE REMAINDER	8	A		
OS-04	CONSIDER ELIMINATING WET WELL AND DRY WELL CONFIGURATION	8	G	CS-01	
OS-05	CONSIDER IN-LINE PIPE STORAGE	8	DS		ALLOW FOR SURCHARGE ACROSS THE SYSTEM
OS-06	INTRODUCE PUMP CONTROL VALVES AT PUMP STATIONS AND NO VFDS	8	A		

List of Creative Ideas

Alter. No.	Creative Idea Description	Rank	Action	Grouped With	Comments / Notes
OS-07	LINE EXISTING INFRASTRUCTURE TO REDUCE I&I	8	G	IP-06	
OS-08	REPLACE INVERTED SIPHONS AND INTERCEPTORS WITH FORCEMAINS	6	X		
OS-09	RELOCATE TRANSFER STATION AT CRAIGLEITH PS	8	ABD	IP-04	
PI-00	**PROTECT INFRASTRUCTURE**	#T	#T		
PI-01	MAINTAIN AND UTILIZE CURRENT SURGE TANKS AT MILL STREET	8	DS		
PI-02	EXAMINE THE MERIT OF NET ZERO IN PUMP STATION BLDG.	8	DS		
PI-03	REPURPOSE MILL STREET SURGE TANKS	8	G	PI-01	

Action
A - Alternative
DS - Design Suggestion
EC - Estimate Correction
G - Group with Other Alternative
ABD - Already Being Done
X - Dropped during Development

Appendix E
VM Study Agenda

AGENDA
HEWS PROJECT VALUE MANAGEMENT STUDY
2026 FEB 23 - 26

DAY 01 (EST)	VM Phase (Six Step Method)	ITEM	HOST
8:30		Workshop and Team Introduction, Agenda Overview	Mushtaq Rabbi
8:45		VM Principles and Methodology Overview	Mushtaq Rabbi
9:00	**INFORMATION**	Program/ Project Overview Presentation: Goals, Constraints, Commitments, Business Drivers	Sponsor/ PM
		Q&A	All
9:15		Project Overview: Site Analysis, Technical Aspects	City/ Consultant
9:45		Q&A	All
11:00		**SITE VISIT**	
		Discussion, Questions on Project Scope, Design	VM Team
		Current Condition: Understand Risks to Performance	VM Team
1:15		**L U N C H**	
1:45	**FUNCTION ANALYSIS**	Identify and Classify Project Functions for Project Component (i.e. Basic Function, Required Secondary, Secondary Functions)	VM Team
3:15		**AFTERNOON BREAK**	
3:30	**FUNCTION ANALYSIS**	Validate/ Modify FAST diagram, Pareto Distribution of Capital Costs, Identify Value Target Functions (5-7)	VM Team
5:00		Adjourn for the day	
DAY 02 (EST)			
8:30		Recap from Previous Day. Ask questions. Validate and Confirm Performance Criteria	Mushtaq Rabbi
8:45	**CREATIVITY**	Brainstorm Alternative Ideas around Required Secondary and Secondary Functions for each segment of the project. Generate large number of ideas. No restriction and free flowing. No judgement by team members at this time. Ideas will be recorded on spreadsheet. Key question: How else can we achieve this function (identified Value Target Functions)?	VM Team
9:45		**MORNING B R E A K**	
10:00	**CREATIVITY**	Brainstorming of Alternative ideas continues	VM Team
12:00		**L U N C H**	
1:00	**EVALUATION**	Review Performance Criteria. Evaluate Ideas those are most suitable and applicable for enhancing performance for each segment of this project. Team scoring approach. Team scoring and discussion continues	VM Team
2:45		**AFTERNOON BREAK**	
3:00	**EVALUATION**	Team scoring and discussion continues	VM Team
4:00	**DEVELOPMENT**	Assign Ideas for detailed Development and Next Steps	Mushtaq Rabbi
5:00		Adjourn for the day	
DAY 03 (EST)			
8:30 - 12:00	**DEVELOPMENT**	Demonstrate Value Alternatives Template. Selected ideas shall be developed on the basis of, what is existing, what value this idea will add, why it is important, impacts on capital cost, O&M cost, LCC, prepare sketches or provide pictures within the write up.	VM Team
12:00		**L U N C H**	
1:00 - 5:00	**DEVELOPMENT**	Compile Developed Business Cases, Grouping of Ideas/ Options	VM Team
DAY 04 (EST)			
8:30 - 12:00	**DEVELOPMENT**	Development Phase Continues (incl. cost estimates) with Morning, Lunch and Afternoon Breaks	VM Team
12:00		**L U N C H**	
1:00 - 2:30	**DEVELOPMENT**	Compile Developed Business Cases, Grouping of Ideas/ Options	VM Team
2:30 - 5:00	**RECOMMENDATION/ PRESENTATION**	**Present Preliminary VM Findings** **Next Steps**	VM Team

Appendix F

Core Value Management Study Team

VM Team Roster

Team Member Name	Organization	Role	Phone or Email
Value Team			
Alan Pacheco	Town of The Blue Mountains	Director, Operations	apacheco@thebluemountains.ca
Allison Kershaw	Town of The Blue Mountains	Manager, Water & WW	akershaw@thebluemountains.ca
Chris Johnston	Kerr Wood Leidel	Hydraulics	cjohnston@kwl.ca
David McPherson	HDR	Pipelines & Pump Stations	david.mcpherson@hdrinc.com
Jamie Baker	EVB Engineering	VP/ Senior Municipal Engineer	jamie.baker@evbengineering.com
Mark Service	Town of The Blue Mountains	Wasterwater Supervisor	mservice@thebluemountains.ca
Mike Humphries	Town of The Blue Mountains	Sr. Infra. Capital Projects Coordinator	mhumphries@thebluemountains.ca
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Monica Quinlan	Town of The Blue Mountains	Director, Corporate & Financial Services	mquinlan@thebluemountains.ca

Appendix G

List of VM Study Participants

HOUSING ENABLING WATER SYSTEMS (HEWS) VM STUDY
LIST OF PARTICIPANTS
2026 FEB 23 - 26 (32.0 Hours)

NAME	DISCIPLINE/ ROLE	ORGANIZATION	CONTACT INFO./ EMAIL	M	T	W	TH
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Ping Pang	Cost Analyst	BTY Group	pingpang@bty.com				

Appendix H

Information Phase Slides

February 23, 2026

Mike Humphries
Allison Kershaw

CRAIGLEITH MAIN LIFT STATION, MILL ST PUMP STATION AND BAY ST RECONSTRUCTION

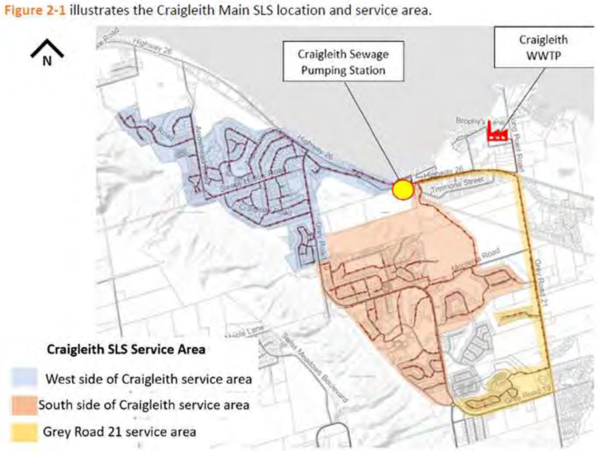
Project Overview

TOWN OF THE BLUE MOUNTAINS

1

CRAIGLEITH MAIN LIFT STATION AND SEWER SHED

Figure 2-1 illustrates the Craigleith Main SLS location and service area.



TOWN OF THE BLUE MOUNTAINS

2

CRAIGLEITH MAIN LIFT STATION UPGRADES: PROJECT INITIATION

- Aging Infrastructure (42 yrs old)
- Health and Safety concerns, station does not meet the electrical regulations (Class 1, Division 1 – separation of electrical gear from sewer gases)
- Town Wide Sanitary Collection System Model and Needs Assessment Report, Cole Engineering 2019 identified:
  - Major upgrades required to Craigleith Main SLS, including the replacement of the existing pumps and addition of a third pump
  - The station is unable to meet the MECP operating requirements under a 2-year rain event
- Existing pumps have been failing on a regular basis since 2018
- Complete pump failure occurred in 2022 and single pump failure in 2025
- Replacement parts for the existing pumps are no longer available
- VFD’s have failed numerous times; installed a third VFD as a temporary preventative (plug and play) measure
- Backup Generator is at the end of its useful service life
- Major sewage backup caused damage to several residences on Frasier Crescent in 2021
- Numerous odour complaints have been received
- Ongoing and planned development pressures in Craigleith

TOWN OF THE BLUE MOUNTAINS

3

MILL ST SEWAGE PUMP STATION UPGRADES

TOWN OF THE BLUE MOUNTAINS

4

MILL ST SPS UPGRADES: PROJECT INITIATION

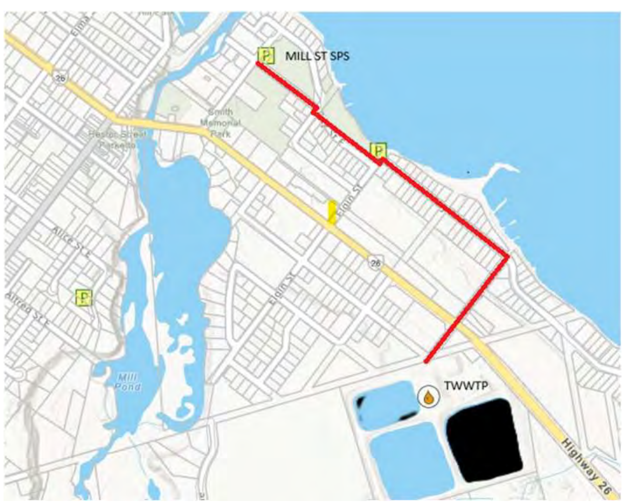
Mill Street SPS – Capacity and Growth Constraints

- Significant development pressure from Lora Bay and multiple developments within Thornbury
- No available sanitary capacity; seven (7) developments are currently on hold
- The *Town-Wide Sanitary Collection System Model and Needs Assessment Report* (Cole Engineering, 2019) identified:
  - Major upgrades required to the Mill Street SPS
  - Forcemain upgrades and/or twinning from Mill Street to the TWWTP
  - Significant sanitary sewer upsizing to address system surcharging
- Existing wet-well is undersized and doesn't provide adequate storage time
- Multiple overflow events have occurred, with sewage hauling required during wet weather events to manage peak flows
- Existing pumps were installed in 2008, and both have been rebuilt twice, and will be due to be replaced in 2028, approaching the end of their useful service
- Ongoing inflow and infiltration (I/I) issues within the Thornbury collection system

TOWN OF THE BLUE MOUNTAINS

5

BAY ST RECONSTRUCTION



TOWN OF THE BLUE MOUNTAINS

6

BAY ST RECONSTRUCTION: PROJECT INITIATION

Bay Street East / Forcemain and Servicing Constraints

- The project was originally scoped for forcemain installation only from the Mill Street SPS to the Thornbury Wastewater Treatment Plant (TWWTP) to align with the Mill Street SPS upgrades
- Full roadway reconstruction is now required due to the poor condition of the aging asbestos cement sanitary sewer and watermain
- Numerous watermain and service breaks have occurred along Bay Street East in recent years
- A new outfall is required from the Thornbury Wastewater Treatment Plant to Georgian Bay; the most efficient alignment is directly north along Grey Street to the water
- This outfall route was identified in the *MacViro Master Servicing Report* (2006)
- The alignment for the additional forcemain was selected to maintain operation of the existing forcemain and allow for safe construction
- Following the existing forcemain alignment is not feasible due to limited corridor space and the brittle condition of the existing pipe

TOWN OF THE BLUE MOUNTAINS

7

PRESENTATION BY THE CONSULTANTS OF RECORD

ENGINEERING SERVICES FOR CRAIGLEITH MAIN SEWAGE PUMPING STATION, MILL STREET SEWAGE PUMPING STATION AND MILL STREET FORCEMAIN IMPROVEMENTS PROPOSAL #2022-82-P-OPS VALUE ENGINEERING EXERCISE

FEBRUARY 23, 2026

WT INFRASTRUCTURE
PRACTICAL INNOVATION

EVB ENGINEERING

1

OVERVIEW

- Introduction
- Scope of Work
- Key Design Changes
- Exterior Factors

2

SCOPE OF WORK - CRAIGLEITH SPS

- **Building Envelope**
  - Separation of the dry well from the ground floor operations and electrical equipment space is the most efficient method of reducing the heating energy efficiency while achieving the area classification for the electrical distribution equipment.
  - Construction of an air lock to isolate the below grade dry well from the above grade operations floor which will de-classify the operations area, then address the classified area with the following:
    - Provide Class 1 Division 2 Group D equipment (process and electrical) in the dry well space only.
    - Provide gas detection including alarming and intermittent ventilation based on occupancy for the dry well.
- **Process**
  - Development of the design criteria and future SPS capacity is required to define the ultimate pumping capacity of the facility.
  - Replace the existing centrifugal pumps with pumps that operate efficiently in the main duty range of the facility. Pumps shall be self-cleaning semi-open impeller designed for wastewater pumping.
  - Replace the suction header to allow the new pumping arrangement to draw from either wet well with any of the pumps in operation.
  - Replace the two (2) 200 mm diameter forcemain transition piping sections.
  - Provide actuated valves at the entrance of each 300 mm forcemain as well as on the drains for each forcemain.
  - Remove the inlet channel grinder.
  - Flow control metering.
  - Limited space in the dry well to provide multiple pumping options, high design flows documented in the Wastewater Master Plan.

3

SCOPE OF WORK - CRAIGLEITH SPS

- **Electrical and Controls**
  - Facility upgrades of the electrical distribution equipment and pump control Variable Frequency Drives be replaced which will improve the efficiency of the wire-to-water efficiency of the station.
  - MCC lineup to be replaced as part of the electrical upgrades.
  - New standby generator to be located outside.
  - SCADA interface and programmable logic controller to be undertaken as part of the electrical upgrades.
  - Installation of PV Solar Panels to offset the energy consumption.
  - Power meter to be incorporated into the design.
  - Mag meter for flow measurement of sanitary flows discharged to the CWWTP.
- **Odour Control**
  - In the short-term, the septage/leachate discharge pipe should be extended below the water level in the entrance channel to the SPS.
  - Odour monitoring will be completed for 6 months to determine the causation and magnitude of treatment required for the site. The Consultant is responsible for the design of the recommended installation.
  - It is anticipated that the septage/leachate receiving will be relocated to the CWWTP within the next 5 to 7 years. Odour control will be required for the pumping station activities only.
  - Site Works
  - A visual tree barrier between the facility and the trail would reduce the visual impact of the facility from the Georgian Trail and the future land development area to the south.
  - As the existing roadway and parking area is deteriorating, the asphalt needs to be rehabilitated.
  - Improved protection of the electrical transformer shall also be incorporated.

4

SCOPE OF WORK - CRAIGLEITH SPS

- **Provisional Works – Public Washroom**
  - **In addition to the upgrades at the Craigleith SPS, the Town wishes to have the Consultant provide an engineering services fee for modifications to the building to support an all season public washroom that could be used by both Town staff and the public. The Craigleith SPS is adjacent to the Georgian Trail.**

5

SCOPE OF WORK - MILL ST. SPS

- **Review of the existing Mill Street Sewage Pump Station (SPS) Performance**
  - Audit Process Systems and related controls
  - Audit Process related equipment
  - Audit Building System
  - Audit of Operations Practices and Procedures
  - Sanitary flows and recommendations
  - Analysis of the future full buildout sanitary flows and submersible pump recommendations
- **Provisional Works – Public Washroom**
  - In addition to the upgrades at the Mill Street SPS, the Town wishes to have the Consultant provide an engineering services fee for modifications to the building to support an all season public washroom that could be used by both Town staff and the public. The Mill Street SPS is adjacent to the Bayview Park and Cedar Grove areas.

6

SCOPE OF WORK - MILL ST. SPS

- **The Town is seeking Consultant Engineering Services for the engineering of a new forcemain between the Mill Street SPS and Thornbury Wastewater Treatment Plant which is approximately 1,300 metres long.**

7

PROJECT TIMELINE AND DESIGN CHANGES

- Agreement – May 1st, 2023
- Kick-off Meeting – May 15th, 2023
- Craigleith SPS
  - 30% Design – September 2024
  - 60% Design – February 2025
  - 90% Design – April 2025
  - Tender Submission – June 2025
  - Tender Close – September 2025
- Mill St. SPS
  - 30% Design – May 2025
  - 60% Design – July 2025
  - 90% Design – September 2025
  - Tender Submission – January 2026

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PROJECT TIMELINE AND DESIGN CHANGES

- Bay St. Reconstruction
  - ECR No. 1 – October 3, 2023 (Approved December 5, 2023)
    - Bay St. Reconstruction
  - December 2nd, 2023 – Project Walkthrough Bay St.
  - PIC No. 1 – April 2024
  - PIC No. 2 – December 2024
  - 60% Design – February 2025
  - 90% Design – May 2025
  - 100% Design – June 2025
  - Tender Close – October 2025

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KEY DESIGN CHANGES - CRAIGLEITH

- Public Washroom omitted from design (Separate building for future). Private washroom added to main scope.
- Re-design the existing generator room to a new electrical room to account for the area classification of the operations space.
- Removal of the air-lock and continuous ventilation to limit heating energy waste
- Significant design flows with limited dry well space and undersized forcemains
- The forcemains created a bottleneck to the design which directly influences the pumping energy requirements
- Due to the limited wetwell space, pump arrangement modifications were limited with minimum pump capacity required to meet MECP design guidelines dictates the redundancy requirements
- Level of Service Standard – Refer to the Wastewater Master Plan
- Net Zero Building Emissions (Corporate Policy POL.COR.23.05)

10

KEY DESIGN CHANGES – BAY ST. RECONSTRUCTION

- Public Consultation Delay Impacts – 14 months (impacted both Bay and Mill)
- Grey St. Outfall Coordination
- Grey St. Reconstruction
  - Originally not urbanized with no storm sewers. Storm added through design for outlet to Bay.
- Storm Requirements
  - CLI-ECA Compliance – Treatment – Not initially included in estimates.
  - Allowance for Highway 26 Development uncontrolled flow.
  - Allowance for Stormwater Master Plan Outfall Upsizing
  - Existing storm outfall headwall could not be used.
- Public Consultation Changes
  - Design change from standard cross-section to one way with active transportation within paved surface (contra-flow)
- Excess Soil
  - Contaminated materials identified at bottom of Grey St.
- Bay St. Utility Relocation
  - EPCOR, Rogers, Bell, Enbridge
- Elgin St. Decommissioning
  - Recommended by WT to eliminate future expansion plans

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KEY DESIGN CHANGES – MILL ST. SPS

- Concurrent Master Plan Impacts – Flows confirmed in 2024
- Design Advancement delayed due to concerns with Public consultation impacts
- Elgin St. SPS Decommissioning – increased inlet sewer depth by 1.5 m. resulting in lowering of the overall facility
- Design Advancement lagged behind Craigleith SPS due to concerns related to public/Council direction related to Bay St. design.
- Lag extends by-pass pumping period.
- Electrical Utility service capacity and emergency generator sizing at ultimate flows
- Solar Panel energy efficiency review based on the existing building layout.

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EXTERIOR FACTORS

- Unanticipated Cost Inflation
- Exterior Scope Impacts (Utilities, Outfall, Council Direction)
- Public Consultation Delays – 14 month delay impacted linearity of project which impacted where the three projects were when estimates were prepared for funding.
- Project delays pushed construction from spring 2025 to fall 2025 which escalated construction costs due to winter construction (Bay St.).

13

QUESTIONS

14

Appendix I

Moments from the VM Session


No Signal

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