




# INFORMATION REPORT

<b>TO:</b>	Chair and Members Public Works Committee
<b>COMMITTEE DATE:</b>	September 19, 2022
<b>SUBJECT/REPORT NO:</b>	Woodward Water Treatment Plant – Phase 2 Process Upgrades (PW22078) (City Wide)
<b>WARD(S) AFFECTED:</b>	City Wide
<b>PREPARED BY:</b>	Stuart Leitch (905) 546-2424 Ext. 7808
<b>SUBMITTED BY:</b>	Mark Bainbridge Director, Water and Wastewater Planning and Capital Public Works Department
<b>SIGNATURE:</b>	

## COUNCIL DIRECTION

Not Applicable

## INFORMATION

### Overview:

Over the last several years Hamilton Water (HW), through the Capital Delivery section completed a Best Available Technologies and Feasibility Study (CH2M Hill 2016) and are nearing completion of a Conceptual Design (AECOM 2022) for the Woodward Water Treatment Plant (WTP) Phase 2 Process Upgrades. Concurrently, Capital Delivery completed the WTP Phase 1 Process Upgrades through a construction project that involved large capital maintenance upgrades. The upcoming WTP Phase 2 Process Upgrades are largely focused on increasing capacity output of select processes within the WTP along with critical process and water quality improvements. The project is currently planned to commence a full design assignment in 2023 and a subsequent construction tender from 2026 through 2032.

The recently completed Core Asset Management Plan (PW22048) including the City of Hamilton's (City) Waterworks identified that the condition of the WTP is rated as four (4) or Poor, largely due to the deficiencies identified in this report.

Financial:

**SUBJECT: Woodward Water Treatment Plant – Phase 2 Process Upgrades  
(PW22078) (City Wide) - Page 2 of 6**

---

A 10-year forecasted budget (cash flowed) for the WTP Phase 2 Process Upgrades of \$165M was included in the 2022 Water, Wastewater and Storm Rate Budget (FCS21088) under Project ID #5142166110. Recent updated estimates developed during the Conceptual Design are in the order of \$348M, excluding inflation and contingency. The estimated increase of \$183M is a result of increasing project scope including unanticipated treatment improvement requirements reflecting guidance from the Ministry of the Environment, Conservation and Parks (MECP), and changing economic factors.

**Influencing Project Factors:**

**Capacity Restrictions**

- At times there are challenges meeting current water production demands and there is a forecasted inability to meet future demands (impact on growth).
- Various treatment processes are currently experiencing hydraulic restrictions and there is evidence of filter underdrains that are failing. These deficiencies impact the efficiency and production capacity of the WTP.

**Filter Backwashing Risks**

- Failure of system due to age-related deterioration or mechanical failure, resulting in underdrain failure(s) and reduction in capacity.

**Aged Infrastructure**

- Filter underdrains (22 of 24),
- Seized/inoperable valves/gates,
- Structural concrete deficiencies,
- Obsolete equipment requiring removal, and
- Low voltage electrical

**Chlorine Building Challenges**

- Building at end of service life due to structural deficiencies.
- Operational/maintenance challenges associated with difficult access.
- Process equipment and piping reaching end of service life.

**Treated Water Quality Concerns**

- Impaired raw water quality due to climate events challenges the treatment efficacy of the existing sedimentation and filter processes.

**SUBJECT: Woodward Water Treatment Plant – Phase 2 Process Upgrades  
(PW22078) (City Wide) - Page 3 of 6**

---

Regulatory Expectations

- Over the last several years, the MECP have commented that while HW is achieving compliance targets for chlorine contact requirements at the WTP, the WTP design does not comply with MECP guidelines or industry best practices. As a result, disinfection credits are being granted for treatment processes upstream of the filters which is considered non-standard and a risk to sustainable treated water quality. In addition, the WTP does not have the ability to direct treated water from the backwashed filters to a waste stream while the filters 'ripen'. Instead the treated water from the 'ripening' filters is mixed with fully treated water in the WTP Clear Wells and distributed to the community.

Individual Project components that Comprise the WTP Phase 2 Process Upgrades:

Project Components	Description	Capital Cost Estimate*
Lowlift Pumping Station (LLPS) upgrades	Upgrades are anticipated as a result of changes to the hydraulics through the new WTP pretreatment process when reusing the existing sedimentation tanks.	\$21.6M
Temporary pre-treatment	Due to seasonal demands and the anticipated duration to sequence the construction works, this is necessary to ensure the City continues to meet capacity during construction.	\$20.1M
Pre-treatment process	New process technology is required to reduce the hydraulic bottleneck in the existing sedimentation tanks and increase capacity. This will also improve pretreatment water quality and filter performance.	\$87.7M
Filter to waste	Currently the plant does not include a filter to waste process. A new filter to waste system will allow for filter 'ripening' after a backwash prior to finished water production. This process will mitigate water quality challenges after a backwash cycle will address MECP design concerns.	\$21.6M
Backwash System	The equipment will be housed in the new ultra- violet (UV) building. The	\$17.3M

**SUBJECT: Woodward Water Treatment Plant – Phase 2 Process Upgrades  
(PW22078) (City Wide) - Page 4 of 6**

Project Components	Description	Capital Cost Estimate*
	new backwash system will use non-chlorinated water which will prolong the service life of the filter media and reduce replacement frequency.	
Filter Underdrains	Replace the filter underdrains in 22 out of 24 filters (two filter underdrains were recently replaced due to failure). The works will ensure filtration redundancy and capacity is maintained.	\$31.6M
Replace Filter Media	This is necessary to ensure filtered water quality and occurs every four years in order to meet water quality objectives.	\$12.9M (two replacement occurrences).
UV Disinfection Process	Adding post-filter UV will address MECP concerns regarding disinfection credits, reduce the use of chlorine for disinfection, and address concerns over degradation of process equipment and filter media due to current practice of pre-treatment with chlorine. In addition, UV will provide Giardia inactivation post filtration.	\$79.1M
Chlorine Building	Required to replace existing aged structure as well as ensure security of supply with growing demands from both Water and Wastewater Treatment Processes. The new building will incorporate the ability to use two alternate chlorine supply strategies.	\$20.1M
Miscellaneous Upgrades	Other ancillary works required such as landscaping, yard piping, filter effluent piping, clearwell tank concrete restoration, excess soils management, etc.	\$35.9M
The total cost estimate for the WTP Phase 2 Process Upgrades excluding contingencies and inflation.		\$348M

\*Identified costs exclude contingencies and inflation.

**Project & Future Staffing:**

Due to the scale and complexity of the WTP Phase 2 Process Upgrades scope of work, successful project delivery will present a number of staffing challenges including the necessity to resource a dedicated project team (similar to the Woodward Upgrades Program), and the requirement for support from dedicated operational representatives.

Overall project timelines are estimated to be 3.5 years for design and between six to eight years for construction. In order to balance the level of internal effort to manage this large capital project, HW anticipates that additional staffing resources will be required including new staff to operate and maintain the new processes and equipment once commissioned.

**Next Steps:**

- 1) HW is undertaking a third-party review of key areas that are deemed critical to the success of this project as part of a due diligence approach. The main project scope of this review includes:
  - Capital Construction Cost Review of the WTP Phase 2 Process Upgrades capital budget evolution from the CH2M Hill 2016 Study to the current AECOM 2022 conceptual design. The review will focus on additional scope identified during the AECOM 2022 conceptual design. Other factors will also be assessed including labour shortages, complex project sequencing, supply chain challenges, excess soil regulations, material costs and escalating inflation.
  - An analysis of HW staff resources that are necessary to support this project including recommendations for additional resources if required, and the development of an organizational structure for the project that will support HW for success.
  - Construction phasing opportunities based on a thorough process, structure and site civil risk analysis (further to the CH2M Hill 2016 and AECOM 2022 assignments).
  - Risk analysis of large capital construction activities proceeding concurrently at the Woodward Avenue Water and Wastewater facilities.

This third-party review is currently in progress with completion anticipated by Q2 2023. The objective is to provide a comprehensive independent assessment of the studies completed to-date including associated cost estimates.

- 2) 2023 Water, Wastewater and Storm Rate Budget (November 2022): The Water Treatment Plant Phase 2 Process Upgrades forecast has been increased by \$183M in the 10 Year Capital Plan as part of the 2023 Budget process. The \$183M increase is based on the latest conceptual design reporting and multi-year budgeting strategy

**SUBJECT: Woodward Water Treatment Plant – Phase 2 Process Upgrades  
(PW22078) (City Wide) - Page 6 of 6**

---

of \$348M. Once the third-party review noted above is completed, staff will again revisit the 10 Year Capital Plan as part of future Budget processes.

- 3) Staff plan to present a recommendation report to the Public Works Committee in summer 2023 that includes a full project plan for the WTP Phase 2 Process Upgrades along with an updated budget, and resource requirements to support the project.

Closing:

This information report identifies significant capital upgrades that are required at the City's Woodward WTP and impacts to the 2023 Water, Wastewater and Storm Rate Budget and the corresponding 10-year Capital Budget. It is anticipated that additional committee reports will be presented in 2023 so that Council can make fully informed decisions regarding financial and staff resource requirements for these upgrades.

**APPENDICES AND SCHEDULES ATTACHED**

Not Applicable