

Staff Report



To	Committee of the Whole
Service Area	Infrastructure, Development and Enterprise Services
Date	Tuesday, June 7, 2022
Subject	2021 Water Supply Master Plan Update

Recommendation

1. That the 2021 Water Supply Master Plan Update be approved according to the requirements of the Class EA process, and the associated projects be implemented subject to future budget approvals.
 2. That Delegation Authority be provided to the Deputy CAO of IDE to enter into a cost sharing agreement with the County of Wellington, Township of Puslinch and Guelph/Eramosa Township, subject to the satisfaction of the City solicitor, for Source Water Protection Services.
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Executive Summary

Purpose of Report

The purpose of the report is to present the findings of the 2021 Water Supply Master Plan (WSMP) Update and receive approval of the recommendations. The goal of the WSMP Update is to support the 2003 Council direction “that the focus of the Water Supply Master Plan establishes a sustainable water supply to regulate future growth”.

Key Findings

Completed through the Municipal Class Environmental Assessment (Class EA) process, this WSMP is an update to the 2014 Plan. With release of new 2051 Places to Grow population forecasts by the Province of Ontario in 2020, it was prudent to undertake an update to the water demand forecast, the existing water system capacity, and the status of ongoing projects to meet this new planning horizon.

Key themes emerged through the completion of an extensive community engagement process: widespread support for the City’s water conservation and efficiency programs, protection of the natural environment, managing growth and development and controlling impacts from large water users and on other water users (such as in the surrounding Townships). Pursuing new water supply inside the City emerged as a priority through this engagement, before seeking water opportunities outside the City. In addition, Indigenous engagement identified valuing the agency of water as an important aspect to consider.

Through analysis, the City’s firm water supply capacity was determined to be approximately 79,422 m³/day however, the system could be subject to events like prolonged droughts and loss of supply capacity (i.e., contamination events, major

maintenance/ upgrades, and Permit to Take Water revisions) that may reduce the available firm capacity. A firm capacity range of approximately 65,447 to 79,422 m³/day is proposed for planning purposes. This would ensure that the water supply capacity always remains at about 15 percent above demand to ensure security of supply and continuity of service during planned and unplanned maintenance events. In comparison to the anticipated average and maximum day demand, the current water supply system capacity will have a deficit for the average day demand of approximately 3,000 m³/day and for the maximum day demand of approximately 26,000 m³/day in 2051 with the inclusion of additional 15% capacity allowance for security of supply.

To address the water supply deficit, the WSMP Update has considered the following water supply alternatives: Water conservation, efficiency, and demand management; Groundwater sources inside and outside of the City; Aquifer storage and recovery (ASR); Local surface water sources; Limit community growth; and Do nothing.

The 2021 WSMP Update has indicated that there is enough water supply within and surrounding the City of Guelph to support growth to 2051. This includes the recently added Dolime quarry land. However, further field assessment and monitoring is required through future water supply master plans to inform exact quantities of local water resources available for future growth in Guelph. Groundwater is a finite resource and there will be a future limit which will need to be considered by future councils on water supply and growth in Guelph.

Through the evaluation of alternatives, preliminary preferred solutions were recommended for the short-term (0 to 10 years), mid-term (11 to 20 years) and long-term (year 21 to 2051). A limit growth alternative and a do nothing alternative were also assessed as part of the Class EA process but were ultimately eliminated as these alternatives do not meet the goals of the WSMP Update which include the goals of the Places to Grow Act.

Financial Implications

Under the Development Charges Act, the development and capital construction of new water servicing capacity to support community growth is funded by Development Charges (DCs), with exact project funding eligibility to be confirmed through the City's Development Charge Review Background Study scheduled to start in the summer of 2022 and due for completion in 2023.

Through development of 2022 Capital Budget, WSMP Update budget needs and cash flows for the next 10-year basis (2022-2031) have mostly been built into the capital forecast and user rates coming from Operations and Maintenance needs of new Capital expenditures. For reference, the table below provides a summary of short-, mid- and long-term capital costs by project alternative under the 2051 forecast of the WSMP, including the location of the projects. The total cost of the plan ending in 2051 is approximately \$164.7 million for groundwater supply development and water conservation, efficiency and demand management programming, based on 2021 construction cost rates. An additional \$57.3 million would be required for the development of surface water supplies and aquifer storage and recovery (ASR), should this be considered in the long term (post 2051). However, it is noted that that these forecasted costs will be further refined through the Class EA process as the individual projects are further developed.

Please find project list, estimated cost and location of project in Attachment 1.

Further to capital costs, it is anticipated that an additional \$5.2 million in future Operations and Maintenance costs to be incurred over the next 10 years.

The City's WSMP is a key step in the overall implementation of the City's Official Plan. As we move from the master plan stage to the implementation stage, more robust analysis of project timing and cost estimates will be performed. This master plan will be considered with the other master plans nearing completion and will be viewed with a corporate lens to incorporate the City's strategic goals. Once the overall financial impact is understood the plan will be compared to our existing capital plan, incorporate fiscal constraints and our capacity to deliver. The timing, pace and overall cost of this plan is subject to change. The financial information outlined is intended to be a high-level estimate that will be refined as it is incorporated into the overall corporate plan and multi-year budget process.

Report

The goal of the WSMP Update is to support the 2003 Council direction "that the focus of the Water Supply Master Plan establishes a sustainable water supply to regulate future growth". The WSMP Update includes reviewing our current water supply sources and identifying priorities for a sustainable municipal water supply from now until 2051 to satisfy the Places to Grow Population forecasts. The proposed implementation strategy must deliver, through to 2051, an adequate amount of water in a safe and cost-effective manner while ensuring that environmental sustainability is not compromised. The WSMP is updated approximately every 5 years. Further information can be found at www.guelph.ca/wsmp.

As outlined in Section 1 of the report, the WSMP Update follows the Municipal Class Environmental Assessment (MCEA - <https://municipalclassea.ca/>) process for Master Plans (Municipal Engineers Association, 2015) and is intended to fulfill the following MCEA process phases:

- Phase 1 - Identify and describe problem(s) and opportunities.
- Phase 2 - Identify and evaluate alternative solutions and establish the preferred solution.

The WSMP Update identifies the need for individual projects and their conceptual feasibility, including anticipated project triggers and impacts. Individual projects will proceed in accordance with remaining Class Environmental Assessment (Class EA) requirements (i.e., Phase 3 – Alternative designs concepts for the preferred alternative, Phase 4 – Environmental study report and Phase 5 – Implementation).

Remaining approvals will be completed with a focus on addressing site-specific environmental impacts, and the required engagement/consultation and documentation as per the MCEA process. This process will provide the City with further understanding of potential impacts and determine if the projects are viable. The WSMP Update was completed by a Project Team consisting of City staff, a consultant team lead by AECOM Canada Ltd. as lead consultant and subconsultants consisting of Matrix Solutions Inc. and Gauley & Associates.

Population and Water Supply Demand Forecasts

The WSMP Update reflects the most recently released population and employment growth rates of the August 28, 2020, A Place to Grow Growth Plan for the Greater Golden Horseshoe report. Therefore, the population forecasts include a residential population and employment population of 203,000 and 116,000, respectively. Further information can be found in [Section 3 of the WSMP report](#).

To develop water demand forecasts to 2051, the Project Team used the historical population and water demand data within the city to develop average annual demand (AAD) and maximum annual day (MAD) water demand projections. In addition, Non-Revenue Water (NRW), water that does not reach customers including leaks in the system, watermain flushing, fire flows, and other uses, were modelled on a per capita basis to assist in forecasting total system demands. These per capita average day water demands were determined to be as follows:

- Average per capita residential demand rate 2015-2019: 166.6 Lcd
- Average per capita employment demand rate 2015-2019: 191.0 Lcd
- Average per capita NRW rate 2015-2019: 60.8 Lcd

The Project Team determined that the per capita rates above represented reasonable estimates to extrapolate to 2051. Therefore, the projected average day water demand and production rates to 2051 are estimated as follows:

- Residential – 33,814 m³/day
- Employment – 22,155 m³/day
- Non-Revenue Water – 12,338 m³/day
- Total Average Day Demand – 68,306 m³/day

The Maximum Day Factor (MDF) for a water system is generally defined as the ratio between the water production rate on the highest single production day each year (maximum day) and the AAD production rate for the entire year. To be conservative, a MDF of 1.34 has been used when projecting future maximum day water demands in Guelph based on the highest demand day operational experienced over the last 5 years. Taking the MDF into account, the following 2051 demand forecasts were defined as:

- Total Average Day Demand – 68,306 m³/day
- Total Maximum Day Demand – 91,530 m³/day

These water supply demand forecasts were then used to compare to the City's existing water supply firm capacity to determine if the City needs additional water to satisfy the demands in 2051.

Existing Water Supply Capacity

As presented in [Section 4 of the WSMP report](#), a capacity assessment was completed for the City's existing groundwater supply system, which comprises 25 drilled groundwater wells screened within overburden, shallow and deep bedrock aquifers, one groundwater collection system, the Eramosa River intake and a groundwater recharge system. The purpose of the capacity assessment is to document the following:

- The current maximum capacity for each individual groundwater supply source and identify any constraints to operating at the maximum.
- The sustainable capacity of the overall groundwater supply system.
- An evaluation of potential risks to system operation and determine the vulnerability of the identified sustainable capacity from a hydrogeological and operational perspective.

The total firm capacity of the City's existing active groundwater sources is approximately 79,422 m³/day. This estimate reflects best-case operating conditions and recognizes interference effects between the City's groundwater supply sources, as well as other interferences from non-municipal water takings.

The City's water supply capacity assessment included a review of the existing system capacity under various conditions that could potentially reduce overall capacity. These included drought conditions, a potential contamination event, and regulatory permitting changes. The results of the supply capacity security assessment are listed as follows:

- Normal conditions: 79,422 m³/day
- Drought conditions: 65,447 m³/day
- Loss of source: 73,437 to 76,200 m³/day
- Regulatory approvals: 73,300 to 77,200 m³/day

For planning purposes, this results in an existing water supply capacity of 65,447 to 79,422 m³/day or a range of approximately 15 percent to ensure a secure water supply of water if a potential loss of supply event were to occur.

Comparing back to the 2051 water demand, with an average day of 68,300 m³/day and a maximum day of 91,500 m³/day, this results in a water supply deficit for the average day demand of approximately 3,000 m³/day and for the maximum day demand of approximately 26,000 m³/day. This deficit, which includes the 15 percent contingency, is the amount of new water supply that needs to be developed prior to 2051 as part of the WSMP Update.

Water Supply Alternatives

As outlined in [Section 5 of the WSMP report](#), the current WSMP Update considered similar water supply alternatives as the past master plans. These alternatives were evaluated with input from various stakeholders including the public. To meet the project demand, the alternatives included the following:

1. Water conservation, efficiency, and demand management
2. Groundwater sources inside and outside of the City of Guelph
3. Aquifer Storage and Recovery (ASR)
4. Local surface water sources
5. Limit Community Growth
6. Do Nothing

Further details on the water supply alternatives described above can be found at www.guelph.ca/wsmp.

Environmental Assessment Evaluation Criteria and Process

As outlined in [Section 6 of the WSMP report](#), following the Municipal Class EA process, each of the alternatives described above were evaluated as compared to criteria used previously and as modified through the community engagement program. The evaluation criteria are listed as follows:

- Effect on Indigenous Values, Culture, and Traditional Use
- Technical Considerations
- Natural Environment
- Built Environment
- Social/ Cultural Environment
- Legal/ Jurisdictional Considerations
- Financial Considerations

The evaluation criteria were used to prioritize the water supply alternatives and to develop a list of preliminary, preferred solutions and an initial implementation timeline.

Implementation Recommendations

The final recommendations for implementation are summarized below and presented in [Section 8 of the WSMP report](#):

1. Continue Supporting Water Conservation, Efficiency and Demand Management

Water conservation, efficiency and demand management alternatives were developed through consideration of four scenarios with different levels of programing to achieve different levels of demand reduction. A summary of potential savings and estimated costs for each scenario is tabulated below.

The final recommendation is that a blended scenario is used to inform targets of the next Water Efficiency Strategy Update. This would include focusing on high water users and current and future water reuse opportunities.

2. Initiate Water Supply Alternatives

The WSMP Update recommends that all the water supply alternatives evaluated be considered as part of the preferred solution. It is noted that all the water supply alternatives must be further studied and evaluated through the Class EA as there is uncertainty on the potential capacity that may result from each project as the projects proceed through the Class EA process.

Further, some projects may identify environmental, social, or economic constraints that may reduce the assumed capacity for each alternative. Some projects may not be feasible, or the environmental impacts may be too significant to mitigate. As the projects proceed and with each subsequent update of the WSMP, the potential supply capacities and the proposed timelines can be re-evaluated, and the priorities adjusted, as necessary.

Further information on each project above can be found in the project's sheets included as [Appendix G](#) to WSMP report.

3. Recommendations

Further to project recommendations of the WSMP, operational investments in future programs, processes and resources are also recommended to best facilitate field works and gain valuable data to inform future iterations of the WSMP. These include:

- a. Continued investment in the maintenance and enhancement of its Tier 3 Groundwater Water Quantity Flow Model at a minimum of a 5-year frequency so that the model best reflects current science on local conditions.
- b. Additional environmental monitoring programs should be established through the development of new supply sources to monitor for potential environmental impacts and adapt the water takings to mitigate impacts, if necessary. This includes working with the County of Wellington and associated Townships, Grand River Conservation Authority and Ministry of the Environment, Conservation and Parks on potential partnerships.
- c. Based on cost variability between the release of this plan and project execution, cost estimates in the WSMP should be updated as part of Class EA projects, once additional details are available.
- d. Concerns on source protection, land use constraints and on well interference for domestic wells were strongly expressed by the Townships through public consultation. Therefore, the implementation of the individual water supply projects defined through the WSMP Update will include focus on intergovernmental relations and dedicated engagement to address these concerns.
- e. Monitor the performance of the WSMP and continue to work with Planning and Building Services through annual Development Priorities Plan reporting, to ensure that firm servicing capacity is communicated when assessing sufficient supply capacity requirements to meet the number of draft plan approved units.

Water Supply Source Protection

Protection of our drinking water sources, within and outside of the municipal boundaries of Guelph is a priority due to our groundwater-based system. The City's Risk Management Official and the Risk Management Official of Wellington County continue to work collaboratively in assessing and managing risks in the wellhead protection areas and intake protection zones for the City's various water sources.

The [Grand River Source Protection Plan](#) outlines [policies which the County of Wellington](#) implements in the Townships of Puslinch and Guelph Eramosa to protect drinking water. These policies are required, as per the Clean Water Act, 2006, based on the City's Wellhead Protection Areas and Intake Protection Zones which extend beyond the City's municipal boundary to protect the resource from [drinking water threats](#). The County and the Townships share a Risk Management Official resource to implement their policies. The work of the County and Township's Risk Management Official provide benefit to the City of Guelph, and, as such, the City is currently working on an agreement to solidify work performed and associated costs.

To ensure sustainable resourcing of source water protection works within the City's wellhead protection areas outside our municipal boundaries, staff have held ongoing meetings with representatives from Guelph Eramosa Township, Puslinch Township and Wellington County to understand current program expenditures and delineate applicable costs to the City. With implementation of new well sources within the City under the Water Supply Master Plan our wellhead protection areas and sourcewater protection works are expected to increase within these respective communities in future. In acknowledgement of benefit to the City and funding concerns heard from these stakeholders through the WSMP process, staff recommend that a proactive funding agreement be established for the County/Township in acknowledgement of benefit and to best navigate future sourcewater protection needs through implementation of the WSMP.

At the time of development of this report City staff continue negotiation of this agreement with representatives of the Township and County. The scope of the agreement would include the implementation of Clean Water Act based planning reviews, risk management plans and building inspections within the City's wellhead protection areas. To validate City related costs for program implementation staff propose a 2-year service agreement after which time the agreement and funding level will be reevaluated to confirm future funding needs. Staff are requesting that Delegated Authority be provided to the Deputy CAO of Infrastructure Development and Enterprise to execute this agreement, subject to the satisfaction of the City Solicitor.

Financial Implications

Under the Development Charges Act, the development and capital construction of new water servicing capacity to support community growth is funded by Development Charges (DCs), with exact project funding eligibility to be confirmed through the City's Development Charge Review Background Study scheduled to start in the summer of 2022 and due for completion in 2023.

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robust analysis of project timing and cost estimates will be performed. This master plan will be considered with the other master plans nearing completion and will be viewed with a corporate lens to incorporate the City's strategic goals. Once the overall financial impact is understood the plan will be compared to our existing capital plan, incorporate fiscal constraints and our capacity to deliver. The timing, pace and overall cost of this plan is subject to change. The financial information outlined is intended to be a high-level estimate that will be refined as it is incorporated into the overall corporate plan and multi-year budget process.

Consultations

As outlined in [Section 7 of the WSMP report](#), the WSMP Update was guided by the City's Community Engagement Framework (CEF) (<https://guelph.ca/plans-and-strategies/community-engagement-framework/>). In alignment with this framework, a WSMP Community Engagement Plan (CEP) was developed by the Project Team.

In following the municipal Class EA process and Corporate Engagement Framework, a robust community engagement plan was completed on April 10, 2022, following a 90-day public review period on the draft WSMP. For reference, phases and outcomes of this consultation program are detailed within [Section 7](#) and [Appendix F](#) of the WSMP report.

City staff from many divisions and departments, in particular, Water Services, Wastewater Services, Planning and Building Services, Finance, and Engineering and Transportation Services have been consulted on the project and contributed to the final recommendations.

Strategic Plan Alignment

Sustaining our Future – the WSMP Update goal is to develop a reliable and sustainable supply of water to meet the current and future needs of all residential, industrial, commercial, and institutional customers.

Building our Future- projects outlined in the WSMP include building new infrastructure to support community growth.

Further to the guidance of the Strategic plan, the WSMP Update continues to be based on the direction provided by Council in 2003: "that the focus of the Water Supply Master Plan establishes a sustainable water supply to regulate future growth."

Attachments

Attachment-1 Project List, Estimated Cost and Location of Project for Short Term and Long Term

Departmental Approval

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