Town of Erin

Corporate Report

Department:	Infrastructure Services	**Report Number:** W2020-04
Business Unit:	Water	**Meeting Date:** 4/21/2020
Presented/ Prepared By:	Nick Colucci, Director of Infrastructure Services Engineer	

Subject
Town of Erin Urban Centre Water Servicing Class EA Summary

Recommendation
Be it resolved that Council hereby receive report number W2020-03 – "*Town of Erin Urban Centre Water Servicing Class EA Summary"* for information.

Background
The Town of Erin initiated the Urban Water Servicing Municipal Class EA (Class EA) to evaluate potential solutions to address water supply and storage limitations for the existing and future development of Erin and Hillsburgh.

The following Problem/Opportunity Statement (Opportunity Statement) was identified:

"Partial water servicing, in Hillsburgh and Erin Village, limits the operational and cost efficiency of the systems and inhibits redevelopment and future development. The capacity of the existing system will need to be augmented to address current limitations and the needs of future development."

It is on the basis of this Opportunity Statement that the planning for this Class EA was undertaken.

Highlights
This report outlines the findings of the Town of Erin Urban Centre Water Servicing Class EA and summarizes the following areas:

- Growth & supply requirements
- Alternative considered & the preferred alternative
- Production well drilling, testing, monitoring and yield
- Storage & pressure zones
- Next steps

Strategic Pillar
Growth Management

Financial Impact

There will be financial impacts once the EA document is approved by the MOECC and the final recommendations begin to be implemented. These costs will be determined during the detailed design phase and included in future Development Charge and Water Rate Studies.

Discussion

Growth & Supply Requirements

The future servicing requirements were determined by referencing Preferred Growth Allocation Scenario of the Growth Management Study (GMS) completed in November 2019. Using the projected number of houses/populations presented in the GMS, the future available water supply reserve capacity for the urban centres of Erin and Hillsburgh were determined to be in deficit prior to 2031, as indicated in Table 6.0 and 7.0 below.

Table 1: Erin Forecasted Water Demands Corresponding to Revised Growth Forecast

Year	Erin Village Independent				
	System Firm Capacity (m^3/day)	MDD Per Unit* (m^3/d)	Total Serviced Households	Max. Day Demand (m^3/d)	Reserve Capacity (m^3/d)
2020	1,968	1.45	1,019	1,473	495
2031	1,968	1.45	1,700	2,457	-489
2036	1,968	1.45	2,000	2,891	-923
2041	1,968	1.45	2,500	3,614	-1,646

* MDD = Maximum Day Demand

Table 2: Hillsburgh Forecasted Water Demands Corresponding to Revised Growth Forecast

Year	Hillsburgh Village Independent				
	System Firm Capacity (m^3/day)	MDD Per Unit* (m^3/d)	Total Serviced Households	Max. Day Demand (m^3/d)	Reserve Capacity (m^3/d)
2020	655	2.31	275	202	21
2031	655	2.31	700	515	-960
2036	655	2.31	900	662	-1,421
2041	655	2.31	1,100	809	-1,883

Alternatives Considered & The Preferred Alternative

As dictated by the Terms of Reference (TOR) for the project, the following supply alternatives were to be considered:

- Alternative 1: Do Nothing
- Alternative 2: Increase Water Taking from Existing Municipal Wells
- Alternative 3: Reinstate Bel-Erin Wells
- Alternative 4: Addition of New Wells for Each Existing Municipal System
- Alternative 5: Interconnect Erin and Hillsburgh Water Systems
- Alternative 6: Interconnect Existing Erin and Hillsburgh Water Systems and Addition of New Well Supply

Alternatives 1 through 3 and 5 where assessed and found either to not be feasible, or did not address the Opportunity Statement. As such, they were eliminated from further consideration. However, Alternatives 4 and 6 both satisfy the Opportunity Statement, so were pursued to the next stage of investigation, new supply well drilling/testing, which is required for both Alternatives and involved evaluation of existing wells and drilling/testing of new wells.

Table 10 below assess these potential solutions in terms of their ability to address the opportunity statement.

Table 10: Summary of Water Supply Alternatives Evaluation Versus Opportunity Statement:

	Opportunity Statement Components			
Alternative Solutions	Increase Supply Capacity to Meet Requirements of Existing Community	Increase Redundancy in Both Communities	Increase Supply Capacity to Meet Future Requirements	Problem Statement Addressed in its Entirety?
Alternative 1: Do Nothing	No	No	No	No
Alternative 2: Increase Water Taking from Existing Municipal Wells	Yes	Yes	No	No
Alternative 3: Reinstate Bel-Erin Wells	Yes Erin Only	Yes Erin Only	No	No
Alternative 4: Addition of New Wells at Each Existing Municipal System	Yes	Yes	Yes	Yes
Alternative 5: Interconnect Existing Erin and Hillsburgh Water Systems	Yes	Yes	No	No
Alternative 6: Interconnect Existing Erin and Hillsburgh Water Systems and Addition of New Well Supply	Yes	Yes	Yes	Yes

As a result of this investigation, water supply sources at E9 (Erin) and H4 (Hillsburgh) were identified as potential new water sources. The next step in the evaluation process was to confirm these locations had sufficient supply capabilities and identify potential impact of municipal usage, this entailed the drilling of production wells at each location

and long-term testing.

Production well drilling, testing, monitoring and yield

Based on the successful exploratory test well program, two sites were chosen for municipal production well construction and testing. One site (well E9) is located north of the village of Erin, and one site (well H4) is located in Hillsburgh.

As part of the Class EA, consultations were held with Credit Valley Conservation (CVC) to help develop a monitoring strategy for the local natural environment system near both municipal well sites. A stream inspection and trout spawning area (redd) survey was completed by CVC (facilitated by this study) in October and November 2018 at accessible properties to assist in the selection of monitoring locations.

Erin Well E9 (Exploratory Drilling Site “Erin 3”)

The municipal water supply system at Erin currently includes two existing bedrock wells (sources), referenced as well E7 and well E8. In order to expand the water supply capacity in Erin, well E9 was drilled as part of the Class EA.

E9 well drilling began on July 24, 2019 and was largely complete and ready for testing by November 14, 2019. The final stage of well construction (chlorination and provision of locking well cap and well tag) was completed by December 23, 2019. Well E9 is completed as a nominal 254 mm diameter bedrock well to a depth of 79.2 m below ground surface, and intersects the target source zone located at the bottom of the dolostone aquifer system. The use of a stainless steel casing and full annular seal grout meets the most recent Ministry of the Environment Conservation and Parks (MECP) guidance on municipal well construction.

Testing at Well E9 included a “step test” (pumped for consecutive increasing rates for a short period of time to check on initial production capability and well efficiency) on December 11, 2019, and, a 5 day continuous pump test (average rate of 32 L/s) from December 12th to 17th, 2019. The pump test allows an evaluation of longer term capacity and potential impacts due to water taking.

To prepare for the testing of well E9, local water well records were reviewed and a private water well survey completed within approximately 1.5 kilometers (km) of the site to obtain additional information and request monitoring access. Based on CVC consultations, two new water table monitoring wells and 6 streambed piezometer stations (some stations included multi-level monitors) were installed to assess groundwater levels and potential impacts near identified sensitive stream areas.

Groundwater levels were measured at a total of 28 different monitors within approximately 1.5 kilometers of well E9 during the test. The monitoring locations

included 10 private wells (at which access was available), 8 municipal observation or test wells, and 9 streambed piezometers and one stream level monitoring gauge. In addition, water level data for existing wells E7 and E8 was available from the Town's monitoring system.

The testing indicated that well E9 has a capacity of 32 L/s (2,765 m^3/day) on continual basis, based on a drawdown (water level change in the well) of approximately 12.2 m. The results indicate well E9 is a relatively efficient high capacity well for the village of Erin water supply system. The 5 day test is a conservative assessment of potential impact based on a potential maximum expected taking (Maximum Day Demand) over an extended period. Typical municipal daily volume requirements are much less, and the taking occurs over shorter pumping periods. For example, current average taking at Well E7 and E8 occurs for 4 and 7 hours per day respectively. The full capacity of E9 (32 L/s) could occasionally be needed as demand increases with growth, however would not be expected for extended periods.

The drawdown at well E9 did affect water levels in some local private wells. However, with the exception of one location, the drawdown measured at private wells did not interfere with the water supply. This indicates that most private well pumps are set deep enough in the well to allow for both drawdown from the individual well use and drawdown from well E9. One private well water supply was interrupted during the test, however the supply was reinstated (on the same day the interference occurred) by lowering the pump in that well. This work was completed by a MECP licensed water well contractor. Based on the results, typical taking at well E9 is not expected to interfere with local water supplies. If any private well interference does occur in the future, it is expected that water supplies can be reestablished by lowering pumps or deepening wells.

No drawdown effects were observed in the water table or at local stream or wetland monitoring locations. Based on the results no short-term pumping related impacts due to taking at well E9 are expected. A monitoring program is proposed to ensure long term taking does not impact the stream and wetland system.

Water quality samples were obtained during the Well E9 test. The results indicate good quality water which after routine use and treatment is expected to meet applicable drinking water standards. No evidence of anthropogenic contamination was found at well E9.

A permit to take water (from MECP) will be required, in addition to other approvals, to allow water taking from well E9. The Class EA report should be used as supporting documentation for the permit application. It is expected that the permit application will be reviewed by agencies, including MECP and CVC, prior to approval. Additional agency consultation may be needed as part of that application process.

Hillsburgh Well H4 (Exploratory Drilling Site “Hillsburgh 2”)

The municipal water supply system at Hillsburgh currently includes two existing bedrock wells (sources), referenced as well H2 and well H3. In order to expand the water supply capacity in Hillsburgh, well H4 was drilled as part of the Class EA.

H4 well drilling began on July 30, 2019 and was largely complete and ready for testing by December 11, 2019. The final stage of well construction (chlorination and provision of locking well cap and well tag) was completed by January 13, 2020. Well H4 was designed and constructed based on the results of the initial exploratory test well and H4 drilling results. During well development it was determined that an unexpected fracture in the bedrock was present at approximately 27.4 mBGS, just below the nominal 254 mm diameter stainless steel well casing (installed and grouted to the original design depth). In order to ensure the upper bedrock was sealed according to the original design intention (to reduce potential connection to surface), a nominal 203 mm diameter stainless steel liner casing was installed inside the original well casing and also grouted (sealed) into bedrock to a depth of 31.7 mBGS. The additional assessment and liner installation resulted in a longer construction period for H4. Below the surface casing Well H4 is completed as a nominal 254 mm diameter bedrock well to a depth of 91.4 m below ground surface, and intersects the target source zone located at the bottom of the dolostone aquifer system. The use of a stainless steel casing and full annular seal grout meets the most recent Ministry of the Environment Conservation and Parks (MECP) guidance on municipal well construction.

Testing at Well H4 included a “step test” (pumped for consecutive increasing rates for a short period of time to check on initial production capability and well efficiency) on January 8, 2020; a 1 day continuous pump test (average rate of 27.6 L/s) from January 9th to 10th,2020; and, a 3 day continuous pump test (average rate of 18.4 L/s) . The pump testing allows an evaluation of longer term capacity and potential impacts due to water taking. The initial 1 day test had to be terminated due to interference with existing well H3, which was in use at that time. Well H3 was not in use during the 3 day test.

To prepare for the testing of well H4, local water well records were reviewed and a private water well survey completed within approximately 1 to 1.5 kilometers (km) of the site to obtain additional information and request monitoring access. One new water table monitoring well and 5 streambed piezometer stations (some stations included multi-level monitors) were installed to assess groundwater levels and potential impacts near identified sensitive stream areas.

Groundwater levels were measured at a total of 20 different monitors within approximately 1.5 kilometers of well H4 during the test. The monitoring locations included 10 private wells (at which access was available), 7 municipal observation or supply wells, 6 other accessible water table observation wells, and ,7 streambed piezometers. In addition, water level data for existing well H2 and 3 Nestlé Waters Canada (NWC) observation wells were available to this study.

The testing indicated that well H4 has a short term (1 day) capacity of 27.6 L/s, and, a long term capacity of 18.4 L/s (or more) on continual basis, based on a drawdown (water level change in the well) of approximately 15.6 m. The results indicate well H4 is a relatively efficient high capacity well for the Hillsburgh water supply system. The 3 day test is a conservative assessment of potential impact based on a potential maximum expected taking (Maximum Day Demand) over an extended period. Typical municipal daily volume requirements are much less, and the taking occurs over shorter pumping periods. For example, current average taking at Well H2 and H3 occurs for 2 and 6 hours per day respectively. The long-term rate (i.e. 18.4 L/s) could occasionally be needed as demand increases with growth, however would not be expected for extended periods.

The drawdown at well H4 over the 3 day test did affect water levels in some local private wells. Drawdown at 3 private wells was confirmed to interfere with water supply. At 2 of those private wells natural water level recovery after the test ended reestablished water supply. At 1 location the water supply could not be restored due to well and pump conditions, however a temporary supply was provided until the residence can be connected to the municipal water supply system. This work was completed by a MECP licenced water well contractor.

Private well pumps are set deep enough to allow for both drawdown from the individual well use and current drawdown related to the use of existing wells H2 and H3. Simultaneous taking at H3 and H4 should not occur under existing conditions due to mutual interference effects. In the long-term H4 pumping would be expected to gradually increase as existing and new residences connect to the municipal supply system. The use of new well H4 at pumping rates higher than currently used at H3 may affect some local water supplies. As taking gradually increases, continued monitoring can occur, and a water supply interference responses policy can be developed and implemented, to ensure water supplies are maintained within the village and surrounding area.

A water supply interference policy should be developed and implemented to ensure local water supplies are maintained. The water supply interference policy should include:

- municipal contact information made publicly available for water supply interference complaints;
- investigation protocol to determine if water supply interference has occurred and if the interference is due to municipal water taking;
- a response protocol to re-established affected water supplies, including established methods such as lowering pumps, deepening wells, or connection to municipal water supply service; and,
- confirmation that the cost of water supply complaint investigations and response be covered by the municipality if a water supply interference is caused by municipal water taking.

No drawdown effects were observed in the water table or at local stream or wetland monitoring locations. Based on the results no short-term pumping related impacts due to taking at well H4 are expected. A monitoring program is proposed to ensure long term taking does not impact the stream and wetland system.

Water quality samples were obtained during the Well H4 testing. The results indicate good quality water which after routine use and treatment is expected to meet applicable drinking water standards. No evidence of anthropogenic contamination was found at well H4.

A permit to take water (from MECP) will be required, in addition to other approvals, to allow water taking from well H4. The Class EA report should be used as supporting documentation for the permit application. It is expected that the permit application will be reviewed by agencies, including MECP and CVC, prior to approval. Additional agency consultation may be needed as part of that application process.

New Supply Impact on Reserve Capacity & Implementation Based on the expected production rates for E9 and H4, and the future supply demands outlined in the GMS, the impact on Reserve Capacity in both the Erin and Hillsburgh system, and on the scenario where the systems as combined (i.e. Alternative 6) was calculated and is presented in *Table 11.*

Table 3: Reserve Capacity Evaluation of Shortlisted Alternatives Versus the Preferred Growth Allocation Scenario

Village	Year	Serviced Population	Supply Requirements (m^3/day)	Additional Supply Capacity (m^3/day)	New System Firm Capacity (m^3/day)	New Reserve Capacity (m^3/day)	Alternative
Erin	2020	3,100	1,473	2,765	4,128	2,655	Alternative 4
	2031	4,500	2,457	2,765	4,128	1,671	
	2036	5,600	2,891	2,765	4,128	1,237	
	2041	7,100	3,614	2,765	4,128	514	
Hillsburgh	2020	1,500	634	1,616	1,637	1,003	
	2031	2,000	1,615	1,616	1,637	22	
	2036	2,500	2,076	1,616	1,637	-439	
	2041	3,200	2,538	1,616	1,637	-901	
Erin & Hillsburgh Connected	2031	6,500	4,072	4,380	7,381	5,273	Alternative 6
	2036	8,100	4,967	4,380	7,381	3,309	
	2041	10,300	6,151	4,380	7,381	2,414	

The additional firm capacity provided by well E9 satisfies the population growth forecast for Erin to year 2041. However, the additional firm capacity provided by well H4 will only meet the water supply target for Hillsburgh to the population forecast to year 2031. In order to achieve the full target in both systems, the Erin and Hillsburgh systems need to be connected as the combined system would provide a greater overall firm capacity, thereby, achieving the 2041 GMS demand requirement. Furthermore, by providing the interconnection of the system, a large geographic area will become available for future well exploration beyond the 2041 horizon.

Based on the evaluation of the alternatives, consultation with the public and applicable agencies Alternative 6 was identified as the preferred solution to provide additional supply capacity and redundancy for the Town's municipal drinking water systems for the existing and future population. This solution will utilize wells E9 and H4 supply and connect the Hillsburgh and Erin water systems. Both alternatives were also assessed for their potential impacts on the environment (Cultural, Social, Natural, Technical & Economic) and found to be similar in overall impact. This alternative will result in efficient use of the

existing and future supply sources by sharing the available redundancy of the wells for both emergency and maintenance purposes.

Well E9 and H4 will require the construction of individual well houses, treatment facilities and watermain to connect to the existing municipal systems.

The interconnection of the systems will require approximately 4.7 km of watermain construction and the associated road/trail restoration which will be shared with the sanitary forcemain installation costs.

Storage & Pressure Zones

In order to support the increased water supply of the systems, on-line storage volume must be increased to satisfy greater requirements including equalization for peak demands and fire/emergency volumes. Table 12 provides a summary of volumes required to support the growth projections to 2041. As indicated in Table 12 there is a requirement for additional storage in both Erin and Hillsburgh facilities. As such, two additional elevated water storage facilities and the associated watermain connections to the municipal system will be required to support the 2041 growth.

Based on Table 12, it is recommended that a minimum 1,200m^3 (0.3MG) Elevated Storage Facility (Tower) be installed at the highpoint (415m) within the “Development Area D” as shown in the GMS within the Town of Erin. This elevation would allow the Tower to operate at a level similar to the existing Erin upper pressure zone, which would be expanded to include the existing industrial area and a portion of Development Area D. This reconfiguring of the upper pressure zone and location of the new Tower would significantly improve fire flows to the industrial area.

In Hillsburgh, placing an additional minimum 1,200m^3 (0.3MG) Elevated Storage Facility (Tower) near the end of Spruce Street within the Glendevon (Lower Zone) is recommended. This location will make efficient use of the two wells (existing H3 and proposed H4) which fed directly into this zone. Also, the majority of existing and future users will be located within this zone, thereby, ensuring access to this storage volume for peak demands and fire flows. The existing booster pumping station is located between the upper and lower zones, this will still be used to fill the Hillsburgh Heights reservoir and pressurize the upper zone in the event that the Hillsburgh Heights Well is not able to satisfy upper zone demand.

Prior to confirming final sizing of these towers, the Town should consider a longer growth period to ensure that the facilities will be adequate to service potential development beyond 2041 since the economies of scale are significant with these facilities and they are not expandable.

Table 4: Future Storage Capacity Evaluation of Shortlisted Alternatives versus the Preferred Growth

	Year	Population	Existing Storage (m^3)	Required Storage (m^3)	Additional Storage Required (m^3)
Erin	2031	3,100	2,200	1938	-262
	2036	5,600	2,200	2793	593
	2041	7,100	2,200	3289	1089
Hillsburgh	2031	2,000	790	1315	525
	2036	2,500	790	1549	759
	2041	3,200	790	1783	993

Conclusion

It is anticipated that the next steps to realize the expansion of the water system will include but not be limited to the following tasks:

- Consult with Town to prepare an implementation strategy for the required water system infrastructure upgrades including phasing and scheduling. This strategy will depend primarily on development timing and funding sources.
- Town should proceed with acquisition of the H4 and H9 well sites from the current owner.
- Complete the next steps/recommendations provided in the Preliminary Assessment of Source Water Protection Implementation Requirements for Potential New Well Sites dated February 7, 2020. This includes but is not limited to completing the WHPA delineation and vulnerability assessment for which the Town Risk Management staff will then include the results in the updated Assessment Report drafted by the Credit Valley Source Protection Authority.
- Applications for production well Permit To Take Water approvals for E9 and H4 wells including implementation of the recommendations provided in the Well E9 and Well H4 Drilling and Testing Hydrogeological Reports provided in Appendices

E.2 and E.3, respectively.

- Preliminary/Final design of required infrastructure including well pumping/treatment facilities, transition watermains, storage facilities and booster pumping / pressure control facilities.

Attachments

Appendix A- Tables
Appendix B- Figures

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