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TECHNICAL MEMORANDUM TM7

DATE	November 20, 2020
TO	**Luis Carvalho, York Region**
CC	
SUBJECT	Stouffville Long-Term Water Supply and Storage Class EA **Confirmation of the Preferred Solution**
FROM	Cassandra Leal, P.Eng.
PROJECT NUMBER	17100

1 Introduction

This Technical Memorandum serves to summarise the outcome of the previous evaluation of the Alternative Solutions, detail the feedback received from the stakeholder consultation, and confirm the recommended preferred solution.

2 Evaluation of the Shortlisted Alternative Solutions

The detailed Evaluation of Shortlisted Alternative Solutions was summarised in TM-6, dated June 5, 2020.

Separate Storage and Supply alternatives were identified and evaluated separately, as there is only limited inter-dependence between them.

The alternative solutions were evaluated based on the following criteria:

- The solution's Technical Feasibility;
- Its ability to satisfy the Stouffville growth projections;
- Its ability to satisfy Regional Design Standards;
- Its ability to comply with Legislative Requirements;
- Provision of Operational Flexibility (present, and future expandability);
- The potential impacts on the Natural Environment;
- The potential impacts on the Social-Cultural Environment; and,
- The life-cycle cost of the solution, including long-term facility asset maagment.

2.1 Storage Alternatives

The shortlisted Alternative Storage solutions considered are listed below:

1. **Do Nothing:** Permit the Growth, but do not increase water storage capacity;
2. **Limit Community Growth:** Limit growth to the capacity of the existing water storage;
3. **Implement Water Conservation:** 'Stretch' the existing water storage by using less water per person;
4. **Facilitate Shared Fire Storage Between Zones 1 to Zone 2/3 and Build Additional Zone 2/3 Storage:** Compensate storage deficit caused by community growth and retiring of facilities by building new Zone 2 Storage while sharing Fire Storage with Zone 1.

    4a. No Storage Facilities Retired
        - Option 4.a.i:
            - Rehabilitate west cell of the Stouffville Reservoir
            - Decommissioning the east cell of the Stouffville Reservoir
            - Upgrade Stouffville Reservoir HLPS to 111 L/s
            - Maintain Zone 2 Elevated Tank

- Construct New PRV Chamber
- Option 4.a.ii:
  - Rehabilitate both cells of the Stouffville Reservoir
  - Upgrade Stouffville Reservoir HLPS to 190 L/s
  - Maintain Zone 2 Elevated Tank
  - Construct New PRV Chamber

4b. Retire Zone 2 Elevated Tank
- Option 4.b.i:
  - Build New Storage Facility (2,229 m^3)
  - Rehabilitate west cell of the Stouffville Reservoir
  - Decommission east cell of the Stouffville Reservoir
  - Upgrade Stouffville Reservoir HLPS to 111 L/s
  - Decommission Zone 2 Elevated Tank
  - Construct New PRV Chamber
- Option 4.b.ii:
  - Build New Storage Facility (93 m^3)
  - Upgrade Stouffville Reservoir (Both East and West Cells)
  - Upgrade Stouffville Reservoir HLPS to 190 L/s

4c. Retire Stouffville Reservoir and High Lift Pumping Station (HLPS)
- Build New Storage Facility (1,825 m^3)
- Maintain Zone 2 Elevated Tank
- Decommission Stouffville Reservoir (Both Cells) and HLPS
- Construct New PRV Chamber

4d. Retire Stouffville Reservoir, HLPS and Zone 2 Elevated Tank
- Build New Storage Facility (5,225 m^3)
- Decommission Stouffville Reservoir (Both Cells)
- Decommission Zone 2 Elevated Tank
- Construct New PRV Chamber

Following the evaluation process the recommended preferred solution was determined to be Alternative 4.a.i.

2.2 Supply Alternatives

The shortlisted Alternative Supply solutions considered were as follows:

1. **Do Nothing:** Permit the Growth, but do not increase the water supply;
2. **Limit Community Growth:** Limit growth to the capacity of the existing water supply;
3. **Implement Water Conservation:** 'Stretch' the existing water supply by using less water per person;
4. **Expand Existing Wells:** Retire Well 3 and replace that supply capacity at existing well site(s)

Following evaluation, the recommended preferred solution was determined to be Alternative 1, Do Nothing.

3 Stakeholder Consultation

The evaluation of the Alternative Solutions and the recommendation that Storage Alternative 4.a.i. and Supply Alternative 1 be accepted as preferred was presented to project stakeholders at the following events:

- June 11, 2020: Phase 2 Consultation with the Toronto and Region Conservation Authority
- August 6 – August 20, 2020: Virtual Public Open House #2 Event
- September 11, 2020: Consultation with the Town of Whitchurch-Stouffville
- First Nations Consultation: Through the Notice of Virtual Open House, and through follow-up by telephone

The Consultation Meeting Notes and Open House #2 Summary Report are included in **Appendix A**.

The Evaluation and Ranking display board that was presented at Open House #2 is included in **Appendix B**.

Overall, the conservation authority, the Town of Whitchurch-Stouffville and the Open House Attendees appreciated that the preferred alternatives maintained and rehabilitated existing facilities rather than construct new facilities. There has been no objections on the preferred solutions.

3.1 Toronto and Region Conservation Authority (TRCA)

The Project Team met with TRCA on June 11, 2020 and received comments on June 24, 2020 and September 16, 2020. Several comments were received and addressed.

TRCA requested confirmation whether the proposed works will be within floodplain limits. There is a non-evaluated wetland west of the reservoir site, and there are surrounding watercourses to the sites. The scale of the potential works on the site do not trigger a wetland delineation. These watercourses are small in scale and mitigation measures will be implemented – as necessary – during construction.

Another comment received pertained to the impervious cover based on the preferred design alternative. The works at the existing Stouffville Reservoir will include increasing the booster station capacity. There is a possibility that the station will require additional footprint, which would then require rainfall runoff to be managed.

There would likely be no increase to impervious cover at the existing Zone 2 Elevated Tank site. This site would just consist of rehabilitation of the existing tank.

The last comment received pertained to erosion and sediment control. This is described in the Mitigation Measures in the Project File Report and will be a key consideration during the preliminary and detailed design phases.

3.2 Town of Whitchurch-Stouffville

The Project Team initiated consultation with the Town of Whitchurch-Stouffville on September 11, 2020. Through this meeting, several questions and comments were raised.

The Town questioned the population numbers utilized in this project. The 2041 community population is presently set to 64,500 (residents plus jobs). While the Town's Master Plan update is expected to consider an "accelerated growth" of 87,500 (residents plus jobs) the Region must deliver infrastructure based on the current Official planning estimates.

It was also noted that the infrastructure recommendations are scalable, to a degree and that this was reflected in the scoring of the evaluation criteria.

It is also discussed that it is the Region's responsibility to supply the Town with sufficient daily water supply at an appropriate pressure while it is then the Town's responsibility to design their water distribution system such that hydraulic losses are acceptable. The recommended alternative was hydraulically modelled and it confirmed that a reduction in water pressure will be minor (see Section 5.1.4).

3.3 First Nations Consultation

Through the Class EA process, the following First Nations were identified as stakeholders, due to their historical ties to this part of Ontario, and previous consultation with these First Nations in previous Class EAs within York Region:

Alderville First Nation	Beausoleil First Nation	Curve Lake First Nation
Georgina Island First Nation	Hiawatha First Nation	Huron-Wendat Nation
Metis Nation of Ontario	New Credit First Nation	Rama First Nation
Scugog First Nation		

The First Nations listed above were contacted at the following steps of the overall Class EA Process:

- **Notice of Commencement and Open House #1 (November 14, 2017):**

  - Notices sent by Mail and E-Mail, including the Open House Materials
- **Detailed Inventory of the Environments (August 1, 2018):**
  - All First Nations were mailed copies of the Archaeological, Natural and Socio-Cultural investigations
  - The letter also included a formal offer to consult specifically with any First Nation that had a particular interest in the project
  - We also requested confirmation of whether any of the First Nations required a specific consultation [none requested a specific meeting]
- **Notice of Virtual Open House #2 (June to August 2020):**
  - Contracted all First Nations by telephone to advise of upcoming Public Consultation Centre (June 9, 2020)
  - Sent Notice of Open House #2 by e-mail (August 7, 2020). The e-mail included the Open House Materials
  - Follow-up phone calls (early September) were completed to confirm receipt of the materials, and to re-confirm whether a specific consultation was required [none requested a specific meeting]. At this time, some First Nations requested copies of the environmental investigations to be e-mailed again.

None of the First Nations provided any comment on any aspects of the Class EA, nor did they voice any objection to the recommended preferred solutions. At no point through the process did any of the First Nations accept the Study Team's offer of scheduling a specific consultation (in-person meeting or video-conference).

4 Recommendations

Based on the evaluation undertaken and the feedback received, we recommend that the preferred Storage Alternative is Alternative 4.a.i and the preferred Supply Alternative is Alternative 1. Alternative 4.a.i involves the following individual works:

- Shared Fire Storage Between Zones 1 and 2/3;
- Construction of a new PRV Chamber to provide redundancy in the transfer of water from Zone 1 to Zone 2 during fire or emergency conditions
  - Timing = initiate in 2021
- Decommissioning of the East Cell at the Stouffville Reservoir
  - Timing = in service by 2027
- Rehabilitation of the West Cell of the Stouffville Reservoir (2,996 m^3)
  - Timing = in service by 2027
- Upgrades to the HLPS to allow for 110 L/s firm pumping capacity (3 Pumps, 2 Duty/1 Standby)
  - Timing = in service by 2026 (consider advancing reservoir works)
- Future Rehabilitation to allow the Zone 2 Elevated Tank to remain operational past 2041 (3,400 m^3)
  - Timing = in service by 2041

Further technical details for both are provided below.

4.1 Storage Recommendation

The Zone 2+3 storage requirement based on the 2041 population projection is 5,225 m^3, with the provision of Fire Storage from the Zone 1 Elevated Tank. The Zone 2+3 volume, then, only needs equalization storage and emergency storage.

As described in Technical Memorandum 6, the 2041 storage requirements are greater than the 2041 effective storage available in Zone 2 (1,242 m^3 of *effective* storage in the Stouffville Reservoir, and no Zone 2 Elevated Tank). Therefore, an additional storage capacity of 3,983 m^3 is required. This volume is provided by the preferred solution.

The preferred solution includes:

1. **Upgrading the West Cell of the Stouffville Reservoir**, to extend design service life;
2. **Increasing the capacity of the Highway 48 Stouffville High-Lift Pumping Station**, to increase the effective storage within the West Cell of the Stouffville Reservoir;
3. **Retiring the East Cell of the Stouffville Reservoir**, as that volume is not required;
4. **Rehabilitating the Zone 2 Elevated Tank**, to extend its service life beyond 2041; and,
5. **Constructing a secondary PRV chamber from Zone 1 to Zone 2**, to facilitate sharing of the Zone 1 fire storage volume.

It is noted that the existing McCowan PD6 Reservoir provides water *supply* to Stouffville, but there is no *storage* allocation to Stouffville at this reservoir. The full storage volume at McCowan is dedicated to the needs of York PD6.

4.1.1 Upgrade the Stouffville Reservoir – West Cell

This upgrade will consist of pouring a new concrete liner within the existing reservoir, effectively restoring the Reservoir to "new" condition, and therefore extending its service life by another 50+ years. A new partition wall is also recommended, creating a dual-cell reservoir which provides for operation and maintenance needs. This will result in an available storage volume of 2,996 m^3. While this is less than 5,143 m^3 that is available today, limitations in the high-lift pumping station capacity limits the existing *effective* storage volume to just 1,242 m^3. Approximate timing for this upgrade has been determined as 2027, but coordinating this work with the upgrades to the high-lift pumping station should be considered.

4.1.2 Upgrade the High-Lift BPS

The High-Lift Booster Pumping Station (BPS) currently has a lower capacity (45 L/s) than the combined capacities of Wells 5 and 6 (60.5 L/s).

By upgrading the High Lift Pumping Station to 110 L/s, with three pumps (2 duty, 1 standby), a sufficient volume of water could be supplied from the reservoir in addition to the maximum day production capacity is being supplied by Wells 5 and 6 (up to 60.5 L/s). This upgrade will allow the Region to use the entire West Cell volume as effective equalization and emergency storage. Approximate timing for this upgrade has been determined as 2026.

4.1.3 Rehabilitate Zone 2 Elevated Tank

The preferred solution includes rehabilitation of the existing Zone 2 Elevated Tank. The elevated tank was initially constructed in 1983 and was fully rehabilitated in 2020. This future rehabilitation will re-extend the service life of existing elevated tank, maintaining its storage capacity of 3,400 m^3 to beyond 2041. Approximate timing for this upgrade has been determined as 2041.

4.1.4 Decommission Stouffville Reservoir – East Cell

The preferred solution includes decommissioning the East Cell of the Stouffville Reservoir. As stated above, the upgrades to the high-lift booster station will provide sufficient effective storage from just the West Cell. Approximate timing for the decommissioning of this cell has been determined as 2027, but coordinating this work with the upgrades to the high-lift pumping station should be considered.

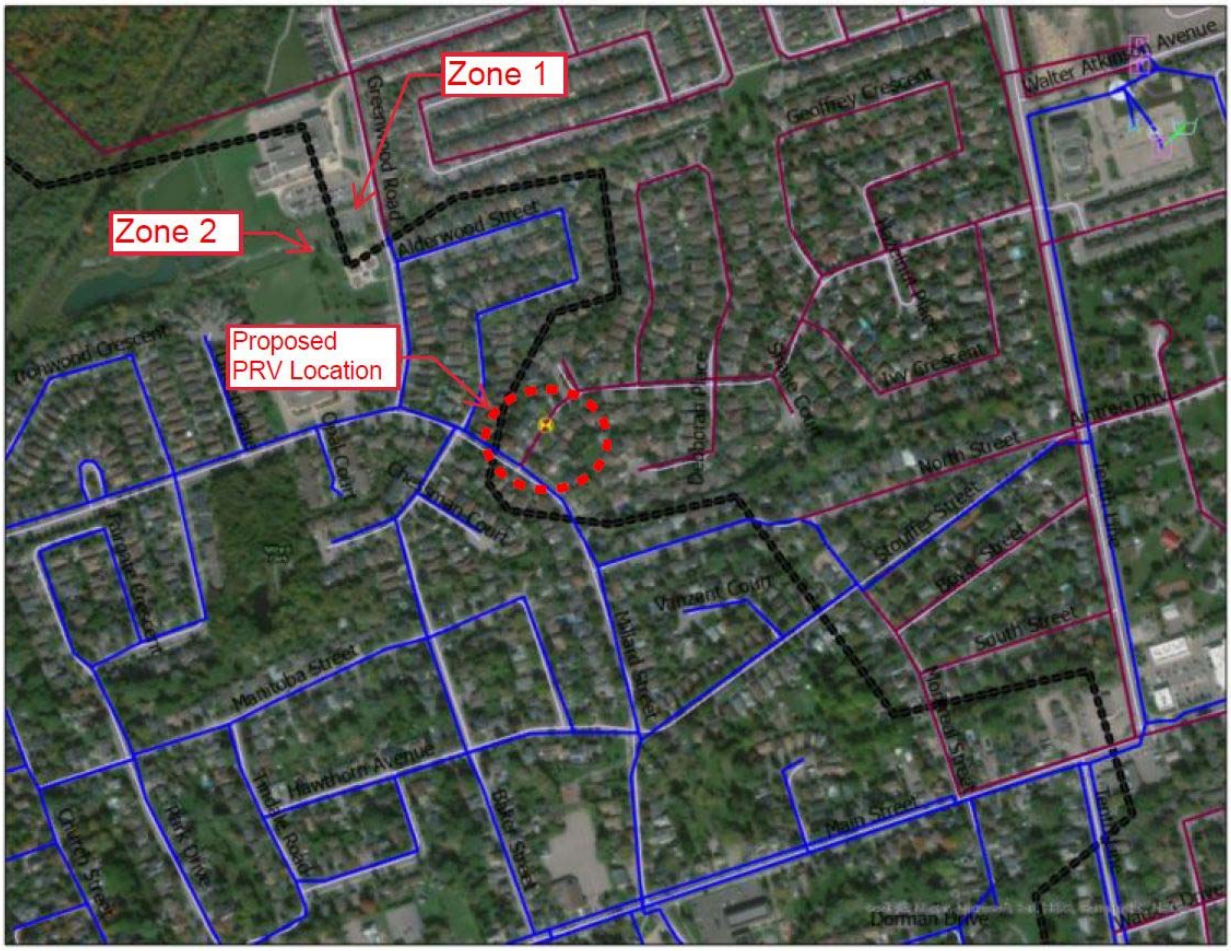
4.1.5 Install New Pressure-Reducing Valve

A new pressure-reducing valve (PRV) should be installed to facilitate the sharing of Fire Storage between Zone 1 and Zone 2+3. There is an existing 250mm PRV within the Zone 1 Booster Pumping Station, but another PRV should be installed elsewhere in the system to provide redundancy to the existing PRV should it ever be out-of-service.

The new PRV should be designed to be able to provide a design fire-flow rate of 17,000 L/min (283 L/s) from the Zone 1 Elevated Tank to Zone 2. This work should be initiated in 2021 to provide redundancy to the existing PRV at the Zone 1 Booster Pumping Station.

An appropriate location for this PRV would be at the existing Zone Boundary on Hemlock Drive, at any suitable location between the Millard Street (Zone 2) and Aspen Crescent (Zone 1). Both the Millard Street and Hemlock Drive watermains are 300 mm in diameter, and can convey the required 283 L/s fire flow at appropriate pressures. This location is also less than 1 km from the PRV at the Zone 1 Booster Pumping Station site, which will provide for a comparable pressure profile to the existing conditions if the PRV is set to provide a similar maximum hydraulic grade line elevation as the existing Zone 2 Elevated Tank.

Figure 1: Proposed Zone 1 to Zone 2 PRV Location



4.2 Supply

The preferred solution for water supply is the “Do Nothing” alterative, as the existing wells are able to provide the average-day demands for the projected 2041 population. This “average-day” supply requirement is the Region’s policy for Stouffville, with the additional supply to meet maximum day demands being provided by the Lake-based system (through the Stouffville Zone 2 Pumping Station).

This alternative does not mean that no work will be completed. This preferred solution allows for rehabilitation, maintenance and well replacement (like for like) of the five existing well facilities to maintain and extend their design service lives. Timing for the rehabilitation of the Wells has been determined as the following:

- Wells 1/2 = Beyond Planning Horizon of this EA
- Well 3 = 2041
- Wells 5/6 = 2027

4.2.1 Raw Water Quality Trending

The Class Environmental Assessment reviewed raw water quality trends and noted that there is a gradual historical decline in some raw water quality parameters over time. This is not unexpected for well-based systems and should continue to be monitored over time.

The trending analysis indicates that Well 3 *could* exceed the proposed Minimum Acceptable Concentration for Manganese by approximately 2040, but this is based on a limited data set. Continued long-term groundwater quality monitoring is recommended to improve reliability of projections and reduce the effect of outlier data.

4.2.2 Well Capacity Reviews

It has been noted that while Wells 5 and 6 have a combined rated maximum day supply capacity of 5,400 m^3/day (62.5 L/s), hydrologic modelling of the wells has indicated that Well 5 can only produce 25.5 L/s when Well 6 is operating at 23 L/s. This results in a combined capacity of just 48 L/s. Additional testing of these wells is recommended to confirm whether there are any limitations when the two wells are operating in tandem, and whether modifications (to the wells or the operational practices) can be implemented such that the wells can produce a combine 5,400 m^3 of water daily.

A 72-hour pumping test is recommended at wells PW5 and PW6 to better-define the long-term well capacity of these supply wells. The program of well performance testing and rehabilitation should continue to monitor and collect potential well yield declines, particularly at wells PW3, PW5 and PW6.

4.2.3 Well Exploration Studies

As a general best practice, it is recommended that the Region initiate well exploration studies in an attempt to identify potential new well sites, particularly at Well 3 which does have some water quality issues. While the results of this Class EA do not identify a specific need to establish new wells at this time, the factors noted above indicate a possibility of new wells ultimately being required if water quality or supply conditions change.

5 Impacts on System Pressures

In this recommended alternative, the increase in effective storage at the Stouffville Reservoir site would be achieved by upgrading the HLPS, which is located adjacent to the Stouffville Reservoir, to pump at 110 L/s, which is more than twice the current rate of 46 L/s. The resulting hydraulics conditions associated with this change have been modelled and are documented below.

5.1.1 Hydraulics from the Reservoir to the Network

There is a 400 mm watermain that connects the Stouffville Reservoir/HLPS to the distribution system. At a rate of 110 L/s, approximately 5 m of headloss will be generated, based on a velocity of 0.87 m/s. The existing 400 mm watermain can handle the increased flow and pressure, and no additional piping infrastructure is required for this scenario.

5.1.2 Hydraulics from the Network to Reservoir

The lowest hydraulic grade line (HGL) elevation at the connection point from the reservoir to the distribution system is 315 m, with the Top Water Level (TWL) at the Stouffville Reservoir of 308 m. The distribution system can therefore fill the Stouffville Reservoir to the TWL, even with 5 m of headloss through the 400 mm connection (315m – 5m = 310m, greater than TWL). This would allow the distribution system to re-fill the Stouffville Reservoir (through a backflow valve) at a rate slightly exceeding 110 L/s. The reservoir would not have to only be re-filled from the Well 5 and Well 6 pumps, as is the case currently.

5.1.3 Hydraulics from Zone 1 Elevated Tank to the Zone 2 Elevated Tank

The existing 250mm PRV (at the Zone 1 BPS) is currently capable of transferring water from Zone 1 to Zone 2 at more than 283 L/s, which is the fire flow demand for the storage calculation. As such, a fire flow within Zone 2 – which would

normally be supplied from the Zone 2 Elevated Tank – can be transferred from Zone 1 to Zone 2 at 190 L/s. As such, the fire storage volume within the Zone 1 Elevated Tank can also provide protection to Zone 2+3 (via PRV's from Zone 2 to Zone 3.

A redundant location for a second PRV is proposed along Hemlock Drive in order to provide security in the event that the existing PRV is ever out of service.

5.1.4 Impact on Existing System Pressures

In order to assess the overall impacts to the system resulting from the implementation of the preferred alternative, a review of the minimum pressures observed at several key locations throughout the modelled network are provided in Table 5-1. These pressures represent the minimum pressure experienced at that location, under maximum day demands, the varying demand profile, and wells cycling based on elevated tank levels.

TABLE 5-1: COMPARISON OF MODELLED MAXIMUM DAY PRESSURES IN THE SYSTEM

Junction ID	Description	Existing Demands		Recommended Alternative with 2041 Demands		Difference	
		kPa	psi	kPa	psi	kPa	psi
J-24	Connection from McCowan reservoir to the system	573	83	546	79	-27	-4
769	Zone 3	568	82	568	82	0	0
718	Southern point in Zone 2	639	93	629	91	-10	-2
J-40	Low point in Zone 2	687	100	680	99	-7	-1
298	Connection point from wells 1 and 2 to the system	619	90	624	91	+5	+1
82	Connection from Stouffville Reservoir to the system	394	57	366	53	-28	-4
316	High point in Zone 2	332	48	334	49	+2	+1

The recommended system modifications will have very little impact on the existing pressures – to a maximum reduction of just 4 psi. It should be noted that the details included in the above table also consider that there is greater overall system demand in the "Recommended Alternative" Scenario, meaning that the overall supply into the system has increased. That means that the wells are generally cycling a little more frequently, and that the lake-based system is supplying more water to the distribution system (since the wells can only supply slightly more water than the Average Day Demands).

6 Environmental Considerations

Through the Class EA, several investigations were completed (archeological screening, cultural heritage screening, natural environment screening and geotechnical desktop study). The studies focused on the entire study area and did not focus solely on the alternative sites, conclusions can still be made.

6.1 Natural Environment

Upgrades to the Stouffville Reservoir and the Zone 2 Elevated Tank involve alterations within the existing footprint of the current Reservoir. Decommissioning of the East Cell of the Stouffville Reservoir will also be required but will involve little Natural Environment Impact. Expansion of the high-lift pumping capacity at the Stouffville Reservoir Site can be

accommodated with little-to-no impact to the natural environment, the extents ot which will be confirmed through the detailed design processes.

Mitigation measures will be implemented as required during construction to minimize or prevent any impact to the natural environment.

6.2 Archaeological

There are 38 registered archeological sites within 1 km of the Class EA study area. The significant sites from a culture heritage perspective are generally located in the established community core.

There is no anticipated archaeological impact from the Preferred Alternative, as all works will be undertaken on existing sites or Right of Ways.

6.3 Socio-Cultural

As all of the proposed works are to take place on existing facility sites, there are no works planned in the vicinity of any cultural heritage properties.

There will be some noise and vibration resulting from the construction activities related to the works to install new PRVs, upgrades to Stouffville Reservoir and High Lift Pumping Station, and rehabilitation of the existing Zone 2 Elevated Tank. These impacts can be mitigated by adhering to daily construction time constraints.

There could be local service disruptions during installation of the required pressure-reducing valve. As per standard procedures, residents should be notified of this disruption in advance.

7 Confirmation of Class EA Schedule

The individual components of the preferred solution dictate the Class EA schedule. Each of the five components of the preferred storage solution are listed below, with their classification under the Class EA guideline.

- Upgrade the Stouffville Reservoir – West Cell

This constitutes a refurbishment of the existing reservoir cell, which is classified as a ‘Schedule A’ activity:

> *1. Normal or emergency operational activities. Such activities may include… repairs and renovations to treatments and pumping plant equipment, water storage facilities, distribution mains and appurtenances.*

- Upgrade the High-Lift BPS

This capacity expansion is classified as a ‘Schedule A’ activity:

> *2. Increase pumping station capacity by adding or replacing equipment where new equipment is located within an existing building or structure.*

- Rehabilitate Zone 2 Elevated Tank

This constitutes a refurbishment of the existing elevated tank, which is classified as a ‘Schedule A’ activity:

> *1. Normal or emergency operational activities. Such activities may include… repairs and renovations to treatments and pumping plant equipment, water storage facilities, distribution mains and appurtenances.*

- Decommission Stouffville Reservoir – East Cell

Retiring the Reservoir cell is classified as a ‘Schedule A+’ activity:

> *5. Retire a water facility which would have been planned under Schedule B or C of the Municipal Class EA for its establishment.*

- Install New Pressure-Reducing Valve

Valves are defined as appurtenances with respect to water distribution systems, which classifies this work as a ‘Schedule A’ activity’

> *1. Normal or emergency operational activities. Such activities may include… install new service connections, hydrants and appurtenances from existing watermains.*

Of the five individual projects identified above, the project with the most rigorous Class EA schedule is the retirement of the Stouffville Reservoir, which is classified as a Schedule A+ activity. As this Class EA process was undertaken as a ‘Schedule B’ exercise, the Class EA requirements of all of the above elements have therefore been satisfied.

8 Property Acquisition

The preferred storage solution projects will all be implemented within existing Regional facilities, and on lands currently owned by the Region. No additional property is required, as the Zone 2 Elevated Tank will be rehabilitated, and not removed and replaced. It is anticipated that the PRV will be constructed by the Town, through a joint agreement with the Region.

There is no property acquisition required for the ‘Do Nothing’ water supply alternative.

9 Next Steps

As there were no objections from the project stakeholders, the next step in the Class EA Process is to prepare the Notice of Completion and the Project File Report, which will be placed on the Public Record for a period of 30 days.

Following the public review period, the Class EA process for Schedule B activities identifies that – unless a Part II Order Request is submitted – the Region can proceed to implementation of the preferred solution (Class EA, Phase 5).

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Appendix A

Open House #2 Summary Package

THIS APPENDIX CAN BE FOUND IN **APPENDIX P** OF THE PROJECT FILE