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Halton Region
Integrated Master Plan

APPENDIX 3A

Strategy Evaluation

Halton Region

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Strategy Evaluation

Milton Groundwater Supply Concept

Screening and Detailed Evaluation Table

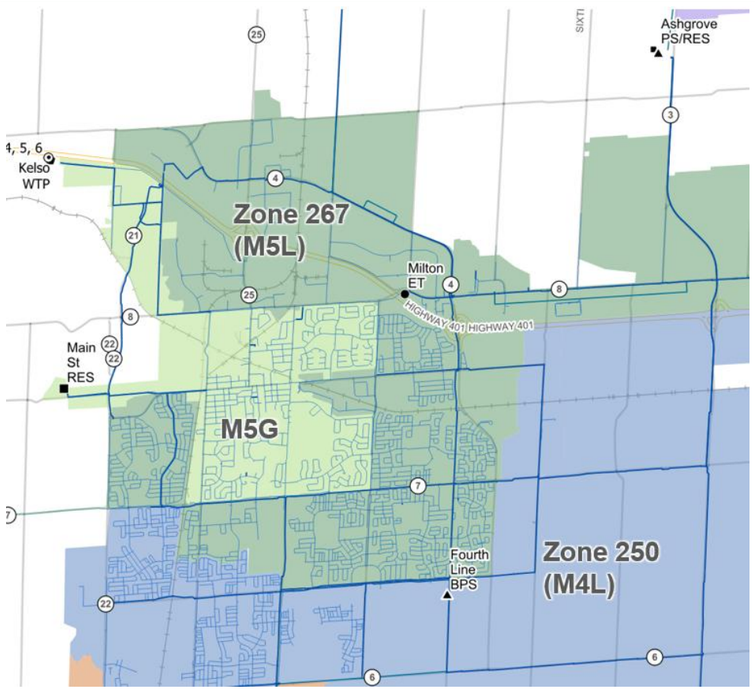
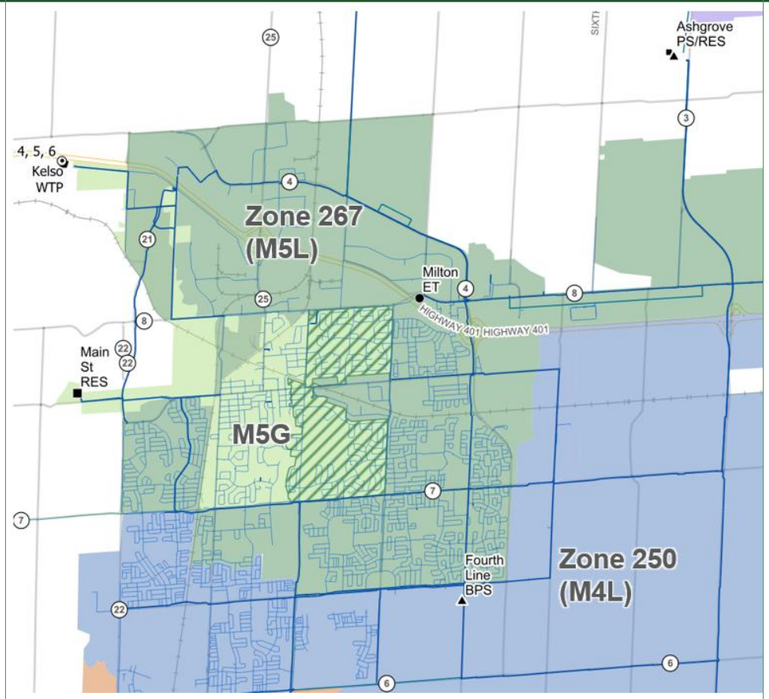
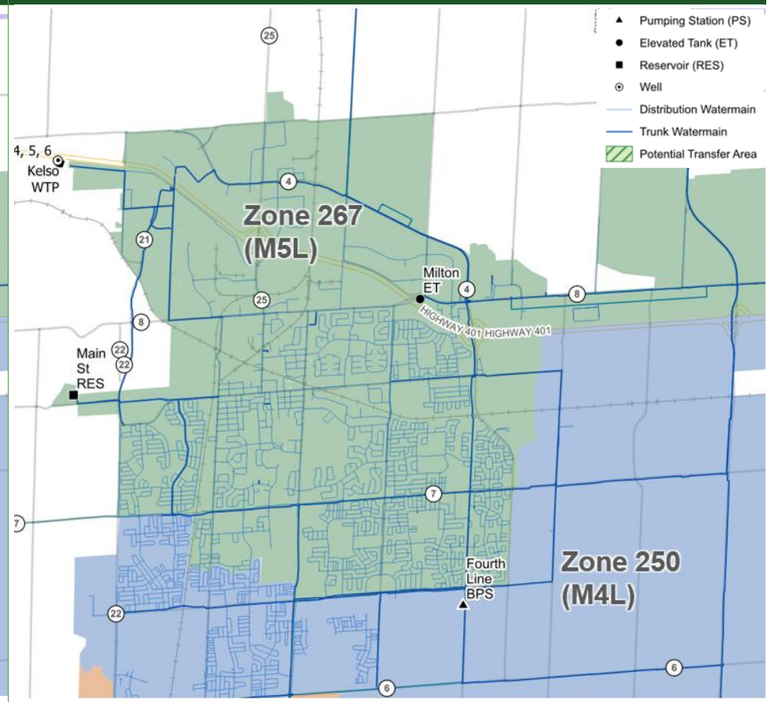
Milton Groundwater System Supply Concepts – Screening of Concepts

What is the Constraint?

If no changes are made to the Milton groundwater system's boundary or capacity, then the existing groundwater treatment capac ity in Milton would be insufficient to meet projected growth to 2051.

Alternatives	Advantages	Disadvantages	Rating	Result
1. Do nothing Existing infrastructure to remain as is.	• Does not incur new capital costs, since system demand would remain within the system's current capacity.	• Does not meet adequate levels of service for existing users and future growth. • Does not comply with the official plans of the four Local Municipalities in Halton and the Provincial Planning Statement (PPS) 2024 growth targets. • Does not align with the IMP's vision and considerations. • Potential social/economic/environmental disruptions due to insufficient supply.	Low	**Screened Out**
2. Limit growth Limit community growth so as to not trigger new infrastructure or upgrades.	• Reduces the extent of capital upgrades required in the system.	• Does not meet adequate levels of service for existing users and future growth. • Does not comply with the official plans of the four Local Municipalities in Halton and the PPS 2024 growth targets. • Does not align with the IMP's vision and considerations.	Low	**Screened Out**
3. Existing M5G area fully remains as groundwater with new or expanded wells Expand / increase groundwater supplies and treatment to account for population growth and increased demand requirements.	• Maximizes utilization of the existing groundwater supply infrastructure. • Maintains flexibility in supply with both groundwater supply infrastructure and lake-based infrastructure within Milton.	• High production cost of groundwater in Milton. • Expected high cost for additional well expansion/exploration. • Potential lack of expansion viability. • Unknown environmental/social impacts with the new supply (location of the well field and associated linear upgrades). • Difficult to accomplish in short-term due to supply limits and rate of growth.	Medium	**Carried Forward**
4. Partial and phased transfer of groundwater to lake-based servicing Expand the lake-based service area while reducing well-based areas to address growth and demand requirements in Milton. Maintains groundwater supplies at existing levels.	• With selected transfer areas, the system demands in M5G can be maintained within the limits of Kelso WTP. • Meets adequate levels of service for existing and future growth. • Maximizes existing infrastructure and some additional linear projects. • Lower production cost from the lake-based supply. • Works well with phased approach as growth occurs. • Greater certainty in long-term supply capacity.	• Potential variances in public perceptions of groundwater vs lake-based supply. • Additional infrastructure is required to facilitate select lake-based transfer.	High	**Carried Forward**
5. Full transfer of Milton groundwater system to lake-based Servicing Eliminate all well-based supplies and transfer from lake-based service areas to address growth and demand requirements in Milton.	• With a full transfer, lake-based system upgrades to 2051 could be planned/sized to support the entirety of Milton. • Meets adequate levels of service for existing and future growth. • Works well with phased approach as growth occurs. • Lower production cost from the lake-based supply. • Greater certainty in long-term supply capacity.	• Does not maximize use of the existing built infrastructure. • Increased capital costs for larger facility upgrades/expansions through the lake-based system. • Unknown long-term viability of wells. • Potential variances in public perceptions of groundwater vs lake-based supply.	Medium	**Carried Forward**

Milton Groundwater System Supply Concepts

Alternative 3 Existing M5G area fully remains as groundwater with new or expanded Wells	Alternative 4 Partial and phased transfer of groundwater to lake-based servicing	Alternative 5 Full transfer of groundwater system to lake-based servicing
		
• New or expanded wells and treatment capacity. • No new local linear infrastructure required to keep a well-looped local system. • Upgrades to the lake-based M5L system to support growth outside the groundwater service areas.	• New linear infrastructure required to keep well-looped local systems. • Upgrades to the lake-based M5L system to support growth outside the groundwater service areas.	• Minimal new linear infrastructure needed for the purposes of looping, but increased sizing of infrastructure towards M5L would be required to support larger service area. • Zone M5G is removed (decommissioning of wells, reservoir and related transmission). • Upgrades to the lake-based M5L system to support growth outside the groundwater service areas.

Milton Groundwater System Supply Concepts – Detailed Evaluation

Criteria, Description and Scoring	Alternative 3 Existing M5G area fully remains as groundwater with New or expanded Wells	Alternative 4 Partial and phased Transfer of groundwater to lake-based servicing	Alternative 5 Full transfer of groundwater system to lake-based servicing
Equitable Infrastructure Services			
• Improves/maintains level of service for existing users	✗ Maintains LOS	✓✓ Improves LOS	✓✓ Improves LOS
	• Maintains LOS if sufficient well capacity expansions are able to be provided to support the Milton area. However, there are major limitations with the speed of growth compared to the timing that it takes to locate, build and operate additional well capacity.	• Improves LOS by providing the additional pumping capacity required to support Milton area. Technically feasible by maintaining the existing well capacity and limiting the groundwater service areas that maximize the well utilization. Remaining areas can be serviced by M5L instead, without negative impact to LOS.	• Improves LOS by providing the additional pumping capacity required to support Milton area. Technically feasible by further upsizing the capacity of the lake-based water system so that larger transfers are available all the way through the system to M5L.
Safe and Healthy Communities			
• Minimizes potential short/long-term noise and odour impacts	✓ Neutral	✓ Neutral	✓ Neutral
• Minimizes construction impact on traffic, local businesses, and residents	✓ Neutral	✓ Neutral	✓ Neutral
• Considers long-term visual aesthetics of the proposed infrastructure	✓ Neutral	✓ Neutral	✓ Neutral
• Minimizes impacts on surrounding properties	✓ Neutral	✓ Neutral	✓ Neutral
	• Short-term noise and odour impact due to construction activities (new facilities expected for expanded/new well field and linear works). • All alternatives will involve some level of construction activity, which may result in temporary impact on traffic, local businesses and residents. Exact location unknown for potential well field. • Minimal new visual impacts due to underground infrastructure or ground level facilities. Potential higher impact from new well-field facility. • The construction increases impacts on surrounding properties. Generally, considered similar for all alternatives.	• Short-term noise and odour impact due to construction activities (new local watermain for select stages of the phased transfer and pumping & linear upgrades related to M5L expansion). • All alternatives will involve some level of construction activity, which may result in temporary impact on traffic, local businesses and residents. • Minimal new visual impacts due to underground infrastructure or ground level facilities. • The construction increases impacts on surrounding properties. Generally, considered similar for all alternatives.	• Short-term noise and odour impact due to construction activities (larger pumping & linear upgrades related to M5L expansion). • All alternatives will involve some level of construction activity, which may result in temporary impact on traffic, local businesses and residents. • Minimal new visual impacts due to underground infrastructure or ground level facilities. • The construction increases impacts on surrounding properties. Generally, considered similar for all alternatives.
Sustainability			
• Minimizes environmental crossings, impact on aquatic/terrestrial species at risk, and environmentally sensitive/protected areas, and nearby agricultural lands	✗ Increases Impact	✓ Neutral	✓ Neutral
• Incorporates water conservation and reuse practices	✓ Neutral	✓ Neutral	✓ Neutral

Criteria, Description and Scoring	Alternative 3 Existing M5G area fully remains as groundwater with New or expanded Wells	Alternative 4 Partial and phased Transfer of groundwater to lake-based servicing	Alternative 5 Full transfer of groundwater system to lake-based servicing
• Minimizes impact on archaeological/resources, and cultural heritage sites	✓ Neutral	✓ Neutral	✓ Neutral
• Maximizes existing infrastructure	✓ Neutral	✓ Neutral	✗ Requires new, dedicated infrastructure that doesn't improve overall system resiliency
• Full lifecycle costs	✗ Higher lifecycle cost	✓✓ Lower lifecycle cost	✓ Neutral
• Staging costs	✓ Neutral	✓✓ Lower staging and throwaway costs	✗ Higher staging and throwaway costs
• State of Good Repair (SOGR) integration	✓ Neutral	✓ Neutral	✓ Neutral
	• Linear work would include several environmental crossings; however, these should be completed via tunneling, resulting in minimal disturbance. New well facilities and increase of permit to take water would require environmental investigations on aquifer and other environmental impacts. • All alternatives should still involve the incorporation of water conservation to limit the capacity increases that are triggered from growth. • Detailed archaeological and cultural heritage impact assessments will be completed during future phases of project development, prior to implementation as required. • Maximizes capacity within existing groundwater system infrastructure. However, growth goes well beyond current capacity, so new dedicated infrastructure is required. • High production cost for groundwater & high costs for groundwater exploration and well facility expansions. Unknown cost impacts of new linear works (length of new feedermains from potential well field; may also require environmental crossings; etc.). • Potential for staging and throwaway costs since it may not be viable to find additional well capacity before the expected growth triggers the need. • Similar level of coordination with SOGR program required to ensure continued operability of groundwater system facilities, while expansions are considered at other sites.	• Linear work would include several environmental crossings; however, these should be completed via tunneling, resulting in minimal disturbance. • All alternatives should still involve the incorporation of water conservation to limit the capacity increases that are triggered from growth. • Detailed archaeological and cultural heritage impact assessments will be completed during future phases of project development, prior to implementation as required. • Maximizes capacity within existing groundwater and lake-based infrastructure. Right-sizes the groundwater system to align with existing capabilities and uses lake-based upgrades to support remainder. • Lowest overall cost (lower production costs from lake-based supply; and has lower additional costs than Alternative 5 in terms of increased PS/WTP expansions from the lake-based system; no groundwater exploration or new groundwater facility costs). • It is more feasible to coordinate the staging as a phased approach, when growth dictates (NE transfer first; then SE area as growth triggers the need). So, no staging/throwaway costs are expected. • Similar level of coordination with SOGR program required to ensure continued operability of groundwater system facilities, while lake-based servicing increases.	• Linear work would include several environmental crossings; however, these should be completed via tunneling, resulting in minimal disturbance. • All alternatives should still involve the incorporation of water conservation to limit the capacity increases that are triggered from growth. • Detailed archaeological and cultural heritage impact assessments will be completed during future phases of project development, prior to implementation as required. • Does not maximize use of existing well-based system infrastructure (fully decommissions it, which increases needs from lake-based system). But could be justified long-term, if the maintenance/rehab is too costly to maintain the Kelso Wells. • Moderate capital costs for new facility upgrades/ facility expansions (larger Burloak WTP expansion need; higher other PS needs; larger new PS to M5L; etc.). • Not viable to conduct full transfer quickly. Would necessitate gradual phased transfer initially prior to full. It is more feasible to coordinate the staging as a phased approach, when growth dictates (NE transfer first; then SE area as growth triggers the need). • Similar level of coordination with SOGR program required to ensure continued operability of groundwater system facilities, while lake-based servicing prepares to take over supply needs.
Climate Change			
• Considers resiliency and operational flexibility to adapt to Climate Change	✓ Neutral	✓ Neutral	✓ Neutral
• Reduction in emissions	✓✓ Lower carbon footprint	✓ Neutral	✗ High carbon footprint

Criteria, Description and Scoring	Alternative 3 Existing M5G area fully remains as groundwater with New or expanded Wells	Alternative 4 Partial and phased Transfer of groundwater to lake-based servicing	Alternative 5 Full transfer of groundwater system to lake-based servicing
	• Having multiple supply sources (well-based M5G and lake based M5L) provides similar levels of operational flexibility as today, particularly during emergencies. • Lowest emissions due to maximizing well supply, where there is no need to pump lake water from a distance (lower total energy requirements).	• Having multiple supply sources (well-based M5G and lake based M5L) provides similar levels of operational flexibility as today, particularly during emergencies. • Lower emission due to maximizing the current well supply. So, there is still partial lake-based supply with the higher pumping/energy requirements. Slightly lower construction related emissions expected.	• Having multiple supply sources (lake-based supply originating from multiple different water treatment plants) provides similar levels of operational flexibility as today, particularly during emergencies. • Highest emissions due to pumping more lake water to Milton from Burlington/Oakville (highest pumping/energy requirements).
Integration of Planning for Regional Structure			
• Minimizes approvals/coordination	✗ Increases approval/coordination needs	✓ Neutral	✓ Neutral
• Integrates with road/transportation projects	✓ Neutral	✓ Neutral	✓ Neutral
	• Unknown location of potential well field (assuming a viable site is found nearby). Significant approval complexity for well exploration and construction, due to unknown future well field location and environmental considerations. • Does not create large scale differences in the integration with other regional infrastructure.	• Some added coordination required for phased transfer and the additional looping needed to support. However, less approvals needed than Alternative 3. • Does not create large scale differences in the integration with other regional infrastructure.	• Coordination required with the additional supply needs towards the expanded M5L from lake-based system. However, less approvals needed than Alternative 3. • Does not create large scale differences in the integration with other regional infrastructure.
Technical Innovation			
• Applies innovation and/or new technologies	N/A	N/A	N/A
• Provides opportunity for operational flexibility and security	✓ Neutral	✓✓ Maximizes operational flexibility and security of supply/capacity	✓ Neutral
• Considers performance of the system under emergency conditions (power outages, fire emergencies) or during construction	✓ Neutral	✓✓ Improves performance	✓ Neutral
• Supports phased growth	✗ Does not support phased growth	✓✓ Supports phased growth	✓ Neutral
• Minimizes roads/utility crossings and existing infrastructure and minimize proximity and/or conflicts with existing infrastructure	✓ Neutral	✓ Neutral	✓ Neutral
• Considers constructability and technical feasibility to build and maintain infrastructure	✗ More constructability challenges and reduced technical feasibility	✓ Neutral	✓ Neutral
	• Limited opportunity for innovation or new technologies. • Moderate operational flexibility and security (well-based M5G and lake based M5L) to maintain security of supply. • This alternative is slightly more at-risk during emergency conditions since it relies on the single source of supply from groundwater wells.	• Limited opportunity for innovation or new technologies. • Highest level of operational flexibility and security from both groundwater and the strengthened lake-based supply system. • This alternative improves performance during emergency conditions since it has more ability to utilize the different source of supplies, as needed, from groundwater and/or lake-based systems.	• Limited opportunity for innovation or new technologies. • Moderate operational flexibility and security (multiple water treatment plants, pump stations and transmissions) to maintain security of supply. • This alternative is slightly more at-risk during emergency conditions since it relies on the lake-based supplies only, however, there are multiple pump stations towards the expanded M5L pressure zone.

Criteria, Description and Scoring	Alternative 3 Existing M5G area fully remains as groundwater with New or expanded Wells	Alternative 4 Partial and phased Transfer of groundwater to lake-based servicing	Alternative 5 Full transfer of groundwater system to lake-based servicing
	• Challenges with supporting phased growth, particularly due to the rapid growth projection being faster than potential exploration/well construction. • All alternatives will involve some level of construction activity, which may result in crossings/conflicts. Exact location unknown for potential well field, so expected impacts are similar for all alternatives. • Moderate constructability (and exploration) concerns, since there may be challenges with finding suitable well field sites for the magnitude of growth that is projected long-term.	• Supports phased intensification growth by incorporating transfers from well-based to lake-based, as and when needed over time. • All alternatives will involve some level of construction activity, which may result in crossings/conflicts. Exact location unknown for potential well field, so expected impacts are similar for all alternatives. • Limited constructability concerns.	• Supports the projected growth, but it is not viable to conduct full transfer quickly. Would necessitate gradual phased transfer initially prior to full conversion. • All alternatives will involve some level of construction activity, which may result in crossings/conflicts. Exact location unknown for potential well field, so expected impacts are similar for all alternatives. • Limited constructability concerns.
Preferred Strategy	✘ Least Preferred	✓✓ Most Preferred	✓ Less Preferred

Alternative 4 – Partial and Phased Transfer of Groundwater to Lake-based Servicing is identified as the preferred strategy as it supports the phased intensification growth, maximizes existing infrastructure, has a relatively lower life cycle cost, and it provides more operational flexibility and security due to the hybrid system from groundwater and lake-based system.

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Strategy Evaluation

Lake-based System Supply Concept

Screening and Detailed Evaluation Table

Lake-based System Supply Concepts – Screening of Concepts

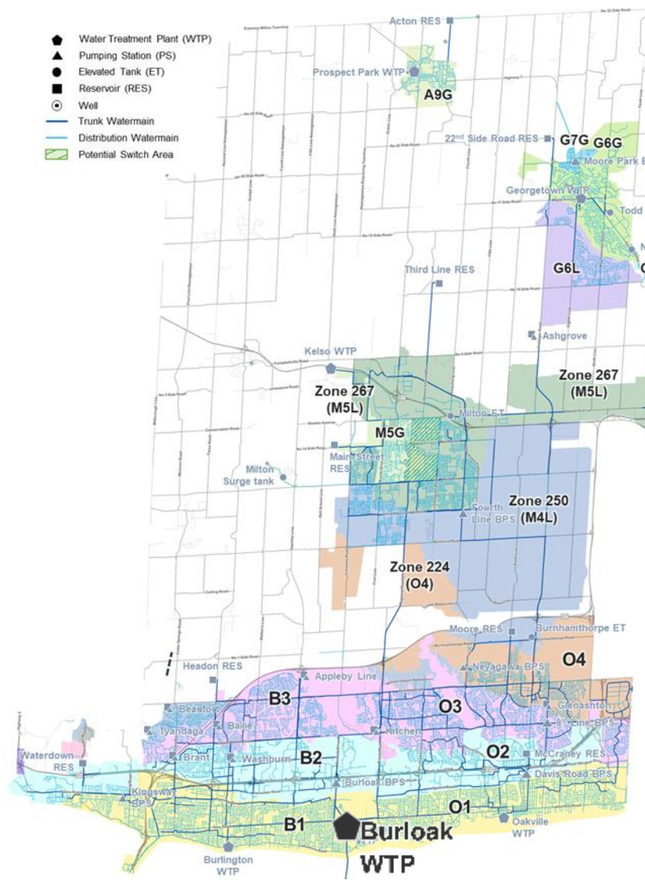
What is the Constraint?

Without upgrades, the existing treatment capacity of the lake-based water system is projected to be insufficient to meet projected growth to 2051.

Alternatives	Advantages	Disadvantages	Rating	Result
1. Do nothing Existing infrastructure to remain as is.	• Does not incur new capital costs. • No potential impacts due to construction of new infrastructure.	• Does not meet adequate levels of service for existing users and future growth. • Does not comply with the official plans of the four Local Municipalities in Halton and the Provincial Planning Statement (PPS) 2024 growth targets. • Does not align with the IMP's vision and considerations. • Potential social/economic/environmental disruptions due to insufficient supply.	Low	**Screened Out**
2. Limit growth Limit community growth so as to not trigger new infrastructure or upgrades.	• Reduces the extent of capital upgrades required in the system.	• Does not meet adequate levels of service for existing users and future growth. • Does not comply with the official plans of the four Local Municipalities in Halton and the PPS 2024 growth targets. • Does not align with the IMP's vision and considerations.	Low	**Screened Out**
3. Expand capacity via existing water treatment plants (Burloak WTP) Expand lake-based service area through Burloak WTP.	• Meets adequate levels of service for existing and future growth. • Maximizes existing infrastructure (Oakville WTP; Burlington WTP). • Burloak WTP is already planned for expansion (existing intake capable of supporting capacity expansion). • More viable to accomplish in near-term with planned capacity expansion at the Burloak WTP site. • Lower costs of expansion compared to a new WTP.	• Significant expansion will require increased coordination to ensure existing facility maintains service throughout the construction phasing.	High	**Carried Forward**
4. Expand capacity with new water treatment plant Expand lake-based service area through a new water treatment plant.	• Meets adequate levels of service for existing and future growth.	• Does not maximize the built capacity for existing WTP elements. • More difficult to support rapid near-term growth as the planning, design, and construction phases of a new WTP are long in duration. • Higher capital cost for a new WTP facility.	Medium	**Carried Forward**

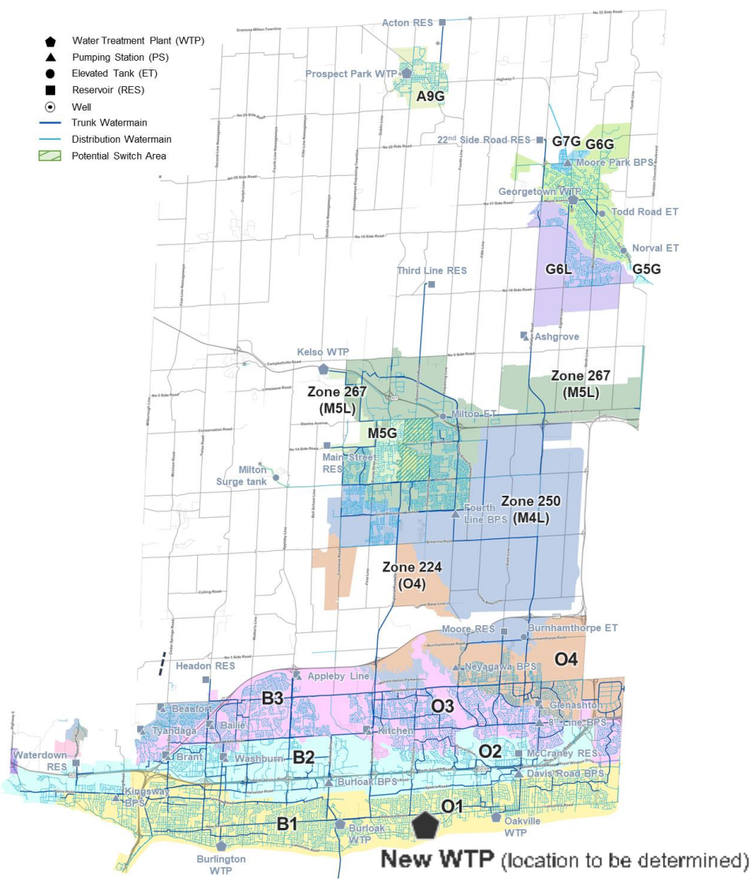
Lake-based System Supply Concepts

Alternative 3
Expand capacity via existing water treatment plants (Burloak WTP)



- Burlington WTP maximizing actual capacity to match rated capacity (263MLD).
- Burloak WTP expands from 52 MLD to 400 MLD (in several phases).
- Oakville WTP increases to 130 MLD.

Alternative 4
Expand capacity with new water treatment plant



- Burlington WTP maximizing actual capacity to match rated capacity (263MLD).
- Burloak WTP expands from 52 MLD to 165 MLD (Planned Phase 2 Expansion).
- Oakville WTP increases to 130 MLD.
- A New WTP added with capacity of ~235MLD.

Lake-based System Supply Concepts – Detailed Evaluation

Criteria, Description and Scoring	Alternative 3 Expand capacity via existing water treatment plants (Burloak WTP)	Alternative 4 Expand capacity with new water treatment plant
Equitable Infrastructure Services		
• Improves/maintains level of service for existing users	✓✓ Improves LOS	✓✓ Improves LOS
	• Technically feasible to maintain levels of service for existing and future users, with maximized capacity of existing facilities (meets 2051 demand projection).	• Technically feasible to maintain levels of service for existing and future users, with maximized capacity of existing facilities (meets 2051 demand projection).
Safe and Healthy Communities		
• Minimizes potential short/long-term noise and odour impacts	✓ Neutral	✗ Increases impact
• Minimizes construction impact on traffic, local businesses, and residents	✓ Neutral	✓ Neutral
• Considers long-term visual aesthetics of the proposed infrastructure	✓ Neutral	✗ Increases visual impact
• Minimizes impacts on surrounding properties	✓ Neutral	✗ Increases road/utility crossings & conflicts
	• Lower short-term noise impacts (compared to Alternative 4) since major construction is largely limited to the existing Burloak WTP site. • All alternatives expected to have construction-related impacts to traffic/residents. • Minimal impact to long-term aesthetics since construction would be at existing WTP site. • Overall, lower level of disruptions at surrounding sites are expected than an entirely new Water Treatment Plant site, although the degree of impact for a new Water Treatment Plant site is heavily influenced by location.	• Short-term noise impacts increased with major construction at Burloak WTP and the construction of an entirely new Water Treatment Plant site (land, new intake, etc.). • All alternatives expected to have construction-related impacts to traffic/residents. • Long-term aesthetics impact is increased with new Water Treatment Plant. • Overall, higher levels of disruptions at surrounding sites are expected due to new site requirements (resulting in noise impact, construction impact, potential visual impact) for a new Water Treatment Plant site. Note this is further influenced by location, which is not known at this time. Limited space opportunities near the waterfront contribute to this challenge.
Sustainability		
• Minimizes environmental crossings, impact on aquatic/terrestrial species at risk, and environmentally sensitive/protected areas, and nearby agricultural lands	✓ Neutral	✗ Increases impact
• Incorporates water conservation and reuse practices	✓ Neutral	✓ Neutral
• Minimizes impact on archaeological/resources, and cultural heritage sites	✓ Neutral	✗ Increases impact
• Maximizes existing infrastructure	✓✓ Maximizes capacity of existing infrastructure	✗ Requires new, dedicated infrastructure that doesn't improve system resiliency
• Full lifecycle costs	✓✓ Lower lifecycle cost	✗ Higher lifecycle cost
• Staging costs	✓ Neutral	✓ Neutral
• State of Good Repair (SOGR) integration	✓ Neutral	✓ Neutral

Criteria, Description and Scoring	Alternative 3 Expand capacity via existing water treatment plants (Burloak WTP)	Alternative 4 Expand capacity with new water treatment plant
	• Lower environmental impacts due to ability to utilize existing intake. • All alternatives should still involve the incorporation of water conservation to limit the capacity increases that are triggered from growth. • Lower potential for impacts on archaeological and cultural heritage resources as the existing WTP site is an already disturbed site. • Maximizes existing treatment plant infrastructure. • Lower overall life cycle cost for an existing facility expansion than an entirely new site/intake/Water Treatment Plant. • Lower staging costs with expansion of existing treatment plant process components and no new intake. • Limited opportunity for coordination with state of good repair.	• Higher environmental impacts expected due to an additional intake into Lake Ontario and the need to develop a Water Treatment Plant on an entirely new site. • All alternatives should still involve the incorporation of water conservation to limit the capacity increases that are triggered from growth. • Higher potential for impacts on archaeological and cultural heritage resources as a new large property will be required within reasonable proximity of the lake shoreline. • Does not maximize existing treatment plant infrastructure (existing intakes). • Higher overall life cycle cost for a new Water Treatment Plant, with land purchase. • Higher staging costs with construction of a new intake, and new connectivity to the existing water distribution system. • New asset requiring coordination and funding within state of good repair program.
Climate Change		
• Considers resiliency and operational flexibility to adapt to Climate Change	✓ Neutral	✓✓ Strategy elements provide improved resiliency for Climate Change adaptation
• Reduction in emissions	✓ Neutral	✓ Neutral
	• May be less resilient to climate change concerns (algal blooms) due to higher reliance on the Burloak WTP intake. • Slightly lower carbon emissions expected from existing facility expansion. Limited differences in terms of emissions from pumping/treatment long-term.	• May be more resilient to climate change concerns (algal blooms) due to having an additional intake with different Lake Ontario location. Less likely to have intake issues at multiple WTPs simultaneously. • Slightly higher carbon emissions expected from the new facility construction. Limited differences in terms of emissions from pumping/treatment long-term.
Integration of Planning for Regional Infrastructure		
• Minimizes approvals/coordination	✓✓ Decreases approval/coordination needs	✖ Increases approval/coordination needs
• Integrates with road/transportation projects	✓ Neutral	✓ Neutral
	• Lower level of coordination/approvals for existing facility expansion, although Permit to Take Water (PTTW) will need to be expanded notably as part of future Class EAs for the capacity expansions. • Limited differences in terms of ability to integrate with transportation planning.	• Unknown future location of potential Water Treatment Plant, but overall significant coordination/approvals would be needed for land acquisition, intake permitting, and Class EA requirements, etc. • Limited differences in terms of ability to integrate with transportation planning.
Technical Innovation		
• Applies innovation and/or new technologies	✓✓ Considers/applies innovative and/or new technologies	✓✓ Considers/applies innovative and/or new technologies
• Provides opportunity for operational flexibility and security	✓ Neutral	✓✓ Maximizes operational flexibility and security of supply/capacity
• Considers performance of the system under emergency conditions (power outages, fire emergencies) or during construction	✓ Neutral	✓ Neutral
• Supports phased growth	✓✓ Supports phased growth	✓✓ Supports phased growth

Criteria, Description and Scoring	Alternative 3 Expand capacity via existing water treatment plants (Burloak WTP)	Alternative 4 Expand capacity with new water treatment plant
• Minimizes roads/utility crossings and existing infrastructure and minimize proximity and/or conflicts with existing infrastructure	✓✓ Minimizes road/utility crossings & conflicts	✓ Neutral
• Considers constructability and technical feasibility to build and maintain infrastructure	✓✓ Reduced constructability challenges and improved technical feasibility	✓ Neutral
	• Future Water Treatment Plant capacity expansion should consider the application of new water technologies. • Good system operational flexibility and security from existing facilities (Burlington/Oakville/Burloak Water Treatment Plants). • Performance of system during emergency conditions would be limited if there was a major outage at the Burloak WTP long-term since it provides ~50% of all supply in 2051. Standby power capacity and other resiliency within the facility should be included in upgrades to ensure reliability. • Supports phased growth by including various phases of expansion at Burloak WTP that align with growth timing. • Water treatment facility expansion has negligible direct impacts to roads/utility crossings. Would be similar impacts for both Alternatives. • Known constructability of the Water Treatment Plant expansion due to well-understood site conditions and the known capacity of the existing intake.	• New Water Treatment Plant should consider the application of new water technologies. • Increased operational flexibility and redundancy under emergency conditions, due to the added water treatment plant. • Improved performance of system expected during emergency conditions due to added redundancy from an additional facility. • Supports phased growth since initial phases of growth would be planned expansions of existing facilities. Followed by a new Water Treatment Plant that is likely in multiple stages to align with growth. • Impacts on roads and utilities are unknown until a location and property are identified. • New Water Treatment Plant constructability is site-dependent and carries higher risk due to limited available waterfront land and permitting complexity.
Preferred Strategy	✓✓ Most Preferred	✓ Least Preferred

Alternative 3 – Expand Capacity via Existing Water Treatment Plants (Burloak WTP) is identified as the preferred strategy as there is significant room for expansion at the Burloak WTP. The prior 2011 Sustainable Halton Water & Wastewater Master Plan had considered the expansion at Burloak WTP, and the intake was intentionally sized to support future growth.

3A

Strategy Evaluation

Overall Transmission Strategy

Alternatives and Detailed Evaluation Table

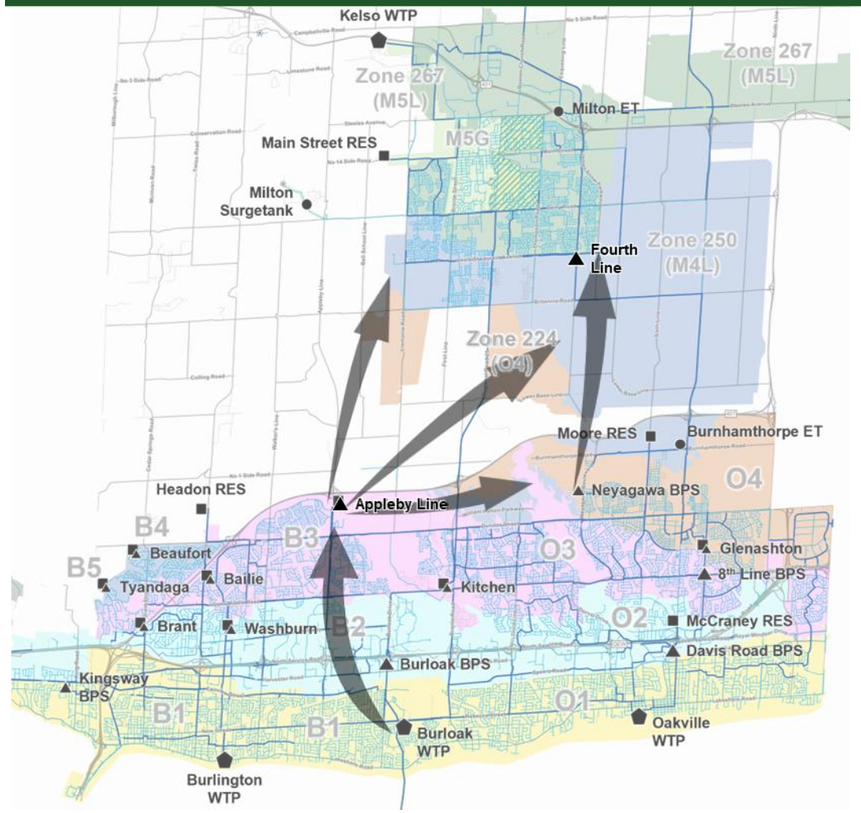
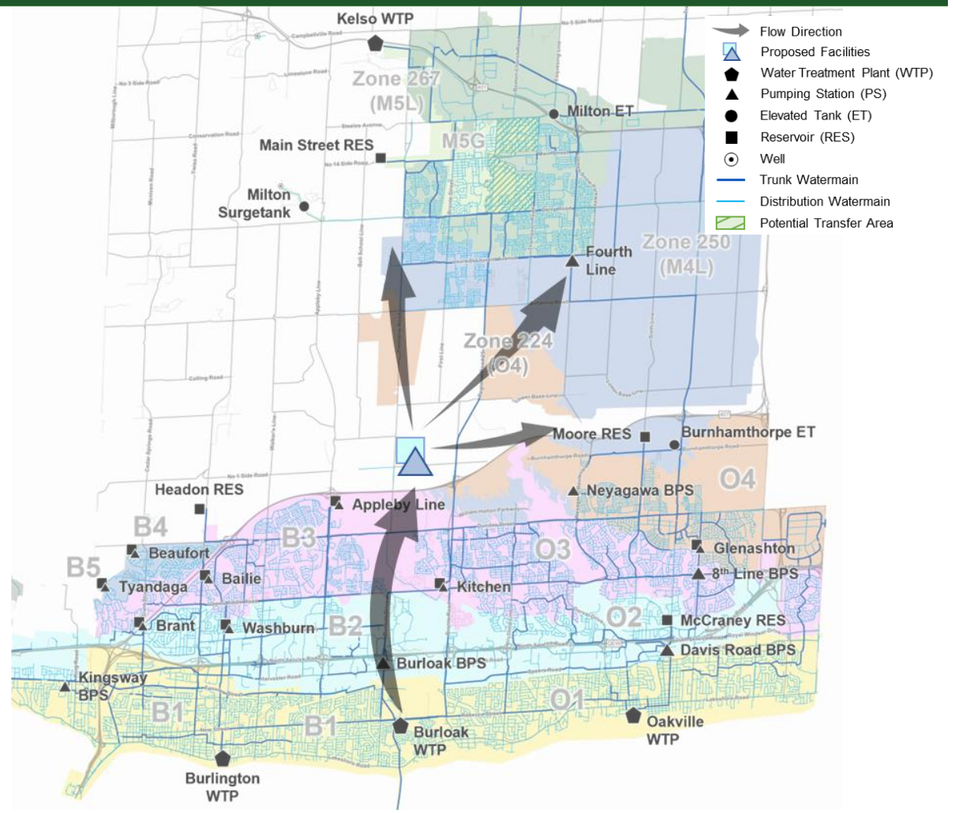
Overall Transmission Strategy – Screening of Concepts

What is the Constraint?

Milton, Georgetown and North Oakville are growing significantly. The existing infrastructure are at the capacity limit that p revent the system to move more water to the north. Therefore, lake-based transmission concepts are being explored to bring water from an expanded Burloak WTP towards the northern growth areas (North Oakville/Milton/Georgetown).

Alternatives	Advantages	Disadvantages	Rating	Result
1. Do nothing Existing infrastructure to remain as is.	• Does not incur new capital costs. • No potential impacts due to construction of new infrastructure.	• Does not meet adequate levels of service for existing and future growth. • Does not comply with the official plans of the four Local Municipalities in Halton and the Provincial Planning Statement (PPS) 2024 growth targets. • Does not align with the IMP's vision and considerations. • Potential social/economic/environmental disruptions due to insufficient supply.	Low	**Screened Out**
2. Limit growth Limit community growth as to not trigger new infrastructure upgrades.	• Reduces extent of upgrades required in the system.	• Does not meet adequate levels of service for existing and future growth. • Does not comply with the official plans of the four Local Municipalities in Halton and the PPS 2024 growth targets. • Does not align with the IMP's vision and considerations.	Low	**Screened Out**
3A. West concept via Appleby RES/PS expansion and Burloak BPS	• Meets adequate levels of service for existing and future growth. • Technically feasible.	• Significant upgrades would be needed through the Zone 1 and Zone 2 systems in order to move this supply towards the Appleby RES.	Medium	**Screened Out**
3B. West concept via Appleby RES/PS expansion skipping Burloak BPS	• Meets adequate levels of service for existing and future growth. • Technically feasible. • Skipping Burloak BPS could avoid the pressure variations in the local B1/B2/O1/O2 systems.	• Requires a significant amount of infrastructure upgrades (Appleby PS/RES with associated transmission watermains).	High	**Carried Forward**
4A. Central concept via a new central facility and Burloak BPS	• Meets adequate levels of service for existing and future growth. • Technically feasible.	• Significant upgrades would be needed through the Zone 1 and Zone 2 systems in order to move this supply towards the higher zones (M4L/B3/O3).	Medium	**Screened Out**
4B. Central concept via a new central facility skipping Burloak BPS	• Meets adequate levels of service for existing and future growth. • Technically feasible. • Skipping Burloak BPS could avoid the pressure variations in the local B1/B2/O1/O2 systems. • Interconnection between this dedicated Zone 2 feedermain and other B2/O2 transmission mains could improve system resiliency.	• Requires a significant amount of new infrastructure (A new station with a reservoir and two sets of pumps with associated transmission watermains).	High	**Carried Forward**
5. East concept via the existing facilities in Oakville	• Meets adequate levels of service for existing and future growth. • Technically feasible.	• Significant upgrades would be needed through fully developed areas in Zone 1, Zone 2 and Zone 3 systems in Oakville. • There are limited suitable crossing opportunities to bring flow from Burloak WTP across Sixteen Mile Creek and towards the existing Oakville facilities.	Low	**Screened Out**

Overall Transmission Strategy – Selected Concepts

Alternative 3B West concept via Appleby RES/PS expansion skipping Burloak BPS	Alternative 4B Central concept via a new central facility skipping Burloak BPS
	
• Brings water supply from Burloak WTP towards Appleby RES before being transferred north. • Transfers water supply directly into Zone 2 from Burloak WTP towards the Appleby RES with a dedicated feedermain. • Significant upgrades at the existing Appleby PS/RES site to include a new set of pumps to Pressure Zone M4L, with the existing pumps to B3. • New transmission mains from Appleby PS/RES to Pressure Zone O3 and M4L system.	• Brings water supply from Burloak WTP towards a future Central Facility before being transferred north. • Transfers water supply directly into Zone 2 from Burloak WTP towards the Central Facility Reservoir with a dedicated feedermain. • The new Central Facility will have two sets of pumps for Pressure Zone O3/B3 and M4L. • New transmission mains from the Central Facility to Pressure Zone O3 and M4L system.

Overall Transmission Strategy – Detailed Evaluation

Criteria, Description and Scoring	Alternative 3B West concept via Appleby RES/PS expansion skipping Burloak BPS	Alternative 4B Central concept via a new central facility skipping Burloak BPS
Equitable Infrastructure Services		
• Improves/maintains level of service for existing users	✓✓ Improves LOS	✓✓ Improves LOS

	• Improves LOS by providing the additional supply/pumping capacity towards the northern growth areas in Lake-based Milton and Georgetown.
	  ○ Improves LOS in local areas of Pressure Zone 1 (O1/B1) by having some direct supply from Burloak WTP (Z2) to Appleby Reservoir. Partly bypassing O1/B1 helps to limit the pressure variations that would otherwise occur in O1/B1 if all flow passed through the lower zones.
		• Improves LOS in northern areas in need of additional supply source.
		  ○ Improves LOS in local areas of Pressure Zone 1 (O1/B1) by having some direct supply from Burloak WTP (Z2) to Appleby Reservoir. Partly bypassing O1/B1 helps to limit the pressure variations that would otherwise occur in O1/B1 if all flow passed through the lower zones.

Safe and Healthy Communities		
• Minimizes potential short/long-term noise and odour impacts	✓ Neutral	✓ Neutral
• Minimizes construction impact on traffic, local businesses, and residents	✓ Neutral	✓ Neutral
• Considers long-term visual aesthetics of the proposed infrastructure	✓ Neutral	✓ Neutral
• Minimizes impacts on surrounding properties	✓ Neutral	✓ Neutral
	• All alternatives will require similar levels of construction with potential for temporary noise impacts, which will be assessed and mitigated through future project-level Class EA studies. • Major transmission construction causing disruptions along route (similar across all alternatives). Future Class EA and design work is intended to assess preferred alignment and construction methods (tunneling, etc.) to minimize construction impacts where possible. • No new facility that would impact long-term aesthetics. • Major transmission work, along with major facility expansion of existing facility (Appleby) is expected to have some impacts to the surrounding community (traffic/construction/noise short term).	• All alternatives will require similar levels of construction with potential for temporary noise impacts, which will be assessed and mitigated through future project-level Class EA studies. • Major transmission construction causing disruptions along route (similar across all alternatives). Future Class EA and design work is intended to assess preferred alignment and construction methods (tunneling, etc.) to minimize construction impacts where possible. • Undefined impact to long-term aesthetics from construction of new Central PS. Location to be selected during future Class EA can help mitigate any impacts. • Major transmission work, along with new facility expected to have some impacts to the surrounding community (traffic/construction/noise short term).
Sustainability		
• Minimizes environmental crossings, impact on aquatic/terrestrial species at risk, and environmentally sensitive/protected areas, and nearby agricultural lands	✓ Neutral	✓ Neutral
• Incorporates water conservation and reuse practices	✓ Neutral	✓ Neutral
• Minimizes impact on archaeological/resources, and cultural heritage sites	✓ Neutral	✓ Neutral
• Maximizes existing infrastructure	✓ Neutral	✓ Neutral

Criteria, Description and Scoring	Alternative 3B West concept via Appleby RES/PS expansion skipping Burloak BPS	Alternative 4B Central concept via a new central facility skipping Burloak BPS
• Full lifecycle costs	✓ Neutral	✗ Higher lifecycle cost
• Staging costs	✓ Neutral	✓ Neutral
• State of Good Repair (SOGR) integration	✓ Neutral	✓ Neutral
	• Similar environmental crossings required for transmission mains across all alternatives. As such, impacts expected are similar for both strategies. • All alternatives should still involve the incorporation of water conservation to limit the capacity increases that are triggered from growth. • Detailed archaeological and cultural heritage impact assessments will be completed during future phases of project development, prior to implementation as required. • Maximizes existing infrastructure (fully uses Appleby Reservoir and PS site, maximizes use of Burloak WTP intake, etc.). • Potential for moderate overall lifecycle costs due to ability to make use of existing site at Appleby. However, moderate risk remains due to potential site constraints at Appleby that may limit expandability. • Limited differences between alternatives in staging costs and no throwaway costs. • Limited opportunity for coordination with state of good repair.	• Similar environmental crossings required for transmission mains across all alternatives. As such, impacts expected are similar for both strategies. • All alternatives should still involve the incorporation of water conservation to limit the capacity increases that are triggered from growth. • Detailed archaeological and cultural heritage impact assessments will be completed during future phases of project development, prior to implementation as required. • Still makes good use of existing infrastructure (Appleby Reservoir and PS still used for original purposes in B2/B3; Burloak WTP intake maximized; etc.). • Higher overall cost expected due to need to identify and purchase land for a new pumping station and reservoir facility (Central PS). • Limited differences between alternatives in staging costs and no throwaway costs. • Limited opportunity for coordination with state of good repair.
Climate Change		
• Considers resiliency and operational flexibility to adapt to Climate Change	✓ Neutral	✓ Neutral
• Reduction in emissions	✓ Neutral	✗ Higher carbon footprint
	• No major differentiator between alternatives for resiliency to climate change. Both alternatives are reliant on operation of Burloak WTP in future. • Similar carbon footprint expected. Potential for slightly lower construction related carbon footprint. However, longer distance to and from Appleby PS (further west) adds to headloss (energy use long-term).	• No major differentiator between alternatives for resiliency to climate change. Both alternatives are reliant on operation of Burloak WTP in future. • Higher carbon footprint expected than Alternative 3B, due to higher construction related carbon footprint. However, more direct route (shorter) distance from Burloak WTP to Central Facility reduces head loss slightly (energy use slightly lower long-term).
Integration of Planning for Regional Infrastructure		
• Minimizes approvals/coordination	✓ Neutral	✗ Increases approval/coordination needs
• Integrates with road/transportation projects	✓ Neutral	✓ Neutral
	• Less approval/coordination required for the existing facility expansion, assuming property acquisition is not required. Similar to Alternative 4B otherwise. • Limited differences in terms of ability to integrate with transportation planning.	• Requires approval/coordination due to the new facility and property requirements. Future Class EA should identify preferred site for Central PS. • Limited differences in terms of ability to integrate with transportation planning.

Criteria, Description and Scoring	Alternative 3B West concept via Appleby RES/PS expansion skipping Burloak BPS	Alternative 4B Central concept via a new central facility skipping Burloak BPS
Technical Innovation		
• Applies innovation and/or new technologies	N/A	N/A
• Provides opportunity for operational flexibility and security	✓ Neutral	✓✓ Maximizes operational flexibility and security of supply/capacity
• Considers performance of the system under emergency conditions (power outages, fire emergencies) or during construction	✓✓ Improves performance	✓✓ Improves performance
• Supports phased growth	✓✓ Supports phased growth	✓✓ Supports phased growth
• Minimizes roads/utility crossings and existing infrastructure and minimize proximity and/or conflicts with existing infrastructure	✓ Neutral	✓ Neutral
• Considers constructability and technical feasibility to build and maintain infrastructure	✓ Neutral	✓✓ Reduced constructability challenges and improved technical feasibility
	• Limited opportunity for innovation or new technologies. • Slightly lower operational flexibility and security without a new Central pumping station facility since it does not add a central supply path for pumping towards O3. • Alternative improves performance of the system during emergency conditions since supply towards Appleby Reservoir could be provided either via the direct Zone 2 feed from Burloak or via B1 and the subsequent B2 stations (Burloak PS/Washburn PS) • Phased growth viable for both alternatives with gradual increases of M4L and B3/O3 pumping capacity. • Similar crossings required for transmission mains (and associated impacts). • Site constraints at Appleby may pose constructability challenges and impact feasibility of major expansion.	• Limited opportunity for innovation or new technologies. • Slightly higher operational flexibility and security due the new facility. Particularly seen in supply towards O3/B3, with the additional link from Central pumping station towards O3 critical in supporting flow across to Moore Reservoir / Neyagawa to support North Oakville and supply to Milton. • Alternative improves performance of the system during emergency conditions since supply can be supplement through provisions for an interconnection between this dedicated Zone 2 feedermain and other B2/O2 transmission mains. • Phased growth viable for both alternatives with gradual increases of M4L and B3/O3 pumping capacity. • Similar crossings required for transmission mains (and associated impacts). • New facility can be tailored to future growth needs and designed with fewer legacy considerations.
Preferred Strategy	✓ Least Preferred	✓✓ Most Preferred

Alternative 4B – Central concept via New Central Facility skipping Burloak Booster Pumping Station is identified as the preferred strategy as it provides more operational flexibility and security of supply. Future Class EA would be required to identify the preferred site. Preferred site should be intended to help minimize future constructability concerns and environmental/social impacts from construction.

3A

Strategy Evaluation

Focus Area Servicing Solutions – Georgetown

Alternatives and Detailed Evaluation Table

Focus Area Servicing Solutions – Lake-based Georgetown (G6L) Pumping – Screening of Concepts

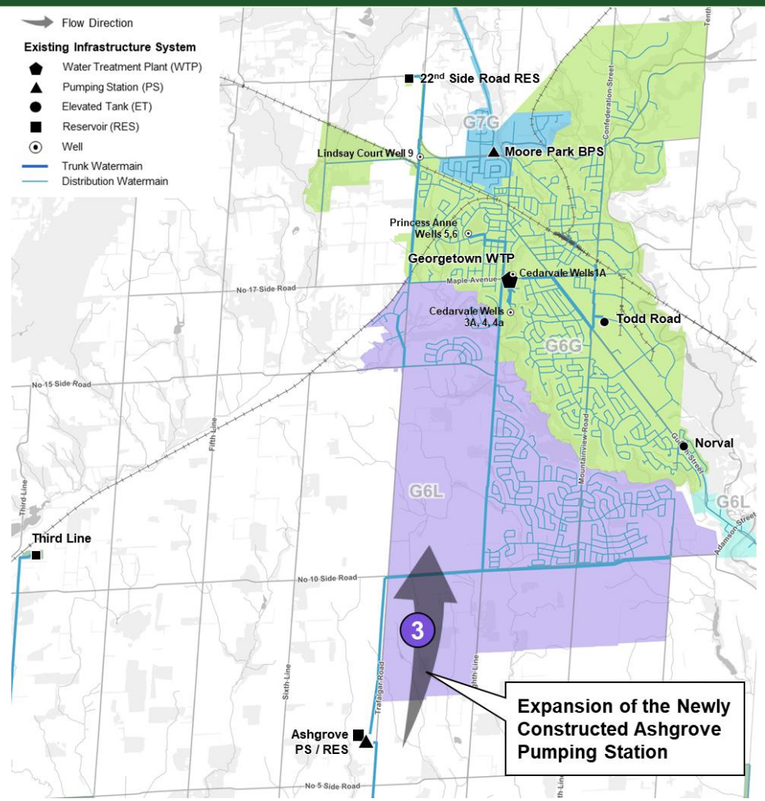
What is the Constraint?

Georgetown lake-based Zone G6L will experience pumping capacity constraints in the long term.

Alternatives	Advantages	Disadvantages	Rating	Result
1. Do nothing Existing infrastructure to remain as is.	• Does not incur new capital costs. • No potential impacts due to construction of new infrastructure.	• Does not meet adequate levels of service for existing users and future growth. • Does not comply with the official plans of the four Local Municipalities in Halton and the Provincial Planning Statement (PPS) 2024 growth targets. • Does not align with the IMP's vision and considerations. • Potential social/economic/environmental disruptions due to insufficient supply.	Low	**Screened Out**
2. Limit growth Limit community growth so as to not trigger new infrastructure or upgrades.	• Reduces the extent of capital upgrades required in the system.	• Does not meet adequate levels of service for existing users and future growth. • Does not comply with the official plans of the four Local Municipalities in Halton and the PPS 2024 growth targets. • Does not align with the IMP's vision and considerations.	Low	**Screened Out**
3. Expansion of the newly constructed Ashgrove PS	• Technically feasible. • Lower cost to expand existing Ashgrove PS. • Limited impact to local community (noise/construction impacts, etc.) by expanding existing PS.	• Single source of pumping capacity/supply to a pressure zone with significant growth. No improvement to system resiliency during planned/unplanned outages.	High	**Carried Forward**
4. Addition of a 2nd G6L pumping station at the Third Line RES site	• Technically feasible. • Improved system resiliency (2nd PS). • Higher operational flexibility during emergency/scheduled shutdowns. • Limited impact to local community (noise/construction impacts; etc.). due to location of Third Line RES site. • Helps water turnover (water quality) at Third Line RES.	• Higher cost for a new facility and linear infrastructure than existing PS expansion. • Higher lifecycle cost with an additional facility to maintain.	High	**Carried Forward**

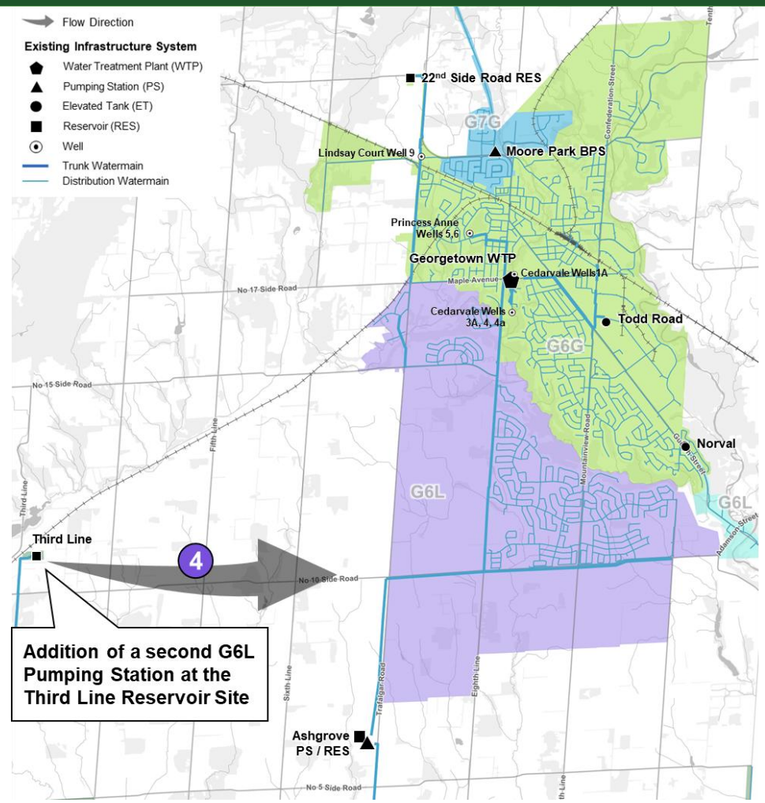
Focus Area Servicing Solutions – Lake-based Georgetown (G6L) Pumping – Selected Concepts

Alternative 3
Expansion of the newly constructed Ashgrove PS



- Pressure Zone G6L pumping will be provided by a single facility, the newly constructed Ashgrove PS with expanded capacity.

Alternative 4
Addition of a 2nd G6L pumping station at the Third Line RES site



- Pressure Zone G6L pumping will be provided by two facilities, the newly constructed Ashgrove PS and the new pumping station at the Third Line Reservoir site.

Focus Area Servicing Solutions – Lake-based Georgetown (G6L) Pumping– Detailed Evaluation

Criteria, Description and Scoring	Alternative 3 Expansion of the newly constructed Ashgrove PS	Alternative 4 Addition of a 2nd G6L pumping station at the Third Line RES site
Equitable Infrastructure Services		
• Improves/maintains level of service for existing users	✓✓ Improves LOS	✓✓ Improves LOS
	• Improves LOS by providing the additional pumping capacity required to support G6L.	• Improves LOS by providing the additional pumping capacity required to support G6L.
Safe and Healthy Communities		
• Minimizes potential short/long-term noise and odour impacts	✓ Neutral	✓ Neutral
• Minimizes construction impact on traffic, local businesses, and residents	✓ Neutral	✗ Increases Impact
• Considers long-term visual aesthetics of the proposed infrastructure	✓ Neutral	✓ Neutral
• Minimizes impacts on surrounding properties	✓ Neutral	✗ Increases road/utility crossings & conflicts
	• Short-term noise and odour impact due to construction activities (expansion of existing PS; and related linear work to increase south-north capacity). • Lower construction-related impacts compared to Alternative 4 due to less watermain related construction activities. • No new facility that would impact long-term aesthetics. • Minimal impacts to surrounding properties, since construction is at existing site.	• Short-term noise and odour impact due to construction activities (addition of new PS at existing reservoir site; and related linear work to connect PS discharge to G6L). • Higher construction-related impacts compared to Alternative 3 due to slightly longer watermain related construction activities (new E-W watermain). • Minimal impact to long-term aesthetics since PS would be at existing reservoir site. • Includes the construction of the new E-W transmission watermain from the new PS site, which may increase impacts on surrounding properties, compared to Alternative 3.
Sustainability		
• Minimizes environmental crossings, impact on aquatic/terrestrial species at risk, and environmentally sensitive/protected areas, and nearby agricultural lands	✓ Neutral	✓ Neutral
• Incorporates water conservation and reuse practices	✓ Neutral	✓ Neutral
• Minimizes impact on archaeological/resources, and cultural heritage sites	✓ Neutral	✓ Neutral
• Maximizes existing infrastructure	✓✓ Maximizes capacity of existing infrastructure	✓✓ Maximizes capacity of existing infrastructure
• Full lifecycle costs	✓ Neutral	✓ Neutral
• Staging costs	✓ Neutral	✓ Neutral
• State of Good Repair (SOGR) integration	✓ Neutral	✓ Neutral

Criteria, Description and Scoring	Alternative 3 Expansion of the newly constructed Ashgrove PS	Alternative 4 Addition of a 2nd G6L pumping station at the Third Line RES site
	• No environmental crossings or impacts from planned infrastructure in this alternative. • All alternatives should still involve the incorporation of water conservation to limit the capacity increases that are triggered from growth. • Detailed archaeological and cultural heritage impact assessments will be completed during future phases of project development, prior to implementation as required. However, limited to no impacts on archeological and cultural heritage sites are expected as the alignment will be located within existing ROW. • Maximizes existing infrastructure with use of existing site (Ashgrove). • Lifecycle costs are moderate, with capital costs driven by the expanded capacity and linear capacity increases from the pump station discharge. • Limited staging costs and no throwaway costs. • Limited opportunity for coordination with state of good repair.	• Linear work would include several environmental crossings; however, these should be completed via tunneling, resulting in minimal disturbance. • All alternatives should still involve the incorporation of water conservation to limit the capacity increases that are triggered from growth. • Detailed archaeological and cultural heritage impact assessments will be completed during future phases of project development, prior to implementation as required. However, limited to no impacts on archeological and cultural heritage sites are expected as the alignment will be located within existing ROW. • Still makes full use out of existing infrastructure with use of the Ashgrove Pump Station and helps to improve turnover at the Third Line Reservoir. • Lifecycle costs are similar, but slightly higher with capital costs driven by the new pump station (on existing land) and linear works from the new pump station. • Limited staging costs and no throwaway costs. • Limited opportunity for coordination with state of good repair.
Climate Change		
• Considers resiliency and operational flexibility to adapt to Climate Change	✓ Neutral	✓✓ Strategy elements provide improved resiliency for Climate Change adaptation
• Reduction in emissions	✓ Neutral	✓ Neutral
	• Does not provide improved resiliency for climate change adaptation since there would remain a heavy reliance on the single supply from the Ashgrove Pump Station that could be at risk of power outages or shutdowns from extreme weather events. • Limited differences in terms of emissions from pump station facilities (similar flow pumped up to G6L HGL regardless of the flow path). Some carbon emissions associated with construction activities.	• Does slightly help to improve resiliency for climate change adaptation since there would now be two alternative sources of supply (two different pump stations / in different pressure zones) reducing the likelihood of power outages (or other events) impacting both facilities simultaneously. • Limited differences in terms of emissions from pump station facilities (similar flow pumped up to G6L HGL regardless of the flow path). Some carbon emissions associated with construction activities.
Integration of Planning for Regional Infrastructure		
• Minimizes approvals/coordination	✓ Neutral	✓ Neutral
• Integrates with road/transportation projects	✓ Neutral	✓ Neutral
	• Requires some approval/coordination requirements related to the expansion of the Ashgrove Pump Station and linear work. • Limited differences in terms of ability to integrate with transportation planning.	• Requires some approval/coordination requirements related to the addition of a new pumping station and linear work. However, since both are on existing properties, the needs are similar for both. • Limited differences in terms of ability to integrate with transportation planning.
Technical Innovation		
• Applies innovation and/or new technologies	N/A	N/A
• Provides opportunity for operational flexibility and security	✓ Neutral	✓✓ Maximizes operational flexibility and security of supply/capacity
• Considers performance of the system under emergency conditions (power outages, fire emergencies) or during construction	✓ Neutral	✓✓ Improves performance

Criteria, Description and Scoring	Alternative 3 Expansion of the newly constructed Ashgrove PS	Alternative 4 Addition of a 2nd G6L pumping station at the Third Line RES site
• Supports phased growth	✓✓ Supports phased growth	✓✓ Supports phased growth
• Minimizes roads/utility crossings and existing infrastructure and minimize proximity and/or conflicts with existing infrastructure	✓ Neutral	✓ Neutral
• Considers constructability and technical feasibility to build and maintain infrastructure	✓ Neutral	✓ Neutral
	• Limited opportunity for innovation or new technologies. • Does not add operational flexibility or security, due to continued reliance on Ashgrove G6L pumping station as the single source of supply to G6L. • This alternative is more at-risk during emergency conditions since Ashgrove PS is the single source of supply to G6L in this scenario. • Supports phased intensification growth by adding expansion capacity when needed. • Similar road/utility crossings due to the proposed watermain being along an existing right-of-way with minimal significant crossings. • Limited constructability concerns. Constructability considered viable at both sites.	• Limited opportunity for innovation or new technologies. • More operational flexibility and security from the new facility, since G6L would not be entirely reliant on the continued operation of Ashgrove G6L pumping station. Furthermore, the two pump stations that feed G6L are based in different pressure zones which helps operational flexibility. • Alternative improves performance of the system during emergency conditions since Ashgrove PS could be offline whilst supply is provided by the new pump station instead. This helps with long-term maintenance and operations during emergencies. • Supports phased intensification growth by adding new PS capacity when needed. • Similar road/utility crossings due to the proposed watermain being along an existing right-of-way with minimal significant crossings. • Limited constructability concerns. Constructability considered viable at both sites.
Preferred Strategy	✓ Least Preferred	✓✓ Most Preferred

Alternative 4 – Addition of a 2nd second G6L pumping station at the Third Line Reservoir site is identified as the preferred strategy as it provides more operational flexibility and improves system resiliency in case of emergency, whilst still having limited technical/social/environmental concerns that can be addressed through design.

3A

Strategy Evaluation

Focus Area Servicing Solutions – Burlington

Alternatives and Detailed Evaluation Table

Focus Area Servicing Solutions – Burlington Pressure Zone B1A – Screening of Concepts

What is the Constraint?

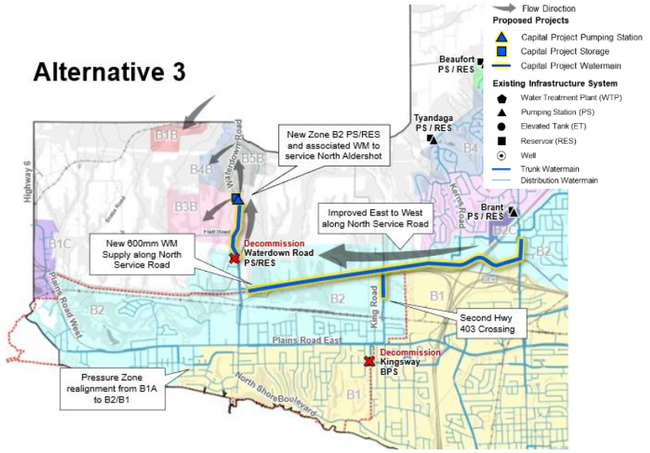
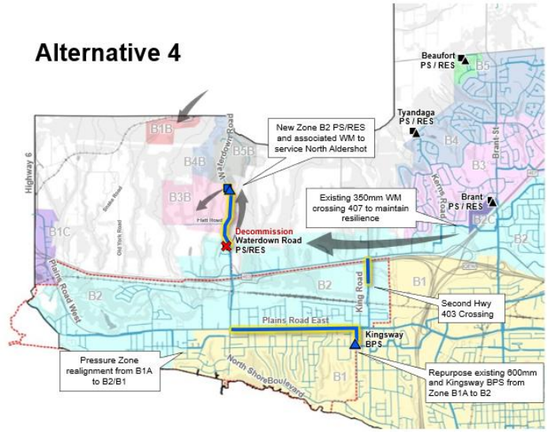
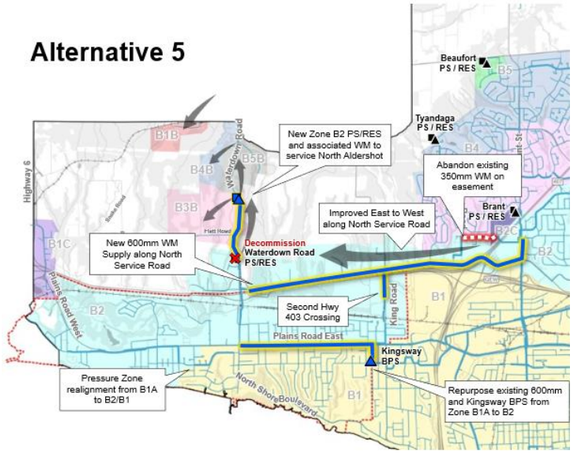
Multiple ongoing challenges combined to lead to a revamped servicing strategy in the BA/B2/B1A and North Aldershot area. These challenges/constraints include:

1. **The existing B1A pressure zone is looking to be altered due to its current reliance on the aging Waterdown Reservoir and the operational challenges (pressure fluctuations from the Kingsway Booster Pump Station).**
2. **The existing highway crossing that connects the main part of B2 to the western portion near Waterdown is in poor condition and is in an existing easement rather than a municipal ROW.**
3. **Projected growth in North Aldershot leads to the Hamilton servicing agreement to be too small to support the full needs. Therefore, a Halton servicing solution is being considered as a long-term option.**

Alternatives	Advantages	Disadvantages	Rating	Result
1. Do nothing Existing infrastructure to remain as is.	• Does not incur new capital costs. • No potential impacts due to construction of new infrastructure.	• Does not meet adequate levels of service for existing users and future growth. • Does not comply with the official plans of the four Local Municipalities in Halton and the Provincial Planning Statement (PPS) 2024 growth targets. • Does not align with the IMP's vision and considerations. • Potential social/economic/environmental disruptions due to insufficient supply.	Low	**Screened Out**
2. Limit growth Limit community growth so as to not trigger new infrastructure or upgrades.	• Reduces the extent of capital upgrades required in the system.	• Does not meet adequate levels of service for existing users and future growth. • Does not comply with the official plans of the four Local Municipalities in Halton and the PPS 2024 growth targets. • Does not align with the IMP's vision and considerations.	Low	**Screened Out**
3. Primary & secondary feeds are a new watermain (WM) across Hwy 407 to North Service Road and the existing WM across Hwy 407 to Kearns Road, respectively	• Improved levels of service and resiliency by keeping the existing watermain crossing (from Brant Street towards the realigned west side of B2 - Aldershot) and adding a new transmission along a similar route. • Removal of Kingsway BPS seen as beneficial to operations and to pressures experienced in B1.	• The new North Aldershot RES would consistently operate at a lower HGL than the other B2 reservoirs (Bailie; etc.) due to headlosses along the B2 watermains towards the west. • Preferred to remove the existing 407 crossing (350mm WM) from Brant towards Kern Rd due to being within an easement with operational challenges. • High costs for new E-W watermain on North Service Rd. • Lower level of operational flexibility and less system resiliency (all flow from same part of B2 system).	Medium	**Carried Forward**

4. Kingsway BPS as primary feed with the existing WM across Hwy 407 as the secondary feed	• Lower cost due to less new watermain construction. • Potential short-term solution since it is similar to the existing system, but with zone boundary realignment.	• Preferred to remove the existing 407 crossing (350mm WM) from Brant towards Kern Rd due to being within an easement with operational challenges. • Kingsway BPS remains the primary feed but now operates at higher discharge to B2 (instead of B1A). Existing suction challenges for operations in B1 would still exist. • Limited resiliency since system is still very reliant on Kingsway BPS.	Medium	**Carried Forward**
5. New primary feed watermain across Hwy 407 to North Service Road, with Kingsway BPS as secondary feed	• Improved levels of service and resiliency by adding a new transmission (from Brant Street towards the realigned west side of B2 – Aldershot) and keeping Kingsway BPS as secondary/backup supply. • Better turnover of future North Aldershot RES. • Maximizing value (existing site & watermains) of Kingsway BPS. • Higher operational flexibility (ability to supply area via B1 (Kingsway BPS) or B2 supply path. • Able to remove the existing 350mm easement watermain to Kerns Rd.	• High costs for new E-W watermain on North Service Rd. • Kingsway BPS remains in service and requires upgrades to operate as B2 pump station. Continued maintenance of BPS also needed. • During occasional Kingsway BPS use, pressure impacts in B1 would remain.	High	**Carried Forward**

Focus Area Servicing Solutions – Burlington Pressure Zone B1A

Alternative 3 Primary & secondary feeds are a new watermain (WM) across Hwy 407 to North Service Road and the existing WM across Hwy 407 to Kearns Road, respectively	Alternative 4 Kingsway BPS as primary feed with the existing WM across Hwy 407 as the secondary feed	Alternative 5 New primary feed watermain across Hwy 407 to North Service Road, with Kingsway BPS as secondary feed
		
Includes Zone Realignment of B1A into B1 & B2; and new B2 storage. a) A new Zone B2 Reservoir (to service areas including the west part of B2, new B2 converted from B1A, B3B, and potentially B4B, B5B, Snake Rd and Bridgeview) and a pumping station near the top of the B3B service area. b) An extension of the transmission main from Waterdown Reservoir up to the proposed B2 reservoir (~600mm; ~1.2km). c) Improved East to West transmission within Zone B2, since B2 area is now expanded (from previously part of B1A). Add ~5km of 600mm watermain from Brant Street to Waterdown Road. (incorporating W3448A and W5881), whilst maintaining the existing East-West B2 (350mm) watermain that crosses the 407 along an easement towards Kerns Road. d) Switchover of various existing B1A mains to B2/B1. New zone boundary valves to be established (some local PRVs in new B2 areas along the lakeshore - low elevation). e) Second 403 crossing down to the “southern” part of the expanded B2. Currently identified on King Road (short segment ~250 metres of 400mm watermain). f) Decommissioning of Kingsway BPS.	**Includes Zone Realignment of B1A into B1 & B2; and new B2 storage.** a) A new Zone B2 Reservoir (to service areas including the west part of B2, new B2 converted from B1A, B3B, and potentially B4B, B5B, Snake Road and Bridgeview) and a pumping station near the top of the B3B service area. b) An extension of the transmission main from Waterdown reservoir up to the proposed B2 Reservoir (~600mm; ~1.2km). c) Maintain the existing East-West B2 (350mm) watermain that crosses the 407 along an easement towards Kerns Road. d) Switchover of various existing B1A mains to B2/B1. New zone boundary valves to be established (some local PRVs in new B2 areas along the lakeshore - low elevation). e) Second 403 crossing down to the “southern” part of the expanded B2. Currently identified on King Road (short segment ~250 metres of 400mm watermain). f) Repurpose Kingsway BPS to pump to B2 with utilizing the existing 600mm watermain along Kingsway Drive and Plains Road. (~2.5km).	**Includes Zone Realignment of B1A into B1 & B2; and new B2 storage.** a) A new Zone B2 Reservoir (to service areas including the west part of B2, new B2 converted from B1A, B3B, and potentially B4B, B5B, Snake Road and Bridgeview) and a pumping station near the top of the Z3 service area. b) An extension of the transmission main from Waterdown Reservoir up to the proposed B2 reservoir (~600mm; ~1.2km). c) Improved East to West transmission within Zone B2, since B2 area is now expanded (from previously part of B1A). Add ~5km of 600mm watermain from Brant Street to Waterdown Road. (incorporating W3448A and W5881), hence allowing for the decommissioning / abandonment of the aging 350mm watermain along an easement that crosses the 407 towards Kerns Road. d) Switchover of various existing B1A mains to B2/B1. New zone boundary valves to be established (some local PRVs in new B2 areas along the lakeshore - low elevation). e) Second 403 crossing down to the “southern” part of the expanded B2. Currently identified on King Road (short segment ~250 metres of 400mm watermain). f) Repurpose Kingsway BPS to pump to B2 with utilizing the existing 600mm watermain along Kingsway Drive and Plains Road. (~2.5km).

Focus Area Servicing Solutions – Burlington Pressure Zone B1A – Detailed Evaluation

Criteria, Description and Scoring	Alternative 3 Primary & secondary feeds are a new watermain (WM) across Hwy 407 to North Service Road and the existing WM across Hwy 407 to Kearns Road, respectively	Alternative 4 Kingsway BPS as primary feed with the existing WM across Hwy 407 as the secondary feed	Alternative 5 New primary feed watermain across Hwy 407 to North Service Road, with Kingsway BPS as secondary feed
Equitable Infrastructure Services			
• Improves/maintains level of service for existing users	✓✓ Improves LOS	✓ Maintains LOS	✓✓ Improves LOS

	• Generally, improves levels of service for existing users.
	  ○ Moderately improved resiliency with second transmission to B2 but partly offset by removal of Kingsway BPS.
	  ○ Pressure zone realignment improves pressures in areas realigned from B1A to B2.
	  ○ However, new North Aldershot Reservoir would operate at a slightly lower TWL/HGL than the other B2 storages, since it is further away from the B2 pump station sources.
	  ○ Supports the North Aldershot Area with proposed reservoir and associated pumping stations.
		• Generally, maintains levels of service for existing users with some improvements offset by remaining limitations.
		  ○ Pressure zone realignment improves pressures in areas realigned from B1A to B2.
		  ○ Resiliency to B2 (and former B1A) area is similar to existing since although two feeds exist, the secondary feed is small diameter and would be insufficient to support the larger B2 area during any major Kingsway BPS outage.
		  ○ Supports the North Aldershot Area with proposed reservoir and associated pumping stations.
			• Generally, improves levels of service for existing users.
			  ○ Pressure zone realignment improves pressures in areas realigned from B1A to B2.
			  ○ Resiliency to B2 (and former B1A) area is improved compared to existing due to upsized East-West transmission that can support the higher flows for the widened B2 area, plus growth. This watermain would be better condition than the existing aging main and therefore more reliable. By repurposing the Kingsway BPS, the secondary supply also can support the entire area during emergencies.
			  ○ Supports the North Aldershot Area with proposed reservoir and associated pumping stations.

Safe and Healthy Communities			
• Minimizes potential short/long-term noise and odour impacts	✗ Increases Impact	✓ Neutral	✗ Increases Impact
• Minimizes construction impact on traffic, local businesses, and residents	✗ Increases Impact	✓✓ Decreases impact	✗ Increases Impact
• Considers long-term visual aesthetics of the proposed infrastructure	✓ Neutral	✓ Neutral	✓ Neutral
• Minimizes impacts on surrounding properties	✓ Neutral	✓✓ Minimizes road/utility crossings & conflicts	✓ Neutral
	• Short-term noise and odour impact due to construction activities (new E-W watermain). Lower potential for long-term noise once in operation due to removal of Kingsway BPS. • Higher construction-related impacts compared to Alternative 4 due to construction activities (new E-W watermain). • No new facility that would impact long-term aesthetics. • Includes the construction of the new E-W transmission for B2, which increases impacts on surrounding properties.	• Lower short-term noise and odour impacts since construction impacts are limited to the Kingsway BPS repurposing. Kingsway BPS still in operation similar to current conditions. • Lower construction-related impacts compared to Alternatives 3 & 5 since this avoids a significant watermain upgrade. • No new facility that would impact long-term aesthetics. • Aims to maximize the existing infrastructure, which decreases impacts on surrounding properties.	• Short-term noise and odour impact due to construction activities (new E-W watermain). Kingsway BPS still in operation long-term, but with lower frequency since it is secondary supply. • Higher construction-related impacts compared to Alternative 4 due to construction activities (new E-W watermain). • No new facility that would impact long-term aesthetics. • Includes the construction of the new E-W transmission for B2, which increases impacts on surrounding properties.

Criteria, Description and Scoring	Alternative 3 Primary & secondary feeds are a new watermain (WM) across Hwy 407 to North Service Road and the existing WM across Hwy 407 to Kearns Road, respectively	Alternative 4 Kingsway BPS as primary feed with the existing WM across Hwy 407 as the secondary feed	Alternative 5 New primary feed watermain across Hwy 407 to North Service Road, with Kingsway BPS as secondary feed
Sustainability			
• Minimizes environmental crossings, impact on aquatic/terrestrial species at risk, and environmentally sensitive/protected areas, and nearby agricultural lands	✓ Neutral	✓ Neutral	✓ Neutral
• Incorporates water conservation and reuse practices	✓ Neutral	✓ Neutral	✓ Neutral
• Minimizes impact on archaeological/resources, and cultural heritage sites	✓ Neutral	✓ Neutral	✓ Neutral
• Maximizes existing infrastructure	✓ Neutral	✓✓ Maximizes capacity within existing infrastructure	✓✓ Maximizes capacity within existing infrastructure
• Full lifecycle costs	✓ Neutral	✓✓ Lower lifecycle cost	✓ Neutral
• Staging costs	✓✓ Lower staging and throwaway costs	✓✓ Lower staging and throwaway costs	✓✓ Lower staging and throwaway costs
• State of Good Repair (SOGR) integration	✓ Neutral	✓ Neutral	✓ Neutral
	• Linear work would include several environmental crossings; however, these should be completed via tunneling, resulting in minimal disturbance. • All alternatives should still involve the incorporation of water conservation to limit the capacity increases that are triggered from growth. • Detailed archaeological and cultural heritage impact assessments will be completed during future phases of project development, prior to implementation as required. However, limited to no impacts on archeological and cultural heritage sites are expected as the alignment will be located within existing ROW. • By not utilizing the Kingsway BPS as a source of supply, this does not fully maximize existing infrastructure. • Lifecycle costs are moderate, with capital costs driven by the proposed new East-West watermain. • Limited staging costs and no throwaway costs. Solution does vary in its extent depending on availability of increased supply from Hamilton. • Pressure zone realignment work could be integrated/aligned with SOGR work in the area.	• No environmental crossings or impacts from planned infrastructure in this alternative. • All alternatives should still involve the incorporation of water conservation to limit the capacity increases that are triggered from growth. • Detailed archaeological and cultural heritage impact assessments will be completed during future phases of project development, prior to implementation as required. However, limited to no impacts on archeological and cultural heritage sites are expected as the alignment will be located within existing ROW. • Maximizes capacity of existing infrastructure, by not adding any new linear upgrades and maintaining Kingsway BPS. • Lowest life cycle costs, since it avoids E-W watermain. • Limited staging costs and no throwaway costs. Solution does vary in its extent depending on availability of increased supply from Hamilton. • Pressure zone realignment work could be integrated/aligned with SOGR work in the area.	• Linear work would include several environmental crossings; however, these should be completed via tunneling, resulting in minimal disturbance. • All alternatives should still involve the incorporation of water conservation to limit the capacity increases that are triggered from growth. • Detailed archaeological and cultural heritage impact assessments will be completed during future phases of project development, prior to implementation as required. However, limited to no impacts on archeological and cultural heritage sites are expected as the alignment will be located within existing ROW. • Maximizes capacity of existing infrastructure. The new infrastructure improves overall system resiliency. • Lifecycle costs are moderate, with capital costs driven by the proposed new East-West watermain. • Limited staging costs and no throwaway costs. Solution does vary in its extent depending on availability of increased supply from Hamilton. • Pressure zone realignment work could be integrated/aligned with SOGR work in the area.

Criteria, Description and Scoring	Alternative 3 Primary & secondary feeds are a new watermain (WM) across Hwy 407 to North Service Road and the existing WM across Hwy 407 to Kearns Road, respectively	Alternative 4 Kingsway BPS as primary feed with the existing WM across Hwy 407 as the secondary feed	Alternative 5 New primary feed watermain across Hwy 407 to North Service Road, with Kingsway BPS as secondary feed
Climate Change			
• Considers resiliency and operational flexibility to adapt to Climate Change	✓ Neutral	✓ Neutral	✓✓ Strategy elements provide improved resiliency for Climate Change adaptation
• Reduction in emissions	✓ Neutral	✓ Neutral	✓ Neutral
	• Does not provide improved resiliency for climate change adaptation since there would remain a heavy reliance on supply from the B2 pumping stations and similar linear crossing route that could be at risk of power outages or extreme weather events. • Limited differences in terms of emissions from pump station facilities (similar flow pumped up to B2 HGL). Some carbon emissions associated with construction activities, particularly for the East-West watermain.	• Does not provide improved resiliency for climate change adaptation since there would remain a heavy reliance on the Kingsway BPS that could be at risk of power outages or extreme weather events. • Limited differences in terms of emissions from pump station facilities (similar flow pumped up to B2 HGL). Lower carbon emissions associated with construction activities, by avoiding the East-West watermain.	• Provides improved resiliency for climate change adaptation since there is stronger resiliency of supply from two very different flow paths (Kingsway BPS via B1; and E-W watermain via B2). • Limited differences in terms of emissions from pump station facilities (similar flow pumped up to B2 HGL). Some carbon emissions associated with construction activities, particularly for the East-West watermain.
Integration of Planning for Regional Infrastructure			
• Minimizes approvals/coordination	✓ Neutral	✓✓ Decreases approval/coordination needs	✓ Neutral
• Integrates with road/transportation projects	✓ Neutral	✓ Neutral	✓ Neutral
	• Requires some approval/coordination requirements due to more linear construction works than Alternative 4. • Limited differences in terms of ability to integrate with transportation planning.	• Decreases approval/coordination requirements due to reduced construction works. • Limited differences in terms of ability to integrate with transportation planning.	• Requires some approval/coordination requirements due to more linear construction works than Alternative 4. • Limited differences in terms of ability to integrate with transportation planning.
Technical Innovation			
• Applies innovation and/or new technologies	N/A	N/A	N/A
• Provides opportunity for operational flexibility and security	✓ Neutral	✓ Neutral	✓✓ Maximizes operational flexibility and security of supply/capacity
• Considers performance of the system under emergency conditions (power outages, fire emergencies, or during construction)	✓ Neutral	✓ Neutral	✓✓ Improves performance
• Supports phased growth	✓✓ Supports phased growth	✓✓ Supports phased growth	✓✓ Supports phased growth
• Minimizes roads/utility crossings and existing infrastructure and minimize proximity and/or conflicts with existing infrastructure	✓ Neutral	✓✓ Minimizes road/utility crossings & conflicts	✓ Neutral

Criteria, Description and Scoring	Alternative 3 Primary & secondary feeds are a new watermain (WM) across Hwy 407 to North Service Road and the existing WM across Hwy 407 to Kearns Road, respectively	Alternative 4 Kingsway BPS as primary feed with the existing WM across Hwy 407 as the secondary feed	Alternative 5 New primary feed watermain across Hwy 407 to North Service Road, with Kingsway BPS as secondary feed
• Considers constructability and technical feasibility to build and maintain infrastructure	✓ Neutral	✓ Neutral	✓ Neutral
	• Limited opportunity for innovation or new technologies. • Does not add operational flexibility or security. With removal of Kingsway BPS, there becomes heavy reliance on the proposed East-West watermain from the east side of B2. • Alternative maintains similar performance of the system, since the addition of the new watermain is offset by the removal of the Kingsway BPS. • Supports phased intensification growth by conducting a pressure zone realignment, only upon completion of the additional watermain. Work can be timed with growth needs. • Moderate road/utility crossings due to the proposed watermain involving Highway 407 crossing (tunnelling). • Moderate constructability challenges for the complex watermain upgrade. This also continues to rely on the difficult to maintain existing East-West 350mm watermain within an easement.	• Limited opportunity for innovation or new technologies. • Does not add operational flexibility or security. Without a new East-West watermain, there is high reliance on continued operation of the Kingsway BPS. • Alternative maintains similar performance of the system, since the system remains heavily reliant on the continued operation of Kingsway BPS. • Supports phased intensification growth by conducting a pressure zone realignment, only upon completion of the additional watermain. Work can be timed with growth needs. • Minimizes road / utility crossings and conflicts by avoiding linear work related to the East-West watermain. • Lower constructability challenges by avoiding E-W linear upgrade. However, this continues to rely on the Kingsway BPS, which will make the facility difficult to isolate and maintain) in future.	• Limited opportunity for innovation or new technologies. • Maximizes operational flexibility and security of supply/capacity by providing two strong supply routes to the realigned B2 service area (Kingsway BPS & East-West watermain within B2). • Alternative improves performance of the system during emergency conditions since Kingsway BPS can be offline whilst supply is provided by the new East-West watermain. Alternatively, if the watermain is temporarily isolated, then the repurposed Kingsway BPS can maintain servicing. • Supports phased intensification growth by conducting a pressure zone realignment, only upon completion of the additional watermain. Work can be timed with growth needs. • Moderate road/utility crossings due to the proposed watermain involving Highway 407 crossing (tunnelling). • Moderate constructability challenges for the complex watermain upgrade. However, the improved resiliency makes it easier to conduct maintenance on the Kingsway BPS and watermains in the future.
Preferred Strategy	✓ Least Preferred	✓ Least Preferred	✓✓ Most Preferred

Alternative 5 – New watermain across Hwy 407 to North Service Road, with Kingsway BPS as secondary feed is identified as the preferred strategy as it offers a more resilient, flexible, and technically feasible long-term solution for previous Pressure Zone B1A area and North Aldershot area. This alternative improves system performance and resiliency, maximizes capacity within existing infrastructure, and supports long-term operational efficiency. Although it involves higher upfront costs and increased coordination during implementation, these are outweighed by the environmental, social, and performance benefits it provides.

3A

Strategy Evaluation

Focus Area Servicing Solutions – Oakville

Alternatives and Detailed Evaluation Table

Focus Area Servicing Solutions – Oakville Pressure Zone O4 Storage and North Pumping

What is the Constraint?

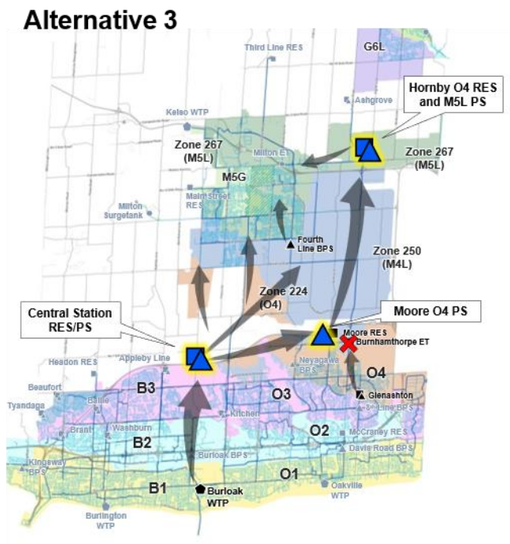
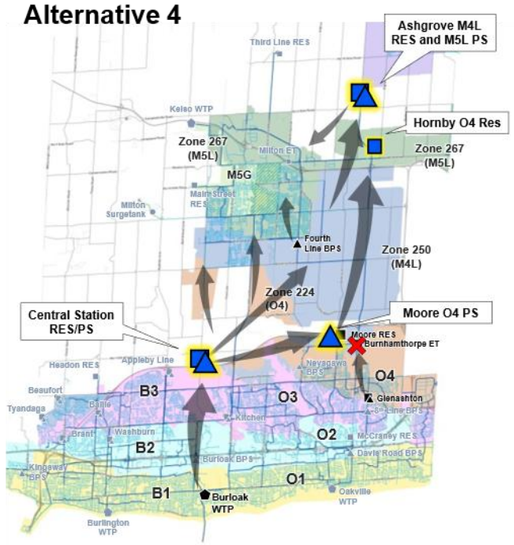
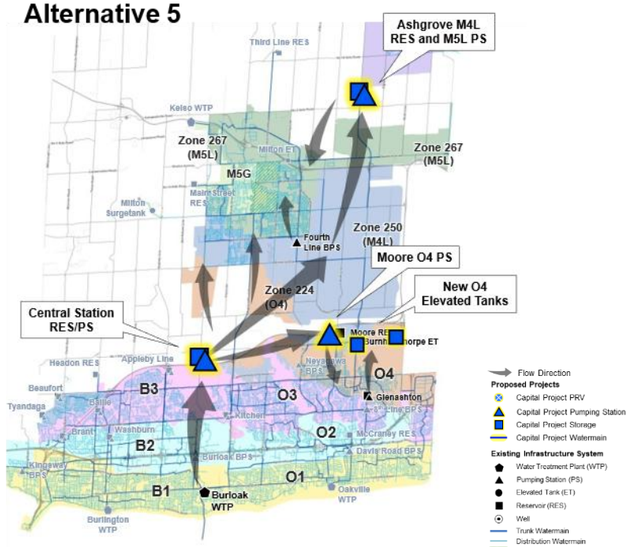
Multiple interrelated challenges lead to a revamped servicing strategy for the North Oakville and Milton growth area. These challenges/constraints include:

1. **Pressure Zone 267 (M5L) is growing significantly. It will be at a storage deficit in the future, with the only reservoir, Third Line RES, after the decommissioning of Milton ET on Steeles Avenue. With the increasing growth, the 2051 storage needs ~33.1ML, the deficit is ~12.9ML. Since the Third Line RES is not considered expandable due to site restrictions, and the Region is not planning to rebuild the Milton ET on Steeles Avenue, the storage deficit is intended to be supplemented by additional pumping (i.e., pumped storage from other pressure zones).**
2. **The existing pumping stations (Fourth Line BPS & Kitchen PS) for Pressure Zone 267 are not expandable. Kitchen PS is preferred not to be upsized due to surge concerns; and Fourth Line BPS is an in-line BPS that is preferred not to increase capacity. As such, it is preferable to add a new pumping station that can pull from an existing/future storage facility for improved operations (either at the Ashgrove M4L Reservoir site or a potential future O4 'Hornby' Reservoir site).**
3. **Pressure Zone 224 (previously O4) is also growing significantly. It is already operating with a storage deficit with only the Burnhamthorpe ET providing floating storage. With increasing growth in the area, the ultimate storage volume needs for O4 reach ~28.3ML in 2051.**
4. **To reduce the storage deficit in O4, various alternatives exist. It is feasible to either build a new in-ground reservoir (further away from the service area of O4 due to topography) or use elevated tanks to support the majority of the floating storage needs, while supplementing any remaining deficit by pumped storage from lower zones (O3) or transferred storage from higher zones (PRVs from M4L, etc.). The planned future pumped supply into O4 comes from the existing Glenashton PS, the newly proposed Moore PS, and PRVs for added resiliency from M4L to O4.**

Focus Area Servicing Solutions – Oakville Pressure Zone O4 Storage and North Pumping - Screening of Concepts

Alternatives	Advantages	Disadvantages	Rating	Result
1. Do nothing Existing Infrastructure to remain as is.	• Does not incur new capital costs. • No potential impacts due to construction of new infrastructure.	• Does not meet adequate levels of service for existing users and future growth. • Does not comply with the official plans of the four Local Municipalities in Halton and the Provincial Planning Statement (PPS) 2024 growth targets. • Does not align with the IMP's vision and considerations. • Potential social/economic/environmental disruptions due to insufficient supply.	Low	**Screened Out**
2. Limit growth Limit community growth as to not trigger new infrastructure or upgrades.	• Reduces the extent of upgrades required in system.	• Does not meet adequate levels of service for existing users and future growth. • Does not comply with the official plans of the four Local Municipalities in Halton and the PPS 2024 growth targets. • Does not align with the IMP's vision and considerations.	Low	**Screened Out**
3. O4 Hornby RES with associated Hornby PS from O4 to M5L	• The new Hornby RES could work with a single transmission (combined inlet/outlet) from future O4 PS, since the Hornby PS can operate to help storage turnover. • Improved system resiliency in O4 (two PS's), in M4L (two PS's) and M5L (three PS's) to provide supply to each major pressure zone. • Full floating storage could be provided within O4. • Slightly lesser transmission needs for M5L system when pumping from Hornby site, rather than Ashgrove. • Best operational flexibility in terms of ways to get supply into M5L.	• High reliance on continued operation of the long-distance single feed to Hornby RES. • Significant linear (transmission) upgrades still needed across all pressure zones (M4L, M5L, O4, and O3). • Hornby RES site, located near Ashgrove RES site, does not maximize value of the Ashgrove site's expandability. • Phasing of infrastructure needs is difficult. Would need all major linear infrastructure (M4L, O4, M5L, and O3) by ~2036 timeframe.	Medium	**Carried Forward**
4. O4 Hornby RES and separate Ashgrove PS from M4L to M5L	• Improved system resiliency in O4 (two PSs), in M4L (two PSs), and M5L (three PS's) to provide supply to each major pressure zone. • Full floating storage could be provided within O4. • Good operational flexibility in terms of ways to get supply into M5L.	• The new Hornby RES would require both a dedicated inlet and a dedicated outlet transmission main, to achieve turnover of the storage when it is a long distance from the O4 service area. • Significant linear (transmission) upgrades still needed across all pressure zones (M4L, M5L, O4, and O3). • Highest amount of construction and disruption. • Highest cost due to the largest amount of major linear transmission upgrades. • Hornby RES site located near Ashgrove RES site, so it does not maximize value of the Ashgrove site's expandability. • Slightly more transmission needs for M5L system when pumping from Ashgrove PS rather than Hornby PS.	High	**Carried Forward**
5. O4 Elevated Tanks and separate Ashgrove PS from M4L to M5L	• Improved system resiliency in O4 (two PS's), in M4L (two PS's) and M5L (three PS's) to provide supply to each major pressure zone. • Phasing of infrastructure needs is most viable. Able to gradually increase O4 storage with first ET; and 2nd ET as growth increases. • Able to defer the third M5L PS until later in planning horizon; spreads out capital costs and infrastructure needs. • Good operational flexibility in terms of ways to get supply into M5L. • RES Maximizes value of the Ashgrove site, by using its expandability (add storage and pumping to M5L).	• Includes elevated storage, which can have negative visual impacts to community. • Significant linear (transmission) upgrades still needed across many pressure zones (M4L, M5L, and O3). • Unable to provide full floating storage within O4. So, partial borrowed storage is needed (PRVs from M4L; pumped from O3). • Reliance on Ashgrove RES, larger transmission upgrades needed towards M4L.	Medium	**Carried Forward**

Focus Area Servicing Solutions – Oakville Pressure Zone O4 Storage and North Pumping

Alternative 3 O4 Hornby RES with associated Hornby PS from O4 to M5L	Alternative 4 O4 Hornby RES and separate Ashgrove PS from M4L to M5L	Alternative 5 O4 elevated tanks and separate Ashgrove PS from M4L to M5L
		
• Central Station to O3: ~90ML/d firm capacity • O3 Transmission upgrades: ~9km of 1200mm (William Halton Parkway with crossing) • Moore PS to O4: ~75 ML/d • O4 Transmission to Hornby RES: ~12km of 900mm • O4 Storage: ~30ML Ground Reservoir (Hornby) • Central Station to M4L: ~125ML/d • M4L Transmission upgrades: ~6km of 1050mm discharge from Central Station (M4L) PS towards Britannia • M5L PS at Hornby: ~40ML/d • M5L Transmission: Minimal since close to Steeles watermain	• Central Station to O3: ~50ML/d firm capacity • O3 Transmission upgrades: ~6km of 1050mm and 3km of 900mm (William Halton Parkway with crossing) • Moore PS to O4: ~40 ML/d • O4 Transmission to Hornby RES: ~12km of twinned 750mm; plus ~2km of 750mm discharge from Moore PS • O4 Storage: ~30ML Ground Reservoir (Hornby) • Central Station to M4L: ~150ML/d • M4L Transmission upgrades: ~6km of 1350mm discharge from Central Station (M4L) PS towards Britannia; 10km of 1200mm to Ashgrove Reservoir • M5L PS at Ashgrove: ~40ML/d • M5L Transmission: ~6km of 750mm to connect along No. 5 Sideroad	• Central Station to O3: ~50ML/d firm capacity • O3 Transmission upgrades: ~6km of 1050mm and 3km of 900mm (William Halton Parkway with crossing) • Moore PS to O4: ~50 ML/d • O4 Transmission to elevated tanks: ~2km of 750mm • O4 Storage: Two ~10ML Elevated Tanks • Central Station to M4L: ~150ML/d • M4L Transmission upgrades: ~6km of 1350mm discharge from Central Station (M4L) PS towards Britannia; 10km of 1200mm to Ashgrove Reservoir • M5L PS at Ashgrove: ~40ML/d • M5L Transmission: ~6km of 750mm to connect along No. 5 Sideroad
Main Infrastructure Differences • O4 Ground Reservoir instead of O4 Elevated Tanks. • Due to the flow transfer leaving O4 to M5L at Hornby, this increases the pumping needs into O4 (via Moore PS) which also leads to higher transmission needs in O4. Single transmission (O4) to Hornby. • Higher use of O4 means a larger transmission is needed in O3 (and more O3 pumping) to get water to Moore Reservoir. • Lower use of M4L (since not using Ashgrove PS to M5L), reduces the need for added M4L transmission to Ashgrove.	**Main Infrastructure Differences** • O4 Ground Reservoir, similar to Alternative 3. • Significant O4 transmission upgrades (one incoming and one outgoing transmission watermain to ensure turnover of O4 storage). • Smaller expansions of the O3 system because lower flow out of O4 means that there is less flow travelling through O3 beforehand. • Ashgrove PS to support M5L; which increases the capacity needs for the M4L system to Ashgrove. (this version does not naturally help to create turnover at the Hornby Reservoir, unlike Alternative 3).	**Main Infrastructure Differences** • O4 Elevated Tanks instead of O4 Ground Reservoir. • Reduces need for significant O4 transmission upgrades by avoiding the distant storage reservoir. • Smaller expansions of the O3 system because lower flow out of O4 means that there is less flow travelling through O3 beforehand. • Leads to Ashgrove PS to support M5L; which increases the capacity needs for the M4L system to Ashgrove. • M4L pumping needs higher than Alternative 3 due to transfer needs.

Focus Area Servicing Solutions – Oakville Pressure Zone O4 Storage and North Pumping – Detailed Evaluation

Criteria, Description and Scoring	Alternative 3 O4 Hornby RES with associated Hornby PS from O4 to M5L	Alternative 4 O4 Hornby RES and separate Ashgrove PS from M4L to M5L	Alternative 5 O4 elevated tanks and separate Ashgrove PS from M4L to M5L
Equitable Infrastructure Services			
• Improves/maintains level of service for existing users	✓✓ Improves LOS	✓✓ Improves LOS	✓✓ Improves LOS

	• Generally, improves levels of service for existing users.
	  ○ Multiple pumping stations to provide supply to each pressure zone, which helps to improve performance in future while adding resiliency.
	  ○ Hornby PS strategically added to Hornby Reservoir site to help achieve turnover at the reservoir site, maintaining water quality for users.
		• Generally, improves levels of service for existing users.
		  ○ Multiple pumping stations to provide supply to each pressure zone, which helps to improve performance in future while adding resiliency.
		  ○ Hornby Reservoir site requires dedicated inlet and dedicated outlet feed to and from the rest of the O4 pressure zone to help achieve turnover at the reservoir site, maintaining water quality for users.
			• Generally, improves levels of service for existing users.
			  ○ Multiple pumping stations to provide supply to each pressure zone, which helps to improve performance in future while adding resiliency.
			  ○ Having elevated tanks located adjacent to the service area in O4 helps to achieve turnover at the storage sites, maintaining water quality for users.

Safe and Healthy Communities			
• Minimizes potential short/long-term noise and odour impacts	✓ Neutral	✗ Increases impact	✓ Neutral
• Minimizes construction impact on traffic, local businesses, and residents	✓ Neutral	✗ Increases impact	✓ Neutral
• Considers long-term visual aesthetics of the proposed infrastructure	✓✓ Decreases visual impact	✓✓ Decreases visual impact	✗ Increases visual impact
• Minimizes impacts on surrounding properties	✓ Neutral	✗ Increases road/utility crossings & conflicts	✓ Neutral
	• All alternatives will require construction with potential for temporary noise impacts, which will be assessed and mitigated through future project-level Class EAs. • Alternative 2 includes a moderate amount of construction, which is quite similar in overall magnitude to Alternative 5 (and less than Alternative 4). O4 transmission crossing towards Hornby more challenging than Britannia to Ashgrove transmission needed in Alternative 5. Traffic and local construction impacts are considered comparatively neutral with Alternative 5. • Decreases visual impact by avoiding elevated tanks. • Includes moderate construction of new infrastructure similar to Alternative 5, which could have negative impacts on surrounding properties, but is intended to be mitigated through design.	• All alternatives will require construction with potential for temporary noise impacts, which will be assessed and mitigated through future project-level Class EA studies. With the highest amount of linear construction work, this is considered the most impactful alternative for noise issues. • Alternative 4 includes the highest amount of construction, which increases the impacts on traffic and local business & residents, surrounding properties. • Decreases visual impact by avoiding elevated tanks. • Includes more construction of new infrastructure compared to Alternative 3 & 5, which is expected to increase impacts on surrounding properties due to wider ranging utility conflicts.	• All alternatives will require construction with potential for temporary noise impacts, which will be assessed and mitigated through future project-level Class EAs. • Alternative 5 includes a similar amount of construction as Alternative 3. It avoids a major O4 transmission, which minimizes the impacts on traffic and local business & residents, surrounding properties. But does require additional transmission towards Ashgrove in M4L. • Increases visual aesthetic impact with two new elevated tanks (one at existing site and one new site). • Includes moderate construction of new infrastructure similar to Alternative 3, which could have negative impacts on surrounding properties, but is intended to be mitigated through design.

Criteria, Description and Scoring	Alternative 3 O4 Hornby RES with associated Hornby PS from O4 to M5L	Alternative 4 O4 Hornby RES and separate Ashgrove PS from M4L to M5L	Alternative 5 O4 elevated tanks and separate Ashgrove PS from M4L to M5L
Sustainability			
• Minimizes environmental crossings, impact on aquatic/terrestrial species at risk, and environmentally sensitive/protected areas, and nearby agricultural lands	✓ Neutral	✗ Increases impact	✓ Neutral
• Incorporates water conservation and reuse practices	✓ Neutral	✓ Neutral	✓ Neutral
• Minimizes impact on archaeological/resources, and cultural heritage sites	✓ Neutral	✓ Neutral	✓ Neutral
• Maximizes existing infrastructure	✓✓ Very Beneficial Impacts	✓✓ Very Beneficial Impacts	✓✓ Very Beneficial Impacts
• Full lifecycle costs	✓ Neutral	✗ Higher lifecycle cost	✓ Neutral
• Staging costs	✓ Neutral	✓ Neutral	✓ Neutral
• State of Good Repair (SOGR) integration	✓ Neutral	✓ Neutral	✓ Neutral
	• Linear work would include several environmental crossings; however, these should be completed via tunneling, resulting in minimal disturbance. • All alternatives should still involve the incorporation of water conservation to limit the capacity increases that are triggered from growth. • Detailed archaeological and cultural heritage impact assessments will be completed during future phases of project development, prior to implementation as required. • Maximizes capacity within existing infrastructure. However, magnitude of growth means that new, dedicated infrastructure is required. • Lifecycle costs are similar for all alternatives, but slightly higher capital costs are driven by the new Hornby RES and associated watermains. • Potential risk of staging/throwaway costs if Hornby RES takes too long to be constructed and O4 growth is rapid. Long wait for storage in O4 is problematic. • Limited opportunity for coordination with state of good repair.	• Linear work would include several environmental crossings; however, these should be completed via tunneling, resulting in minimal disturbance. This alternative requires more construction and environmental crossings compared to Alternative 3 & 5; therefore, potential impacts are considered higher. • All alternatives should still involve the incorporation of water conservation to limit the capacity increases that are triggered from growth. • Detailed archaeological and cultural heritage impact assessments will be completed during future phases of project development, prior to implementation as required. • Maximizes capacity within existing infrastructure. However, magnitude of growth means that new, dedicated infrastructure is required. • Highest lifecycle costs due to the capital costs driven by the new Hornby RES and twinned watermain. • Potential risk of staging/throwaway costs if Hornby RES takes too long to be constructed and O4 growth is rapid. Long wait for storage in O4 is problematic. • Limited opportunity for coordination with state of good repair.	• Linear work would include several environmental crossings; however, these should be completed via tunneling, resulting in minimal disturbance. • All alternatives should still involve the incorporation of water conservation to limit the capacity increases that are triggered from growth. • Detailed archaeological and cultural heritage impact assessments will be completed during future phases of project development, prior to implementation as required. • Maximizes capacity within existing infrastructure. However, magnitude of growth means that new, dedicated infrastructure is required. • Lifecycle costs are similar, but slightly lower with capital costs aided by not requiring the new Hornby RES and associated O4 transmission. • Significant staging costs still remain for new facilities. Alternative does allow more flexible phasing, which reduces the risk of potentially needing throwaway investments. • Limited opportunity for coordination with state of good repair.

Criteria, Description and Scoring	Alternative 3 O4 Hornby RES with associated Hornby PS from O4 to M5L	Alternative 4 O4 Hornby RES and separate Ashgrove PS from M4L to M5L	Alternative 5 O4 elevated tanks and separate Ashgrove PS from M4L to M5L
Climate Change			
• Considers resiliency and operational flexibility to adapt to Climate Change	✓✓ Strategy elements provide improved resiliency for Climate Change adaptation	✓✓ Strategy elements provide improved resiliency for Climate Change adaptation	✓✓ Strategy elements provide improved resiliency for Climate Change adaptation
• Reduction in emissions	✓ Neutral	✖ High carbon footprint	✓ Neutral
	• Does improve resiliency and operational flexibility for climate change adaptation since there would be alternative sources of supply (multiple pump stations for each pressure zone – O4/M5L/M4L) reducing the likelihood of power outages (or other climate change related events) impacting all facilities simultaneously. • Limited differences in terms of emissions from pump station facilities (similar flow pumped towards O4 and Milton). Moderately high carbon emissions associated with construction activities, but lower than Alternative 2 due to less construction work.	• Does improve resiliency and operational flexibility for climate change adaptation since there would be alternative sources of supply (multiple pump stations for each pressure zone – O4/M5L/M4L) reducing the likelihood of power outages (or other climate change related events) impacting all facilities simultaneously. • Highest carbon footprint due to most construction. Limited differences in terms of emissions from pump station facilities (similar flow pumped towards O4 and Milton).	• Does improve resiliency and operational flexibility for climate change adaptation since there would be alternative sources of supply (multiple pump stations for each pressure zone – O4/M5L/M4L) reducing the likelihood of power outages (or other climate change related events) impacting all facilities simultaneously. • Limited differences in terms of emissions from pump station facilities (similar flow pumped towards O4 and Milton). Moderately high carbon emissions associated with construction activities, but lower than Alternative 2 due to less construction work.
Integration of Planning for Regional Infrastructure			
• Minimizes approvals/coordination	✓ Neutral	✓ Neutral	✓ Neutral
• Integrates with road/transportation projects	✓ Neutral	✓ Neutral	✓ Neutral
	• All alternatives will require similar levels of approvals/coordination for expansion of existing and new facilities and watermains. • Similar alternatives do not create large scale differences in the integration with other Regional infrastructure.	• All alternatives will require similar levels of approvals/coordination for expansion of existing and new facilities and watermains. • Similar alternatives do not create large scale differences in the integration with other Regional infrastructure.	• All alternatives will require similar levels of approvals/coordination for expansion of existing and new facilities and watermains. • Similar alternatives do not create large scale differences in the integration with other Regional infrastructure.
Technical Innovation			
• Applies innovation and/or new technologies	N/A	N/A	N/A
• Provides opportunity for operational flexibility and security	✓✓ Maximizes operational flexibility and security of supply/capacity	✓✓ Maximizes operational flexibility and security of supply/capacity	✓✓ Maximizes operational flexibility and security of supply/capacity
• Considers performance of the system under emergency conditions (power outages, fire emergencies) or during construction	✓✓ Improves performance	✓✓ Improves performance	✓✓ Improves performance
• Supports phased growth	✓ Neutral	✓ Neutral	✓✓ Supports phased growth
• Minimizes roads/utility crossings and existing infrastructure and	✓ Neutral	✖ Increases road/utility crossings & conflicts	✓✓ Minimizes road/utility crossings & conflicts

Criteria, Description and Scoring	Alternative 3 O4 Hornby RES with associated Hornby PS from O4 to M5L	Alternative 4 O4 Hornby RES and separate Ashgrove PS from M4L to M5L	Alternative 5 O4 elevated tanks and separate Ashgrove PS from M4L to M5L
minimize proximity and/or conflicts with existing infrastructure			
• Considers constructability and technical feasibility to build and maintain infrastructure	✓ Neutral	✓ Neutral	✓ Neutral
	• Limited opportunity for innovation or new technologies. • Improves operational flexibility since there would be alternative sources of supply (different pump stations for each pressure zone). • Improves performance of the system during emergency conditions since Glenashton PS and Neyagawa BPS could be offline whilst supply is still provided by the new pumping stations of the pressure zone. • There is limited ability to suitably phase the infrastructure needs in this alternative. The Hornby RES and transmission would be required to support the growth in O4, hence limiting flexibility to phase the needs. • Moderate road/utility crossings due to the proposed transmission mains involving major highway crossing (tunnelling). • Limited constructability concerns. Constructability considered viable for all three alternatives.	• Limited opportunity for innovation or new technologies. • Improves operational flexibility since there would be alternative sources of supply (different pump stations for each pressure zone). • Improves performance of the system during emergency conditions since Glenashton PS and Neyagawa BPS could be offline whilst supply is still provided by the new pumping stations of the pressure zone. • There is limited ability to suitably phase the infrastructure needs in this alternative. The Hornby RES and transmission would be required to support the growth in O4, hence limiting flexibility to phase the needs. • Highest road/utility crossings due to the proposed twin transmission mains involving major highway crossing (tunnelling). • Limited constructability concerns. Constructability considered viable for all three alternatives.	• Limited opportunity for innovation or new technologies. • Improves operational flexibility since there would be alternative sources of supply (different pump stations for each pressure zone). • Improves performance of the system during emergency conditions since Glenashton PS and Neyagawa BPS could be offline whilst supply is still provided by the new pumping stations of the pressure zone. • Supports phased intensification growth especially in O4 by adding phased storage capacity when needed. O4 storage can start with one ET and add the second as needed. The Central Station can operate in the mid-term before new transmission to Ashgrove is required. The additional Ashgrove M5L PS is only needed when M5l growth reaches the trigger. • Reduces road/utility crossings and conflicts (compared to other alternatives) by avoiding linear work related to the Hornby RES in O4. • Limited constructability concerns. Constructability considered viable for all three alternatives.
Preferred Strategy	✓ Less Preferred	✗ Least Preferred	✓✓ Most Preferred

Alternative 5 – O4 Elevated Tank and separate Ashgrove Pumping Station from M4L to M5L is identified as the preferred strategy as it provides a high level of operational flexibility and system resiliency, less disruptions and construction challenges. Furthermore, Alternative 5 appears most viable from a phasing perspective, where it is possible to gradually build out the ultimate needs in O4 (storage) and to add resiliency in northern areas.