7. Description of Existing Water Supply and Distribution System

7.1 Overview

The Region of Halton is responsible for all its water systems, including treatment plants and distribution systems.

Water supply in the South Halton study area is currently and will continue to be provided by three water purification plant (WPP) facilities (Burlington, Oakville and Burloak WPPs) which treat Lake Ontario source water: The downtown core of Milton will continue to be supplied by groundwater primarily by the Kelso Well Field and WPP.

Due to the gradual rise in ground elevation northerly from the shore of Lake Ontario to the lake-based service area boundary in Milton and Halton Hills 401 Corridor, separate pressure zones have been established. Each pressure zone spans an elevation difference of approximately 30 metres. Local distribution watermains are fed from larger trunk feedermains connected between the WPPs, Pumping Stations and Storage Facilities. There are approximately 2,420 km of watermains and feedermains in the Halton Region water system.

In North Halton (Acton and Georgetown), treated water is provided by six municipal well fields: Davidson, Fourth Line, and Prospect Park Well Fields in Acton; and, Cedarvale, Princess Anne and Lindsay Court Well Fields in Georgetown. Groundwater pumped from the Cedarvale Well Field is treated at the Georgetown WPP. New groundwater-based servicing strategies for both Acton and Georgetown have been developed under the Sustainable Halton Water and Wastewater Master Plan and include the increase of water takings at existing wells, new Well Field, treatment, transmission and storage facilities. Due to the significant growth in Georgetown, a future extension of the Lake Ontario based South Halton water system to Georgetown is required to service the new growth area.

7.2 South Halton Lake-Based System

7.2.1 Water Purification Plants

The vast majority of the Region's residents in Burlington, Oakville and parts of Milton, are supplied by the South Halton Lake-Based System. This system is supplied by three Lake Ontario based water purification plants (Burlington, Oakville, and Burloak WPPs).

Burlington WPP

The Burlington WPP is located at 3249 Lakeshore Road, just south west of Wilton Street in Burlington. The direct filtration facility treats water from Lake Ontario, and mainly services the urban area of Burlington. The Burlington Zone 1 distribution system is integrated with Oakville Zone 1 distribution system. This west to east transfer is primarily through a 750 mm watermain located on Rebecca Street and crosses Bronte Creek. To a lesser extent, water can be transferred from west to east through a 400 mm watermain on Rebecca Street and a 200 mm to 300 mm watermain on Lakeshore Road.

Following the upgrades and expansion in the year 2000, the Burlington WPP now meets all current and anticipated drinking water standards, including *Cryptosporidium* inactivation, aluminum residuals and THMs.

The Burlington WPP has no additional site capacity available to accommodate further building/treatment expansions.

Oakville WPP

The Oakville WPP is located at 21 Kerr St, south of Lakeshore Rd in the Town of Oakville. The conventional filtration facility treats water from Lake Ontario and services the majority of the urban area of Oakville. Water from the Oakville WPP is combined with water from the Burlington system and is distributed to the lake-based pressure zones within Milton.

The Oakville WPP is able to achieve all current treatment standards including aluminum residuals and total Trihalomethanes (TTHM). Following the ActifloTM and ozone upgrades the plant provides a high level of treatment to Lake Ontario water and meets the water quality objectives defined by current and anticipated regulations.

A preliminary design of the upgrades and expansion of the site to 163 ML/d was completed in 1993. Additional site area is available to expand the existing treatment plant to up to a nominal rated capacity of 218 ML/d. However, existing lands available for this expansion are currently being used as recreational park land. The Region has reviewed opportunities to increase plant capacity and the potential to ultimately provide increased security of supply.

A study was completed by Associated Engineering to assess the capacity of the existing plant processes. It was determined that based on the process review and the hydraulic assessment, the Oakville WPP can be improved to accommodate a production capacity of approximately 135 ML/d (net) without any major infrastructure modifications.

The study also shows that much of the existing infrastructure at the plant has capacity to accommodate an increase in production (i.e. intake, chemical treatment systems, and process residuals treatment systems). In addition, the existing site has available space to accommodate additional equipment required to increase production capacity.

Although there are distribution system constraints to move water from the Oakville WPP directly north to growth areas, the additional capacity can be moved west to supplement the supply feed to the Kitchen Reservoir and Pumping Station.

Burloak WPP

The Burloak WPP located on the south side of Rebecca Street, just east of Great Lakes Boulevard was recently commissioned. The new plant in the Town of Oakville provides drinking water for Oakville, Burlington, and Milton lake-based service areas.

The plant has been designed to enable phased expansions to meet future water demand with an eventual design capacity of 220 ML/d.

The South Halton Lake-Based WPPs are summarized in Table 13.

Table 13 Existing Lake-Based Water Purification Plants in Halton Region

WPP	Existing Rated Capacity	Raw Water Source
Burlington WPP	263 ML/d	Lake Ontario
Oakville WPP	109 ML/d	Lake Ontario
Burloak WPP	55 ML/d	Lake Ontario

7.2.2 Distribution System

Halton Region's existing distribution system is shown in Figure 12. The Region's service areas are categorized by pressure zone and its relationship to the overall system operation. Due to the gradual rise in ground elevation northerly from the shore of Lake Ontario to the lake-based service area boundary in Milton and Halton Hills 401 Corridor, separate pressure zones have been established as shown in Figure 13. Each pressure zone spans an elevation difference of approximately 30 metres and is identified by the local municipality that it services.

Oakville Pressure Zones

Oakville is serviced by four primary pressure zones: O1, O2, O3, and O4, with sub-pressure zones fed through isolated supply points.

Pressure Zone O1

Water supply from the Oakville WPP is pumped to the Davis Pumping Station, Kitchen Reservoir & Pumping Station and to Zone O1 distribution system. This pressure zone is interconnected with Zone B1 and includes lands east of Bronte Creek, from ground elevations of 76 m to 100.7 m. All flows to the higher Oakville Pressure Zones pass through Zone O1. Storage and pressure regulation is provided by the Kitchen, Brant and Washburn Reservoirs.

Pressure Zone O2

The Davis Pumping station supplies water to Pressure Zone O2 and pumps water up to the Eighth Line Booster station and Eighth Line Reservoir and Pumping Station to feed the upper zones in Oakville. Pressure Zone O2 generally includes all lands in Oakville between elevations of 97.2 m and 133.7 m East of Bronte Creek. The Eighth Line Reservoir provides storage and maintains pressure control.

Pressure Zone O2A

Pressure Zone O2A consists of the southern portion of the Clearview Neighbourhood on the eastern end of Oakville (south of Winterbourne Dr. and north of Royal Windsor Drive). Zone O2A is serviced by Zone O3 by pressure reducing valve.

Pressure Zone O3

Water supply to Pressure Zone O3 is pumped from the Kitchen Reservoir and Pumping Station and Eighth Line Booster Pumping Station.

Pressure Zone O3 generally consists of lands in Oakville, between ground elevations of 127.6 m and 164.0 m and east of Bronte Creek. From the east system, the Eighth Line Booster Pumping Station also provides water to Zone O3 while Moore Reservoir provides storage and maintains pressure control.

Pressure Zone O4

Pressure Zone O4 is made up of lands north east of Zone O3, with the Halton Region /Region of Peel Border as its eastern boundary in Oakville. The ground elevations are between 165.6 m and 198.7 m. Zone 4 Elevated Tank provides storage and pressure control. Water is pumped to Zone O4 by the Eighth Line Pumping Station.

Legend

Existing Infrastructure

- Water Pumping Station
- Water Well
- Water Standpipe
- Water Reservoir
- Water Purification Plant
- Elevated Water Tower
- Existing Watermain
- Water Pressure Zones

N

4th Line Well
4th Line PS
Churchill Rd Res
Davidson Well
Davidson Well #2
Davidson Pump Station
Prospect Park Well
Prospect Park WPP
A9G
22nd Sideroad Res
Lindsay Court Well
Moore Park PS
G7G
Lindsay Ct. PS
Princess Anne Well
Cedarvale Well #2
Georgetown WPP
G6G
Todd Rd Tower
Cedarvale Well
Cedarvale Well #4
Norval Standpipe
G6L
G5G
Campbellville Well
Kelso Well
Kelso PS
Kelso WPP
Steeles Ave. Tower
M5L
Main St. Res
M5G
M5L
Walker's Line Well
Walker's Line PS
M4L
Zone 4 ET
Moore Res
Burnhamthorpe Rd. Elevated T.
O4
Appleby Line Res
Headon Rd. Res
8th Line Res
8th Line (O-4) PS
O3
Beaufort Res
Beaufort (B-5) PS
Baillie (B-4) PS
Baillie Res
B5
B3
8th Line (O-3) PS
Tyandaga Res
B4
Tyandaga (B-4) PS
Kitchen Res
REGIONAL ROAD 25, UPPER MIDDLE
REGIONAL ROAD 25, UPPER MIDDLE
McCraney Res
O2A
Brant St. (B-3) PS
Brant St. Res
Washburn (B-2) PS
Washburn Res
Washburn (B-3) PS
Mount Forest (B-2) PS
Mount Forest Res
B5B
B5A
B4A
B3A
B2
B1B
B1A
Waterdown Standpipe
Waterdown (B-1B) PS
Waterdown Res
Kingsway (B-1A) PS
Davis Rd. (O-2) PS
O2
O1
Oakville WPP
Burloak WPP
Burlington WPP
Hamilton Harbour
Lake Ontario

Halton REGION
Sustainable Halton
Water and Wastewater Master Plan

Halton Region
Existing Water Distribution System
Figure 12

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Burlington Pressure Zones

Burlington is serviced by five major pressure zones: B1, B2, B3, B4, and B5, plus the smaller North Aldershot (B3A, B4A, B5A), Snake Road (B5B), and Bridgeview (B1B, serviced by Hamilton) pressure zones. The North Aldershot system is located in the northwest area of the City of Burlington, in the Waterdown area, north of highway 403).

Pressure Zone B1

Pressure District B1 comprises the southern portion of Burlington, between Bronte Creek and Kingsway Drive. Burlington and Oakville's Zone 1 distribution systems have been integrated by an interconnecting feedermain between the two districts, which are serviced by the Burlington WPP, Burloak WPP and Oakville WPP. Storage and pressure control for B1 and O1 is provided by reservoirs in both Burlington and Oakville. Zone B1 consists of land between elevations of 76 m and 101.4 m.

Elevated storage for District B1 is provided in ground-level reservoirs at three separate locations with the Brant Street and Washburn reservoirs having a top water level of 133.0 m, and the Mount Forest Reservoir having a top water level of 126.6 m. These reservoirs provide security and operational equalization of the system.

Pressure Zone B1A

Pressure Zone B1A is serviced by the Kingsway Drive Booster Pumping Station with storage and pressure control provided by the Waterdown Reservoir. This zone generally consists of all lands to the west of Kingsway Drive and to the North of Hamilton Harbour up to a ground elevation of 107 m (generally lands south of Highway 403).

Pressure Zone B2

Pressure Zone B2 comprises the central portion of the City of Burlington, between Upper Middle Road and the QEW/ Fairview Street. Zone B2 generally consists of all lands between elevations of 97.5 m and 134.3 m that are west of Bronte Creek. The Washburn and Mount Forest Pumping Stations supply water to the Burlington B2 Pressure Zone.

Pressure Zone B3

Pressure Zone B3 is located mainly north of Upper Middle Road in Burlington and generally includes all lands with ground elevations between 129.7 and 165.9 m west of Bronte Creek. The Washburn Pumping Station supplies water to Pressure Zone B3 and the Headon Road and Tyandaga Reservoirs provide storage and regulate pressure.

Pressure Zone B4

Pressure Zone B4 consists of most of the north-west corner of Burlington, north of the 407, between ground elevations of 165.8 to 203.2 m.

Water is supplied to Pressure Zone B4 by the Bailie and Tyandaga Pumping Stations.

Pressure Zone B5

Pressure Zone B5 is a very small area located just north-west of the Beaufort Reservoir. The Zone is supplied by the Beaufort Pumping Station.

North Aldershot

The North Aldershot system is currently supplied by the City of Hamilton (through the Woodward Avenue Water Treatment Plant) through an interconnection to their distribution system on Waterdown Road. It can also be supplied by the Waterdown Pumping Station. Due to elevations of lands being serviced, pressures exceed 700 kPa, and pressure reducing valves are required on individual service connections. The Waterdown Standpipe provides storage and regulates pressure. The North Aldershot system is connected to the South Halton Lake-Based System, but the connection is normally closed to prevent mixing of water which contains a free chlorine residual (Halton) with water than contains a combined chlorine residual (Hamilton).

Snake Road

The Snake Road system is also supplied by the City of Hamilton through an interconnection on Snake Road. However, unlike the North Aldershot system, the Snake Road system is currently not connected to the South Halton Lake-Based System.

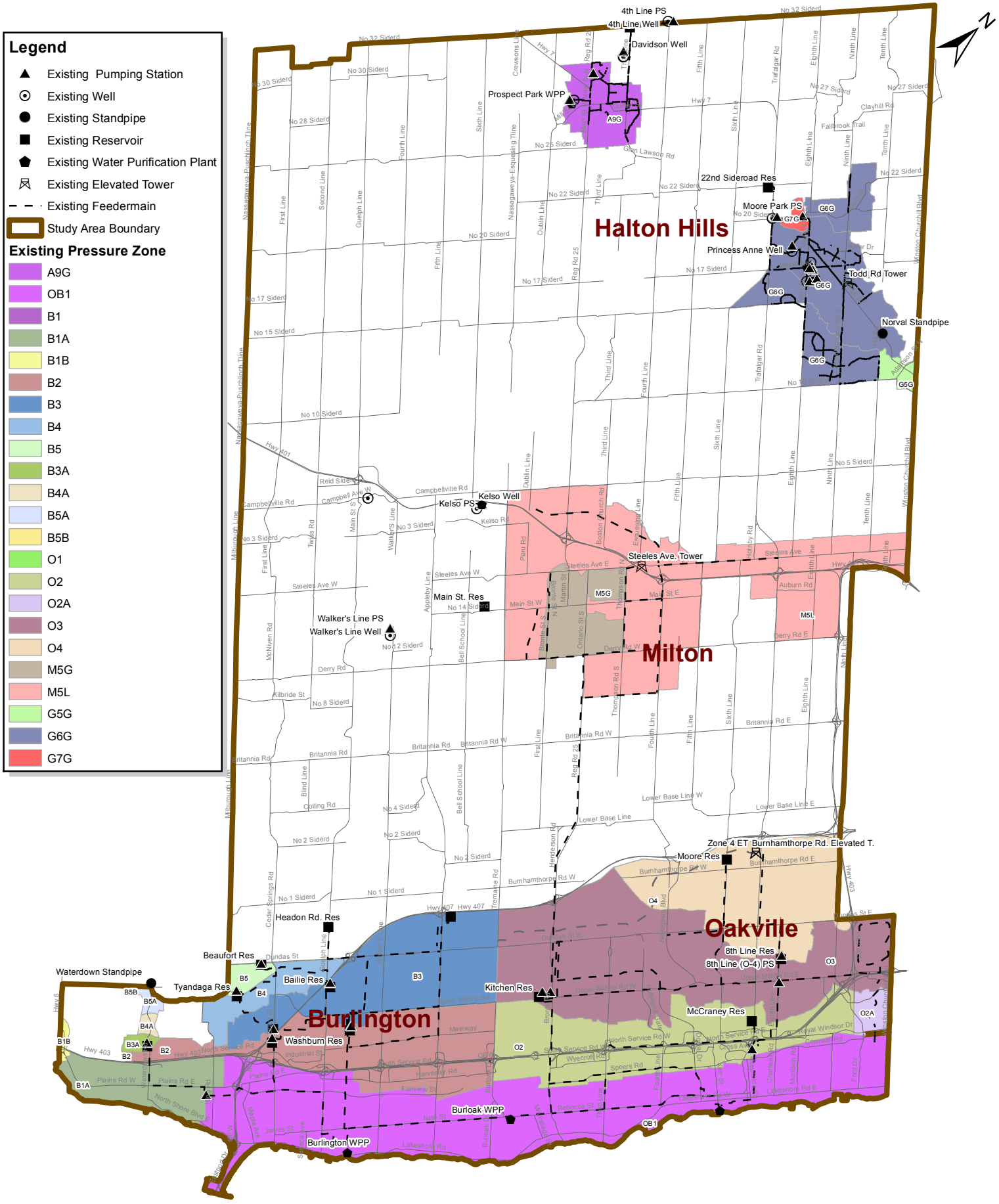
Bridgeview

The Bridgeview system is located at the west end of the City of Burlington and is currently supplied by the City of Hamilton through an interconnection on Plains Road. The Bridgeview system is not connected to the South Halton Lake-Based System.

Milton Lake-based system

Milton is currently serviced by one lake-based pressure zone, M5L, and one groundwater-based pressure zone, M5G. Pressure Zone M5L consists of new growth areas surrounding Zone M5G within elevations of 196.6 m and 232.5 m. Water to pressure zone M5L is pumped from Oakville Zone O1 through Kitchen Reservoir and Pumping Station and will soon be interconnected with Zone O4. The Milton Elevated Tank provides storage and maintains pressure control for the area.

In addition to the three (3) lake-based WPPs, the South Halton distribution system also includes three (3) booster pumping stations, five (5) storage reservoirs, nine (9) storage reservoirs and pumping stations, two (2) elevated storage tanks, and approximately 1,563 km of trunk watermains and 193 km of distribution watermains.



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Sustainable Halton
Water and Wastewater Master Plan

Halton Region
Existing Water Pressure Zones
Figure 13

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Storage facilities must be capable of providing emergency and fire storage as well as equalization to the system. A summary of the storage facilities in South Halton with their existing capacities are summarized in Table 14.

Table 14 Existing Lake-Based Storage Facilities and Capacities

Storage Facility	Zone of Service	Top Water Level (m)	Existing Storage Capacity (ML)
Brant Street Reservoir	B1	135.03	11.50
Washburn Reservoir	B1	135.03	13.50
Waterdown Reservoir	B1A	140.21	7.50
Waterdown Tower	B1B	277.67	2.00
Mt. Forest Reservoir	B2	126.64	5.50
Bailie Reservoir	B2	167.93	17.50
Appleby Reservoir	B2	167.70	32.00
Tyandaga Reservoir	B3	203.30	4.55
Headon Road Reservoir	B3	200.20	18.00
Beaufort Reservoir	B5	236.22	2.05
Kitchen Reservoir	O1	135.00	40.00
McCraney Reservoir *	O1	128.016	17.00
Eighth Line Reservoir	O2	167.64	17.60
RJ Moore (6th Line) Reservoir	O3	198.03	32.00
Zone 4 Elevated Tank	O4, M4L	236.0	5.68
Milton Elevated Tank	M5L	267.00	6.83
* Note: McCraney Reservoir operates at a lower Zone 1 hydraulic grade line.			

For each pressure zone, the pumping stations must be capable of meeting the water supply requirement based on maximum day for the specific zone and all higher zones supplied by the station based on having sufficient floating storage. Pumping requirements for peak hour demand are considered for pressure zones with deficient storage. Firm station capacity is the capacity that is required with the largest pump out of service. A summary of the existing pumping stations with their respective firm capacities are shown in Table 15.

Table 15 Existing Lake-Based Pumping Stations and Capacities

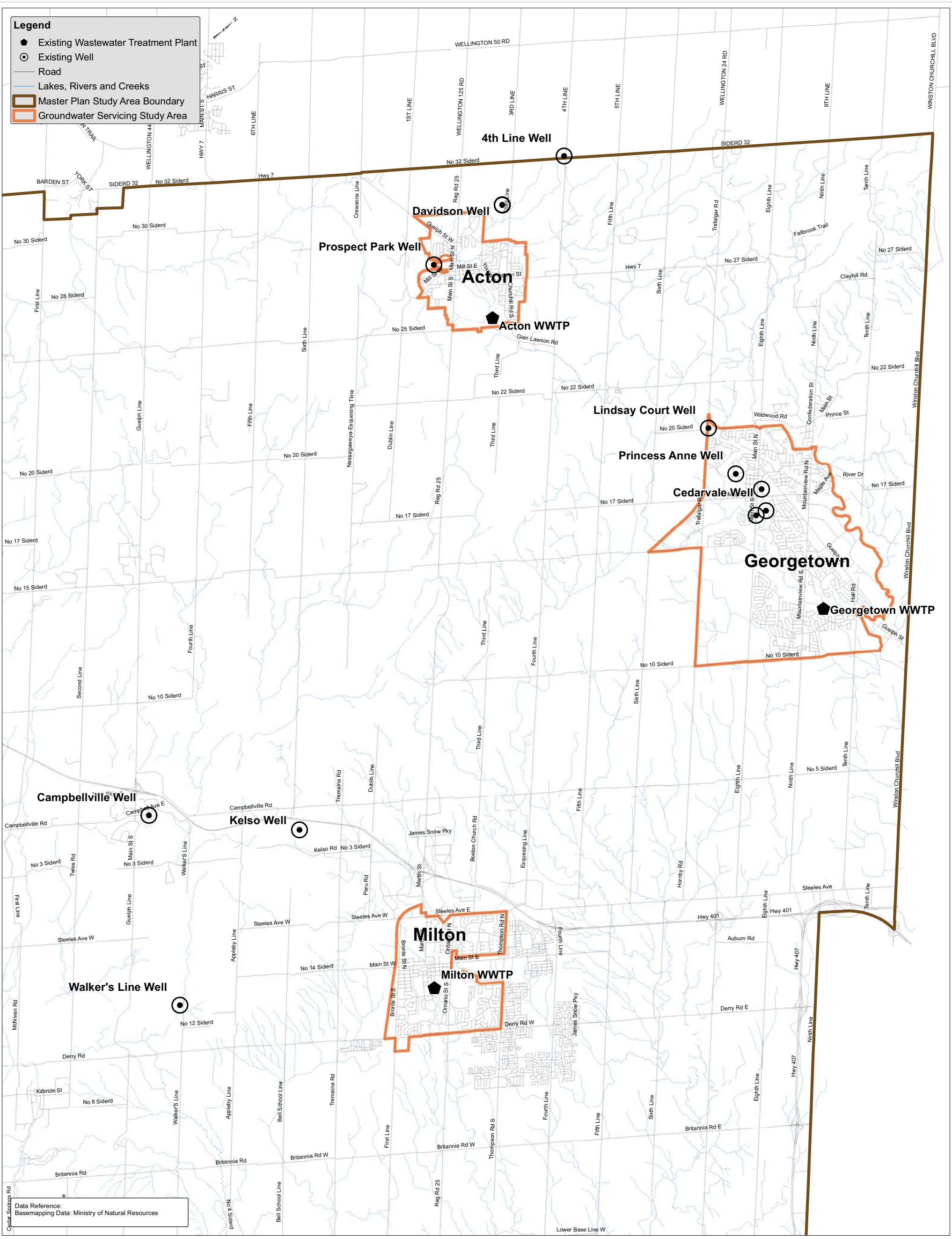
Pumping Station	Zone of Service	Existing Firm Capacity (ML/d)
Kingsway Booster Pumping Station	B1A	30.00
Waterdown Pumping Station	B1B	2.29
Washburn (Z2) Pumping Station	B2	109.20
Washburn (Z3) Pumping Station	B3	36.34
Mount Forest Pumping Station	B2	2.31
Brant Street Pumping Station	B3	0.00
Bailie Pumping Station	B4	9.20
Tyandaga Pumping Station	B4	1.96
Beaufort Pumping Station	B5	1.00
Davis Road Booster Pumping Station	O2	102.26
Eighth Line (Z3) Booster Pumping Station	O3	55.16
Eighth Line (Z4) Booster Pumping Station	O4	43.73
Kitchen (Z3) Pumping Station	O3	75.0
Kitchen (Z5) Pumping Station	M5L	75.0

7.3 North Halton Groundwater System

7.3.1 Well Water Supply Systems

There are three (3) well water supply systems currently operating and servicing residents of Milton, Georgetown and Acton.

The core of Milton is supplied by the Kelso and Walker's Line well fields. These wells draw water from an aquifer comprised of sand and gravel. Georgetown is currently supplied by three well fields: Cedarvale, Princess Anne, and Lindsay Court. These wells also draw water from an aquifer comprised of sand and gravel. Acton is supplied by three well fields: Davidson, Fourth line, and Prospect Park. The Prospect Park well draws water from the Prospect Park aquifer, while the Davidson and Fourth Line wells draw water from the Amabel Formation aquifer. See Figure 14 for the location of the wells.



Halton Region
Sustainable Halton
Water and Wastewater Master Plan

Existing Well Locations
Figure 14

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Milton Well Water Supply System

The Milton Well Water Supply System supplies water to the core area of the Town of Milton which sits on the Halton Clay plain, which is underlain by low permeability shale bedrock. The portion of Milton's water supply derived from groundwater is obtained at two well fields outside of town. These are the Kelso well field (4 km outside of Milton) and the Walker's Line wells (approximately 6 km outside of Milton). There are four wells from the well field in the Kelso aquifer and two wells in the well field in the Walkers Line aquifer.

The upgraded Kelso Well Treatment Facility, completed in 2003, was designed to produce a maximum day capacity of 22.7 ML/d matching the permit to take water. Despite this, the facility has been estimated to have a capacity of only 14 ML/d to 16 ML/d. Accordingly, the current firm capacity of this Well Based water system is constrained.

Likewise, currently only one of the two wells at the Walker's Line well field is operational (Well No. 1) and this well is operating at a reduced capacity of 1.25 ML/d, due to turbidity issues encountered at higher pumping rates. As a result, with no standby well available, the Walker's Line wells are not contributing firm capacity to the system.

The existing Permitted capacity of the Milton wells represents the safe aquifer yield for the Walker's Line and Kelso well fields. As such, an increase in the rated capacity of the Milton Well Water Supply system would require remediation of existing limitations described above. It is for this reason that the Region proceeded with constructing a connection to the Lake Ontario based water system servicing Oakville and Burlington to provide for water demand required for growth outside of the Milton core.

Conditions on both well fields allow for an increased maximum daily taking during peak demand times at Kelso and for emergency situations at Walkers Line. An excess daily taking is permitted for both the Kelso and Walkers Line wells as follows:

Kelso:

i) 22,730 m^3/day for up to 5 days/year
ii) 20,457 m^3/day for up to 10 days/year
iii) 18,184 m^3/day for up to 30 days/year
iv) 15,911 m^3/day for up to 60 days/year

Walkers Line:

i) 5,240 m^3/day for up to 10 days/year

A summary of the actual amount of water available for distribution and firm system capacity is presented in Table 16.

Table 16 Permitted Groundwater Taking and Actual Available Supply for Milton

Well Field	PTTW Daily Average Taking (m^3/day)	PTTW Daily Maximum Taking (m^3/day)	Actual Average Amount of Water Available for Distribution (m^3/day)*[1]	Actual Maximum Amount of Water Available for Distribution (m^3/day)*[1]	Daily Average Firm Capacity (m^3/day)*[2]	Daily Maximum Firm Capacity (m^3/day)*[2]
Kelso	13,635	22,730	13,635	15,911	13,635	13,635
Walkers Line	3,180	3,180	1,250	1,250	0	0

Notes: *[1] Actual amount of water available for distribution maybe less than permitted value due to operational losses (ex. Backwash), existing performance constraints and/or treatment capacity.
*[2] Defined as the actual taking minus the loss of the highest producing well at each well field.

Georgetown Well Supply System

Presently, Georgetown relies entirely on groundwater supply, derived from seven wells at three municipal well fields: Lindsay Court, Princess Anne, and Cedarvale. Water from the Cedarvale Well Field is treated at the Georgetown WPP.

Georgetown's water supply comes entirely from overburden sediments deposited above the Queenston Formation, within a network of buried valley aquifers. Specifically, the Lindsay Court and Princess Anne wells are completed in the Acton/Georgetown Bedrock Valley and the Cedarvale wells are completed in the Georgetown/Huttonville Bedrock Valley (AECOM and AquaResource, 2010). However, these two bedrock valleys are connected and therefore the aquifers that supply these municipal wells are interconnected from a hydrogeological perspective. Therefore, it is imperative that the system be considered as a whole when evaluating the possibility of expanding the groundwater supply system under the *Sustainable Halton* initiative.

A summary of the actual amount of water available for distribution and the firm capacity for the system is presented in Table 17. The firm capacity is defined as the actual amount of water that would be available if the largest well in each well field failed (due to power outage, pump failure, contamination etc.). Ideally, the firm capacity should be greater than the actual demand from both an annual average daily perspective and a maximum daily perspective.

The existing permitted capacity of the Georgetown wells represents the safe aquifer yield for the Lindsay Court, Princess Anne and Cedarvale well fields. A summary of the actual amount of water available for distribution is presented in Table 17.

Table 17 Permitted Groundwater Taking and Actual Available Supply for Georgetown

Well field	PTTW Daily Average Taking (m^3/day)	PTTW Daily Maximum Taking (m^3/day)	Actual Average Amount of Water Available for Distribution (m^3/day)*[1]	Actual Maximum Amount of Water Available for Distribution (m^3/day)*[1]	Daily Average Firm Capacity (m^3/day)*[2]	Daily Maximum Firm Capacity (m^3/day) *[2]
Lindsay Court	6,545	6,545	6,218	6,218	8,593*[3]	12,472*[4]
Princess Anne	6,800	13,091	6,800	12,436		
Cedarvale	4,500	14,404	4,240	8,120		

Notes:
*[1]Actual amount of water available for distribution is less than permitted value due to operational losses (ex. Backwash) and/or treatment capacity.
*[2]Defined as the actual taking minus the loss of the highest producing well at each well field.
*[3]Based on the loss of Lindsay Court 9 permitted annual average daily.
*[4]Based on the loss of Princess Anne 6 permitted maximum daily. The firm capacity for the system with standby wells at Lindsay Court and Princess Anne 6 would be 26,744 m^3/day (6,218+12,436+8,120)

The permitted capacity for the Cedarvale well field includes the option for increasing the water taking, contingent on the results of the pumping test required under PTTW Condition 4.4. If the analysis of this test data indicates that pumping at the increased rate will not have undesirable impacts to the quality and quantity of identified groundwater and surface water features, the permit allows an increase in the total average annual daily withdrawal from the well field to 5,790 m^3/day. Following an analysis of the results of all studies outlined in the PTTW, a further increase in the total average annual daily withdrawal from the Cedarvale well field to 6,972 m^3/day may be permitted by the MOE. No increase in the maximum day taking is provided for in this permit.

The Princess Anne and Cedarvale well fields have permitted maximum day takings that are higher than their respective permitted average day takings. Lindsay Court's taking is restricted to its average annual day taking and does not allow for a short term increase above this.

The two production wells at the Princess Anne well field (Well 5 and Well 6) also derive their supply from the Acton/Georgetown buried bedrock valley aquifer. Both wells are located within the same pumphouse. It is understood that a work program is being undertaken by Halton to twin Princess Anne 6.

The Cedarvale well field has four operational pumping wells: 1A, 3A, 4, and 4A, all of which are screened in the Georgetown/Huttonville buried bedrock valley aquifer. A recent assessment determined that Cedarvale wells 1A, 3A and 4A are GUDI with effective in situ filtration (CTC SPR, 2010). This means that these wells are potentially influenced by the local surface water features; however, the residency time of the water in the subsurface is sufficient to filter out potential surface water contamination. The Cedarvale well field has been active since the late 1960's. In this time, as described above, production wells have been added and the annual groundwater takings have varied significantly.

Acton Well Supply System

Presently, Acton's water supply is derived entirely from groundwater, extracted from five wells at three well fields: Prospect Park, Davidson and Fourth Line. Water from the Prospect Park Well Field is treated at the Prospect Park WPP.

The Prospect Park wells are screened in overburden sediments that infill the Acton/Georgetown buried bedrock valley. This valley has previously been delineated as being a continuous feature between Acton and Georgetown; however, a recent study completed for Halton in the Limehouse area concluded that the buried bedrock valley is not continuous through Limehouse. The Prospect Park municipal well field is located in the segment of the buried bedrock valley to the west of Limehouse and is therefore not directly connected to the buried bedrock valley aquifer supplying the Georgetown wells (AECOM, 2011). In contrast to the Prospect Park wells, the Davidson and Fourth Line wells are bedrock wells that obtain water from the Silurian dolomite formations above the Niagara Escarpment. These bedrock units were previously thought to be the Amabel Formation but the Tier Three study findings suggest that the Fourth Line well may be drawing water from the either the overlying Eramosa Formation or the Guelph Formation (AECOM and AquaResource, 2010).

A summary of the actual amount of water available for distribution and the firm capacity for the system is presented in Table 18. The firm capacity is defined as the actual amount of water that would be available if the largest well in each well field failed (due to power outage, pump failure, contamination etc.). Ideally, the firm capacity should be greater than the actual demand from both an annual average daily perspective and a maximum daily perspective.

The existing Permitted capacity of the Acton wells represents the safe aquifer yield for the Prospect Park, Davidson and Fourth Line wells.

The PTTW allows a daily maximum taking of 2,273 m^3/day from Prospect Park; however, due its proximity to Fairy Lake, the taking is restricted to a daily maximum of 1,137 m^3/day during the spawning season (October 1 through May 31). The permit also prohibits the simultaneous operation of the two Prospect Park wells, with the exception of an emergency situation, when the daily maximum taking is increased. This allowance for additional emergency taking is in place to account for the deficit between the current maximum system demand and the actual maximum daily available supply. Historically, the maximum daily taking has not been required from the Acton system.

The PTTW allows for a daily maximum taking of 1,250 m^3/day from each well at the Davidson well field, for a combined total taking of 2,500 m^3/day. During any period that the ponds on the adjacent property are in use for trout rearing, the Region is required to maintain sufficient flow in the stream feeding these ponds such that at least three

of these ponds are available for use. The maximum flow required in the stream is 304.5 L/min (438 m^3/day) from May 1 – October 31 and 227 L/min (327 m^3/day) from November 1 to April 30.

The PTTW allows for the maximum daily taking of 1,309 m^3/day from the Fourth Line well (Well A). However, there currently is no backup well for the Fourth Line well, therefore this reduces the firm capacity of the overall Acton system. It is understood that Halton is planning to twin this well in the future.

In contrast to the Georgetown water supply, the Acton PTTW does not specify an average annual daily taking for any of the wells. Therefore, by default, the average annual daily taking for this assessment should be considered the maximum daily taking outlined in Table 18 (please note in the Prospect Park well field has two rates based on the time of year.)

Table 18 Permitted Groundwater Taking and Actual Available Supply for Acton

Well field	PTTW Daily Maximum Taking (m^3/day)	Actual Maximum Amount of Water Available for Distribution (m^3/day)*[1]	Actual Daily Maximum Firm Capacity (m^3/day)*[2]
Prospect Park	2,273*[3]	1,809*[3]	2,997*[5]
Davidson	2,500	2,376*[4]	
Fourth Line	1,309	1,244	

Notes:

*[1]Actual amount of water available for distribution is less than permitted value due to operational losses (ex. Backwash) and maintenance.

*[2]Defined as the actual taking minus the loss of the highest producing well at each well field.

*[3]Prospect Park well is restricted to a daily maximum of 1,137 m^3/day during the spawning season (October 1 through May 31).

*[4]Does not include 438 m3/day for Acri ponds.

*[5]Based on the loss of Fourth Line permitted maximum daily and assuming no mitigation required for Acri ponds. Note that the firm capacity with a standby well at Fourth Line would be 4,241 m^3/day (1,809+1,188+1,244).

7.3.2 Summary of Well Water Supply Systems

Well water supply capacities for each of the groundwater systems are provided in Table 19.

Table 19 Existing Well Water Actual Maximum Daily Supply in Halton Region

Well Water Supply System	Well Fields	Actual Supply (MLD)	Raw Water Source
Milton Well Water Supply System	Kelso Well Field (4 wells) Walker's Line Well Field (2 wells)[1] **Total**	15.9 1.3 **17.2**	Sand and gravel aquifer system Non-GUDI
Georgetown Well Water Supply System	Cedarvale Well Field (4 wells) Princess Anne Well Field (2 wells) Lindsay Court (1 well) **Total**	8.1 12.4 6.2 **26.7**	Sand and gravel aquifer system Non-GUDI (except Cedarvale)
Acton Well Water Supply System	Fourth Line Well Field (1 well) Davidson Well Field (2 wells) Prospect Park Well Field (2 wells) **Total**	1.3 2.4[2] 1.8[3] **5.5**	Bedrock and overburden aquifers GUDI

Notes: [1] *Currently, only one well is operational at Walker's Line (Halton Region Water Quality Annual Report, 2010).*

[2] *Does not include 483m³/day for Acri ponds.*

[3] *Prospect Park well is restricted to a daily maximum of 1,137m³/day during the spawning season (October 1 - May 31).*

7.3.3 Distribution System

Halton Region's service areas are categorized by pressure zone and its relationship to the overall system operation. Due to the gradual rise in ground elevation northerly from the shore of Lake Ontario to the groundwater service areas in Milton, Georgetown, and Acton, separate pressure zones have been established. Each pressure zone spans an elevation difference of approximately 30 metres and is identified by the local municipality that it services.

Milton is currently serviced by one lake-based pressure zone, M5L supplied from the Kitchen Reservoir and Pumping Station (Zone O1), and one groundwater-based pressure zone, M5G, supplied by the Kelso and Walker's Line well fields. Well water from the Kelso well field is pumped to the Kelso WPP for treatment, is then pumped to the Milton Reservoir, and is later fed to the distribution system. Water from the Walker's Line wells is disinfected and pumped to the Milton Surge Tank, where it is then fed to the distribution system. Storage facilities and pumping stations are summarized in Table 20 and Table 21 respectively.

Georgetown is currently serviced by three pressure zones, G5G, G6G and G7G, and is supplied by three well fields: Cedarvale, Princess Anne, and Lindsay Court. The Georgetown water supply and distribution system includes three (3) well fields, one (1) water purification plant, one (1) booster pumping station, three (3) storage facilities and approximately 91.53 kilometres of trunk watermains and 11.31 kilometres of distribution watermains. Water from the Cedarvale well is pumped to the Georgetown WPP and then feeds the distribution system. Water from the Princess Anne and Lindsay Court wells is disinfected on-site before supplying the distribution system. Storage facilities and pumping stations are summarized in Table 20 and Table 21 respectively.

Acton is serviced by a single pressure zone, A9G, and is supplied by three well fields: Davidson, Fourth line, and Prospect Park. The Acton distribution system includes three (3) well fields, one (1) drinking water treatment plant, one (1) storage reservoir, and approximately 46.4 km of trunk watermains and 5.2 km of distribution watermains.

Well water comes from two separate aquifers and is disinfected and pumped to the Third Line Reservoir, where it then feeds the Acton distribution system. Storage facilities and pumping stations are summarized in Table 20 and Table 21 respectively.

Table 20 Existing Groundwater Storage Facilities and Capacities

Storage Facility	Zone of Service	Top Water Level (m)	Existing Storage Capacity (ML)
Main St Reservoir	M5G	257.0	14.7
Milton Surge Tank	M5G	259.3	3.7
Norval Standpipe	G5G	254.84	0.591
Todd Road Tower	G6G	303.01	2.273
22nd Sideroad Reservoir	G6G	303.00	8.200
Third Line Reservoir	A9G	410.98	4.545

Table 21 Existing Groundwater Pumping Stations and Capacities

Pumping Station	Zone of Service	Existing Firm Capacity (ML/d)	PTTW (ML/d)
Kelso WPP	M5G	22.12	22.730
Walker's Line Pump House	M5G	2.85	3.180
Georgetown WPP	G5G, G6G, G7G	8.64	14.404
Lindsay Court Pumping Station	G6G	6.54[1]	6.545
Moore Park Pumping Station	G7G	54.0	
Prospect Park WPP	A9G	2.223[2]	2.273
Davidson Well Pump House	A9G	2.500[3]	2.500
Fourth Line Well Pump House	A9G	1.309[1]	1.309
Princess Anne Pump House	G6G	4.907	4.582
Princess Anne Pump House 2	G6G	13.080	13.091

Note: *[1] Has no standby well.*

[2] Prospect Park well is restricted to a daily maximum of 1,137m³/day during the spawning season (October 1 through May 31).

[3] 458m³/day may be required for Acri ponds mitigation.

8. Existing and Future Water Infrastructure Assessment

This section summarizes findings from the analysis of the performance of the existing water systems and assessment of future servicing needs. The approach focused on identifying existing system opportunities and constraints and layering on growth to determine future servicing requirements.

Based on the June 2011 BPE data and Design Criteria, evaluation of the planning data and ultimately the project requirements was completed through summarizing the water demands for the following geographic areas:

- Complete lake-based service area (i.e., serviced by all WPPs)
- Milton well-based service area (i.e., serviced by Milton wells)
- Georgetown well-based service area (i.e., serviced by Georgetown wells)
- Acton well-based service area (i.e., serviced by Acton wells).

Complete water demand projections for residential, industrial, commercial, institutional, and total employment are included in Appendix 1-3.

In order to evaluate the water servicing requirements including immediate pressure zone demands as well as capacity required to service subsequent pressure zones, water servicing flow schematics were developed for each of the planning intervals, 2011, 2016, 2021, 2026, and 2031. The water servicing flow schematics are included in Appendix 1-3.

8.1 Opportunities and Constraints

Opportunities and constraints were identified for each system through discussions with Regional and local area municipal staff and based on the ability to provide adequate levels of service, such as pressure and fire flow demands. Other factors, such as reliable security of supply, were previously mentioned in Sections 4.3 and 4.7.

8.1.1 South Halton Lake-Based Water System

The following opportunities and constraints were identified in the South Halton Lake-Based Water System:

- Intensification impacts on existing system
- Impact of transferring areas in Milton and Georgetown to the lake-based system
- Treatment capacity vs. Projected demands
- Pressure zone boundary adjustments
- System redundancy
- West to east water transfer
- Build-out servicing
- Operational constraints in existing Burlington area
- Interregional water connections

8.1.2 Milton Water System

The following opportunities and constraints were identified in the Milton Water System:

- Existing well supply not sufficient to meet projected growth
- Intensification impacts on existing system
- Walker's Line Wells are limited in available supply, are not meeting Permit to Take Water, and significant surge tank / watermain rehabilitation is required
- Kelso Water Plant is not meeting Permit to Take Water and requires optimization to increase production
- Need groundwater system servicing redundancy
- Political / public perception of maintaining groundwater service area
- Pressure zone boundary adjustments

8.1.3 Georgetown Water System

The following opportunities and constraints were identified in the Georgetown Water System:

- Existing well supply not sufficient to meet projected growth
- Intensification impacts on existing system
- Need groundwater system servicing redundancy
- Existing storage constraints (operational and quantity)
- Hamlets servicing requirement
- Expanded urban boundary (large greenfield growth)
- Water balance requirements
- Political / public perception of maintaining groundwater service area
- Interregional water connection

8.1.4 Acton Water System

The following opportunities and constraints were identified in the Acton Water System:

- Existing well supply not sufficient to meet projected growth
- Intensification impacts on existing system
- Need groundwater system servicing redundancy
- Existing storage capacity constraints
- Isolated system
- Water balance requirements
- Existing urban boundary will remain

8.2 Water Demand Requirements

In order to evaluate the water servicing requirements including immediate pressure zone demands as well as capacity required to service subsequent pressure zones, water servicing flow schematics were developed for each of the planning intervals, 2011, 2016, 2021, 2026, and 2031. The flow schematics are included in Appendix 1-3.

Water demand requirements were developed for each system to identify existing and potential future supply deficiencies. Based on the best planning estimates, maximum day demand projections for the entire Halton Region are summarized in Table 22 by service area.

Table 22 Halton Region Water Demand Requirements by Service Area

Max Day Water Demand Requirements (MLD)					
Service Area	**2011**	**2016**	**2021**	**2026**	**2031**
Burlington & Oakville	269.17	292.22	316.74	327.41	340.28
Milton	56.45	85.08	114.95	144.59	175.64
Georgetown	24.62	26.08	28.19	36.30	44.47
Acton	5.48	5.66	6.26	7.67	8.34
TOTAL	**355.72**	**409.04**	**466.14**	**515.97**	**568.73**

8.2.1 South Halton Lake-Based Water System

An opportunity to expand the service area of the lake-based system in Halton was identified based on the potential supply capacity in the system. A breakdown of the demand requirements for the lake-based system is summarized in Table 23.

Table 23 Water Demand Projections in the South Halton Lake-Based System

Max Day Water Demand Requirements (MLD)					
Service Area	**2011**	**2016**	**2021**	**2026**	**2031**
Lake-Based Burlington-Oakville	269.17	292.22	316.74	327.41	340.28
Lake-Based Georgetown	0	0	8.66	15.70	20.75
Lake-Based Milton	43.25	71.12	99.56	128.66	159.13
Total Lake-Based	**312.41**	**363.35**	**424.96**	**471.76**	**520.16**

8.2.2 Milton Water System

Population projections in the Milton groundwater service area indicate that the projected demands could be potentially higher than the supply capacity of the groundwater system. An opportunity was identified to transfer some of the growth areas as well as some existing groundwater service areas to the lake-based system. This would minimize the impact on the well based system in Milton. Table 24 shows a breakdown of the projected demands in Milton and the proposed demand transfers.

Table 24 Water Demand Projections in the Milton Service Area

Max Day Water Demand Requirements (MLD)					
Milton Service Area	**2011**	**2016**	**2021**	**2026**	**2031**
Existing Groundwater-Based	14.75	15.98	17.52	18.11	18.75
Proposed transfer groundwater to lake-based	*0.00*	*0.69*	*0.83*	*0.86*	*0.92*
Future Groundwater-Based	14.75	15.29	16.68	17.26	17.82
Existing Lake-based	43.25	70.44	98.73	127.80	158.20
Proposed transfer groundwater to lake-based	*0.00*	*0.69*	*0.83*	*0.86*	*0.92*
Future Lake-based	43.25	71.12	99.56	128.66	159.13
Total Milton	**58.00**	**86.42**	**116.24**	**145.92**	**176.95**

8.2.3 Georgetown Water System

The expansion of the urban area boundary in Georgetown will allow for significant growth in Georgetown. These new Greenfield growth areas will be serviced by the South Halton Lake-Based System. The groundwater system will also experience growth and the current groundwater system may not have the capacity to supply water to the current groundwater service areas. There is an opportunity to transfer some of the existing well based system areas to the South Halton Lake-Based System. Table 25 shows a breakdown of the projected demands in Georgetown and the proposed demand transfers.

Table 25 Water Demand Projections in the Georgetown Service Area

Max Day Water Demand Requirements (MLD)					
Georgetown Service Area	**2011**	**2016**	**2021**	**2026**	**2031**
Existing Georgetown Groundwater Service Area	24.69	27.28	28.16	29.28	32.45
Proposed transfer Groundwater to Lake-based	0.00	0.00	8.63	8.67	8.73
Future Groundwater Service Area	24.69	27.28	19.53	20.60	23.72
Proposed transfer Groundwater to Lake-based	0.00	0.00	8.63	8.67	8.73
Lake-based Growth Areas	0.00	0.00	0.03	7.03	12.03
Future Lake-based Service Area	0.00	0.00	8.66	15.70	20.75
Total Georgetown	**24.62**	**26.28**	**28.19**	**36.30**	**44.47**

8.2.4 Acton Water System

There is a fair amount of growth expected in Acton which will be serviced by expansions to the existing system. The projected demands for this service area are presented in Table 26.

Table 26 Water Demand Projections in the Acton Service Area

Max Day Water Demand Requirements (MLD)					
Service Area	**2011**	**2016**	**2021**	**2026**	**2031**
Acton	5.48	5.66	6.26	7.67	8.34

8.3 Hydraulic Analysis

8.3.1 Lake-based Pumping Capacity

Assessment of pumping capacity was based on the ability to provide the required firm capacity to meet the required demands in the system, as described in Section 6.1.1.3. Firm capacity in the Sustainable Halton Water and Wastewater Master Plan was defined as the sum of all pump capacities, minus the largest pump capacity at each well field.

The hydraulic analysis carried out in this Master Plan flagged a number of new pumping stations that will be required within the 2031 timeframe for servicing new growth areas. The timing for these triggered projects have been mainly driven by best planning estimates, the allocation program, the Transportation Master Plan and other planned roadwork. Table 27 shows the lake-based pumping station requirements every five years to be able to meet the projected demands.

Table 27 Pumping Station Requirements by Year (MLD)

Pumping Station	Existing Firm Capacity (MLD)	2011	2016	2021	2026	2031
Oakville WPP	112.73	88.46	116.11	114.65	114.34	117.17
Davis Rd O-2	102.26	69.88	66.16	98.39	98.45	98.20
Eighth Line BPS O-3	55.16	22.34	29.45	46.89	46.76	42.34
Eighth Line PS O-4	43.73	16.98	10.07	28.43	40.22	41.00
NO M4L Pumps	100.00	0.00	38.74	71.50	92.63	121.60
Kitchen O3 Pumps	75.00	28.29	33.68	57.67	71.41	107.89
Kitchen M5L Pumps	75.00	37.62	45.52	44.73	52.15	60.80
Burlington WPP	252.95	177.66	198.96	182.80	201.34	201.81
Kingsway BPS	30.00	14.21	14.86	15.51	15.52	15.80
Waterdown PS	2.29	0.59	0.92	1.20	1.19	1.19
Washburn PS B-3	36.34	29.58	33.34	33.83	33.90	32.50
Washburn PS B-2	109.20	37.38	49.46	45.55	51.55	52.44
Mount Forest PS	2.31	2.08	2.52	2.29	1.95	1.98
Brant St. PS B-3	0.00	4.22	4.27	4.35	4.36	6.21
Bailie PS B-4	9.20	4.85	4.89	4.94	4.94	5.04
Tyandaga. PS B-4	1.96	0.93	0.94	0.95	0.95	0.96
Beaufort PS B-5	1.00	0.28	0.28	0.28	0.27	0.27
Burloak WPP	55.00	46.31	48.19	127.42	155.95	201.04
Appleby PS - B-3	0.00	0.00	27.76	21.53	28.91	27.69
B-2 BPS	0.00	0.00	22.24	27.72	43.96	44.16

Pumping Station	Existing Firm Capacity (MLD)	2011	2016	2021	2026	2031
5th Sideroad 5L PS	0.00	0.00	0.00	6.89	8.03	9.12
5th Sideroad 6L PS	0.00	0.00	0.00	8.67	15.70	20.76
Fourth Line M5L Pumps	0.00	0.00	3.09	6.57	7.55	7.01

8.3.2 Lake-Based Storage Capacity

The need for additional storage in each pressure zone was based on meeting equalization, fire, and emergency needs, as described in Section 6.1.1.4.

The hydraulic analysis carried out in this Master Plan triggered a number of new and upgraded storage facilities required within the 2031 timeframe. The bulk of the water storage projects were triggered by the need to service new growth areas and the timing has been mainly driven by best planning estimates, the allocation program, the Transportation Master Plan, and other planned roadwork. The 2031 lake-based storage requirements by facility are shown in Table 28.

Table 28 2031 Storage Requirements

Facility	Existing Capacity (ML)	Proposed Storage Capacity by Year (ML)				
		2011	2016	2021	2026	2031
McCraney Res *	17.0	17.00	17.00	17.00	17.00	17.00
Eighth Line Res	17.6	17.60	17.60	17.60	17.60	17.60
RJ Moore (6th Line) Res	32.0	32.00	32.00	32.00	32.00	32.00
Zone 4 ET	5.7	5.68	5.68	5.68	5.68	5.68
Milton ET	6.8	6.83	6.83	6.83	6.83	6.83
Main St Res	14.7	14.70	14.70	14.70	14.70	14.70
Brant St Res	11.5	11.50	23.00	23.00	23.00	23.00
Washburn Res	13.5	13.50	27.00	27.00	27.00	27.00
Kitchen Res	40.0	40.00	40.00	40.00	40.00	40.00
Waterdown Res	7.5	7.50	7.50	15.00	15.00	15.00
Waterdown Tower	2.0	2.00	2.00	2.00	2.00	2.00
Mount Forest Res	5.5	5.50	11.00	11.00	11.00	11.00
Bailie Res	17.5	17.50	17.50	17.50	17.50	17.50
Appleby Line Res	32.0	32.00	32.00	32.00	32.00	32.00
Tyandaga Res	4.5	4.55	9.05	9.05	9.05	9.05
Headon Res	18.0	18.00	18.00	18.00	18.00	18.00
Beaufort Res	2.1	2.05	4.55	4.55	4.55	4.55
Milton M4L Res	0.0	0.00	30.00	30.00	50.00	50.00
Milton M5L Res	0.0	0.00	20.00	20.00	30.00	30.00
Georgetown G6L Res	0.0	0.00	0.00	0.00	20.00	20.00
* Note: McCraney reservoir does not contribute full volume given that the Top Water Level is below the water system hydraulic grade line.						

8.3.3 Intensification Analysis

A fundamental component of the Provincial Places to Grow Act is providing growth within the existing built boundary of the Region. For the purposes of intensification, the existing built boundary was established as the year 2006. The Province's Growth Plan identifies that by 2015 and for each year thereafter Halton Region must have a minimum of 40 per cent of all residential development occurring annually within the 2006 built boundary.

The approach for the intensification analysis under the Master Plan was in 2 stages:

1. Complete a Region wide review of the existing systems, both trunk and local, and identify high level opportunities and constraints to support intensification
2. Complete a detailed hydraulic modeling exercise to identify specific projects related the proposed intensification

The results from both stages of the intensification analysis are presented in Appendix 1-7 and discussed further in Section 15.

9. Water Alternative Solutions

9.1 Servicing Strategy Development and the Sustainable Halton Process

The evaluation and decision making process carried out as part of the Sustainable Halton Water and Wastewater Master Plan was completed to a greater level of detail than previous Water and Wastewater Master Plans.

The Sustainable Halton Water and Wastewater Master Plan is an integrated component of the overall Sustainable Halton process. As such, the development of the servicing strategies evolved in complexity and detail throughout the implementation of Sustainable Halton.

For the Growth Conformity Exercises under Sustainable Halton, land use plans evolved over time from overall growth concepts, to a short list of growth options, to the preferred land use plan ultimately updated for the Regional Official Plan Review ROPA 38. During this land use evaluation process, preliminary water and wastewater servicing considerations and comments were provided to support the land use decision making.

Once the preferred growth option/land use plan was finalized, the Sustainable Halton Water and Wastewater Master Plan utilized the planning data as the foundation for the servicing needs.

At this point in the Sustainable Halton process, the Class EA process for the Master Plan was initiated. The Master Plan followed Phases 1 and 2 of the Class EA process including establishing and evaluating servicing alternatives.

The process for evaluating and selecting the preferred servicing strategies was as follows:

- Generate a long list of water and wastewater concepts for the lake-based, groundwater-based and stream-based systems – this was a general description of the servicing strategy/intent with only high level description of infrastructure needs
- Evaluate the long list of concepts and short-list preferred servicing concepts
- Generate specific servicing alternatives from the short-listed concepts – this involved determination of specific infrastructure needs, locations and capacity for each alternative
- Evaluate the servicing alternatives using Triple Bottom Line evaluation criteria
- Establish the preferred water and wastewater servicing strategies including the capital and implementation programs

Figure 15 provides visual context for understanding the development of the preferred servicing strategy.

The overall capital and implementation programs for the water and wastewater servicing strategies form the primary recommendations of the Sustainable Halton Water and Wastewater Master Plan. The Master Plan documentation is ultimately integrated into the total documentation of the Sustainable Halton process.

9.1.1 Groundwater Servicing Impact

From the outset the Master Plan process recognized the interrelationship between the groundwater servicing and lake–based servicing strategies. The generation and evaluation of servicing solutions for the Region was undertaken in an integrated and holistic manner. The northern groundwater systems of Acton and Georgetown and dual existing ground and lake-based system of Milton were evaluated first in order to determine the impact on the south lake-based system.

9.1.2 Screened Out Concepts

Do Nothing

This concept is traditionally carried forward as a benchmark. This concept would not provide for additional capacity needed to service approved growth or address any potential current limitations in the water and wastewater systems. This would ultimately lead to significant drop in level of service, water distribution and transmission issues, wastewater collection and pumping issues, insufficient system security and insufficient treatment capacity. This option would also not meet the goals and objectives of the Halton Servicing Policies including servicing approved growth, providing sustainable water and wastewater systems, or providing high level of service to existing service areas. This is not carried forward for evaluation because it is not reasonable and feasible and does not address the problem/opportunity statement.

Limit Community Growth

This concept would generally consist of limiting growth to within the existing system capacities. Under this alternative, however, existing system deficiencies, including limited system security, areas with insufficient storage and transmission capacity, areas with insufficient conveyance capacity, would not be addressed. Under Places To Grow Act, the Region is required to plan for future residential and employment growth. This growth and the goals and objectives of the Sustainable Halton process would not be met. In addition, the preferred growth option from Sustainable Halton was approved by Halton Region Council under ROPA 38 and does require additional servicing capacity. This is not considered a viable option.

Water Conservation and Efficiency

A water conservation and efficiency concept represents a scenario where improvements in water conservation and water efficiency may reduce water consumption and corresponding wastewater generation as well as reduce overall water supply needs to the extent that the existing facilities and systems will be sufficient to service the planned population and employment growth across the Region.

As highlighted in Section 4.9.5, through analysis of the Region's water efficiency program and design criteria, a 5% reduction (average day demand reduction of ~ 16 litres per capita per day) in residential growth water use for the Region moving forward was utilized as a foundation in the Master Plan. This target was based on savings achieved through anticipated use of high efficiency front loading clothes washers in new homes and anticipated changes to the building code for low flush toilets (6.0 L to 4.8 L toilets).

While this reduction will be integral to the determination of infrastructure capacity and timing, it was determined that the water conservation and efficiency program was not sufficient on its own to provide for adequate level of servicing to existing and future residents.

For example, the impact of the water needs of the Georgetown service area from water conservation and efficiency was evaluated. A table top exercise to assess the impacts if 100 per cent of all Georgetown residents were retrofitted to ultra high efficiency toilets and high efficiency showerheads, clothes washers and humidifiers was completed. This aggressive water efficiency scenario resulted in a theoretical water savings of approximately 3.7 million litres per day.

In accordance with the Best Planning Estimates, Georgetown is projected to grow by approximately 32,600 residents and 3,500 employees by 2031. Using the current Regional water design criteria, approximately 20 million litres of

new water capacity is required to service this growth, the majority of which is planned to be provided by the South Halton lake-based system.

Based on this analysis, it has been concluded that even with the implementation of the highest level of water efficiency in Georgetown, the existing groundwater system capacity would not be able to service future growth demands.

Halton Region will continue to annually monitor Georgetown's groundwater system supply capacity/demand and compare actual growth uptake with the theoretical growth projections. In addition, the overall water servicing strategy will be reviewed every five years in accordance with updated population and employment estimates.

The water conservation and efficiency concept alone does not provide a complete solution to the problem/opportunity statement and additional water and wastewater solutions are required to satisfy the current uses and planned growth.

Inflow and Infiltration Reduction

Under an Inflow and Infiltration Reduction concept, significant investment into rehabilitation of the wastewater collection systems would need to be made to reduce wastewater flows in the pipes and to the pumping stations and wastewater treatment plants. This flow reduction would create capacity to support additional flows from growth.

Inflow and infiltration programs can only address the extraneous flow component of the wastewater peak wet weather flows. Through extensive system study, the Region is proceeding to identify priority areas for system rehabilitation. This program is pragmatic and will require and extended time period for implementation. As such, system wide results will require time for implementation and will not be sufficient to achieve the level of capacity gain to meet the growth related flows.

Halton Region will continue to analyze the collection system and implement an appropriate rehabilitation program. However, the Inflow and Infiltration concept alone does not provide a complete solution to the problem/opportunity statement and additional wastewater solutions are required to satisfy the current uses and planned growth.

9.2 South Halton Lake-Based Water System

South Halton's existing water system is being serviced by a network of watermains, pumping stations, and storage facilities that convey water supply from the Burlington, Oakville, and Burloak Water Purification Plants (WPPs) to subsequent pressure zones.

Drawing from the opportunities and constraints in the South Halton Water System described in Section 8.1.1, the need to develop alternative servicing concepts and strategies was based on ensuring that there is sufficient treatment and distribution capacity available in time to service projected growth in South Halton, including supply for future lake-based service areas in North Halton.

Evaluations for individual projects are provided in *Volume II - Project File.*

9.2.1 Concepts

Three servicing concepts were identified for servicing the South Halton Lake-Based Water System:

Concept 1

Concept 1 is based on expanding the planned 2021 network. This includes expanding the Burloak WPP and pumping through upgraded and existing Oakville infrastructure to supplement supply to new growth areas. Zone 4 west would see the extension of the watermain off Britannia Road West / Tremaine Road. Zone 4 east would see the extension of looped watermains off Trafalgar Road / Britannia Road West. The Milton Zone 5 watermain, south of the Halton Hills 401 Corridor would be extended east on Main Street, crossing Sixteen Mile Creek and Trafalgar Road. Halton Hills Zone 5 would see the extension of looped watermains north off Steeles Avenue.

Concept 1 also sets the stage for servicing Georgetown's future water servicing needs. Three (3) alternatives (1A-C) offering distinct solutions to servicing Georgetown were developed within Concept 1.

1. Concept 1A – A new Zone 5 Pumping Station would be constructed at the Zone 4 Reservoir and would pump south to supplement and provide security of supply to Milton East. A new Zone 6 Pumping Station would be constructed at the Zone 4 Reservoir to pump north to Georgetown.
2. Concept 1B – No Zone 5 pumping station would be constructed at the Zone 4 Reservoir site and hence no supplemental supply to Milton East would be provided. A new Zone 6 Pumping Station would be constructed at the Zone 4 Reservoir to pump north to Georgetown.
3. Concept 1C – A new Zone 6 Pumping Station would be constructed at the Zone 5 Reservoir and would pump north to Georgetown.

Concept 1 leverages existing infrastructure for full build-out conditions. It also provides system redundancy within Halton Hills Zone 5. It helps provide flexibility for sizing and design to support the strategy and is a Halton only servicing concept. However, the strategy requires an extra highway 401 crossing and includes only one feed to Georgetown.

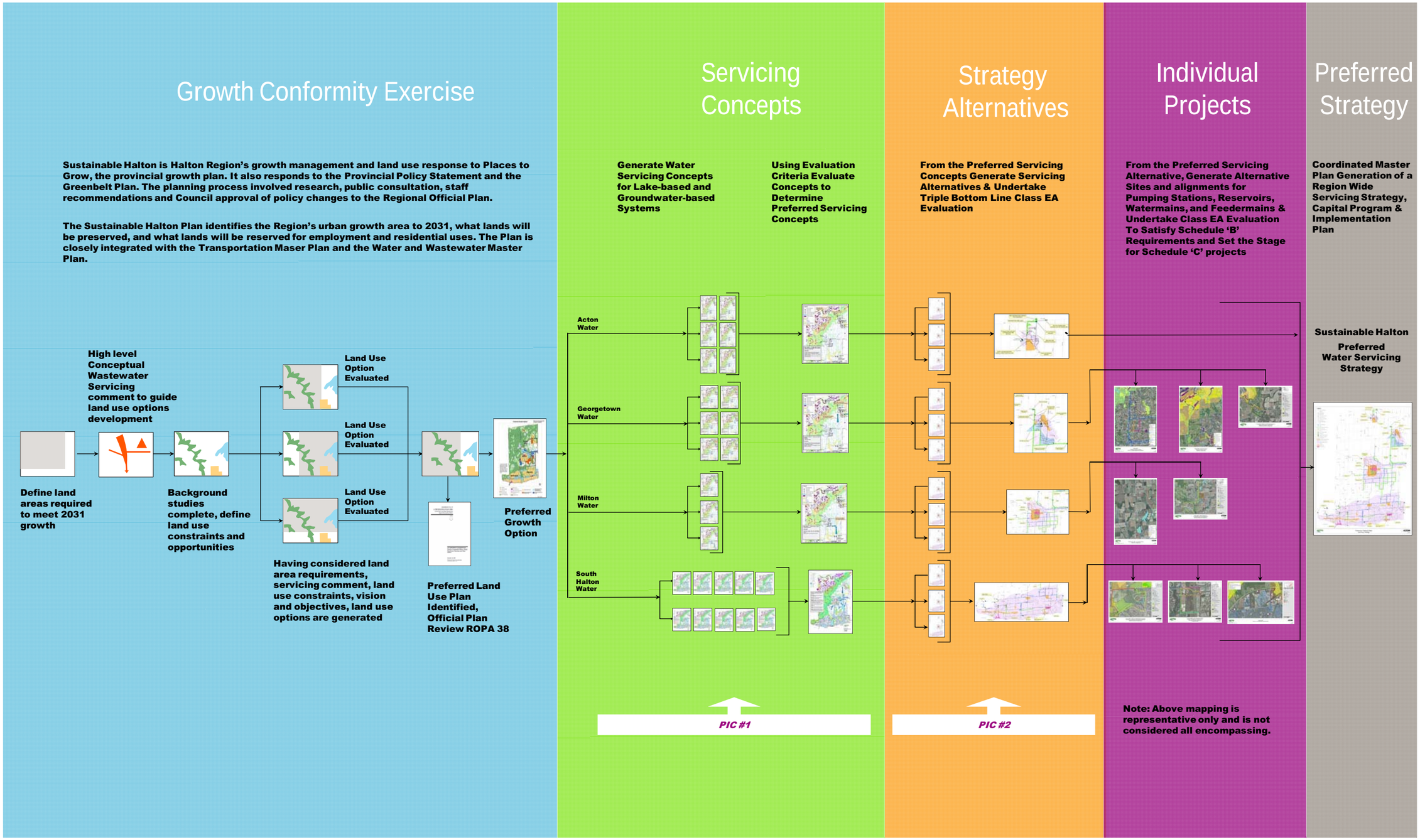


Figure 15 Overall Water Evaluation and Decision Making Process

Concept 2

Concept 2 is based on constructing an independent feedermain (third spine) to supplement supply to new growth areas. This third spine would supplement the west feedermain from the Kitchen Reservoir and the east feedermain along Trafalgar Road to Milton.

Milton Zone 4 East would see the extension of looped watermains off Trafalgar Road / Britannia Road West. The watermain south of the Halton Hills 401 Corridor would be extended east on Main Street, crossing the Sixteen Mile Creek and Trafalgar Road. A new Zone 5 pumping station would be constructed at the Zone 4 Reservoir to pump south to supplement and provide security of supply. Halton Hills Zone 5 would see the extension of looped watermains north off Steeles Avenue. A new Halton Hills Zone 6 pumping station would be constructed at the Zone 4 Reservoir and would pump north to Georgetown.

Four alternative alignments (2A-D) for the third spine were considered and are described as follows:

1. Concept 2A – Expand Burloak WPP and construct new Zone 4 PS at Appleby Line Reservoir and pump north to supplement supply to new growth areas. Feed Milton Zone 4 west from Appleby Line Reservoir 3rd Spine.
2. Concept 2B – Expand Burloak WPP and pump independent feed north to supplement supply to new growth areas. Feed Milton Zone 4 west from Bronte Rd 3rd Spine.
3. Concept 2C – Expand Burloak WPP and North Oakville PS and pump independent feed north on James Snow Parkway to supplement supply to new growth areas. Extend looped watermains off James Snow Parkway 3rd Spine.
4. Concept 2D – Expand Burloak WPP and Oakville WPP and pump independent feed northeast to Eighth Line to supplement supply to new growth areas.

Concept 2 addresses full build-out needs and is a Halton only servicing concept. It also has the potential to create further redundancy in the Burlington / Oakville system. An independent feed to Milton means that the system would not be reliant on the Kitchen Pumping Station and the RR25 and Trafalgar spines. However, Concept 2 provides less system redundancy and requires upgrades to the existing / planned infrastructure. It also has less flexibility to service build-out areas and is very reliant on pumping.

Concept 3

Concept 3 is based on constructing a new inter-regional supply from Peel. The Milton Zone 4 West watermain would be extended off Britannia Road West / Tremaine Road. Milton Zone 4 East would see the extension of looped watermains off Trafalgar Road / Britannia West. The Milton Zone 5 watermain, south of the Halton Hills 401 Corridor would be extended east on Main Street, crossing Sixteen Mile Creek and Trafalgar Road. In Halton Hills Zone 5, looped watermains would be extended north off Steeles Avenue.

Three inter-regional connection alternatives (3A-C) with Peel were considered and are described as follows:

- Concept 3A – Provide inter-regional connection from Peel to Zone 5 to supplement supply to both Zone 5 and new growth areas. A new Zone 6 pumping station at the Zone 4 Reservoir would also be constructed to pump north to Georgetown.
- Concept 3B – Provide inter-regional connection from Peel to Zone 6 to supply to Zone 6 and new growth areas. A new Zone 5 pumping station would be required at the Zone 4 Reservoir to pump south to supplement and provide security of supply.

- Concept 3C – Provide inter-regional connection from Peel to Zone 1, 2, or 3 supplementing south water supply prior to pumping north to new growth areas. A new Zone 5 pumping station would be required at the Zone 4 Reservoir to pump south to supplement and provide security of supply. A new Zone 6 pumping station would also be required at the Zone 4 Reservoir to pump north to Georgetown.

The preferred concept for the South Halton Water System is **Concept 1A, expand the 2021 network and service Georgetown and Milton East / Halton Hills 401 Corridor through the Future Zone M4L Reservoir**. This concept provided the greatest operating and security flexibility while maximizing existing infrastructure. Staging will also provide opportunity to defer capital costs. The evaluation for the preferred servicing concept is described in Table 29 and the preferred concept is depicted in Figure 16.

9.2.2 Strategies

Following the conceptual servicing analysis, a strategy analysis was carried out in order to translate the preferred concept into actual infrastructure projects. The preferred concept for the South Halton system described above, feeds into the Milton and Georgetown water servicing strategies. The preferred strategy was developed with the intent to maximize the available capacity in existing infrastructure and integrating capacity and timing with infrastructure required for Burlington, Oakville and Milton. The strategy also includes local infrastructure upgrades through the intensification program to meet demand projections caused by intensification.

The recommended water servicing strategy for the South Halton service area is described below.

North Oakville (East Growth Area) Water Servicing

- The North Oakville (East Growth Areas) area is generally located east of Sixteen Mile Creek. Parts of these lands are serviced by pressure zone O3 and the remainder is serviced by pressure zone O4
- Water supply is from the existing and proposed WPPs at Lake Ontario and pumped through a series of pumping stations and reservoirs
- Maximize capacity from existing 8th Line infrastructure and expand capacity from the Kitchen Reservoir and Pumping Station and new Oakville Zone 4 Pumping Station

North Oakville (West Growth Area) Water Servicing

- The North Oakville (West Growth Areas) area is generally located west of Sixteen Mile Creek. These lands are serviced by pressure zone O3
- Water supply is from the existing and proposed WPPs at Lake Ontario and pumped through a series of pumping stations and reservoirs

Oakville (Central) Water Servicing

- The Oakville (Central) areas are generally located east of Bronte Creek and South of Dundas. These lands are serviced by pressure zone O1, O2 and parts of O3. Water supply is from the existing and proposed WPPs at Lake Ontario and pumped through a series of pumping stations and reservoirs

Burlington (Central) Water Servicing

- The Burlington (Central) areas include all areas in Burlington south of the Hwy 407 and Dundas Street excluding the North Aldershot areas. These lands are serviced by pressure zones B1, B2, B3, B4 and B5.
- Water supply is from the existing and proposed WPPs at Lake Ontario (primarily the Burlington WPP) and pumped through a series of pumping stations and reservoirs.

North Aldershot Water Servicing

- The North Aldershot service areas include all areas in Burlington generally west of the Hwy QEW and north of Hwy 403. These lands are serviced by pressure zones B1, B1A, B1B, B2 and B3A, B4A and B5A. Based on the topography, the areas in North Aldershot, north of the Hwy 403, will require several additional pressure zones
- Water supply is from the existing and proposed WPPs at Lake Ontario (primarily the Burlington WPP) and pumped through a series of pumping stations and reservoirs

The decision-making process behind the development of the preferred servicing strategy for the South Halton Lake-Based Water System is summarized in Table 29.

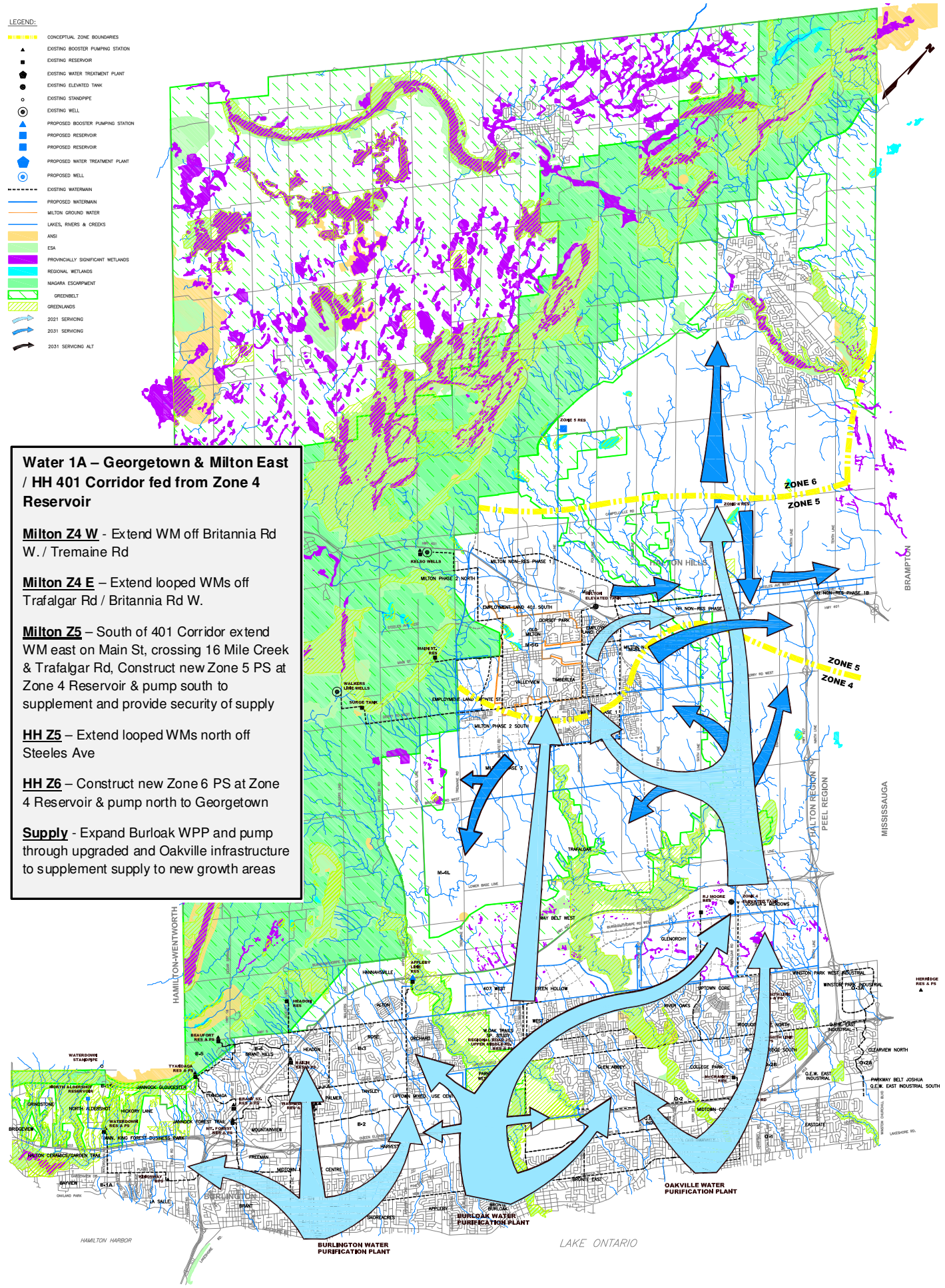
9.2.3 Individual Projects

The preferred servicing strategy led to a number of projects requiring separate evaluations for alternative sites and alignments. This separate evaluation was carried out with the intent to satisfy Phases 1 and 2 of the Class EA requirements, particularly for Schedule B projects identified through the Sustainable Halton Water and Wastewater Master Plan.

Individual projects within the South Halton service area that are being screened under this Master Plan include:

- Project No. 6367 – 120 MLD Burloak (Zone B2) Pumping Station
- Project No. 6601 – 7.8 ML/d Expansion at Beaufort Water Pumping Station (new site) (Zone B5)
- Project No. 6665 – 400 mm (Zone B4) Watermain between Tyandaga Reservoir and Beaufort Reservoir
- Project No. 6670 – 2.5 ML Storage Expansion (2.5 ML) at the Beaufort (Zone B4) Reservoir
- Project No. 6701 – Kitchen Zone O3 Water Pumping Station Expansion by 80 ML/d
- Project No. 6863 – Waterdown Road Water Pumping Station Expansion (Zones B2, B3A & B5A)
- Project No. 6661 – 900 mm (Zone O1) 2nd Feedermain to Davis Road
- Project No. 6663 – 400 mm (Zone O3) Watermain from Ninth Line on easement to Bristol Circle

Full documentation for the above projects, including tracking sheets, evaluation tables, maps, and other technical supporting documentation are provided in *Volume II –Project File*.



Halton Region
Sustainable Halton
Water and Wastewater Master Plan

South Halton
Preferred Water Servicing Concept
Figure 16

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Table 29 South Halton Lake-Based Water Servicing Decision Making Process

Long List of water servicing concepts	High Level Evaluation & Screening based on 12 pt criteria		Preferred water servicing concepts from PIC#1	Summary of Triple Bottom Line Evaluation & Screening (including hydraulic modelling) based on 12 pt criteria to develop alternative solutions				Preliminary Preferred Alternative Solution	
	Positives	**Negatives**		**Environmental**	**Social/Legal**	**Technical**	**Financial**		
Concept 1 - Expand 2021 Network (1A, 1B, 1C)	• Provides Halton Hills Z5 redundancy • Leverages existing infrastructure for full build-out • Greater flexibility for sizing and design to support strategy • Halton only servicing concept	• Requires extra Hwy 401 Crossing • One feed to Georgetown no supply redundancy	**Concept 1 A - Expand 2021 Network** **Georgetown & Milton East/HH 401 Corridor fed from Zone 4 Reservoir**	Common Halton only infrastructure. Infrastructure alignments will maximize existing roads and minimize environmental impacts **Preferred**	Maintains infrastructure within existing roads **Preferred**	Provides greatest operating and security flexibility. Maximizes existing infrastructure **Preferred**	Staging can provide opportunity to defer capital Lowest cost alternative **Preferred**	**Alternative 1 A - Expand 2021 Network** **Georgetown & Milton East/HH 401 Corridor fed from Zone 4 Reservoir** Separate alignment and facility site evaluations have been undertaken	
Concept 2 – Third Spine (2A, 2B, 2C, 2D)	• Addresses potential full build-out needs • Potential to create further redundancy in Burlington/Oakville system • Independent feed to Milton (not reliant on Kitchen PS & RR25 and Trafalgar spines) • Halton only servicing concept	• New crossing through Greenbelt required • Overly redundant (not needed to service 2031 growth) • Does not maximize existing infrastructure (new pumping stations required) • One feed to Georgetown no supply redundancy	Concept 2 – Third Spine	(Screened Out - no further evaluation undertaken)					
Concept 3 – Inter-Regional (3A, 3B, 3C)	• Existing Peel infrastructure in close proximity to Halton service areas • Potential to provide early phasing strategy • More direct feed to Georgetown • Potential to defer Burloak WPP expansion • Existing Oakville system can support greater Oakville Plant Capacity (achieved through optimization at existing site)	• Fundamentals of agreement needs to be established • Confirmation of available Peel capacity and trunk system impacts need to be confirmed • Need to enter into Inter-regional cost sharing supply agreement • One feed to Georgetown no supply redundancy	**Concept 3A – Peel Inter-regional** **Inter-regional Peel Supply to Zone 5**	Common Halton only infrastructure. Triggers Peel infrastructure with environmental mitigation requirements **Least Preferred**	Requires coordination and agreement with Peel **Neutral**	Provides service area flexibility. Requires significant Peel infrastructure. Staging dependent on Peel capacity **Neutral**	Requires investment in Peel infrastructure Intermediate cost alternative **Least Preferred**		
			Concept 3B – Peel Inter-regional Inter-regional Peel Supply to Zone 6	Common Halton only infrastructure. Triggers less Peel infrastructure with environmental mitigation requirements **Least Preferred**	Requires coordination and agreement with Peel **Neutral**	Provides service area flexibility. Requires significant Peel infrastructure and greater amount of infrastructure over 3A Staging dependent on Peel capacity **Neutral**	Requires investment in Peel infrastructure Highest cost alternative **Least Preferred**		

Notes:
Zone 6 Peel interconnection has been carried forward under preliminary preferred alternative 1A as an emergency supply to Georgetown

9.3 Milton Water System

Milton's existing water system is partially being serviced through the South Halton Lake-Based Water System (outside the Core) and by the groundwater system (within the Core). Currently, the Milton Water System is connected to the South Halton Water System through the feedermains along Regional Road 25 and future Trafalgar Road 2nd spine currently under construction. The groundwater system is supplied through the existing Walker's Line and Kelso Well Fields.

Drawing from the opportunities and constraints in the Milton Water System described in Section 8.1.2, the need to develop alternative servicing concepts and strategies was based on ensuring that there is sufficient treatment and distribution capacity available in time to service projected growth in Milton.

Evaluations for individual projects are provided in *Volume II - Project File.*

9.3.1 Concepts

Three servicing concepts were identified and evaluated for the Milton Water System:

- Concept 1 is based on restoring the Walker's Line Well Field to a Max Day Taking of 3.18 MLD. The Milton groundwater system would continue to be serviced from both the Walker's Line and Kelso Well Fields.
- Concept 2 is based on upgrading the Kelso Water Purification Plant (WPP), maintaining the current water taking of Walker Line, and servicing Milton mainly from Kelso with support from Walker's Line.
- Concept 3 is based on disconnecting areas from the groundwater system and connecting them to the lake-based system. This would in turn reduce the Milton groundwater service area.

The preferred concept for the Milton Water System is **Concept 3, the phased transfer to lake-based servicing**. The solution is based on optimization to gain capacity at the Kelso WPP and the decommissioning of the Walker's Line Well Field. This solution maintains the system's high level of service and maintains historic Milton areas on groundwater. This was also the most cost effective transfer strategy, and lowest cost concept overall. The evaluation for the preferred servicing concept is described in Table 31 and the preferred concept is depicted in Figure 18.

9.3.2 Lake-Based Transfer Area Evaluation

As part of the Milton Water System concept and alternative evaluations, significant analyses were undertaken to evaluate the water needs and servicing options of the groundwater system. Based on the level of intensification planned in the current groundwater service area of the Milton core, it was evident that there would not be sufficient groundwater supply capacity to maintain the existing service limits on groundwater.

Under the Master Plan, analysis was undertaken to determine various options to transfer existing service areas to lake-based water supply. The goal of the analysis was to prioritize employment areas with the intent to minimize or avoid transfer of existing residential areas.

The nine areas were analyzed as summarized in Table 30 and shown in Figure 17.

Table 30 Potential Milton Transfer Areas

Area	Description	Streets in Area
1	North and South Side of Main Street between Regional Road 25 and Bronte.	Garden Lane, Main Street East, Mary Street, Mill Street and Kingsleigh Court.
2	North and south side of Steeles Avenue between Bronte Street North.	Chris Hadfield Way, Hannant Court, Morobel Drive, Steeles Avenue East.
3	Bronte Street South triangle (west side) between Derry Road and Main Street.	Bronte Street South 28 - 520, Dawson Crescent
4	Northwest triangle bordered by Bronte Street South and Derry Road.	Ontario Street South 185 and 255, Childs Drive 498 (includes ICI frontage (east side) of RR #25 and School).
5	ICI frontage on RR #25 and Derry Road (Laurier Plaza).	Ontario St South 525-598, Laurier Avenue 500.
6	South East Corner to Derry Road and Bronte Street South (Milton District Hospital).	Milton District Hospital.
7	Urban Growth Centre west of Ontario Street and east of Martin Street.	Designated Urban Growth Centre for Intensification.
8	Main Street Central Core.	Urban Growth Centre, Main Street and surrounding area (SGU's refer to map).
9	ESSO and Chevrolet Garages south of Derry Road.	No's 6788 and 6791 Regional Road #25.

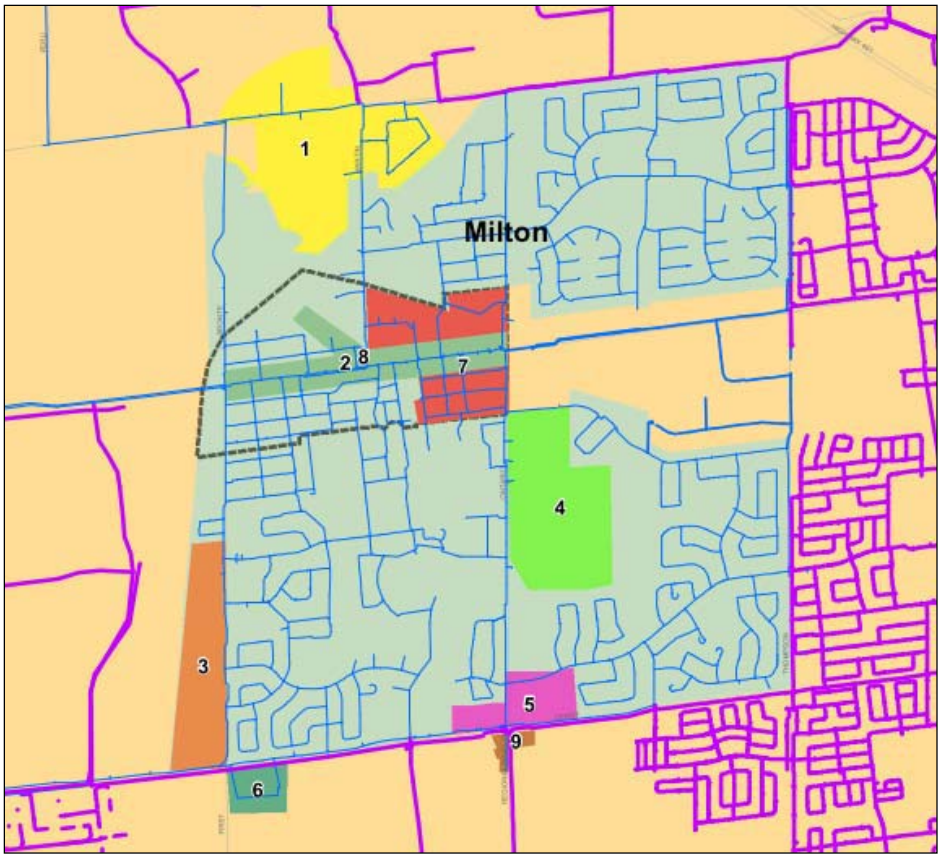


Figure 17 Potential Milton Transfer Areas

The nine areas provided a range of potential water capacity transfer from 0.02 to 1.49 MLD. However, each area also presented unique construction requirements to facilitate the transfer with costs ranging from approximately $100,000 to $3,000,000.

Based on the cost benefit analysis, it was determined to transfer only areas 1, 6 and 9.

Halton Region will continue to annually monitor Milton's groundwater system supply capacity/ demand and compare actual growth uptake with the theoretical growth projections. In addition, the overall water servicing strategy will be reviewed every five years in accordance with updated population and employment estimates.

9.3.3 Strategies

Following the conceptual servicing analysis, a strategy analysis was carried out in order to translate the preferred concept into actual infrastructure projects. The preferred concept for the Milton system described above is integrated with the South Halton and the Georgetown water servicing strategies. Due to the significant Greenfield growth anticipated in Milton within 2031, there were numerous projects identified within the 2021 urban boundary and the 2031 planned urban boundary expansion areas.

The recommended water servicing strategy for Milton is described below.

Milton Lake-Based Water Servicing

- Milton lake-based service area includes existing areas outside the central core of the community and is serviced by Zone M4L and M5L
- Water supply is from the existing and proposed expansions of the WPPs at Lake Ontario and pumped through a series of pumping stations and reservoirs north to Milton
- Additional areas of the existing groundwater serviced area will need to be transferred to lake-based supply to ensure sustainable groundwater and lake-based service areas

Core Milton Groundwater Servicing

- Upgrade Kelso WPP
- Upgrade Feedermain to Main Street Reservoir
- Decommission Walkers Line Well Field facilities
- Switch over strategic areas of Milton, predominantly employment, to help reduce groundwater demand

Milton & Halton Hills 401 Employment Corridor Lake-Based Water Servicing

- Milton/Halton Hills 401 Corridor lake-based service area includes existing areas generally along Steeles Ave and is serviced by Zone M5L
- Water supply is from the existing and proposed WPPs at Lake Ontario and pumped through a series of pumping stations and reservoirs north to Milton
- Extension of existing lake-based watermain system network

In addition to the decommissioning of the Walker's Line Well Fields, the preferred strategy includes the upgrade of the Kelso WPP, the implementation of a new lake-based Zone 4/5 boundary, new lake-based storage facilities and the switchover of strategic areas from the groundwater system to the lake-based system.

Halton Region will continue to annually monitor Milton's groundwater system supply capacity / demand and compare actual growth uptake with the theoretical growth projections. In addition, the overall water servicing strategy will be reviewed every five years in accordance with updated population and employment estimates.

The decision-making process behind the development of the preferred servicing strategy for the Milton Water System is summarized in Table 31.

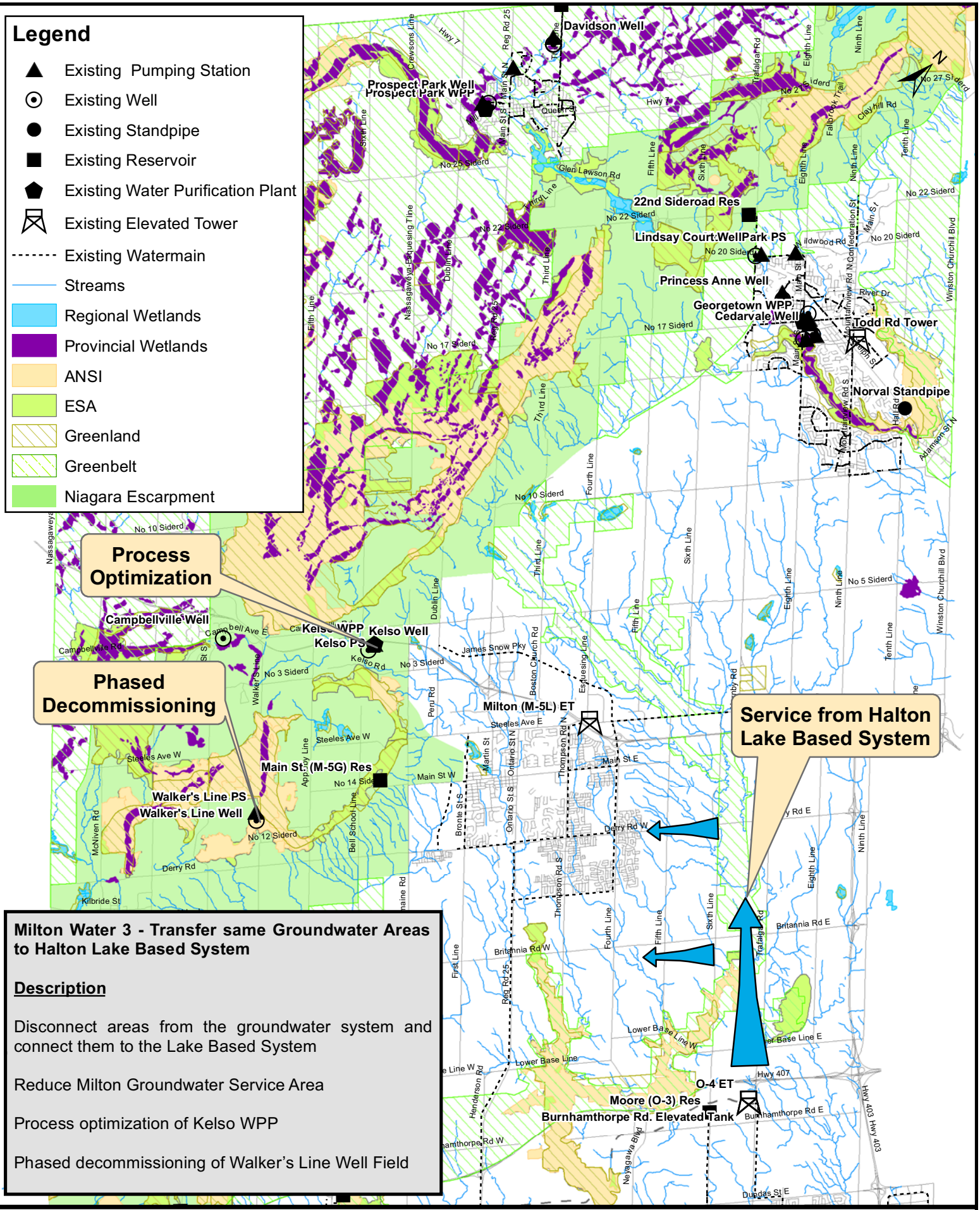
9.3.4 Individual Projects

The preferred servicing strategy led to a number of projects requiring separate evaluations for alternative sites and alignments. This separate evaluation was carried out with the intent to satisfy Phases 1 and 2 of the Class EA requirements, particularly for Schedule B projects identified through the Sustainable Halton Water and Wastewater Master Plan.

Individual projects within the Milton service area that are being screened under this Master Plan include:

- Project No. 6640 – 600 mm Watermain on Trafalgar Road from Zone 4 Reservoir to 600 mm Zone M5L Watermain on Steeles Avenue (ID 3844) (Zone M5L)
- Project No. 6688 – 400 mm Watermain on Trafalgar Road from Steeles Avenue to Hwy 401(Zone M5L)
- Project No. 6689 – 400 mm Watermain on Trafalgar Road Hwy 401 crossing (Zone M5L)
- Project No. 6690 – 400 mm Watermain on Trafalgar Road from Hwy 401to Main St Extension (Zone M5L)

Full documentation for the above projects, including tracking sheets, evaluation tables, maps, and other technical supporting documentation are provided in *Volume II –Project File*.



Halton Region

Sustainable Halton
Water and Wastewater Master Plan

Milton Preferred Water Servicing Concept
Figure 18

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Table 31 Milton Water Servicing Decision Making Process

Long List of water servicing concepts	High Level Evaluation & Screening based on 12 pt criteria		Preferred water servicing concepts from PIC#1	Summary of Triple Bottom Line Evaluation & Screening (including hydraulic modelling) based on 12 pt criteria to develop alternative solutions				Preliminary Preferred Alternative Solution from PIC#2
	Positives	**Negatives**		**Environmental**	**Social/Legal**	**Technical**	**Financial**	
Concept 1 - Walker's Line Well Field Upgrades	• Maximizes existing well infrastructure • Maintaining groundwater system based on some perception/feedback that groundwater is a preferred source	• Requires regular well maintenance • Assessment for potential impact on local ecology and private wells is required • Potential not to meet PTTW • Does not meet future demand requirements	**Concept 1 –** Walker's Line Well Field Supply Upgrades Concept screened out as a stand alone solution Concept combined with Concepts 2 and 3 for further evaluation	Potential impact from increased water taking to local ecology and private wells Upcoming Tier 3 water budget assessment required to evaluate long term sustainability of water taking **Least Preferred**	If capacity were available, meets feedback that maintaining groundwater system is a preferred source **Preferred**	Requires new well, surge tank, linear infrastructure and additional treatment (Significant rehabilitation required) Provides minimum security of supply **Least Preferred**	Requires substantial capital investment for minimal capacity gain Least cost effective High operation and maintenance costs **Least Preferred**	Phased decommissioning of Walker's Line well field once Kelso WPP optimization results are confirmed (Combined solution with Alternative 3)
Concept 2 – Kelso WPP Upgrades	• Maximizes existing well infrastructure • Currently a higher yielding well field • Maintaining groundwater system based on some perception/feedback that groundwater is a preferred source	• Requires regular well maintenance • Assessment for potential impact on local ecology and private wells is required • Potential not to meet PTTW • Does not meet future demand requirements	**Concept 2 -** Kelso WPP Upgrades Concept screened out as a stand alone solution Concepts combined with Concepts 1 and 3 for further evaluation	Potential impact from increased water taking to local ecology and private wells Upcoming Tier 3 water budget assessment required to evaluate long term sustainability of water taking **Least Preferred**	If capacity were available, meets feedback that maintaining groundwater system is a preferred source **Preferred**	Increase in supply anticipated through optimization of plant although potential not to meet Permit to take Water (PTTW) **Neutral**	Requires moderate capital investment for small capacity gain **Neutral**	Solution based on optimization of the Kelso WPP to minimize transfer of existing groundwater service to lake-based. (Combined solution with Alternative 3)
Concept 3 – Transfer Areas to Lake Based System	• Provides security of supply • Potential to minimize upgrades to existing supply system • Opportunity to continue to maintain a groundwater service area or consider transfer of the full system • Opportunity for staging. Lake based servicing already provided in Milton • Addresses full build-out needs	• Requires operational plans to implement	Concept 3 – Transfer Areas to Lake Based System Concept considered a viable stand alone solution Concept combined with Concepts 1 and 2 for further evaluation	Maintains current water balance **Preferred**	High level of service maintained. May not meet feedback Allows historic Milton area to remain on groundwater and service future intensification demands **Neutral**	Provides greatest operating and security flexibility **Preferred**	Cost effective transfer strategy Lowest cost alternative **Preferred**	**Alternative 3 – Transfer areas to lake based system** Phased transfer of some existing groundwater service areas to lake-based servicing and maximize the size of the groundwater service area base on available capacity Solution based on optimization to gain capacity at Kelso WPP and decommissioning of Walker's Line well field.

9.4 Georgetown Water System

Georgetown's existing water system is being serviced through groundwater supplies provided through the Cedarvale, Princess Anne, and Lindsay Court Well Fields. Groundwater pumped from the Cedarvale Well Field is treated at the Georgetown Water Purification Plant (WPP).

Drawing from the opportunities and constraints in the Georgetown Water System described in Section 8.1.3, the need to develop alternative servicing concepts and strategies was based on ensuring that there is sufficient water supply and capacity available in time to service the significant growth projected in Georgetown.

Evaluations for individual projects are provided in *Volume II - Project File.*

9.4.1 Concepts

Six servicing concepts were identified and evaluated for the Georgetown Water System:

- Concept 1 is based on increasing both the Cedarvale and Lindsay Court well capacities. Georgetown would continue to be serviced form the existing well systems.
- Concept 2 is based on increasing the Cedarvale Well Field capacity and constructing a new well field. Studies would need to be undertaken to determine new feasible well field locations. Georgetown would continue to be serviced from existing well systems plus the new well.
- Concept 3 is based on increasing the Lindsay Court Well Field capacity and constructing a new well field. Studies would need to be undertaken to determine new feasible well field locations. Georgetown would continue to be serviced from existing well systems plus the new well.
- Concept 4 is based on increasing the Lindsay Court and Cedarvale Well Field capacities and constructing a new well field. Studies would need to be undertaken to determine new feasible well field locations. Georgetown would continue to be serviced from existing well systems plus the new well systems.
- Concept 5 is based on connecting the Georgetown water system to another system – either the South Halton Lake-Based System (Concept 5a) or the Peel Region Lake-Based System (Concept 5b). This would involve constructing infrastructure to service some areas of Georgetown from either the Peel System or the South Halton Lake-Based System. A small area of Georgetown would remain on the existing well system.
- Concept 6 is based on increasing both the Lindsay Court and Cedarvale Well Field capacities and implementing an Aquifer Recharge program. The Georgetown system would continue to be serviced from the existing well systems.

The preferred concept for the Georgetown Water System is **Concept 5a, connect to the South Halton Lake-Based System**. The new lake-based service area includes existing Georgetown South and existing Stewarttown, as well as all new Georgetown Southwest growth. This concept involves no new well fields, rather it maintains the existing Princess Anne Well Field, and increases the capacity at the Cedarvale and Lindsay Court Well Fields. This concept provides increased long term water supply security and leverages the South Halton water supply and servicing strategy, both in terms of infrastructure and cost.

The evaluation for the preferred servicing concept is described in Table 32 and the preferred concept is depicted in Figure 19.

9.4.2 Strategies

Following the conceptual servicing analysis, a strategy analysis was carried out in order to translate the preferred concept into actual infrastructure projects. The preferred concept for the Georgetown system described above is integrated with the Milton and the South Halton water servicing strategies. There is a major employment growth area south and southwest of Georgetown, which triggered a number of projects within 2021 and 2031.

The preferred servicing strategy for the Georgetown Water System extends the existing distribution system to a larger network of lake-based watermains, reservoirs and pumping stations phased within 2031. The strategy for the groundwater system includes an increase in water takings at Cedarvale and Lindsay Court Well Fields, artificial recharge to Silver Creek and transfer of some key areas to the lake-based system to maintain the groundwater system within sustainable yields.

The recommended water servicing strategy for Georgetown is described below.

Georgetown Water Servicing

- Maximize the groundwater service area
- Provide new lake-based water supply to new growth areas (Georgetown Southwest) as well as transfer existing Georgetown South and Stewarttown to lake-based supply in order to maintain the groundwater system within sustainable yields
- Increased water taking at Cedarvale and Lindsay Court Well Fields
- Expand water storage capacity at 22nd Sideroad Reservoir
- Artificial Recharge to Silver Creek / wetlands as support to overall strategy
- Water supply is from the existing and proposed WPPs at Lake Ontario and pumped through a series of pumping stations and reservoirs north to Georgetown

The decision-making process behind the development of the preferred servicing strategy for the Georgetown Water System is summarized in Table 32.

9.4.3 Individual Projects

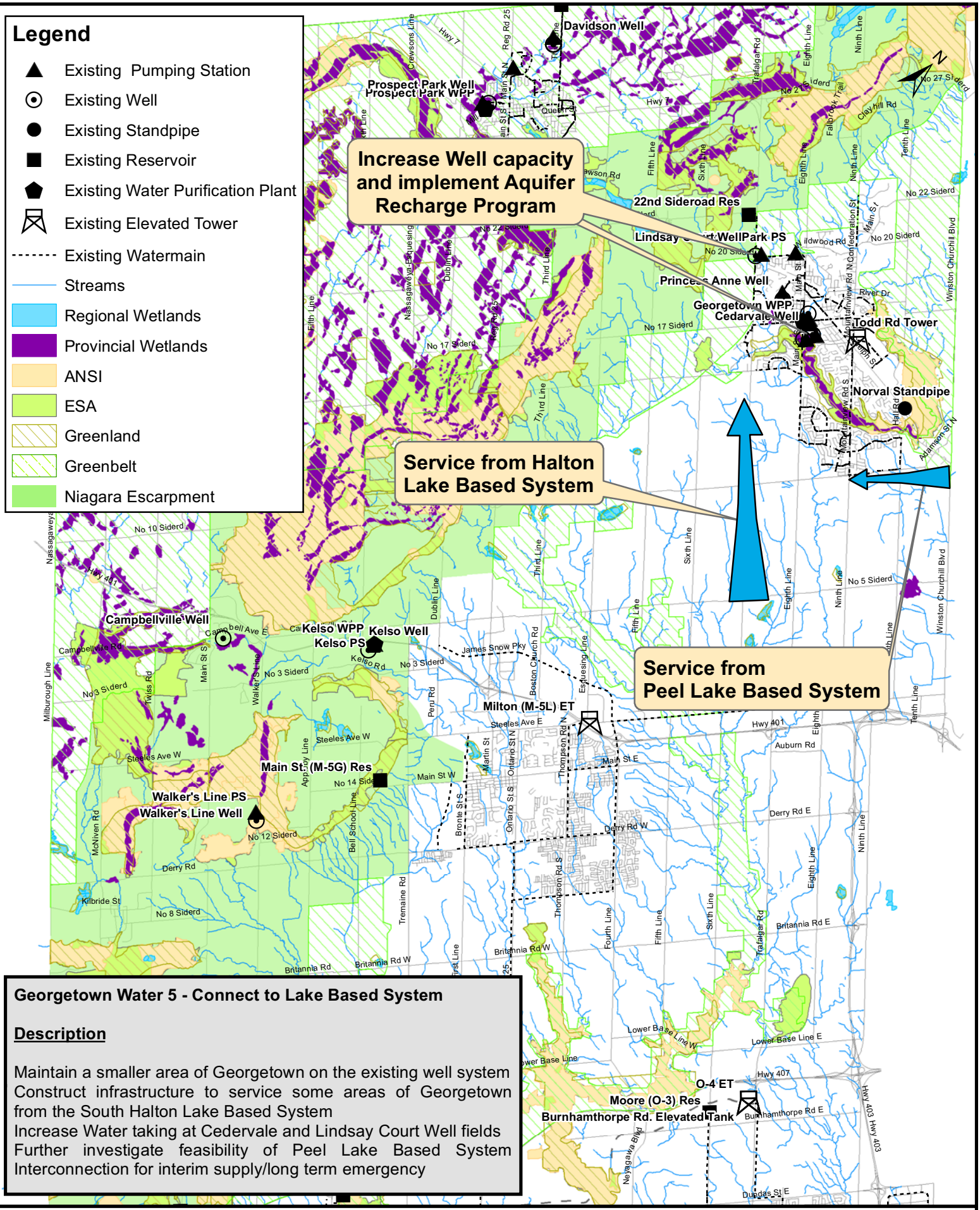
The preferred servicing strategy led to a number of projects requiring separate evaluations for alternative sites and alignments. This separate evaluation was carried out with the intent to satisfy Phases 1 and 2 of the Class EA requirements, particularly for Schedule B projects identified through the Sustainable Halton Water and Wastewater Master Plan.

Individual projects within the Georgetown service area and located within the southern areas of Halton Hills that are being screened under this Master Plan include:

- Project Nos. 6606, 6607, 6608 – 750 mm Watermain on Trafalgar Road from the new Zone M4L Reservoir north to the Future Zone G6L Reservoir on 22nd Sideroad (Zone G6L)
- Project No. 6614 – 600 mm Watermain on Adamson Street from 10th Sideroad to Guelph Street and on Guelph Street from Adamson Street to 10th Sideroad (Zone G6L)
- Project No. 6693 – 20 ML/d Water pumping station at Zone 4 Reservoir (Zone G6L)
- Project No. 6694 – 10 ML Water Reservoir on 22nd Sideroad and Trafalgar Road (Zone G6L)
- Project No. 6696 – 20 ML/d Water pumping station at Zone 4 Reservoir (Zone M5L)

- Project No. 5061 – 20 ML Water Reservoir, near Trafalgar Road and No. 5 Sideroad (Zone M4)

Full documentation for the above projects, including tracking sheets, evaluation tables, maps, and other technical supporting documentation are provided in *Volume II –Project File*.



Georgetown Water 5 - Connect to Lake Based System

Description

Maintain a smaller area of Georgetown on the existing well system
Construct infrastructure to service some areas of Georgetown from the South Halton Lake Based System
Increase Water taking at Cedervale and Lindsay Court Well fields
Further investigate feasibility of Peel Lake Based System Interconnection for interim supply/long term emergency

Table 32 Georgetown Water Servicing Decision Making Process

Long List of water servicing concepts	High Level Evaluation & Screening based on 12 pt criteria		Preferred water servicing concepts from PIC#1	Summary of Triple Bottom Line Evaluation & Screening (including hydraulic modelling) based on 12 pt criteria to develop alternative solutions				Preliminary Preferred Alternative Solution from PIC#2
	Positives	**Negatives**		**Environmental**	**Social/Legal**	**Technical**	**Financial**	
Concept 1 - Increase both Cedarvale and Lindsay Court Well Field Capacities	• Maximizes existing well infrastructure • Groundwater capacity can meet current urban boundary needs to 2031 • Potential to increase firm capacity and security of supply through follow on stage at Lindsay Court	• Requires regular well maintenance • Re-rating dependant upon Review Agency approval • Assessment for potential impact on local ecology and private wells is required • Insufficient redundancy/firm capacity to meet the current urban boundary 2031 needs • Insufficient supply for full 2031 needs	**Concept 1 – Increase both Cedarvale and Lindsay Court Well Field Capacities** **Concept screened out as a stand alone solution**	**(Screened Out – no further evaluation undertaken)**				
Concept 2 – Increase Cedarvale Well Field Capacity and Construct a New Well Field	• Maximizes existing well infrastructure • Groundwater capacity can meet current urban boundary needs to 2031 • Allowance for redundancy/firm capacity for current urban boundary only	• Requires regular well maintenance • New infrastructure required • Re-rating dependant upon Review Agency approval • Assessment for potential impact on local ecology and private wells is required • Requires pumping tests to confirm new well supply yield predictions	**Concept 2 – Increase Cedarvale Well Field Capacity and Construct a New Well Field** ***Concept screened out as a stand alone solution*** ***Concept combined with Concept 5A***	Low to moderate risk of potential impact from increased water taking to local ecology and private wells Upcoming Tier 3 water budget assessment required to evaluate long term sustainability of water taking Not a viable solution in the short term **Neutral**	Higher risk associated with agency approvals for increased Permit To Take Water (PTTW) Coordination with local residents required Requires new site Maintain groundwater supply **Neutral**	Based on Sustainable Halton groundwater study and preliminary Tier 3 Modeling results, it is anticipated that this alternative would meet projected supply needs in combination with Concept 5A. Concept does require some transfer of existing groundwater service area to lake based (Alternative requires long term testing to support future production increase) **Neutral**	Higher costs associated with new well field Capital investment into existing and new infrastructure **Least Preferred**	
Concept 3 – Increase Lindsay Court Well Field Capacity and Construct a New Well Field	• Maximizes existing well infrastructure • Groundwater capacity can meet current urban boundary needs to 2031 • Allowance for redundancy/firm capacity for current urban boundary only	• Requires regular well maintenance • New infrastructure required • Re-rating dependant upon Review Agency approval • Assessment for potential impact on local ecology and private wells is required • Requires pumping tests to confirm new well supply yield predictions	**Concept 3 – Increase Lindsay Court Well Field Capacity and Construct a New Well Field** **Concept screened out as a stand alone solution** **Concept combined with Concept 5A**	Moderate risk of potential impact from increased water taking to local ecology and private wells Upcoming Tier 3 water budget assessment required to evaluate long term sustainability of water taking Not a viable solution in the short term **Neutral**	Higher risk associated with agency approvals for increased Permit To Take Water (PTTW) Coordination with local residents required Requires new site Maintain groundwater supply **Neutral**	Based on Sustainable Halton groundwater study and preliminary Tier 3 Modeling results, it is anticipated that this alternative would meet projected supply needs in combination with Concept 5A. Concept does require some transfer of existing groundwater service area to lake based (Alternative requires long term testing to support future production increase) **Neutral**	Higher costs associated with new well field Additional costs will be incurred for on-going operation, maintenance and monitoring Capital investment into existing and new infrastructure **Least Preferred**	
Concept 4 – Increase both Cedarvale and Lindsay Court Well Field Capacities plus Construct a New Well Field	• Maximizes existing well infrastructure • Allows staging of works • Groundwater capacity can meet current urban boundary needs to 2031 • Greatest flexibility for redundancy/firm capacity for current urban boundary only	• Requires regular well maintenance • New infrastructure required • Re-rating dependant upon Review Agency approval • Assessment for potential impact on local ecology and private wells is required • Requires pumping tests to confirm new well supply yield predictions	**Concept 4 – Increase both Cedarvale and Lindsay Court Well Field Capacities plus Construct a New Well Field** **Concept screened out as a stand alone solution** **Concept combined with Concept 5A**	Moderate risk of potential impact from increased water taking to local ecology and private wells Upcoming Tier 3 water budget assessment required to evaluate long term sustainability of water taking Not a viable solution in the short term **Neutral**	Risk associated with agency approvals for increased Permit To Take Water (PTTW) Coordination with local residents required Requires new site Maintain groundwater supply **Neutral**	Based on Sustainable Halton groundwater study and preliminary Tier 3 Modeling results, it is anticipated that this alternative would meet projected supply needs in combination with Concept 5A. Given that lake-based supply would still be required, additional new well field would be redundant over Concept 5a/1 Concept does require some transfer of existing groundwater service area to lake based (Alternative requires long term testing to support future production increase) **Least Preferred**	Higher costs associated with new well field Additional costs will be incurred for on-going operation, maintenance and monitoring Capital investment into existing and new infrastructure **Least Preferred**	
Concept 5a – Connect to the Lake based system in South Halton	• Increased redundancy in supply from Lake Ontario • Addresses 2031 and potential urban buildout needs • Firm groundwater system capacity can be maintained to continue to provide servicing with existing urban boundary • Could consider full system capacity	• Currently planned infrastructure for lake-based system is required to be in place in order to extend servicing to Georgetown	**Concept 5a – Connect to the Lake based system in South Halton** **Concept considered a viable stand alone solution** **Concept combined with Concepts 2,3,4,5a & 5b for further evaluation**	Lower potential for impact from increased water taking to local ecology and private wells Ability to reduce impact by transferring some groundwater service areas to Lake Based Maintain water balance **Preferred**	Some areas transferred to lake based water supply Coordination with local residents required **Preferred**	Long term water supply security Leverages South Halton water supply and servicing strategy Water balance coordination with wastewater required **Preferred**	Leverages costs associated with South Halton lake based solution as well as minimum groundwater costs Additional costs will be incurred for on-going operation, maintenance and monitoring **Preferred**	**Alternative 5a** • **Increase capacity at Cedarvale** • **Increase capacity at Lindsay Court** • **Maintain Princess Anne** • **No new well fields** • **Transfer existing Georgetown South and existing Stewarttown to lake based supply** • **All new Southwest Georgetown and Stewarttown growth on lake based supply**
Concept 5b – Connect to the Peel System	• Increased redundancy in supply from Lake Ontario • Addresses 2031 and potential mature state needs • Firm groundwater system capacity can be maintained to continue to provide servicing with existing urban boundary • Could consider full system capacity • Potential opportunity for interim supply • Current Peel distribution system is located closer to the Georgetown service area	• Confirmation of available Peel capacity and trunk system impacts need to be confirmed • Fundamentals of agreement need to be established	**Concept 5b – Connect to the Peel System** **Concept screened out as a stand alone solution** **Concept combined with Concept 5A**	Common Halton only infrastructure. Triggers Peel infrastructure with environmental mitigation requirements **Least Preferred**	Requires coordination and agreement with Peel **Neutral**	Provides service area flexibility. Requires significant Peel infrastructure. Staging dependent on Peel capacity Provides long term emergency connection (security of supply) **Neutral**	Highest cost alternative Requires investment in Peel infrastructure **Least Preferred**	Alternate 5b Zone 6 Peel interconnection has been carried forward under preliminary preferred alternative 5a as an emergency supply to Georgetown
Concept 6 – Increase both Cedarvale and Lindsay Court Well Field Capacities plus Implement Aquifer Recharge Program	• Maximizes existing well infrastructure • Increased redundancy/firm capacity in supply • Addresses growth within urban boundary • Aquifer recharge implementation study can run concurrently with Well Field Re-rating	• Aquifer recharge feasibility study required • Potential public concern • Not a viable solution in the short term • Re-rating dependant upon Review Agency approval • Assessment for potential impact on local ecology and private wells is required	**Concept 6 – Increase both Cedarvale and Lindsay Court Well Field Capacities plus Implement Aquifer Recharge Program** **Concept screened out as a stand alone solution** **Concept combined with Concept 5a**	Low to moderate risk of potential impact from increased water taking to local ecology and private wells Upcoming Tier 3 water budget assessment required to evaluate long term sustainability of water taking Potential mitigation through artificial recharge of aquifer/Silver Creek **Neutral**	Potential for public perception/acceptance of aquifer recharge solution to be negative Risk associated with agency approvals for increased Permit To Take Water (PTTW) Maximizes existing well field sites Maintain groundwater supply Agency approvals required for aquifer recharge pilot study **Neutral**	Based on Sustainable Halton groundwater study and preliminary Tier 3 Modeling results, it is anticipated that this alternative would meet projected supply needs in combination with Concept 5A Concept does require some transfer of existing groundwater service area to lake based (Alternative requires long term pumping testing to support future production increase) Further pilot study recommended to test viability of aquifer recharge **Neutral**	Lowest capital cost alternative Additional costs will be incurred for on-going operation, maintenance and monitoring Capital investment into existing and new infrastructure **Neutral**	Integrated into Preliminary Preferred Alternative 5a

9.5 Acton Water System

Acton's existing water system is being serviced through groundwater supplies provided through the Davidson Fourth Line, and Prospect Park Well Fields.

Drawing from the opportunities and constraints in the Acton Water System described in Section 8.1.4, the need to develop alternative servicing concepts and strategies was based on ensuring that there is sufficient supply and capacity available in time to service projected in Acton, as well as address the limited system redundancy and existing storage capacity limitations.

Evaluations for individual projects are provided in *Volume II - Project File.*

9.5.1 Concepts

Six servicing concepts were identified and evaluated for the Acton Water System:

- Concept 1 is based on increasing both the Prospect Park and Fourth Line well capacities. Acton would continue to be serviced form the existing well systems.
- Concept 2 is based on increasing the Fourth Line Well Field capacity and constructing a new well field. Studies would need to be undertaken to determine new feasible well field locations. Acton would continue to be serviced from existing well systems plus the new well.
- Concept 3 is based on increasing the Prospect Park Well Field capacity and constructing a new well field. Studies would need to be undertaken to determine new feasible well field locations. Acton would continue to be serviced from existing well systems plus the new well.
- Concept 4 is based on increasing the Prospect Park and Fourth Line Well Field capacities and constructing a new well field. Studies would need to be undertaken to determine new feasible well field locations. Acton would continue to be serviced from existing well systems and the new well systems.
- Concept 5 is based on connecting the Acton water system to another system – either the Wellington County system or the South Halton Lake-Based Water System. This would involve constructing infrastructure to service some areas of Acton from either the Wellington County system or the South Halton Lake-Based Water System. A small area of Acton would remain on the existing groundwater system.
- Concept 6 is based on increasing both the Prospect Park and Fourth Line Well Field capacities and implementing an Aquifer Recharge program. The Acton water system would continue to be serviced from the existing well systems.

The preferred concept for the Acton Water System is **Concept 4, increasing the Prospect Park and Fourth Line Well Field capacities and constructing a new well field**. This concept is expected to meet the projected supply needs, based on the Sustainable Halton groundwater study and preliminary Tier 3 Modeling results. The evaluation for the preferred servicing concept is described in Table 33 and the preferred concept is depicted in Figure 20

9.5.2 Strategies

Following the conceptual servicing analysis, a strategy analysis was carried out in order to translate the preferred concept into actual infrastructure projects. The recommended water servicing strategy for Acton is described below.

Acton Water Servicing

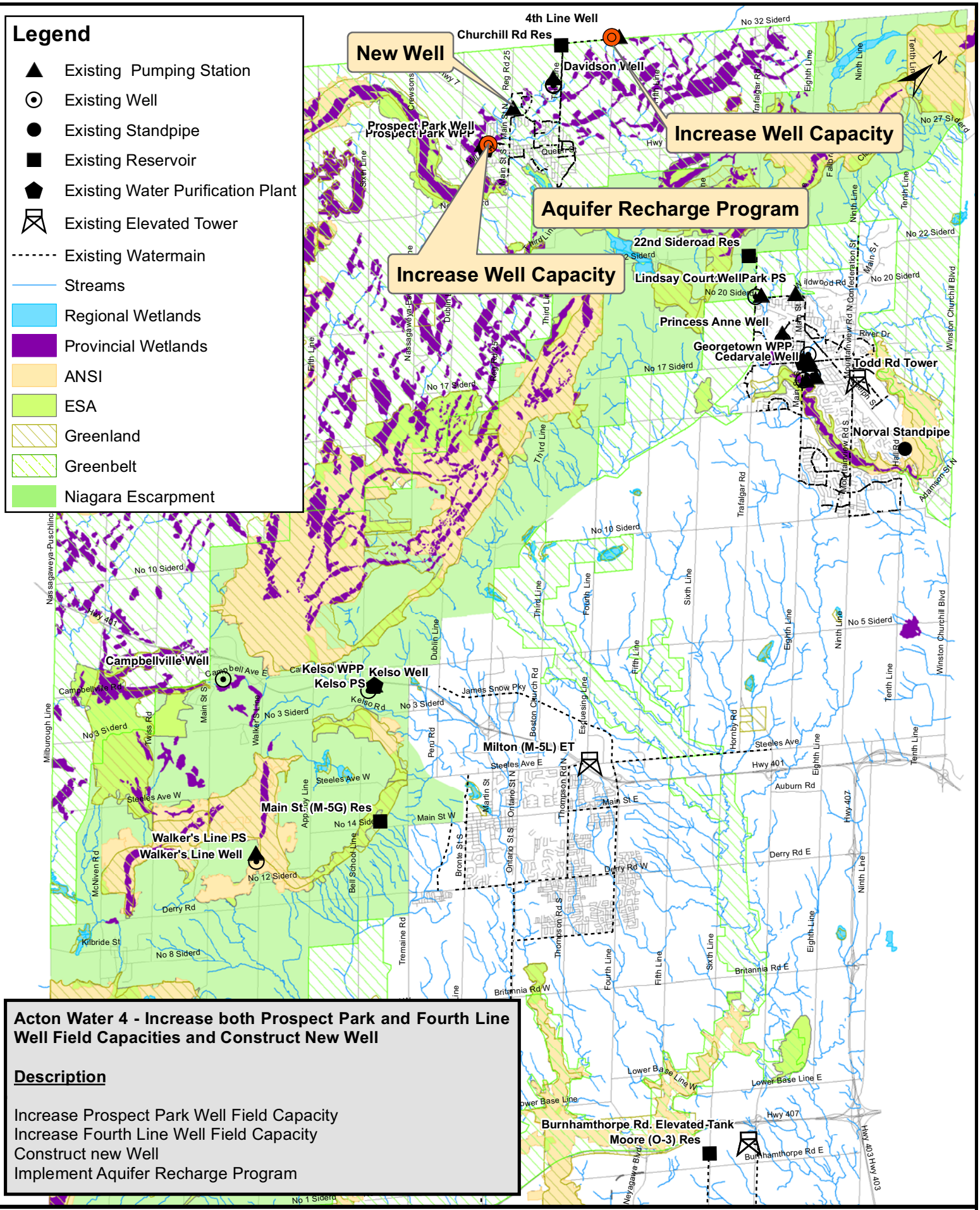
- Maintain the existing and future service areas on groundwater
- Increase groundwater capacity at the Fourth Line and Prospect Park Well Fields as well as provide additional capacity from new groundwater well supply
- Maximize groundwater capacity and redundancy through centralized treatment for the northern supplies
- Artificial Recharge to Black Creek / wetlands as support to the overall strategy

In addition to the increased water taking at the Prospect Park and Fourth Line Well Fields, the preferred strategy includes the expansion of and centralized treatment at the Third Line Reservoir, a new north Acton well, a standby well at Fourth Line, and local infrastructure upgrades in the existing distribution system.

The decision-making process behind the development of the preferred servicing strategy for the Acton Water System is summarized in Table 33.

9.5.3 Individual Projects

Within the Acton service area, there are no Schedule B projects that require separate evaluation of sites and/or alignments.



Acton Water 4 - Increase both Prospect Park and Fourth Line Well Field Capacities and Construct New Well

Description

Increase Prospect Park Well Field Capacity
Increase Fourth Line Well Field Capacity
Construct new Well
Implement Aquifer Recharge Program

Halton Region
Sustainable Halton
Water and Wastewater Master Plan

Acton Preferred Water
Servicing Concept
Figure 20

AECOM
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File: 60114062-141-W

Table 33 Acton Water Servicing Decision Making Process

Long List of water servicing concepts

High Level Evaluation & Screening

based on 12 pt criteria

Preferred water servicing concepts from PIC#1

Summary of Triple Bottom Line Evaluation & Screening (including hydraulic modelling)

based on 12 pt criteria to develop alternative solutions

Preliminary Preferred Alternative Solution from PIC#2

	Positives	Negatives		Environmental	Social/Legal	Technical	Financial	
Concept 1 - Increase both Prospect Park and Fourth Line Well Field Capacities	• Maximizes existing well infrastructure	• Requires regular well maintenance • No allowance for redundancy/firm capacity of the well system • Re-rating dependant upon Review Agency approval • Assessment for potential impact on local ecology and private wells is required	**Concept 1** – Increase both Prospect Park and Fourth Line Well Field Capacities Concept screened out as a stand alone solution	**(Screened Out – no further evaluation undertaken)**				
Concept 2 – Increase Prospect Park Well Field Capacity and Construct a New Well Field	• Maximizes existing well infrastructure • Increased redundancy/firm capacity in supply • Addresses growth within urban boundary	• Requires regular well maintenance • New infrastructure required • Re-rating dependant upon Review Agency approval • Assessment for potential impact on local ecology and private wells is required • Requires pumping tests to confirm new well supply yield predictions	**Concept 2** – Increase Prospect Park Well Field Capacity and Construct a New Well Field (Concept further evaluated through Groundwater Study)	Low to moderate risk of potential impact from increased water taking to local ecology and private wells Upcoming Tier 3 water budget assessment required to evaluate long term sustainability of water taking **Least Preferred**	Risk associated with agency approvals for increased Permit To Take Water (PTTW) **Least Preferred**	Sustainable Halton groundwater study and preliminary Tier 3 Modeling results show alternative does not meet projected supply needs Not considered a viable alternative **Least Preferred**	Lower cost alternative Additional costs will be incurred for on-going operation, maintenance and monitoring **Least Preferred**	
Concept 3 – Increase Fourth Line Well Field Capacity and Construct a New Well Field	• Maximizes existing well infrastructure • Increased redundancy/firm capacity in supply • Addresses growth within urban boundary	• Requires regular well maintenance • New infrastructure required • Re-rating dependant upon Review Agency approval • Assessment for potential impact on local ecology and private wells is required • Requires pumping tests to confirm new well supply yield predictions	**Concept 3** – Increase Fourth Line Well Field Capacity and Construct a New Well Field (Concept further evaluated through Groundwater Study)	Low to moderate risk of potential impact from increased water taking to local ecology and private wells Upcoming Tier 3 water budget assessment required to evaluate long term sustainability of water taking **Least Preferred**	Risk associated with agency approvals for increased Permit To Take Water (PTTW) **Least Preferred**	Sustainable Halton groundwater study and preliminary Tier 3 Modeling results show alternative does not meet projected supply needs Not considered a viable alternative **Least Preferred**	Lower cost alternative Additional costs will be incurred for on-going operation, maintenance and monitoring **Least Preferred**	
Concept 4 – Increase both Prospect Park and Fourth Line Well Field Capacities plus Construct a New Well Field	• Maximizes existing well infrastructure • Greatest flexibility for redundancy/firm capacity in supply • Allows staging of works • Addresses growth within urban boundary	• Requires regular well maintenance • New infrastructure required • Re-rating dependant upon Review Agency approval • Assessment for potential impact on local ecology and private wells is required • Requires pumping tests to confirm new well supply yield predictions	**Concept 4** – Increase both Prospect Park and Fourth Line Well Field Capacities plus Construct a New Well Field Concept combined with Concept 6 (Concept further evaluated through Groundwater Study)	Low to moderate risk of potential impact from increased water taking to local ecology and private wells Upcoming Tier 3 water budget assessment required to evaluate long term sustainability of water taking Aquifer recharge / assimilative capacity required to Black Creek or Fairy Lake **Neutral**	Lower risk associated with agency approvals for increased Permit To Take Water (PTTW) Coordination with local residents required Opportunity for community betterment Maximizes existing well field sites Requires new site **Preferred**	Based on Sustainable Halton groundwater study and preliminary Tier 3 Modeling results, it is anticipated that this alternative would meet projected supply needs (Alternative requires long term pumping testing to support future production increase) **Preferred**	Higher cost alternative Additional costs will be incurred for on-going operation, maintenance and monitoring **Preferred**	**Alternative 4 – Increase both Prospect Park and Fourth Line Well Field Capacities plus Construct a New Well Field** Upcoming Tier 3 water budget assessment required to evaluate long term sustainability of water taking
Concept 5a – Connect to the Lake based system in South Halton (Lake Ontario)	• Increased redundancy and security in supply • Could potentially address full build-out needs	• Contrary to Greenbelt Policy	**Concept 5a –** Connect to the Lake based system in South Halton (Lake Ontario)	**(Screened Out – no further evaluation undertaken)**				
Concept 5b – Connect to the Wellington County System (Lake Erie)	• Increased redundancy and security in supply	• Intra basin transfer issues, ground watershed flows to Lake Erie • Studies required to determine feasibility of balancing water budget • Fundamentals of agreement needs to be established • Confirmation of available Wellington capacity and trunk system impacts need to be confirmed	Concept 5b – Connect to the Wellington County System (Lake Erie)	**(Screened Out – no further evaluation undertaken)**				
Concept 6 – Increase both Prospect Park and Fourth Line Well Field Capacities plus Implement Aquifer Recharge Program	• Maximizes existing well infrastructure • Increased redundancy/firm capacity in supply • Aquifer recharge implementation study can run concurrently with Well Field re-rating • Addresses growth within urban boundary	• Feasibility study required for aquifer recharge • Re-rating dependant upon Review Agency approval • Assessment for potential impact on local ecology and private wells is required • Potential public concern • Not a viable solution in the short term	Concept 6 – Increase both Prospect Park and Fourth Line Well Field Capacities plus Implement Aquifer Recharge Program Concept screened out as a stand alone solution Concept combined with Concept 4	Low to moderate risk of potential impact from increased water taking to local ecology and private wells Potential mitigation through artificial recharge of aquifer at Black Creek/Fairy Lake Upcoming Tier 3 water budget assessment required to evaluate long term sustainability of water taking Neutral	Potential for public perception/acceptance of aquifer recharge solution to be negative Risk associated with agency approvals for increased Permit To Take Water (PTTW) Maximizes existing well field sites Agency approvals required for aquifer recharge pilot study Neutral	Alternative does not meet projected supply needs. Further pilot study recommended to test viability of aquifer recharge Neutral	Capital investment into existing and new infrastructure Additional costs will be incurred for on-going operation, maintenance and monitoring Neutral	Integrated into Preliminary Preferred Alternative 4