APPENDIX B
TECHNICAL MEMORANDUM NO.1 – ASSESSMENT OF EXISTING CONDITIONS AND FUTURE NEEDS FOR PROSPECT PARK WPP

XCG CONSULTANTS LTD.
T 905 829 8880 F 905 829 8890 | toronto@xcg.com
2620 Bristol Circle, Suite 300, Oakville, Ontario, Canada L6H 6Z7

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Prepared for:

REGIONAL MUNICIPALITY OF HALTON
1075 North Service Road
Oakville, Ontario
L6M 3L1

Attention: Michelle Gillespie

Prepared by:

XCG CONSULTANTS LTD.
2620 Bristol Circle, Suite 300
Oakville, Ontario
L6H 6Z7

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1. INTRODUCTION

The water supply for the Town of Acton (the Town) currently consists of three well fields that are owned and operated by the Region of Halton (the Region): Prospect Park Well Field, Davidson Well Field, and the Fourth Line Well Field. The Prospect Park Well Field and Water Purification Plant (WPP), located in Halton Hills, currently provides approximately 40 percent of the Town's average daily water supply.

The Region plans to expand production from the Prospect Park Well Field from the current permitted limits to 3,500 m^3/day year round to ensure a safe and reliable water supply to the Town.

XCG Consultants Ltd. (XCG) was retained by the Region to identify and evaluate servicing solutions in accordance with the Municipal Class Environmental Assessment (Class EA) process, and to conduct a review of previous studies and programs to prepare an Impact Assessment Report that can be used to support the increase in water takings.

The Sustainable Halton Water and Wastewater Master Plan identified that an expansion of the Prospect Park WPP was the preferred alternative solution. The purpose of this Technical Memorandum is therefore to provide a summary of existing conditions for the Prospect Park Well Field and WPP. The outcome of the Technical Memorandum will be to assist with the development of alternative design concepts the Class EA.

1.1 Study Background and Objective

Previous studies have indicated that the existing Prospect Park Well Field has sufficient capacity to expand production from the current permitted limits to 3,500 m^3/day year round. The Region has initiated a Class EA to determine the most cost effective and environmentally sound means of providing water that ensures a safe and reliable water supply to the Town of Acton. Part of the study will include a review of previous studies and programs to prepare an Impact Assessment Report that can be used to support the increase in water takings.

Specific objectives of this Technical Memorandum are:

- To review the historical operation and performance of the Prospect Park WPP, and conduct a review of unit processes; and
- To identify the unit processes that limit the plant's capacity or inhibit the performance of the plant.

1.2 The Class Environmental Assessment

The Class EA is an approved process that proponents must follow in order to meet the requirements of the Environmental Assessment Act (EA Act). The Class EA approach allows for the evaluation of the environmental effects of alternatives to a project and alternative methods of carrying out a project. It includes mandatory requirements for public input and expedites the environmental assessment of smaller recurring projects, such as water supply projects and sanitary wastewater projects.

The Class EA process for municipal water and wastewater projects is a five phased planning process as illustrated in Figure 1.1.

Phase 1 represents the development of the problem or opportunity statement that is to be addressed through the subsequent phases.

In Phase 2, alternative solutions are identified and evaluated in terms of their impact on the environment and a preferred planning solution is selected. Review agencies and the public are consulted in Phase 2 to solicit input and comment.

In Phase 3, possible design concepts that might be utilized to implement the preferred solution are evaluated. A second public consultation occurs in Phase 3 at which the preferred design alternative is presented for comment.

Phase 4 represents the culmination of the planning and design process in which all activities undertaken in Phases 1 through 3 are summarized in an Environmental Study Report (ESR). The ESR is placed on the public record for at least 30 calendar days for public review and a Notice of Completion is issued. At this point in the process, there is an opportunity for objectors to request that the Minister of the Environment issue a Part II Order for an individual environmental assessment. If there are no objections or any objections are resolved in Phase 4, the project can proceed to final design and construction in Phase 5.

There are four categories of projects that require increasing levels of activity under the Class EA process.

- **Schedule A** projects typically have very minor and predictable environmental impacts, usually involving operational solutions rather than design and construction solutions. Schedule A projects are approved and can proceed without any further environmental assessment.
- **Schedule A +** projects are pre-approved and require the public to be informed of the project prior to implementation. The public is given the opportunity to comment on the project to the municipal council.
- **Schedule B** projects have more significant environmental impacts and are subject to "screening" by the public and review agencies. Schedule B projects can proceed to implementation after completion of Phases 1 and 2 of the Class EA process and following public notification of completion.
- **Schedule C** projects typically involve the construction of new or expanded facilities and are subject to the full Class EA process.

This project has been classified as a Schedule C project under the Class EA process. Phases 1 and 2 of this EA were completed as part of the Sustainable Halton Water and Wastewater Master Plan.

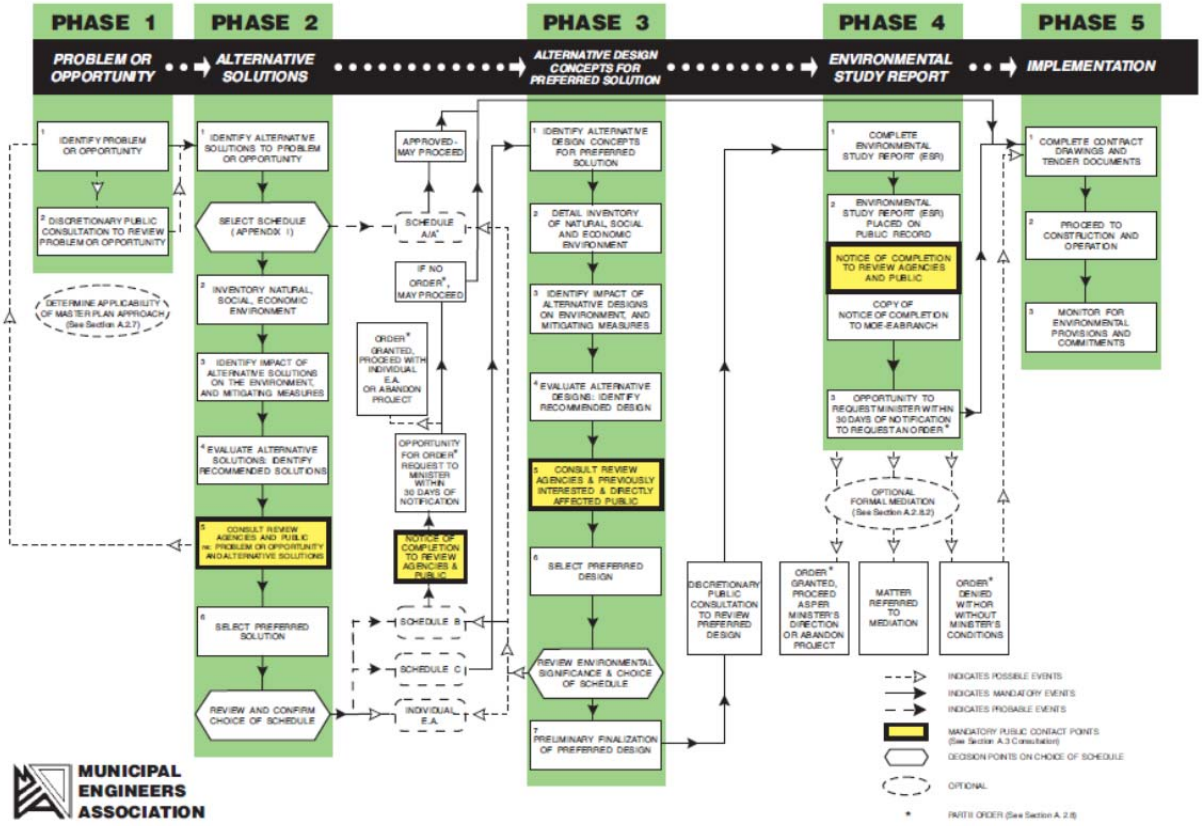

Figure 1.1 Municipal Class Environmental Process

1.3 Data Sources

Previous reports and studies that were reviewed for the preparation of this TM include:

- North Halton Well Rehabilitation Study/Capital Needs Assessment - K.W. Thompson Inc. March 2011
- MOE Acton Drinking Water System Inspection Report, April 2012
- Sustainable Halton Water and Wastewater Master Plan - AECOM, September 12, 2011

2. SUMMARY OF PREVIOUS STUDIES AND REPORTS

Several of the documents listed above also highlighted several infrastructure and operational issues that are of relevance to this study. These findings are summarized in Table 2.1.

Table 2.1 Summary of Previous Studies and Background Documentation

Report/Study and Relevant Findings
North Halton Well Rehabilitation Study/Capital Needs Assessment - K.W. Thompson Inc. March 2011
• Prospect Park Aquifer pumping test was carried out during the spring and summer of 2010 to evaluate the potential for increasing the supply form the Prospect Park Aquifer to a sustainable average day yield of 4,645 m^3/day. • The results showed that pumping at the proposed rate of 4, 646 m^3/day resulted in a significant degradation of water quality; higher levels of iron and manganese result in operational problems at the existing Prospect Park WPP related to both efficiency of removals and a marked decrease in run times for the greensand filters. • The pumping tests did show that a sustainable average day demand of approximately 3,500 m^3/day can be supplied by the Prospect Park Well Field. It was suggested that raw water iron and manganese concentrations can be treated at this pumping rate using the existing Prospect Park WPP green sand filters; however, no data or information was provided to support this assertion, nor was any stress testing or optimization work completed. • The capital works required to provide a sustained average day demand of 3,500 m^3/day are summarized below. – Replacement of Well No. 1 and No. 2 pumps and motors. – Expansion to Well No. No. 1 Pumphouse (17m^2) on the south side of the existing building to accommodate installation of the required electrical upgrades. – Modify and construct additional process piping within Well No. 1 Pumphouse and WPP. – Relocation/replacement of the main electrical service panel and breaker. Installation of a new central motor control centre and PLC panel to control Well Pump No.1 & No.2 and to permit both pumps to run in parallel mode. Install variable frequency drives (VFD's) on both pumps and upgrades to SCADA system. – Interim modifications to existing chlorine gas and fluoride systems and installation of additional equipment to handle the increased capacity. – Installation of Emergency Chlorine Gas Leak Closure system on all active chlorine tanks. – Replacement of the discharge piping between the Prospect Park Well Site and the Prospect Park Water Treatment Plant. – Replacement of the existing 50 mm treated water line from the Prospect Park WPP with a 150 mm line and provision of a 50 mm sewage forcemain from the pumphouse No.1 to the WPP. – Installation of a concrete duct bank from Well No.1 to the WPP to accommodate a new power cable from the WPP Standby Generator and Fibre Optic Communication lines. – Repairs to the existing roof on Well No.1 Pumphouse. – Construction of an expansion to the existing water treatment plant building on the west and north side of the existing building (±100m^2). – Construction of a new Chlorine Containment room within the proposed building expansion to accommodate storage of chlorine gas cylinders, weigh scale, Chlorine Gas Regulators, Chlorine feed pumps, monitoring equipment and alarms. – Installation of an emergency chlorine gas scrubber in the new Chlorine Containment room. – Replacement/relocation of existing chlorinators, chlorine feed pumps and provision of secure storage for chlorine gas cylinders. All chlorine gas equipment is proposed to be located in the new Chlorine Containment room. – Construction of a new Fluoride Containment room within the proposed building expansion to accommodate storage of fluoride solution drums, spill containment, weigh scale, day tank, fluoride feed pumps and monitoring equipment. – The relocation of the fluoride feed pumps and provision of secure storage for fluoride chemical drums. All fluoride feed equipment is proposed to be located in the new Fluoride Containment room.

Table 2.1 Summary of Previous Studies and Background Documentation

Report/Study and Relevant Findings
– The building envelope for the expansion to the Prospect Park WPP will be sized to accommodate the future installation of a third filter which will be required to accommodate the increased flow from the Prospect Park Well Site. – It was recommended that a detailed Optimization Study for filter operation be carried out in advance of the detailed design to determine the size of the filter and detailed specification. – Modifications to raw and treated water process piping to suit installation of new filter. – Relocation of existing SCADA/PLC equipment to the former Chlorine Containment Room. – Water quality testing area and related equipment. – Modification to SCADA system for all new equipment related to treatment plant expansion, chlorination room relocation/ expansion, fluoride room relocation/ expansion. – New PLC panel(s) to control all existing and proposed equipment. – Replacement of existing Standby Generator Set with a 200 -250 kW unit in order to supply emergency power to Prospect Park Wells No.1 & No.2 and ancillary equipment in the WPP. – Provision for a pressurized Chlorine Contact Chamber. – The size of the contact chamber and detailed specification cannot be determined until the Optimization Study for the WPP is completed. – Conduct an equipment grounding analysis of all equipment in facility and prepare record drawings. Install lighting protection at facility in conjunction with building expansion. – Install new raw water turbidity meters. – Install new flow meters to monitor raw water from Well No.1 and No. 2 to the WPP.
MOE Acton Drinking Water System Inspection Report, April 2012
• All production wells are located in their own building and are elevated above the constructed floor as per the requirements of O. Reg. 903. • Prospect Park Well No. 2 had a new bowl installed in March 2010. Prospect Park Well No. 1 had a new liner and a new pump installed. The Region conducted a step test on both wells. • Work on the Acton Well Supply System included installation of a permanent pump for Well No. 1 at Prospect Park and a geotechnical investigation. • The Region was granted a temporary Permit to Take Water for a pumping test at the Prospect Park Wells. The maximum flow rate for Prospect Park Well No. 1 was increased to 2,600 m^3/day and the maximum flow rate for Well No. 2 was increased to 4,725 m^3/day. The maximum recorded flow rate for the Prospect Park Wells during the inspection period were 2,042 m^3/d on August 2, 2011 and 1,004 m^3/d on March 13, 2012. • A particle counter was installed at the Prospect Park Wells and the readings commenced on November 1, 2010 to the SCADA system. • SCADA reports generated for the UV system demonstrated that the Region met and most times exceeded the minimum pass through dosage of 40 mJ/cm^2. • There were no adverse water quality incidents during the inspection period. • No non-compliance with regulatory requirements or best practice issues were identified during the inspection period.
Prospect Park Groundwater Supply Study - Golder Associates, May 2012
• The surface water and groundwater monitoring results of two long-term pumping tests undertaken at the Prospect Park Well Field by the Region were analyzed. Pumping Test No. 1 was undertaken for 77 days at a rate of 3,045 m^3/day from December 22, 2009 to March 9, 2010. Pumping Test No. 2 was undertaken for 111 days at a rate of 4,400 m^3/day from July 14 to November 1, 2010. • Prospect Park Well Field can sustain a long-term water taking rate of 3,500 m^3/day. • The groundwater level drawdown caused by pumping from the Prospect Park Well Field at the proposed increased water taking rate (3,500 m^3/day) should not affect the operation of local private wells.

3. EXISTING CONDITIONS

3.1 Drinking Water System Description

The Prospect Park Well Field and Water Treatment Plant, located on Lot 28, Concession II, Halton Hills, Ontario, is part of the Acton Drinking Water System owned and operated by the Regional Municipality of Halton. The Prospect Park system was constructed in 1990 with upgrades completed in 2003 to the water supply and treatment process. The water supply is obtained from the underlying aquifer via two drilled groundwater wells. The raw groundwater is pumped from each of the wells into the associated pumphouse and transferred to the Prospect Park WPP.

Figure 3.1 shows the location of the Well No. 1 and No. 2 and associated pumphouses and WPP.

Figure 3.1 Site Location

The treatment process consists of pre-chlorination, potassium permanganate addition followed by manganese greensand filters, UV disinfection, post-chlorination and fluoridation. The water is discharged to an in-ground reservoir for chlorine contact and is then pumped to the distribution system.

The Region is responsible for operation of the water supply, water treatment system and distribution system, and performance of maintenance activities.

3.2 Prospect Park Well Field & Pumphouses

Prospect Park Well No. 1 and Well No. 2 provide approximately 40 percent of the water supply to the Acton Drinking Water System. The wells are located within two separate pumphouse buildings adjacent to Fairly Lake in the Black Creek Drainage Basin.

UTM Coordinates

Well No. 1 and Pumphouse:	**Well No. 2 and Pumphouse:**
NAD 83, Zone 17	NAD 83, Zone 17
Easting 576819.00 m	Easting 576802.96 m
Northing 4830867.00 m	Northing 4830882.81 m

Well No. 1 is approximately 23.8 m deep while Well No. 2 is approximately 23.2 m deep. Each of the wells is equipped with a 300 mm diameter well casing, a vertical turbine pump rated at 53 L/s (at 82.3 m TDH). Well No.1 pump is equipped with a variable frequency drive. Both wells are considered GUDI with effective in-situ filtration. Well No. 1 was rehabilitated in 2010 by Lotowater Technical Services Inc. (Golder, 2011).

Well Pumphouse No.1, constructed in 1990, is equipped with a flow meter to monitor the flow entering the WPP and a pre-chlorination system. Well Pumphouse No. 2, constructed in 2003 to function are an alternate source to Well No. 1, is capable of pre-chlorination via the Well No. 1 Pumphouse chlorination system. The raw water from Well No. 1 and No. 2 after chlorination is pumped approximately 300 meters from the pumphouses to the WPP.

A copy of the Drinking Water Works Permit (No. 004-202) is provided in Appendix A.

3.3 Water Treatment Plant

The Prospect Park WPP building is equipped with pre-oxidation using chlorine and greensand manganese pressure filters for removal of manganese and iron, UV for primary disinfection, fluoridation utilizing hydrofluosilicic acid and chlorination for secondary disinfection. The treated water is discharged into a chlorine contact chamber prior to discharge to the distribution system. The filtration system consists of blowers for air scouring of filter media and a backwash wastewater management system.

Free chlorine residual, fluoride residual and turbidity are continuously monitored as the treated water enters the distribution system. The continuous monitoring equipment and UV units are alarmed through the SCADA system. The well pumps automatically stop in the event that the chlorine residual or UV dosage are detected below the pre-set conditions.

Stand-by power is provided to the Prospect Park WPP by a diesel generator.

The municipal address of the water treatment plant is 30 Park Street, Halton Hill, Ontario.

UTM Coordinates of Water Treatment Plant:

NAD 83, Zone 17
Easting 576941.353 m
Northing 4831064.453 m

Figure 3.2 presents the Prospect Park system process flow diagram.

Design parameters for each unit process for the Prospect Park WPP are listed in Table 3.1.

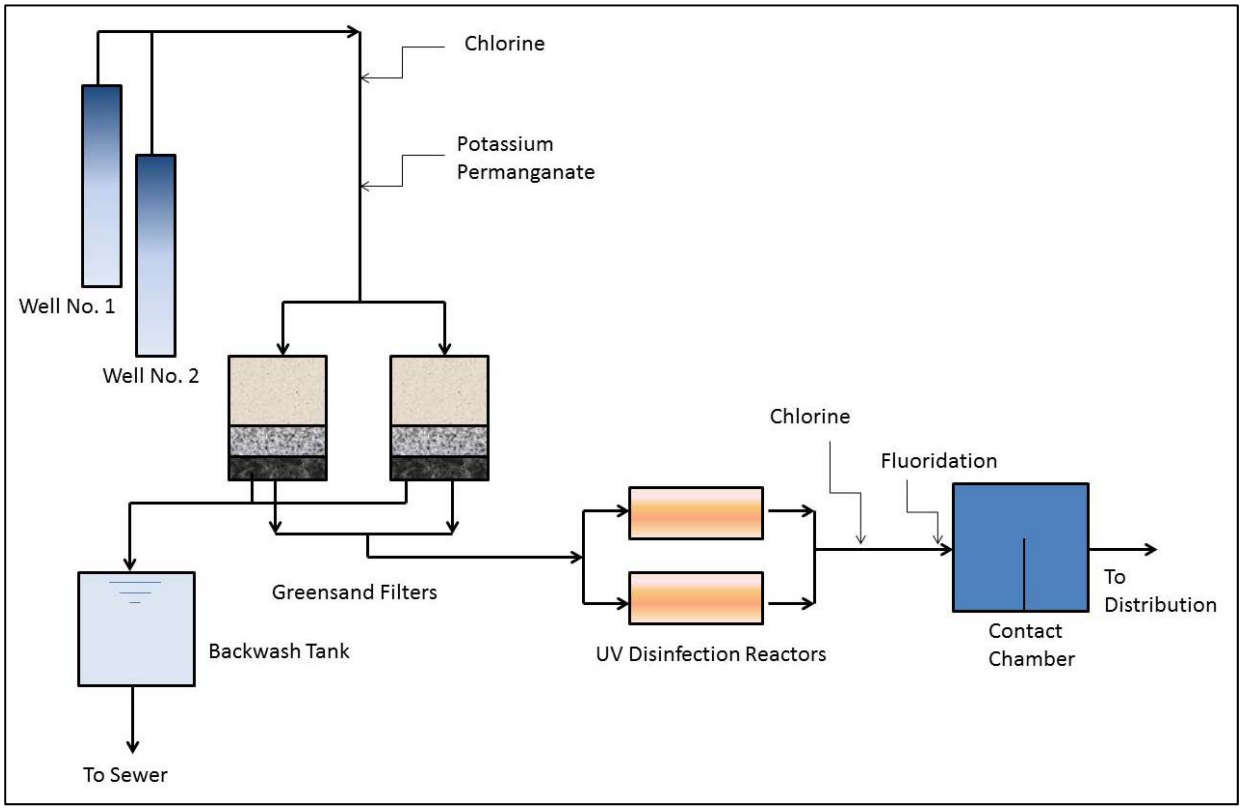

Figure 3.2 Prospect Park Process Flow Diagram

Table 3.1 Prospect Park Treatment Process Table

Parameter	Process Design
Pre-Chlorination	
Type	Chlorine Gas
Capacity (each)	9.07 kg/d
Chlorine Booster Pumps	Two
Filtration	
Capacity	Filter 1: 1,136 m^3/d, Filter 2: 1,136 m^3/d
Filtration Rate	5.3 m/h
Surface Area	7.3 m^2
Media	0.3 m deep sand, 0.6 greensand, 0.3 anthracite
Backwash rate	65 L/s
Chemical	Potassium Permanganate
Meter Pump Capacity	Pump 1: 10 L/hr
Wastewater Management System	
Tank Capacity	150 m^3
Transfer Pumps Capacity	Pump 1: 3.5 L/s, Pump 2: 3.5 L/s
Air Scour System	
Blowers Capacity	Blower 1: 170 scfm, Blower 2: 170 scfm
Air Scour Supply Rate	0.6 m^3/m^2/min
Motor	6.25 kW
UV Disinfection	
Reactors	Trojan Swift
Capacity	Reactor 1: 53 L/s, Reactor 2: 53 L/s
Minimum Dosage	40 mJ/cm^2
Secondary Disinfection	
Type	Chlorine Gas
Booster Pumps Capacity	Pump 1: 6 kg/d, Pump 2: 6 kg/d
Fluoridation	
Chemical	Hydrofluosilicic acid
Number of Metering Pumps	1
Chlorine Contact Tank	
Capacity	48.3 m^3 useable
Baffle Factor	0.5
Standby Power	
Type	Diesel Engine Generator Set
Capacity	100 kW with 1,135 L diesel fuel tank

3.4 Distribution System

The treated water from the Prospect Park WPP is pumped directly into the Acton distribution system. The water then flows into the Acton distribution system which services approximately 9,889 residents. The distribution system is composed of ductile, cast iron and PVC watermains.

4. EXISTING TREATMENT CAPACITY

A review of the current status of each treatment process at the Prospect Park WPP was conducted to identify the unit processes capacities. The unit process review was based on the design capabilities of the unit processes identified in the current Drinking Water Works Permit for the Prospect Park WPP.

4.1 Raw Water Pumping

Prospect Park Well No. 1 and Prospect Park Well No. 2 are equipped with a vertical turbine pump rated at 53 L/s (4,579 m^3/d) at 82.3 TDH, including a variable frequency drive to allow for parallel operation.

The existing wells pumps appear to be sufficient to accommodate the future flows of 3,500 m^3/d with firm capacity.

The K.W. Thompson North Halton Well Rehabilitation Study/Capital Needs Assessment (March 2011) recommended and an expansion of the south side of Well No. 1 Pumphouse to allow space for installation of additional electrical equipment. The report also recommended that replacement of pumps and motors for Well No. 1 and Well No. 2 and the installation of VFD's on both motors. It appears that this has been completed given that the wells described in the Drinking Water Works Permit are rated for 53 L/s.

4.2 Filtration

The existing filtration system contains two greensand manganese pressure filters for removal of iron and manganese from the raw groundwater. Potassium permanganate is added as a pre-oxidant upstream of the filters. In 2012, the addition of potassium permanganate was stopped at the Prospect Park WPP by the Region to simplify the operations for staff, and pre-oxidation is now accomplished using chlorination.

Regional staff have indicated that historical operating experience suggests that the filters are capable of producing water at a rate of 25 L/s (2,160 m^3/d) each, while still maintaining acceptable water quality. While this would indicate that the filters have sufficient capacity to meet the expanded flow rates, the current configuration does not provide for firm capacity. It is possible that the existing filters will not provide for sufficient iron and manganese removal at the expanded capacity and there is potential for water quality deterioration at the higher flow rate. Additional filter stress testing is recommended to confirm the higher filtration rates.

The backwash water flows from the distribution system, through the contact chamber and UV disinfection system to remove solids accumulated in the filters. Air scouring is provided during backwashing by two blowers each with a rated capacity of 170 scfm. The filter backwash wastewater is directed to a 150 m^3 backwash holding tank prior to discharge to the sanitary sewer by two submersible pumps each rated at 3.5 L/s.

Expansion of the filtration system and upgrades to the filter back wash systems and air scour system are required to accommodate the future flows. A water pipeline dedicated for backwashing (by-passing the contact chamber and UV units) should be provided. To accommodate the installation of new filtration equipment an expansion to the existing building may be required.

Table 4.1 Filtration Capacity

Parameter	Existing Prospect Park WPP
Surface Area (total)	14.6 m^2
Filtration Rate	5.3 m/h
Rated capacity	77 m^3/h (1,857 m^3/d)

4.3 Disinfection

The existing primary disinfection process at the Prospect Park WPP is achieved by a combination of UV radiation and chlorination, while secondary disinfection is maintained using free chlorine.

The closed vessel UV reactors have a rated capacity of 53 L/s (4,579 m^3/d) each. Each reactor is capable of producing a minimum dosage of 40 mJ/cm^2. Based on the future capacity of 3,500 m^3/d the UV reactors are capable of accommodating future flows, with full redundancy. No expansion or upgrades to the UV system are required.

Chlorine is added to the treated water by a chlorine gas system located in a self-contained room in the WPP. The chlorine is added downstream of the UV reactor units. Contact time is provided by an underground chlorine contact tank with a total usable volume of 48.3 m^3 and a baffle factor of 0.5 according to the current Drinking Water Works Permit.

The estimated contact times based on the existing chlorine contact tank for current and future conditions are presented in Table 4.2. The existing contact tank can provide a CT value of 4.9 mg/L·min at the future flow of 3,500 m^3/d. The disinfection requirements should be evaluated during the preliminary design.

The K.W. Thompson North Halton Well Rehabilitation Study/Capital Needs Assessment (March 2011) recommended a new pressurized chlorine contact chamber to ensure adequate disinfection is met with an increase in flow to 3,500 m^3/d. A study completed by Associated Engineering confirmed that the existing chlorine system is sized adequately for the increased flow. Replacement of the v-notch control valves is required.

Table 4.2 Contact Time

Parameter	Existing Conditions	Future Conditions
Flow	2,275 m^3/d	3,500 m^3/d
Contact Tank Volume	48.3 m^3	
Baffle Factor	0.5	
Contact Tank Effective Volume	24 m^3	
Contact Time	15.2 min	9.8 min
CT (1) (2)	7.6 mg/L·min	4.9 mg/L·min

Notes:

1. The *MOE Procedure for Disinfection in Ontario, 2006* requires a CT of 3 mg/L*min for 2-log inactivation/removal or viruses and 6 mg/L*min for 4-log inactivation/removal of viruses @ 10^0C and pH of 7.
2. CT value calculated based on chlorine residual of 0.5 mg/L.

4.4 Fluoridation

Hydrofluosilicic acid is added to the treated water immediately after UV disinfection. The K.W. Thompson North Halton Well Rehabilitation Study/Capital Needs Assessment (March 2011) proposed an expansion to the Fluoridation Containment Room to accommodate the additional capacity needed to meet the increase in flow to 3,500 m^3/d.

4.5 Standby Power

Emergency power is provided to the facility by a 100 kW diesel engine generator set located in the Prospect Park WPP. The K.W. Thompson North Halton Well Rehabilitation Study/Capital Needs Assessment (March 2011) indicated that the existing diesel generator does not have adequate capacity to accommodate the expansion of the Prospect Well. It was recommended that the existing generator set be replaced with a 200 to 250 kW unit to provide backup power to the wells and WPP, and that the underground emergency power cable and communication lines be upgraded.

5. WATER QUALITY REVIEW

Over the review period (January 2007 to February 2013), the Prospect Park WPP treated water quality met or exceeded the Ontario Drinking Water Standards (ODWS) and the Canadian Drinking Water Quality Guidelines. Table 5.1 presents the historical raw water quality for Prospect Park Well No. 1 and Prospect Park No. 2, and the treated water quality data for the Prospect Park WPP.

The raw groundwater from Well No. 1 and No. 2 contains iron and manganese concentrations that are treated using the existing greensand filters at Prospect Park WPP.

Elevated iron concentrations frequently occur in groundwater sources and may cause aesthetic water quality problems after treatment and distribution. Elevated iron concentrations may discolour water and cause turbidity. It can also cause brownish staining of plumbing fixtures, laundry and dishes and may cause a bitter and astringent taste in water and beverages (MOE, 2006). In the distribution system, iron can settle out in the mains and gradually reduce the flow rate through the pipe. Iron can also promote the growth of iron bacteria, which may contribute to biofilm formation in the distribution system.

Manganese is naturally present in some groundwaters because of chemical reducing underground conditions and presence of manganese mineral deposits. Like iron, drinking water supplies with evaluated manganese concentrations may cause discoloured water and stain laundry and fixtures black and cause undesirable tastes in beverages (MOE, 2006).

The ODWS aesthetic objective (AO) is 0.3 mg/L for iron and 0.05 mg/L for manganese. Drinking water supplies with concentrations above the iron and manganese AO may impair taste and colour of water. The existing Prospect Park treatment system is capable of achieving a 99 percent removal efficiency of iron and manganese based on the data reviewed. Treated water iron and manganese concentrations are below the ODWS AO for iron and manganese.

Turbidity for the raw water ranged from 5.4 to 85.4 NTU with an average of 13.8 NTU for Prospect Park Well No.1, and from 3.4 to 30.8 NTU with an average of 13.1 NTU for Prospect Park Well No. 2. The treated water turbidity ranged from 0.06 to 0.2 NTU with an average of 0.16 NTU. Turbidity levels in the Prospect Park treated water were well below the ODWS AO of 5 NTU.

Operations staff has indicated that elevated ammonia concentrations are present in the raw water from the Prospect Park Wells, which affect the chlorine demand. Based on the data provided the raw water total ammonia nitrogen (TAN) concentrations ranged from 0.11 to 0.53 mg/L with an average of 0.32 mg/L in Prospect Park #1 well and from 0.26 to 0.60 mg/L with an average of 0.50 mg/L in Prospect Park #2 well. The treated water TAN ranged from < 0.02 to 0.11 mg/L. The chlorine demand exerted by the TAN will vary depending on the type of ammonia that is present in the raw water (i.e. organic vs inorganic compounds). Information provided by the Region indicated that ammonia present in the raw water causes high chlorine demand at the Prospect Park WPP.

Table 5.2 presents the historic trihalomethane (THM) concentrations at various locations within the distribution system between 2007 and 2012. The overall average THM concentration of 31.0 µg/L was observed in the distribution system during this period.

Table 5.1 Raw and Treated Water Quality

Parameter	Unit	Raw						Treated			ODWS
		Prospect Park #1			Prospect Park #2			Prospect Park #2			
		Average	Minimum	Maximum	Average	Minimum	Maximum	Average	Minimum	Maximum	
Alkalinity	mg/L	215	128	281	279	269	298	262	253	279	30-500 (OG)
Aluminium	mg/L	0.017	0.004	0.063	0.017	0.001	0.068	0.009	< 0.001	0.056	0.1 (OG)
Antimony	mg/L	NA	NA	NA	NA	NA	NA	< 0.0005	< 0.0005	< 0.0005	0.006 (IMAC)
Arsenic	mg/L	NA	NA	NA	NA	NA	NA	< 0.001	< 0.001	< 0.001	0.025 (IMAC)
Barium	mg/L	NA	NA	NA	NA	NA	NA	0.17	0.15	0.24	1 (IMAC)
Boron	mg/L	NA	NA	NA	NA	NA	NA	0.02	0.02	0.02	5 (IMAC)
Cadmium	mg/L	0.0005	< 0.0001	0.0011	0.0004	< 0.0001	0.0009	0.0002	<0.0001	0.0004	0.005 (MAC)
Calcium	mg/L	69	31	99	91	78	104	90	84	103	
Chloride	mg/L	85	58	112	69	58	84	76	67	92	250 (AO)
Chromium	mg/L	0.0009	0.0005	0.001	0.001	< 0.0005	0.002	0.001	< 0.001	0.002	0.05 (MAC)
Cobalt	mg/L	0.0004	< 0.0002	0.0004	0.0004	< 0.0005	0.0007	0.0003	< 0.0002	0.0003	
Colour TCU	TCU	10	1	23	16	10	24	1	< 1	2	5 (AO)
Conductivity	µS/cm	678	540	871	779	699	931	776	697	815	
Copper	mg/L	0.0083	< 0.002	0.05	0.0113	0.005	0.019	0.0118	0.0074	0.023	1 (AO)
Dissolved Organic Carbon	mg/L	1.7	0.1	2.4	2.2	1.5	2.7	2.1	1.8	2.5	5 (AO)
Fluoride	mg/L	0.07	0.05	0.09	0.08	0.06	0.17	0.63	0.09	0.97	1.5 (MAC)
Free Chlorine	mg/L	NA	NA	NA	NA	NA	NA	1.23	0.67	1.80	
Iron	mg/L	1.96	1.00	4.02	1.78	0.91	2.58	0.010	0.005	0.034	0.3 (AO)
Lead	mg/L	0.001	0.002	0.005	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001	0.01 (MAC)
Magnesium	mg/L	23	21	25	25	23	29	25	23	26	
Manganese	mg/L	0.09	0.05	0.14	0.27	0.21	0.41	0.0019	0.0001	0.02	0.05 (AO)

Table 5.1 Raw and Treated Water Quality

Parameter	Unit	Raw						Treated			ODWS
		Prospect Park #1			Prospect Park #2			Prospect Park #2			
		Average	Minimum	Maximum	Average	Minimum	Maximum	Average	Minimum	Maximum	
Mercury	mg/L	NA	NA	NA	NA	NA	NA	< 0.0001	< 0.0001	< 0.0001	0.001 (MAC)
Nickel	mg/L	NA	NA	NA	NA	NA	NA	0.0003	< 0.0002	0.0012	
Nitrate	mg/L	0.0014	0.0005	0.0061	0.0004	< 0.0002	0.0016	0.33	< 0.05	0.99	10 (MAC)
Nitrate + Nitrite Nitrogen	mg/L	NA	NA	NA	NA	NA	NA	0.07	< 0.02	0.23	10 (MAC)
Nitrite	mg/L	0.03	< 0.02	0.12	0.08	< 0.02	0.36	0.06	< 0.02	0.14	1 (MAC)
pH		7.83	7.35	8.37	7.44	7.26	7.86	7.3	7.1	7.9	6.5-8.5 (OG)
Potassium	mg/L	1.67	1.5	1.92	1.55	1.42	1.69	1.62	1.46	1.89	
Selenium	mg/L	NA	NA	NA	NA	NA	NA	0.002	< 0.002	< 0.002	
Sodium	mg/L	42	31	63	34	31	38	35	31	38	200 (AO) 1
Sulfate	mg/L	19	18	42	30	23	54	28	22	32	500 (AO)
Temperature	° C	11.5	9.0	13.0	11.4	9.0	13.0	11.7	10.0	12.6	15°C (AO)
Total Ammonia Nitrogen	mg/L	0.32	0.11	0.56	0.50	0.26	0.60	0.06	< 0.02	0.11	
Total Dissolved Solids	mg/L	367	269	469	438	404	499	426	393	445	500 (AO)
Total Hardness	mg/L	253	143	341	331	312	372	322	308	333	80-100 (OG)
Turbidity	NTU	13.8	5.4	85.4	13.1	3.4	30.8	0.16	0.06	1.0	5 (AO)
Uranium	mg/L	NA	NA	NA	NA	NA	NA	0.00031	0.00015	0.0005	0.02 (MAC)
Zinc	mg/L	0.0127	0.0030	0.0650	0.0111	0.0043	0.0230	0.0045	< 0.0005	0.0310	5 (AO)

Notes:
MAC - maximum acceptable concentration
IMAC - maximum acceptable concentration
AO - aesthetic objective
OG - operational guideline
NA- Not analyzed

Table 5.2 Distribution Water Quality

Location	Total Trihalomethanes (µg/L)	ODWS (µg/L)
Acton Public Library	41.2	100 (1)
Acton Reservoir	10.4	
Churchill Road	7.2	
Leathertown Lumber	30.9	
Mac's Convenience	22.4	
Subway	52.7	
Overall	31.0	

Notes:
The Ontario Drinking Water Standards THM maximum acceptable concentration of 100 µg/L is based on a locational running annual average of a minimum of quarterly samples taken in the distribution system.

6. SUMMARY AND RECOMMENDATIONS

Based on the available information, the following observations for the Prospect Park WPP process capacity evaluation were identified:

- The existing well pumps (Prospect Park Well No. 1 and No. 2) are rated at 53 L/s (4,579 m^3/d); existing capacity is adequate for the higher flow rate.
- Currently the rated capacity for each of the filers is 1,136 m^3/d. As a result expansion of the filtration system is required to meet the future 3,500 m^3/d, and to ensure water quality with respect to iron and manganese does not degrade at the higher flow rate.
- Filter stress testing is recommended to confirm if higher filtration rates are sustainable.
- Given the existing UV reactors rated capacity of 53 L/s (4,579 m^3/d) each, expansion or upgrading is not required.
- Expansion of the chlorine contact chamber and chlorination equipment may be required to meet disinfection requirements.
- The capacity of the existing generator set should be assessed to ensure standby power can be provided to the expanded process.
- Additional upgrades may be required for the following: building, electrical system, SCADA system and process piping.

7. REFERENCES

AECOM. "Sustainable Halton Water and Wastewater Master Plan". September 12, 2011.

Golder Associates (Golder). " Reconstruction of Prospect Park Well No. 1 Halton Hills (Action), Ontario". March 18, 2011.

K.W. Thompson. "North Halton Well Rehabilitation Study - Prospect Park Well Site & Water Treatment Plant". March, 2011.

Ministry of Environment (MOE). “Technical Support Document for Ontario Water Standards, Objectives and Guidelines”. June 2006.

APPENDIX A
DRINKING WATER WORKS PERMIT (NO. 004-202)

Ontario

DRINKING WATER WORKS PERMIT

Permit Number: 004-202
Issue Number: 3

Pursuant to the *Safe Drinking Water Act*, 2002, S.O. 2002, c. 32, and the regulations made thereunder and subject to the limitations thereof, this drinking water works permit is issued under Part V of the *Safe Drinking Water Act*, 2002, S.O. 2002, c. 32 to:

The Regional Municipality of Halton

1151 Bronte Road
Oakville ON L6M 3L1

For the following municipal residential drinking water system:

Acton Drinking Water System

This drinking water works permit includes the following:

Schedule	Description
Schedule A	Drinking Water System Description
Schedule B	General
Schedule C	All documents issued as Schedule C to this drinking water works permit which authorize alterations to the drinking water system

DATED at TORONTO this 14th day of December, 2011

Signature

Aziz Ahmed, P.Eng.
Director
Part V, *Safe Drinking Water Act*, 2002

Schedule A: Drinking Water System Description

System Owner	**The Regional Municipality of Halton**
Permit Number	**004-202**
Drinking Water System Name	**Acton Drinking Water System**
Schedule A Issue Date	**December 14th, 2011**

1.0 System Description

1.1 The following is a summary description of the works comprising the above drinking water system:

Overview

The **Acton Drinking Water System** consists of five (5) groundwater wells, four (4) pumphouses, one (1) drinking water treatment plant, one (1) storage reservoir, and approximately 46.4 kilometres of trunk watermains and 5.2 kilometres of distribution watermains.

Well Fields

- Davidson Well Field
  - Davidson Well No. 1
  - Davidson Well No. 2
  - Davidson Well No. 1 and Well No. 2 Pumphouse
- Fourth Line Well Field
  - Fourth Line Well
  - Fourth Line Well Pumphouse
- Prospect Park Well Field
  - Prospect Park Well No. 1 and Pumphouse
  - Prospect Park Well No. 2 and Pumphouse

Water Treatment Plants

- Prospect Park Water Treatment Plant

Storage Reservoirs

- Acton Reservoir

Davidson Well Field

Davidson Well No. 1

Location	14032 3rd Line, Town of Halton Hills, ON
UTM Coordinates	NAD 83, Zone 17, +/- 5 m, Easting 576873.000 m, Northing 4833284.000 m
Description	A drilled groundwater production well
Source Type	GUDI with effective in-situ filtration
Dimensions	250 mm, 14.6 m deep
Equipment	7 stage vertical turbine pump, rated at 14.2 L/s, 56.4 m TDH
	200 mm diameter discharge line connected to the well pump header in the pumphouse including a vented watertight galvanized steel enclosure over the well head
Notes	

Davidson Well No. 2

Location	14032 3rd Line, Town of Halton Hills, ON
UTM Coordinates	NAD 83, Zone 17, +/- 5 m, Easting 576873.000 m, Northing 4833284.000 m
Description	A drilled groundwater production well
Source Type	GUDI with effective in-situ filtration
Dimensions	250 mm, 14.3 m deep
Equipment	7 stage vertical turbine pump, rated at 14.2 L/s, 56.4 m TDH
	200 mm diameter discharge line connected to the well pump header in the pumphouse including a vented watertight galvanized steel enclosure over the well head
Notes	

Davidson Well No. 1 and Well No. 2 Pumphouse

Location	14032 3rd Line, Town of Halton Hills, ON
UTM Coordinates	NAD 83, Zone 17, +/- 5 m, Easting 576873.000 m, Northing 4833284.000 m
Equipment	One (1) flow meter for monitoring flow from Well No. 1 and one (1) flow meter for monitoring flow from Well No. 2
	A turbidity meter
	A 300 mm diameter feeder watermain with no fire hydrants and no service connections on its entire length of approximately 200 m from the Pump House to the connection with the Distribution System
	A valve, flow meter and associated appurtenances, including a backflow preventer, to allow discharge of raw water to the stream on the neighboring property for non-potable purposes
Cartridge Filters	Two (2) housings, each containing thirty-three (33) one-micron rated microfiber cartridge filters for a total of sixty-six (66) cartridges. Each 70 mm (2.75 inch) diameter cartridge is 763 mm (30 inches) in length and has an effective filtration area of 0.41 m^2.
UV Treatment	A primary disinfection ultraviolet (UV) system consisting of two (2) UV units, each unit having a design dosage rate of 40 millijoules per square-centimetre at a design maximum flowrate of 2,500 cubic metres per day with associated piping, monitoring equipment including UV transmittance analyzer, controls and alarm systems
Chlorine Disinfection	A chlorine disinfection system located in a separate room of the pumphouse consisting of a chlorine booster pump, scales for two chlorine cylinders, a manifold, automatic switchover, one (1) 4.54 kg/day capacity duty chlorinator, one (1) stand-by chlorinator rated at 4.54 kg/day, with a stand-by chlorination pump, chlorine diffuser with all associated valves, piping, spill containment area, equipment, controls and instrumentation including a continuous chlorine residual analyzer
	A chlorine contact chamber having a minimum effective contact volume of 77 cubic metres and chlorine booster pump (No. 2) complete with a sampling line from the chlorine contact tank to the pump house
Fluoridation	A fluoridation system using hydrofluosilicic acid, consisting of one weigh scale, a storage tank (carboy) of hydrofluosilicic acid complete with spill containment, two (2) metering pumps (duty and standby) rated at 3.785 L/h at 120 m TDH, all installed in a equipment/storage room
Standby Power	One (1) standby diesel generator set, having a rating of 50 kilowatts, to provide power for the Davidson Wells Pumping Station during emergency situations
Notes	

Fourth Line Well Field

Fourth Line Well

Location	9098 32nd Sideroad, Town of Halton Hills, ON
UTM Coordinates	NAD 83, Zone 17, +/- 5 m, Easting 576369.813 m, Northing 4834397.000 m
Description	A drilled groundwater production well
Source Type	GUDI with effective in-situ filtration
Dimensions	250 mm, 20.7 m deep
Equipment	7 stage vertical turbine pump, rated at 15.8 L/s, 59.1 m TDH
	150 mm diameter discharge line connected to the well pump header in the pumphouse
Notes	

Fourth Line Well Pumphouse

Location	9098 32nd Sideroad, Town of Halton Hills, ON
UTM Coordinates	NAD 83, Zone 17, +/- 5 m, Easting 577000.000 m, Northing 4835296.000 m
Equipment	A magnetic flow meter on the discharge pipe to monitor the flow entering the distribution system
	A 150 mm diameter watermains and associated valves connecting to the chlorine contact chamber
	A 150 mm diameter feeder watermain with fire hydrants and no service connections for approximately 15 m from the Fourth Line Pump house to the Distribution System
	All associated piping, valves and controls
UV Treatment	A primary disinfection ultraviolet (UV) system located in a separate room of the pumphouse consisting of two (2) UV units, each unit having a design dosage rate of 40 millijoules per square-centimeter at a design maximum flowrate of 15.8 L/s with associated piping, monitoring equipment including UV transmittance analyzer, controls and alarm systems, connected to SCADA system
Chlorine Disinfection	A disinfection system consisting of two (2) chlorine booster pumps, scales for two chlorine cylinders, a manifold, automatic switchover, one 2.0 kg/d capacity chlorinator, chlorine diffuser, and associated equipment, instrumentation and controls, including weigh scales and a continuous chlorine residual analyzer
	Two (2) chlorine contact chambers, each 1.8 m nominal diameter x 9.936 m long pressure pipe, equipped with perforated inlet and outlet pipes, three perforated baffles plates and bulkhead ends, having an effective contact volume of approximately 26 cubic metres complete with a sampling line from the chlorine contact tank to the pump house
Fluoridation	A fluoridation system using hydrofluosilicic acid, consisting of one weigh scale, a carboy storage tank of hydrofluosilicic acid complete with spill containment, one metering pump of 3.785 L/h capacity at 120 m TDH

Notes	

Prospect Park Well Field

Prospect Park Well No. 1

Location	Prospect Park adjacent to Fairy Lake in the upper reaches of the Black Creek Drainage Basin in the Town of Halton Hills, ON
UTM Coordinates	NAD 83, Zone 17, Easting 576819.00 m and Northing 4830867.00 m
Description	A drilled groundwater production well
Source Type	GUDI with effective in-situ filtration
Dimensions	300 mm, 17.7 – 23.8 m deep
Equipment	7 stage vertical turbine pump, rated at 53 L/s, 82.3 m TDH with VFD
	200 mm diameter discharge line connected to the well pump header in the pumphouse
Notes	

Prospect Park Well No. 1 Pumphouse

Location	Prospect Park adjacent to Fairy Lake in the upper reaches of the Black Creek Drainage Basin in the Town of Halton Hills, ON
UTM Coordinates	NAD 83, Zone 17, Easting 576819.00 m and Northing 4830867.00 m
Equipment	A magnetic flow meter on the discharge pipe to monitor the flow entering the water treatment plant
	300 mm diameter feeder watermain with no fire hydrants and service connections from Prospect Park Pump House to the Water Treatment Plant
Chlorine Disinfection	Two (2) disinfection systems consisting of two (2) chlorine booster pumps, two (2) scales for two (2) chlorine cylinders, two (2) manifolds, two (2) automatic switchovers, two (2) 9.07 kg/d capacity chlorinators, chlorine diffuser, and associated equipment, instrumentation and controls including weigh scales capable of feeding pre-filter chlorination to either Well N. 1 or Well No. 2
Notes	

Prospect Park Well No. 2

Location	Prospect Park adjacent to Fairy Lake in the upper reaches of the Black Creek Drainage Basin in the Town of Halton Hills, ON
UTM Coordinates	NAD 83, Zone 17, Easting 576802.96m and Northing 4830882.81m
Description	A drilled groundwater production well (alternate source to Prospect Well No. 1)
Source Type	GUDI with effective in-situ filtration
Dimensions	300 mm, 23.2 m deep
Equipment	Vertical turbine pump, rated at 53 L/s, 82.3 m TDH, with a variable frequency drive (located in the WTP) and all associated piping and valves, located in the well pumphouse
	200 mm diameter discharge line connected to the well pump header in the pumphouse
Notes	

Prospect Park Well No. 2 Pumphouse

Location	Prospect Park adjacent to Fairy Lake in the upper reaches of the Black Creek Drainage Basin in the Town of Halton Hills, ON
UTM Coordinates	NAD 83, Zone 17, Easting 576802.96m and Northing 4830882.81m
Equipment	Complete with all associated valves and piping including a 150 mm discharge line to the Prospect Park WTP, sample lines, sink, electrical, and instrumentation
Chlorine Disinfection	Capable of pre-filter chlorination via the chlorination system located in Well No. 1 Pumping Station
Notes	

Prospect Park Water Treatment Plant

Location and System Type

Street Address	30 Park Street, Halton Hills ON
UTM Coordinates	NAD 83, Zone 17, +/- 5 m, Easting 576941.353 m, Northing 4831064.453 m
System Type	Treatment
Notes	

Filtration

Filters

Description	Two (2) greensand manganese pressure filters
Dimensions	Each filter with 1,136 m^3/d maximum capacity, 5.3 m/h filtration rate, and 65 L/s backwash rate with the following design criteria: 7.3 m^2 surface area with 0.3 m deep sand, 0.6 m greensand, 0.3 m anthracite
Equipment	Complete with associated appurtenances such as filter control panel, flow control valves, flow meter at each filter effluent line, a continuous chlorine residual analyzer and turbidity meter
Notes	

Filter Backwash Wastewater Management System

Description	Filter backwash wastewater management system
Equipment	One (1) 150 m^3 capacity backwash holding tank
	Two (2) submersible pumps each rated at 3.5 L/s to transfer the backwash to the sewer system and spray nozzles
Notes	

Air Scour System

Description	Two (2) positive displacement blowers (one duty and one stand-by)
Equipment	Each blower rated at 170 scfm capacity, 0.6 m^3/m^2/min air scour supply rate, 100 kPa discharge pressure, 6.25 kW blower motor rating
Notes	

Primary Disinfection

Ultraviolet (UV) Reactors

Description	Two (2) UV reactors
Capacity	Each reactor rated at 53 L/s and a minimum pass-through dose of 40 mJ/cm^2 complete with all associated piping, controls, and instrumentation
Notes	

Chlorine Contact Chamber

Description	One (1) baffled contact chamber
Dimensions	Total usable volume of 48.3 m^3 with a baffle factor of 0.5

Notes	

Instrumentation and Control

SCADA System

Description	Integrated process control system
Notes	Combines system control with data acquisition including various in-line analyzers and monitors

Emergency Power

Backup Power Supply

Description	A 100 kW diesel engine stand-by power generator set and associated equipment with a 1,135 L diesel fuel tank supplying the generator, located in a separate room
Notes	

Chemical Addition

Chlorine

Description	Chlorine addition for disinfection
Feed Point	200 mm diameter discharge pipe downstream of the UV units
Equipment	Dual cylinder weigh scale with one (1) 68 kg chlorine cylinder on each side
	Automatic switchover valves, duplex chlorinators rated at 6 kg/d each with a spare V-notch and meter tube for 12 kg/d
	Two (2) booster pumps, injectors, and piping to the injection point
Notes	

Hydrofluosilicic Acid

Description	Hydrofluosilicic acid addition for fluoridation
Feed Point	Immediately after UV disinfection
Equipment	One (1) weigh scale and a carboy storage tank for hydrofluosilicic acid
	One (1) metering pump
Notes	

Potassium Permanganate

Description	Potassium permanganate addition for iron and manganese removal and filter media regeneration
Feed Point	Prior to filtration system
Equipment	Two (2) 400 L capacity mixing tanks with one (1) mixer in each tank
	One (1) metering pump rated at 10 L/hr at 1,035 kPa
Notes	

Storage Reservoirs

Acton Reservoir

Location	14386 Churchill Road, Town of Halton Hills ON
UTM Coordinates	NAD 83, Zone 17, +/- 5 m, Easting 576253.612m, Northing 4834145.090m
Description	In Ground Storage Reservoir
Dimensions	Total volume 4,456 m^3 and useable volume 2,584.48 m^3
Notes	

Watermains

1.2 Watermains within the distribution system comprise:

1.2.1 Watermains that have been set out in each document or file identified in column 1 of Table 1.

Table 1: Watermains

Column 1 Document or File Name	Column 2 Date
Acton Water Distribution System	November 28, 2008

1.2.2 Watermains that have been added, modified, replaced or extended further to the provisions of Schedule C of this drinking water works permit on or after the date identified in column 2 of Table 1 for each document or file identified in column 1.

1.2.3 Watermains that have been added, modified, replaced or extended further to an authorization by the Director on or after the date identified in column 2 of Table 1 for each document or file identified in column 1.

Schedule B: General

System Owner	**The Regional Municipality of Halton**
Permit Number	**004-202**
Drinking Water System Name	**Acton Drinking Water System**
Schedule B Issue Date	**December 14th, 2011**

1.0 Applicability

1.1 In addition to any other requirements, the drinking water system identified above shall be altered and operated in accordance with the conditions of this drinking water works permit and the licence.

1.2 The definitions and conditions of the licence shall also apply to this drinking water works permit.

2.0 Alterations to the Drinking Water System

2.1 Any document issued by the Director as a Schedule C to this drinking water works permit shall provide authority to alter the drinking water system in accordance, where applicable, with the conditions of this drinking water works permit and the licence.

2.2 All Schedule C documents issued by the Director for the drinking water system shall form part of this drinking water works permit.

2.3 All parts of the drinking water system in contact with drinking water which are:

2.3.1 Added, modified, replaced, extended; or

2.3.2 Taken out of service for inspection, repair or other activities that may lead to contamination,

shall be disinfected before being put into service in accordance with the provisions of the AWWA C651 – Standard for Disinfecting Water Mains; AWWA C652 – Standard for Disinfection of Water-Storage Facilities; AWWA C653 – Standard for Disinfection of Water Treatment Plants; or AWWA C654 – Standard for Disinfection of Wells; or an equivalent procedure.

2.4 The owner shall notify the Director within thirty (30) days of the placing into service or the completion of any addition, modification, replacement or extension of the drinking water system which had been authorized through:

2.4.1 Schedule B to this drinking water works permit which would require an alteration of the description of a drinking water system component described in Schedule A of this drinking water works permit;

2.4.2 Any Schedule C to this drinking water works permit respecting works other than watermains; or

2.4.3 Any approval issued prior to the issue date of the first drinking water works permit respecting works other than watermains which were not in service at the time of the issuance of the first drinking water works permit.

2.5 For greater certainty, the notification requirements set out in condition 2.4 do not apply to any addition, modification, replacement or extension in respect of the drinking water system which:

2.5.1 Is exempt from subsection 31(1) of the SDWA by subsection 9.(2) of O. Reg. 170/03;

2.5.2 Constitutes maintenance or repair of the drinking water system; or

2.5.3 Is a watermain authorized by condition 3.1 of Schedule B of this drinking water works permit.

2.6 The owner shall notify the legal owner of any part of the drinking water system that is prescribed as a municipal drinking water system by section 2 of O. Reg. 172/03 of the requirements of the licence and this drinking water works permit as applicable to the prescribed system.

2.7 For greater certainty, any alteration to the drinking water system made in accordance with this drinking water works permit may only be carried out after other legal obligations have been complied with including those arising from the *Environmental Assessment Act*, *Niagara Escarpment Planning and Development Act*, *Oak Ridges Moraine Conservation Act, 2001* and *Greenbelt Act, 2005*.

3.0 Watermain Additions, Modifications, Replacements and Extensions

3.1 The drinking water system may be altered by adding, modifying, replacing or extending a watermain within the distribution system subject to the following conditions:

3.1.1 The design of the watermain addition, modification, replacement or extension:

a) Has been prepared by a Professional Engineer;

b) Has been designed only to transmit water and has not been designed to treat water;

c) Satisfies the design criteria set out in the Ministry of the Environment publication “Watermain Design Criteria for Future Alterations Authorized under a Drinking Water Works Permit – March 2009”, as amended from time to time; and

d) Is consistent with or otherwise addresses, the design objectives contained within the Ministry of the Environment publication “Design Guidelines for Drinking Water Systems, 2008”, as amended from time to time.

3.1.2 The maximum demand for water exerted by consumers who are serviced by the addition, modification, replacement or extension of the watermain will not result in an exceedance of the rated capacity of a treatment subsystem or the maximum flow rate for a treatment subsystem component as specified in the licence, or the creation of adverse conditions within the drinking water system.

3.1.3 The watermain addition, modification, replacement or extension will not adversely affect the distribution system's ability to maintain a minimum pressure of 140 kPa at ground level at all points in the distribution system under maximum day demand plus fire flow conditions.

3.1.4 Secondary disinfection will be provided to water within the added, modified, replaced or extended watermain to meet the requirements of O. Reg. 170/03.

3.1.5 The watermain addition, modification, replacement or extension is wholly located within the municipal boundary over which the owner has jurisdiction.

3.1.6 The owner of the drinking water system consents to the watermain addition, modification, replacement or extension.

3.1.7 A Professional Engineer has verified in writing that the watermain addition, modification, replacement or extension meets the requirements of condition 3.1.1.

3.1.8 The owner of the drinking water system has verified in writing that the watermain addition, modification, replacement or extension meets the requirements of conditions 3.1.2 to 3.1.6.

3.2 The authorization for the addition, modification, replacement or extension of a watermain provided for in condition 3.1 does not include the addition, modification, replacement or extension of a watermain that:

3.2.1 Passes under or through a body of surface water, unless trenchless construction methods are used;

3.2.2 Has a nominal diameter greater than 750 mm;

3.2.3 Connects to another drinking water system; or

3.2.4 Results in the fragmentation of the drinking water system.

3.3 The verifications required in conditions 3.1.7 and 3.1.8 shall be:

3.3.1 Recorded on "Form 1 – Record of Watermains Authorized as a Future Alteration" as published by the Ministry of the Environment; and

3.3.2 Retained for a period of ten (10) years by the owner.

3.4 For greater certainty, the verification requirements set out in condition 3.3 do not apply to any addition, modification, replacement or extension in respect of the drinking water system which:

3.4.1 Is exempt from subsection 31(1) of the SDWA by subsection 9.(2) of O. Reg. 170/03; or

3.4.2 Constitutes maintenance or repair of the drinking water system.

3.5 The document or file referenced in Column 1 of Table 1 of Schedule A of this drinking water works permit that sets out watermains shall be retained by the owner and shall be

updated to include watermain additions, modifications, replacements and extensions within 12 months of the addition, modification, replacement or extension.

3.6 The updates required by condition 3.5 shall include watermain location relative to named streets or easements and watermain diameter.

4.0 Minor Modifications to the Drinking Water System

4.1 The drinking water system may be altered by modifying or replacing the following components:

4.1.1 Raw water, treatment process or treated water pumps;

4.1.2 Chemical metering or chemical handling pumps;

4.1.3 Valves;

4.1.4 Instrumentation and controls;

4.1.5 Cathodic corrosion protection; or

4.1.6 Spill containment works.

4.2 The drinking water system may be altered by replacing the following:

4.2.1 Raw water, treatment process or treated water piping within the treatment subsystem.

4.3 The modification or replacement of a drinking water system component set out in condition 4.1 or the replacement of a drinking water system component set out in condition 4.2 must not result in:

4.3.1 An exceedance of a treatment subsystem rated capacity or a treatment subsystem component maximum flow rate as specified in the licence;

4.3.2 The bypassing of any unit process within a treatment subsystem;

4.3.3 A deterioration in the quality of drinking water provided to consumers;

4.3.4 A reduction in the reliability or redundancy of any component of the drinking water system;

4.3.5 An negative impact on the ability to undertake compliance and other monitoring; or

4.3.6 An adverse effect on the environment.

4.4 The owner shall verify in writing that the modification or replacement of drinking water system components in accordance with conditions 4.1 and 4.2 has met the requirements of the conditions listed in condition 4.3.

4.5 The verifications required in condition 4.4 shall be:

4.5.1 Recorded on "Form 2 – Record of Minor Modifications or Replacements to the Drinking Water System" as published by the Ministry of the Environment; and

4.5.2 Retained for a period of ten (10) years by the owner.

4.6 For greater certainty, the verification requirements set out in conditions 4.4 and 4.5 do not apply to any modification or replacement in respect of the drinking water system which:

4.6.1 Is exempt from subsection 31(1) of the SDWA by subsection 9.(2) of O. Reg. 170/03; or

4.6.2 Constitutes maintenance or repair of the drinking water system.

4.7 The owner shall update any drawings maintained for the drinking water system to reflect the modification or replacement of the works, where applicable.

5.0 Equipment with Emissions to the Air

5.1 The drinking water system may be altered by adding, modifying or replacing any of the following drinking water system components that may discharge or alter the rate or manner of a discharge of a compound of concern to the atmosphere:

5.1.1 Any equipment, apparatus, mechanism or thing that is used for the transfer of outdoor air into a building or structure that is not a cooling tower;

5.1.2 Any equipment, apparatus, mechanism or thing that is used for the transfer of indoor air out of a space used for the production, processing, repair, maintenance or storage of goods or materials, including chemical storage;

5.1.3 Laboratory fume hoods used for drinking water testing, quality control and quality assurance purposes;

5.1.4 Low temperature handling of compounds with a vapor pressure of less than 1 kilopascal;

5.1.5 Maintenance welding stations;

5.1.6 Minor painting operations used for maintenance purposes;

5.1.7 Parts washers for maintenance shops;

5.1.8 Emergency chlorine and ammonia gas scrubbers;

5.1.9 Venting for activated carbon units for drinking water taste and odour control;

5.1.10 Venting for a stripping unit for methane removal from a groundwater supply;

5.1.11 Natural gas or propane fired boilers, water heaters, space heaters and make-up air units with a total facility-wide heat input rating of less than 20 million kilojoules per hour, and with an individual fuel energy input of less than or equal to 10.5 gigajoules per hour; and

5.1.12 Emergency generators that fire No. 2 fuel oil (diesel fuel) with a sulphur content of 0.5 per cent or less measured by weight, natural gas, propane, gasoline or biofuel, and that are used for emergency duty only with periodic testing.

5.2 The owner shall not add, modify or replace a drinking water system component set out in condition 5.1 for an activity that is not directly related to the treatment and distribution of drinking water.

5.3 The emergency generators identified in condition 5.1.12 shall not be used for non-emergency purposes including the generation of electricity for sale or for peak shaving purposes.

5.4 The owner shall prepare an emission summary table for nitrogen oxide emissions only, for each addition, modification or replacement of emergency generators identified in condition 5.1.12.

Performance Limits

5.5 The owner shall ensure that a drinking water system component identified in conditions 5.1.1 to 5.1.12 is operated at all times to comply with the following limits:

5.5.1 For equipment other than emergency generators, the maximum concentration of any compound of concern at a point of impingement shall not exceed the corresponding point of impingement limit;

5.5.2 For emergency generators, the maximum concentration of nitrogen oxides at sensitive populations shall not exceed the applicable point of impingement limit, and at non-sensitive populations shall not exceed the Ministry of the Environment half-hourly screening level of 1880 ug/m^3 as amended;

5.5.3 The noise emissions comply at all times with the limits set out in publication NPC-205 and/or publication NPC-232, as applicable; and

5.5.4 The vibration emissions comply at all times with the limits set out in publication NPC-207.

5.6 The owner shall verify in writing that any addition, modification or replacement of works in accordance with condition 5.1 has met the requirements of the conditions listed in condition 5.5.

5.7 The owner shall document how compliance with the performance limits outlined in 5.5.3 and 5.5.4 is being achieved, through noise abatement equipment and/or operational procedures.

5.8 The verifications required in condition 5.6 shall be:

5.8.1 Recorded on “Form 3 – Record of Addition, Modification or Replacement of Equipment Discharging a Contaminant of Concern to the Atmosphere” as published by the Ministry of the Environment.

5.8.2 Retained for a period of ten (10) years by the owner.

5.9 For greater certainty, the verification requirements set out in conditions 5.6 and 5.8 do not apply to any addition, modification or replacement in respect of the drinking water system which:

5.9.1 Is exempt from subsection 31(1) of the SDWA by subsection 9.(2) of O. Reg. 170/03; or

5.9.2 Constitutes maintenance or repair of the drinking water system.

5.10 The owner shall update any drawings maintained for the works to reflect the addition, modification or replacement of the works, where applicable.

6.0 Previously Approved Works

6.1 The owner may add, modify, replace or extend, and operate part of a municipal drinking water system if:

6.1.1 An approval was issued after January 1, 2004 under section 36 of the SDWA in respect of the addition, modification replacement or extension and operation of that part of the municipal drinking water system;

6.1.2 The approval expired by virtue of subsection 36(4) of the SDWA; and

6.1.3 The addition, modification, replacement or extension commenced within five years of the date that activity was approved by the expired approval.

Ontario

RETAIN COMPLETED FORM
DO NOT SEND TO MOE

Form 1 – Record of Watermains Authorized as a Future Alteration

Part 1 – Drinking Water Works Permit Number: _____

(Insert the Drinking Water Works Permit number authorizing the addition, modification, replacement or extension of watermains)

Part 2 – Description of watermain addition, modification, replacement or extension (Use attachments if required)

The description shall include:

1) A brief description above of the undertaking (e.g. street name(s); subdivision name; project name); and
2) An attachment including a plan view drawing identifying at a minimum:
   a) location(s) of the undertaking (e.g. showing street names, easements, etc.); and
   b) nominal diameter of the watermain(s) associated with the addition, modification, replacement or extension.

Part 3 – Verification by Professional Engineer

I hereby verify that I am a Professional Engineer who is licensed to practice in the Province of Ontario and the design of the watermain addition, modification, replacement or extension:

1) Has been prepared by a Professional Engineer who is licensed to practice in the Province of Ontario;
2) Has been designed only to transmit water and has not been designed to treat water;
3) Satisfies the design criteria set out in the Ministry of the Environment publication "Watermain Design Criteria for Future Alterations Authorized under a Drinking Water Works Permit – March 2009", as amended from time to time; and
4) Is consistent with or otherwise addresses, the design objectives contained within the Ministry of the Environment publication "Design Guidelines for Drinking Water Systems, 2008", as amended from time to time.

Name: (Print) _____ Signature: _____

PEO Licence Number: _____ Date: _____

Part 4 – Verification by Owner

I hereby verify that:

1) The maximum demand for water exerted by consumers who are serviced by the addition, modification, replacement or extension of the watermain will not result in an exceedance of the rated capacity of a treatment subsystem or the maximum flow rate for a treatment subsystem component as specified in the licence, or the creation of adverse conditions within the drinking water system;
2) The watermain addition, modification, replacement or extension will not adversely affect the distribution system's ability to maintain a minimum pressure of 140 kPa at ground level at all points in the distribution system under maximum day demand plus fire flow conditions.
3) Secondary disinfection will be provided to water within the added, modified, replaced or extended watermain to meet the requirements of O. Reg. 170/03;
4) The watermain addition, modification, replacement or extension is wholly located within the municipal boundary over which the owner has jurisdiction;
5) The owner consents to the watermain addition, modification, replacement or extension; and
6) I am authorized by the owner to complete this verification.

Name of Owner: (Print) _____

Name: (Print) _____ Signature: _____
Owner Representative

Date: _____

Ontario

RETAIN COMPLETED FORM
DO NOT SEND TO MOE

Form 2 – Record of Minor Modifications or Replacements to the Drinking Water System

Part 1 – Drinking Water Works Permit Number: _____

(Insert the Drinking Water Works Permit number authorizing minor modifications or replacements to the Drinking Water System)

Part 2 – Description of Minor Modifications or Replacements (Use attachments if required)

The description shall include:
1) An identification of the system component being modified or replaced;
2) The location of the works being modified or replaced; and
3) A brief description of the modification or replacement.

Part 3 – Verification by Owner

I hereby verify that:

1) The minor modifications or replacements described in Part 2 of this form meets the requirements of the conditions of the Drinking Water Works Permit identified in Part 1 of this form which authorizes the minor modifications or replacements; and
2) I am authorized by the owner to complete this verification.

Name of Owner: (Print) _____

Name: (Print) _____ Signature: _____
Owner Representative

Date: _____

Ontario

RETAIN COMPLETED FORM
DO NOT SEND TO MOE

Form 3 – Record of Addition, Modification or Replacement of Equipment Discharging a Contaminant of Concern to the Atmosphere

Part 1 – Drinking Water Works Permit Number: _____

(Insert the Drinking Water Works Permit number authorizing the addition, modification or replacement of equipment discharging a contaminant of concern to the atmosphere)

Part 2 – Description of Equipment Added, Modified or Replaced (Use attachments if required)

The description shall include:

1) *A brief description of the undertaking; and*
2) *An attachment including a plan view drawing identifying at a minimum the location of the undertaking and the location of the stack or vent discharging to the atmosphere*

Part 3 – Verification by Owner

I hereby verify that:

1) The addition, modification or replacement of equipment discharging a contaminant of concern to the atmosphere described in Part 2 of this form meets the requirements of the conditions of the Drinking Water Works Permit identified in Part 1 which authorizes the addition, modification or replacement;
2) Where required, an Emission Summary Table was prepared by a Professional Engineer who is licensed to practice in the Province of Ontario; and
3) I am authorized by the owner to complete this verification.

Name of Owner: (Print) _____

Name: (Print) _____ Signature: _____
Owner Representative

Date: _____