

APPENDIX "G"



DRINKING WATER WORKS PERMIT

Permit Number: 014-201

Issue Number: 6

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 Corporation of the City of Barrie

**70 Collier Street
P.O. Box 400
Barrie, ON L4M 4T5**

For the following municipal residential drinking water system:

Barrie 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 16th day of October, 2014

Signature

A handwritten signature in black ink that reads "A. Ahmed". The signature is written in a cursive style and is underlined with a single horizontal line.

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

Schedule A: Drinking Water System Description

System Owner	The Corporation of the City of Barrie
Permit Number	014-201
Drinking Water System Name	Barrie Drinking Water System
Schedule A Issue Date	October 16, 2014

1.0 System Description

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

Overview

The **Barrie Drinking Water System** consists of one (1) surface water treatment plant, twelve (12) groundwater wells, seven (7) booster pumping stations, three (3) in-ground storage reservoirs, three (3) elevated storage tanks, and approximately 620 kilometers of watermains and transmission mains.

Barrie Drinking Water System

Water Supply Plant

- Surface Water Treatment Plant

Groundwater Wells

- Well 3A
- Well 5
- Well 7
- Well 9
- Well 11
- Well 12
- Well 13
- Well 14
- Well 15
- Well 16
- Well 17
- Well 18

Booster Pumping Stations

- Anne North Booster Pump Station
- Big Bay Point Booster Pump Station
- Codrington Booster Pump Station
- Harvie Road Booster Pump Station
- Innisfil Booster Pump Station
- Leacock Booster Pump Station
- Sunnidale Road Booster Pumping Station

Storage Reservoirs

- Anne Street North In-ground Reservoir
- Harvie Road At-Grade Water Reservoir
- Sunnidale Road Reservoir

Elevated Storage Tanks

- Bayfield Elevated Water Reservoir
- Ferndale North Elevated Water Reservoir
- Mapleview Elevated Water Reservoir

Surface Water Treatment Plant

Site Description

Name	City of Barrie Surface Water Treatment Plant
Street Address	20 Royal Parkside Drive, Barrie ON L4M 0C4
UTM Coordinates	NAD 83, Zone 17, +/- 3.0 m, 4913080 m N, 609500 m E
System Type	Surface water treatment
Notes	N/A

Surface Water Supply

Intake Pipe

Description	Raw water intake pipe equipped with screened intake structure and raw water sample line extending into Kempenfelt Bay
Dimensions	A 1525 mm nominal diameter pipe extending approximately 750 metres at a depth of approximately 26 m into the Kempenfelt Bay
Mussel Control	A mussel control system utilizing a chlorine gas system to inject chlorine at the intake using two (2) 50 mm HDPE carrier lines (one duty, one standby) extending the length of the intake, terminating in a diffuser at the intake structure
Intake Sampling System	Total chlorine residual and pH sampled at the intake structure downstream of the chlorine injection location and at the raw water header
	Turbidity and temperature sampled at the intake structure upstream of the chlorine injection location
Notes	N/A

Secondary Intake Pipe

Description	A second incomplete raw water intake pipe with provision for a chlorine solution injection line for mussel control and a raw water sample line, for future use if required
Dimensions	A 1525 mm nominal diameter pipe extending approximately 150 metres (terminated with a blind flange)
Notes	N/A

Low Lift Works

Low Lift Pumping Station

Location	23 Camelot Square, Barrie ON
UTM Coordinates	NAD 83, UTM Zone 17, 609040 m E, 4913821 m N
Description	One (1) 20 m diameter by 14 m deep in-ground wet well structure with two (2) interconnected raw water wet well cells of equal size, with provision to isolate each cell through one (1) 1200 mm by 1800 mm isolation sluice gate. Each cell equipped with one (1) 1200 mm by 1800 mm inlet sluice gate
Equipment	One (1) travelling screen and one (1) fixed screen, one in each wet well cell, with a mesh opening size of 9.5 mm One (1) duty 900 mm discharge header complete with a 600 mm magnetic flow meter and surge/pressure relief valves and one (1) standby 900 mm discharge header complete with a 600 mm magnetic flow meter and surge/pressure relief valves, both connected to 900 mm and 600 mm raw water mains
Pumps	Two (2) variable speed vertical turbine raw water pumps, each rated at 31.5 ML/d at 55 m TDH One (1) variable speed vertical turbine raw water pump rated at 15.75 ML/d at 49 m TDH One (1) constant speed vertical turbine raw water pump rated at 15.75 ML/d at 49 m TDH
Chlorine	A chlorine gas system used for pre-chlorination (mussel control) and disinfection located at the low lift pumping station in one tonne chlorine gas cylinders and stored in a chlorine gas storage room A dry type chlorine gas scrubber capable of neutralizing 200 kg/min of chlorine gas or one (1) complete one tonne chlorine gas cylinder
Notes	N/A

Strainers

Membrane Feed Strainers

Description	Two (2) self-cleaning strainers (one duty, one standby) with mesh openings of 0.5 mm
Notes	Hydraulic pressure differential indicates need for cleaning

Flocculation

Flocculation Tanks

Description	A flocculation system consisting of two (2) basins, each with two (2) compartments. Each compartment containing one mechanical mixer
Dimensions	Each basin with a total storage volume of 670 m ³
Monitoring	A sampling station complete with temperature transmitter, turbidity analyzer and pH analyser located immediately upstream of the dynamic mixer One (1) ultrasonic level sensor located in the flocculation inlet channel
Notes	N/A

Primary Membrane Filtration

Filters

Description	A total of five (5) trains for a total firm production of 60 ML/day
Pumps	Five (5) variable speed centrifugal type permeate pumps (one per train), each pump capable of delivering 1,012 m ³ /hour with a TDH of 15.8 m, complete with a magnetic flow meter and a sampling station on each permeate discharge monitoring turbidity and a particle counter on the combined primary permeate header Two (2) recirculation pumps (one duty, one standby) capable of delivering 214 m ³ /hour at a TDH of 8.1 m to transfer membrane cleaning solution into the membrane tanks and to complete neutralization within the neutralization tanks. The recirculation pumps are shared with the secondary membrane system Two (2) heated water recirculation pumps (one duty, one standby) to circulate water within the membrane tank during a recovery clean and capable of delivering 18 m ³ /hour at a TDH of 10 m. The pumps are shared with the secondary membrane system Two (2) backpulse pumps, (one duty, one standby) capable of delivering 1,012 m ³ /hour with a TDH 16.1 m to draw water from the backpulse tanks and to reverse flow through the primary membranes to remove foulants
Tanks	Two (2) concrete equalization tanks (one duty, one standby) with volumes of 685 m ³ (Equalization tank #1) and 875 m ³ (Equalization Tank #2) used for primary membrane backwash water and GAC backwash water storage. Each tank is equipped with an ultrasonic level sensor Two (2) concrete neutralization tanks (one duty, one standby) with the dimensions of 2.4 m by 3.6 m by 4.7 m high and an operating volume of 35 m ³ for the neutralization of the membrane cleaning solution, and heating of water for the membrane heated cleans. Each tank is shared with the secondary membrane system and equipped with an ultrasonic level sensor
Heat Cleaning System	Heated cleaning system utilizing hot water from the building services boilers through a heat exchanger, and comprised of air separators, pressure and temperature gauges, pressure and flow switches and associated valves and piping. The heated cleaning system is shared with the secondary membrane system

Air Compressors	Two (2) air compressors (one duty, one standby) for providing compressed air to the pneumatic valves. The air compressors are shared with the secondary membrane system
Air Blowers	Two (2) air blowers (one duty, one standby) capable of delivering approximately 1100 Nm ³ /h for providing scouring air to the membrane tanks during backwashes and chemical cleans
Air Removal System	Ejector on each primary membrane header to evacuate air from the system
Primary Membrane Feed Channel	One (1) concrete primary membrane feed channel equipped with two (2) ultrasonic level sensors
Monitoring	Operating interface that monitors membrane integrity testing, log reduction value criteria, filtrate turbidity measurements, particulate counts, maintenance clean sequences and operating pressures
Notes	N/A

Secondary Membrane Filtration

Filters

Description	Two (2) trains each with a production rate of 3.3 ML/day
Pumps	Two (2) variable speed centrifugal type permeate pumps (one per train) capable of delivering 1.58 ML/d each, complete with a magnetic flow meter and a sampling station on each permeate discharge pipe monitoring turbidity and a particulate counter on the combined secondary permeate header
Tanks	Two (2) concrete waste tanks (one duty, one standby) with the dimensions of 5.0 m by 3.2 m by 4.7 m high and 7.0 m by 3.0 m by 4.7 m high, used for temporary storage of secondary membrane backwash water, neutralized secondary membrane chemical waste and flocculation drain lines. Each tank is equipped with an ultrasonic level sensor. Turbidity and total suspended solids analyzers are located at the combined discharge of the waste tanks to sewer
Air Blowers	Two (2) air blowers (one duty, one standby) capable of delivering approximately 1100 Nm ³ /h for providing scouring air to the membrane tanks during backwashes and chemical cleans
Air Removal System	Ejectors are located on each secondary membrane header to evacuate air from the system
Secondary Membrane Feed Channel	One (1) concrete secondary membrane feed channel equipped with one (1) ultrasonic level sensor
Monitoring	Operating interface that monitors membrane integrity testing, log reduction value criteria, filtrate turbidity measurements, particulate counts, maintenance clean sequences and operating pressures
Notes	N/A

Granular Activated Carbon Contractors

Dimensions	Three (3) granular activated carbon contactors, with a total carbon volume of 120 m ³
Backwash Pumps	Two (2) backwash pumps (one duty, one standby) capable of delivering 44 ML/day at a TDH of 12 m.
Notes	N/A

Chlorine Contact Chamber/On-Site Storage**Reservoir**

Chlorine Contact Tank	Two (2) 5 ML chlorine contact tanks, each tank directly joined to the adjacent reservoir cells via a weir and equipped with a 450 mm magnetic flow meter and an ultrasonic level sensor
	A sampling station at the weir capable of monitoring pH and free chlorine
In-ground reservoir	Two (2) 5 ML inground interconnected reservoirs, complete with baffles and equipped with an ultrasonic level sensor for monitoring water levels in the reservoir
Notes	N/A

High Lift Works**High Lift Pumps**

Description	Six (6) fixed speed vertical turbine pumps to provide a firm capacity of 72 ML/day (described below)
Pumps	Two (2) constant speed high lift pumps each rated at 29 ML/day, at a TDH of 65.5 m
	Three (3) constant speed high lift pumps each rated at 14.5 ML/day at a TDH of 65.5 m
	One (1) constant speed high lift pump rated at 7.0 ML/day at a TDH of 65.5 m for use during low demand periods
Sampling	A sampling station on the discharge of the high lift header capable of monitoring pH, temperature, free chlorine and turbidity
Notes	One (1) 900 mm discharge header complete with a 600 mm magnetic flow meter and surge/pressure relief valve and one (1) standby 900 mm discharge header complete with a 600 mm magnetic flow meter and surge/pressure relief valve, both connected to a 1200 mm watermain

Standby Power

Equipment	One (1) 2,000 kW diesel fired generator with a 25,000 L fuel tank to provide standby power requirements for Phase 1. The generator also supplies power to the low lift pumping station via a 13.8 kV feeder
Notes	N/A

Chemical Addition

Coagulant

Description	Coagulant dosing system
Feed Point	Coagulant added and mixed after the strainers using a 900 mm inline dynamic mixer
Equipment	Two (2) coagulant storage tanks 25,000 L each, complete with spill containment
	Two (2) peristaltic dosing pumps (one duty, one standby) capable of providing the appropriate dosage
Notes	N/A

Sulphuric Acid

Description	Sulphuric acid dosing system
Equipment	Two (2) sulphuric acid storage tanks, 25,000 L each, complete with spill containment
	Two (2) peristaltic dosing pumps (one duty, one standby) capable of providing the appropriate dosage
Notes	N/A

Sodium Hypochlorite

Description	Sodium Hypochlorite dosing system
Equipment	One (1) 1,000 L sodium hypochlorite storage tank and tote, spill containment
	Two (2) peristaltic dosing pumps (one duty, one standby) capable of providing the appropriate dosage
Notes	N/A

Sodium Hydroxide

Description	Sodium Hydroxide dosing system
Equipment	One (1) 1,000 L sodium hydroxide storage tank and tote, spill containment
	Two (2) peristaltic dosing pumps (one duty, one standby) capable of providing the appropriate dosage
Notes	N/A

Citric Acid

Description	Citric acid dosing system
Equipment	One (1) 1,000 L citric acid storage tank and tote, spill containment
	Two (2) peristaltic dosing pumps (one duty, one standby) capable of providing the appropriate dosage
Notes	N/A

Calcium Thiosulfate

Description	Calcium thiosulphate dosing system
Equipment	One (1) 1,000 L calcium thiosulphate storage tank and tote, spill containment
	Two (2) peristaltic dosing pumps (one duty, one standby) for membrane cleaning neutralization capable of delivering the appropriate dosage
	Two (2) peristaltic dosing pumps (one duty, one standby) for emergency plant overflow dechlorination capable of delivering the appropriate dosage
Notes	N/A

Chlorine

Description	A chlorine gas system used for primary and secondary disinfection
Primary Feed Point	The chlorine contact tank inlet at surface water treatment plant
Secondary Feed Point	The high lift discharge header prior to entry to the distribution system at the surface water treatment plant
Equipment	Chlorine gas held in one tonne cylinders and stored in a chlorine storage room
	A dry type chlorine gas scrubber capable of neutralizing 200 kg/min of chlorine gas or one (1) complete one tonne chlorine gas cylinder
Notes	N/A

Groundwater Wells

Well 3A, Anne Street

Location	54 Anne Street South, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 603383 m, Northing 4914769 m
WWR No.	5732108
Description	Drilled groundwater well, pumphouse and appurtenances
Source Type	Non-GUDI
Dimensions	610 mm diameter, 107 m deep
Equipment	<p>Vertical turbine pump rated at 75.7 L/s, 47.2 m TDH</p> <p>200 mm diameter discharge line and magnetic flowmeter connected to the well pump header and to the Chlorine Contact Chamber</p> <p>One (1) vertical turbine high lift water pump, with a rated capacity of 75.7 L/s at a TDH of 64.9 m with a 200 mm diameter discharge line and magnetic flowmeter connected to the distribution system</p> <p>Continuous on-line free chlorine residual and turbidity analyzers, including alarms, to monitor continuous chlorine disinfection prior to entry into the distribution system, including interlock between the chlorine analyzer and high lift pump to shut down the pump on low free chlorine residual</p> <p>Appurtenances including a pump control valve and process piping</p> <p>Associated SCADA, electrical, mechanical, and controls for an operable system</p>
Chlorine Disinfection	<p>A chlorine disinfection system in a separate room in the pumphouse, consisting of two (2) chlorine gas cylinders including weigh scales, automatic switchover regulators, an automated control valve and with an injector (located in the pump room) with a feed line discharging into the well pump header prior to entry into the Chlorine Contact Chamber</p> <p>A single cell, in-ground Chlorine Contact Chamber having a minimum usable storage volume of 182 m³, an ultrasonic liquid level transmitter with alarms, goose necked vents complete with insect screen overflow complete with air gap, and vandal proof water tight access hatchways, dedicated to provide the required CT prior to the first customer</p>
Iron and Manganese Sequestering	An iron and manganese sequestering system utilizing a sodium silicate sequestering agent, consisting of a 2,788 L capacity storage tank, within a fabricated steel crib for secondary containment, and one (1) automated chemical metering pump with a feed line system discharging into the well pump header prior to entry into the Chlorine Contact Chamber
Stand-by Power	None
Notes	N/A

Well 5, John Street

Location	217 John Street, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 602923 m and Northing 4914271 m
WWR No.	5700271
Description	Drilled groundwater well, pumphouse and appurtenances
Source Type	Non-GUDI
Dimensions	660 mm diameter, 106 m deep
Equipment	<p>One vertical turbine well pump rated at 75.7 L/s, 76.8 m TDH, located in the well pumphouse with a 200 mm diameter discharge line connected to the well pump header and magnetic flow meter prior to entry into the distribution system</p> <p>Continuous on-line free chlorine residual and turbidity analyzers, located in the well pumphouse, including alarms to monitor continuous chlorine disinfection prior to entry into the distribution system including interlock between the continuous chlorine residual analyzer and the vertical turbine well pump to shut down the vertical turbine well pump on low free chlorine residual</p> <p>Appurtenances and process piping, including a pump to waste connection, magnetic flowmeter and chemical injection points, prior to entry into the dedicated chlorine contact pipe</p> <p>Associated SCADA, electrical, mechanical and controls for an operable system</p>
UV Primary Disinfection	<p>Primary disinfection provided by a UV system (for a groundwater raw water supply in accordance with O. Reg. 170/03) composed of a UV reactor and a UV control cabinet. The UV reactor is a 300 mm cross flow design with four (4) medium pressure high intensity (MPHI) lamps, each MPHI lamp is equipped with a dedicated UV intensity sensor calibrated for 254 nm wave length. The MPHI lamps are housed in a quartz sleeve fitted with an automatic cleaning mechanism. The UV disinfection system is designed to provide a dosage of 40 mJ/cm² with a minimum UV transmittance of 85% and a maximum flow rate of 75.7 L/s. The UV control cabinet contains four (4) ballasts (1 ballast per each MPHI lamp) and maintains the UV dosage including controls and alarms to monitor continuous UV disinfection prior to entry into the distribution system including interlock between the UV monitors and vertical turbine well pump to shut down the vertical turbine well pump on low UV disinfection</p>
Chlorine Secondary Disinfection	<p>A secondary paced to flow disinfection system in a separate room in the well pumphouse, consisting of two (2) chlorine gas cylinders including weigh scales, automatic switchover regulators injector, an automated control valve and a feed line and chlorine booster pump discharging into the well pump header in the well pumphouse prior to entry into the distribution system</p>
Iron and Manganese Sequestering	<p>An iron and manganese sequestering system in the well pumphouse, utilizing a sodium silicate sequestering agent, consisting of a 4,540 L capacity double wall storage tank, with vacuum monitoring for secondary containment, and one automated chemical metering pump with a feed line system discharging into the well pump header in the well pumphouse prior to the entry into the distribution system</p>
Stand-by Power	<p>A 130 kW standby diesel generator complete with automatic transfer switch and one 1,135 L capacity diesel fuel storage tank and concrete containment crib. Standby power provided is sufficient to maintain full operation of the facility</p>
Notes	N/A

Well 7, Sarjeant Drive

Location	44 Sarjeant Drive, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 602484 m and Northing 4914187 m
WWR No.	5709125
Description	Drilled groundwater well, pumphouse and appurtenances
Source Type	Non-GUDI
Dimensions	762 mm diameter, 100.7 m deep
Equipment	<p>One vertical turbine well pump rated at 75.7 L/s at a TDH of 82.3 m located in the well pumphouse with a 200 mm diameter discharge line connected to the well pump header and magnetic flow meter prior to entry into the dedicated Chlorine Contact Pipe</p> <p>Continuous on-line free chlorine residual and turbidity analyzers, located in the well pumphouse, including alarms to monitor continuous chlorine disinfection prior to entry into the distribution system including interlock between the continuous chlorine residual analyzer and the vertical turbine well pump to shut down the vertical turbine well pump on low free chlorine residual</p> <p>Appurtenances including pump control valve and process piping</p> <p>Associated SCADA, electrical, mechanical and controls for an operable system</p>
Chlorine Disinfection	<p>A paced to flow disinfection system in a separate room in the well pumphouse, consisting of two (2) chlorine gas cylinders including weigh scales, automatic switchover regulators injector, an automated control valve and a feed line and chlorine booster pump discharging into the well pump header in the well pumphouse prior to entry into the dedicated Chlorine Contact Pipe</p> <p>An in-ground dedicated Chlorine Contact Pipe, 2,100 mm diameter and 30.5 m long, located adjacent to the well pumphouse, including five (5) perforated baffle walls, vandal proof water tight access hatchways; dedicated to provide the required CT prior to the first customer</p>
Iron and Manganese Sequestering	A paced to flow iron and manganese sequestering system in the well pumphouse, utilizing a sodium silicate sequestering agent, consisting of a 4,540 L capacity double wall storage tank, with vacuum monitoring for secondary containment, and one automated chemical metering pump with a feed line system discharging into the well pump header in the well pumphouse prior to the entry into the dedicated Chlorine Contact Pipe
Stand-by Power	A 130 kW standby diesel generator complete with automatic transfer switch and one 1,135 L capacity diesel fuel storage tank and concrete containment crib. Standby power provided is sufficient to maintain full operation of the facility
Notes	N/A

Well 9, Johnson Street

Location	168 Johnson Street, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 607034 m and Northing 4917647 m
WWR No.	5712496
Description	Drilled groundwater well, pumphouse and appurtenances
Source Type	Non-GUDI
Dimensions	610 mm diameter, 93 m deep
Equipment	<p>A vertical turbine well pump, rated at 75.7 L/s at a TDH of 48.8 m, with a 250 mm diameter discharge line and magnetic flowmeter connected to the well pump header to the Chlorine Contact Chamber</p> <p>One (1) vertical turbine high lift water pump, with a rated capacity of 75.7 L/s at a TDH of 85 m with a 200 mm diameter discharge line and magnetic flowmeter, shared with the Well 13 high lift pump, connected to the distribution system</p> <p>Continuous on-line free chlorine residual and turbidity analyzers, including alarms, to monitor continuous chlorine disinfection prior to entry into the distribution system, including interlock between the chlorine analyzer and the high lift pump to shut down the pump on low free chlorine residual</p> <p>Appurtenances including pump control valve and process piping</p> <p>Associated SCADA, electrical, mechanical, and controls for an operable system</p>
Chlorine Disinfection	<p>A paced to flow disinfection system in a separate room in the pumphouse, consisting of two (2) chlorine gas cylinders including weigh scales and automatic switchover regulators, and with an injector (located in the pump room), an automated control valve and with a feed line discharging into the well pump header prior to entry into the Chlorine Contact Chamber</p> <p>A twin cell, in-ground Chlorine Contact Chamber having a minimum one (1) cell usable storage volume of 182 m³ including baffle walls, dedicated to Well 9 that provides the required CT prior to the first customer</p>
Iron and Manganese Sequestering	A paced to flow iron and manganese sequestering system utilizing a sodium silicate sequestering agent, consisting of an 8,000 L capacity storage tank, shared with Well 13, within a concrete crib for secondary containment, and one (1) dedicated automated chemical metering pump with a feed line system discharging into the well pump header prior to entry into the Chlorine Contact Chamber
Stand-by Power	A 300 kW standby diesel generator operated for either the Well 9 or Well 13 well pump and their associated systems (the other will be locked out), complete with automatic transfer switch and one (1) 900 L diesel fuel storage tank and concrete crib containment located in the Well 13 pumphouse
Notes	Second cell of in-ground Chlorine Contact Chamber is dedicated to Well 13 treatment under normal operating conditions

Well 11, Heritage Park

Location	5 Simcoe Street, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 604692 m and Northing 4915824 m
WWR No.	5719246
Description	Drilled groundwater well, pumphouse and appurtenances
Source Type	Non-GUDI
Dimensions	610 mm diameter, 61.2 m deep
Equipment	<p>A vertical turbine well pump, rated at 105.3 L/s at a TDH of 114.9 m with a 250 mm diameter discharge line and magnetic flowmeter connected to the well pump header to the supply main through a chlorine contact chamber of 18.3 m in length and 2.1 m in diameter</p> <p>Appurtenances including gate valve and process piping</p> <p>Associated SCADA, electrical, mechanical, and controls for an operable system</p>
Chlorine Disinfection	<p>A paced to flow disinfection system consisting of two (2) chlorine gas cylinders including weigh scales, automatic switchover regulators, an injector and chlorine booster pump (located in the pump room), an automated control valve and with a feed line discharging into the well pump header prior to entry into the supply main to the Simcoe Street Chlorine Contact Chamber</p> <p>An in-ground chlorine contact chamber, 2.1 m diameter and 18.3 m long equipped with baffles and vandal proof water tight hatchway, located approximately 22 m north of the well</p>
Iron and Manganese Sequestering	A paced to flow iron and manganese sequestering system utilizing a sodium silicate sequestering agent, consisting of a 2,788 L capacity storage tank, within a fabricated steel crib for secondary containment and one (1) automated chemical metering pump with a feed line system discharging into the well pump header prior to entry into the supply main to the Simcoe Street Chlorine Contact Chamber
Stand-by Power	A 350 kW standby diesel generator operated for either the Well 11 or Well 14 well pump and their associated systems (the other will be locked out), complete with automatic transfer switch and one (1) 1,135 L diesel fuel storage tank and concrete crib containment located in the Well 14 pumphouse. Standby power provided is sufficient to maintain full operation of Well 11 or Well 14 but not both
Notes	N/A

Well 12, Centennial Park

Location	85 Lakeshore Drive, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 604479 m and Northing 4914589 m
WWR No.	5720696
Description	Drilled groundwater well, pumphouse and appurtenances
Source Type	Non-GUDI
Dimensions	762 mm diameter, 84 m deep
Equipment	<p>A vertical turbine well pump, rated at 105.3 L/s at a TDH of 127.1 m, with a 300 mm diameter discharge line and magnetic flowmeter connected to the well pump header to the Chlorine Contact Pipe</p> <p>Continuous online free chlorine residual and turbidity analyzers, including alarms, to monitor continuous chlorine disinfection prior to entry into the chlorine contact/transmission main, including interlock between the chlorine analyzer and the well pump to shut down the pump on low free chlorine residual</p> <p>Appurtenances and process piping including a pump to waste connection, magnetic flowmeter and chemical injection points, prior to entry into the dedicated chlorine contact pipe</p> <p>Associated SCADA, electrical, mechanical, and controls for an operable system</p>
Chlorine Disinfection	<p>A paced to flow disinfection system in a separate room in the pumphouse, consisting of two (2) chlorine gas cylinders including weigh scales, automatic switchover regulators, an automated control valve and with an injector and chlorine booster pump (located in the pump room) with a feed line discharging into the well pump header prior to entry into the Chlorine Contact Pipe</p> <p>A minimum of 750 m of 600 mm diameter transmission main which is utilized as a Chlorine Contact Pipe with a combined rated pump capacity of approximately 316 L/s</p>
Iron and Manganese Sequestering	A paced to flow iron and manganese sequestering system utilizing a sodium silicate sequestering agent, consisting of a 2,788 L capacity storage tank, within a fabricated steel crib for secondary containment, and one (1) automated chemical metering pump with a feed line system discharging into the well pump header prior to entry into the Chlorine Contact Pipe
Stand-by Power	A 210 kW standby diesel generator complete with automatic transfer switch and one (1) 900 L diesel fuel storage tank and concrete crib containment. Standby power provided is sufficient to maintain full operation of the facility
Notes	N/A

Well 13, Johnson Street

Location	168 Johnson Street, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 607016 m and Northing 4917663 m
WWR No.	5724686
Description	Drilled groundwater well, pumphouse and appurtenances
Source Type	Non-GUDI
Dimensions	610 mm diameter, 97.8 m deep
Equipment	<p>A vertical turbine well pump, rated at 75.7 L/s at a TDH of 54.9 m, with a 250 mm diameter discharge line connected to the well pump header and magnetic flowmeter to a separate Chlorine Contact Chamber beneath the pumphouse building as referenced for Well 9 with a dedicated cell for the Well 13 supply</p> <p>One (1) sand separator rated at 75.7 L/s</p> <p>One (1) vertical turbine high lift water pump, with a rated capacity of 75.7 L/s at a TDH of 85 m with a 200 mm diameter discharge line and magnetic flowmeter, shared with the Well 9 high lift pump, connected to the distribution system</p> <p>Continuous online free chlorine residual and turbidity analyzers, including alarms, to monitor continuous chlorine disinfection prior to entry into the distribution system, including interlock between the chlorine analyzer and the high lift pump to shut down the pump on low free chlorine residual</p> <p>Appurtenances including pump control valve with isolation valve and process piping</p> <p>Associated SCADA, electrical, mechanical, and controls for an operable system</p>
Chlorine Disinfection	<p>A paced to flow disinfection system in a separate room in the pumphouse, shared with Well 9, consisting of two (2) chlorine gas cylinders including weigh scales, automatic switchover regulators, an automated control valve, and with an injector (located in the pump room) with a feed line discharging into the well pump header prior to entry into the Chlorine Contact Chamber</p> <p>A twin cell, in-ground Chlorine Contact Chamber having a minimum one (1) cell usable storage volume of 182 m³ including baffle walls, dedicated to Well 13 that provides the required CT prior to the first customer</p>
Iron and Manganese Sequestering	A paced to flow iron and manganese sequestering system utilizing a sodium silicate sequestering agent, consisting of an 8,000 L capacity storage tank, shared with Well 9, within a concrete crib for secondary containment, and one (1) automated dedicated chemical metering pump with a feed line system discharging into the well pump header prior to entry into the Chlorine Contact Chamber
Stand-by Power	A 300 kW standby diesel generator operated for either the Well 9 or Well 13 well pump and their associated systems (the other will be locked out), complete with automatic transfer switch and one (1) 900 L diesel fuel storage tank and concrete crib containment located in the Well 13 pumphouse and shared with Well 9. Standby power provided is sufficient to maintain full operation of Well 9 or Well 13 but not both
Notes	First cell of in-ground Chlorine Contact Chamber is dedicated to Well 9 treatment, under normal operating conditions

Well 14, Heritage Park

Location	19 Simcoe Street, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 604660 m and Northing 4915792 m
WWR No.	5727877
Description	Drilled groundwater well, pumphouse and appurtenances
Source Type	Non-GUDI
Dimensions	610 mm diameter, 61.1 m deep
Equipment	<p>A vertical turbine well pump, rated at 105.3 L/s at a TDH of 114.3 m, with a 300 mm diameter discharge line and magnetic flowmeter connected to the well pump header to the dedicated Chlorine Contact Pipe</p> <p>One (1) sand separator rated at 106.1 L/s</p> <p>Continuous online free chlorine residual and turbidity analyzers, including alarms, to monitor continuous chlorine disinfection prior to entry into the transmission main, including interlock between the chlorine analyzer and the well pump to shut down the pump on low free chlorine residual</p> <p>Appurtenances and process piping including a pump to waste connection, magnetic flowmeter and chemical injection points, prior to entry into the dedicated chlorine contact pipe</p> <p>Associated SCADA, electrical, mechanical, and controls for an operable system</p>
Chlorine Disinfection	<p>A paced to flow disinfection system in a separate room in the pumphouse, consisting of two (2) chlorine gas cylinders including weigh scales and automatic switchover regulators, an automated control valve, and with an injector and chlorine booster pump (located in the pump room) with a feed line discharging into the well pump header prior to entry into the dedicated Chlorine Contact Pipe</p> <p>Common 900 m of 450 mm diameter dedicated Chlorine Contact Pipe and 150 m of 400 mm diameter dedicated Chlorine Contact Pipe with a rated pump capacity of approximately 105 L/s</p>
Iron and Manganese Sequestering	A paced to flow iron and manganese sequestering system utilizing a sodium silicate sequestering agent, consisting of a 2,788 L capacity storage tank, within a fabricated steel crib for secondary containment, and one (1) automated chemical metering pump with a feed line system discharging into the well pump header prior to entry into the dedicated Chlorine Contact Pipe
Stand-by Power	A 350 kW standby diesel generator operated for either the Well 11 or Well 14 well pump and their associated systems (the other will be locked out) complete with automatic transfer switch and one (1) 1,135 L diesel fuel storage tank with concrete crib containment located in the Well 14 pumphouse and shared with Well 11. Standby power provided is sufficient to maintain full operation of Well 11 or Well 14 but not both
Notes	N/A

Well 15, Centennial Park

Location	55 Lakeshore Drive, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 604425 m and Northing 4915194 m
WWR No.	5728705
Description	Drilled groundwater well, pumphouse and appurtenances
Source Type	Non-GUDI
Dimensions	610 mm diameter, 61.1 m deep
Equipment	<p>A vertical turbine well pump, rated at 105.3 L/s at a TDH of 127.1 m, with a 300 mm diameter discharge line and magnetic flowmeter connected to the well pump header to the dedicated Chlorine Contact Pipe</p> <p>Continuous online free chlorine residual and turbidity analyzers, including alarms, to monitor continuous chlorine disinfection prior to entry into the chlorine contact/transmission main, including interlock between the chlorine analyzer and the well pump to shut down the pump on low free chlorine residual</p> <p>Appurtenances and process piping including a pump to waste connection, magnetic flowmeter and chemical injection points, prior to entry into the dedicated chlorine contact pipe</p> <p>Associated SCADA, electrical, mechanical, and controls for an operable system</p>
Chlorine Disinfection	<p>A paced to flow disinfection system in a separate room in the pumphouse, consisting of two (2) chlorine gas cylinders including weigh scales and automatic switchover regulators, an automated control valve and with an injector and chlorine booster pump (located in the pump room) with a feed line discharging into the well pump header prior to entry into the dedicated Chlorine Contact Pipe</p> <p>A minimum of 715 m of 500 mm and 600 mm Transmission Main that is utilized as Chlorine Contact Pipe, with a combined minimum pump capacity of 210 L/s.</p>
Iron and Manganese Sequestering	A paced to flow iron and manganese sequestering system utilizing a sodium silicate sequestering agent, consisting of a 200 L capacity storage tank, within a fabricated steel crib for secondary containment, and one (1) automated chemical metering pump with a feed line system discharging into the well pump header prior to entry into the dedicated Chlorine Contact Pipe
Stand-by Power	A 230 kW standby diesel generator complete with automatic transfer switch and one (1) 900 L diesel fuel storage tank and concrete crib containment. Standby power provided is sufficient to maintain full operation of the facility
Notes	N/A

Well 16, Brown Wood Drive

Location	101 Brown Wood Drive, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 604025 m and Northing 4919588 m
WWR No.	5733545
Description	Drilled groundwater well, pumphouse and appurtenances
Source Type	Non-GUDI
Dimensions	600 mm diameter, 74.7 m deep
Equipment	<p>A vertical turbine well pump, rated at 90.8 L/s at a TDH of 42.67 m, with a 300 mm diameter discharge line and magnetic flowmeter connected to the well pump header to the Chlorine Contact Chamber</p> <p>One (1) vertical turbine variable frequency drive high lift water pump, with a rated capacity of 90.8 L/s at a TDH of 82.55 m with a 300 mm diameter discharge line and magnetic flowmeter connected to the distribution system</p> <p>Continuous online free chlorine residual and turbidity analyzers, including alarms, to monitor continuous chlorine disinfection prior to entry into the distribution system, including interlock between the chlorine analyzer and the high lift pump to shut down the pump on low free chlorine residual</p> <p>Appurtenances including pump check valve and process piping</p> <p>Associated SCADA, electrical, mechanical, and controls for an operable system</p>
Chlorine Disinfection	<p>A paced to flow disinfection system in a separate room in the pumphouse, consisting of two (2) chlorine gas cylinders including weigh scales and automatic switchover regulators, with an injector, an automated control valve, and a feed line discharging into the well pump header prior to entry into the Chlorine Contact Chamber</p> <p>A single cell, in-ground Chlorine Contact Chamber having a minimum usable storage volume of 141 m³ including baffle walls, ultrasonic liquid level transmitter with alarms, goosenecked vents complete with insect screen overflow complete with air gap, vandal proof water tight access hatchways; dedicated to provide the required CT prior to the first customer</p>
Iron and Manganese Sequestering	A paced to flow iron and manganese sequestering system utilizing a sodium silicate sequestering agent, consisting of a 3,300 L capacity storage tank, within a fabricated steel crib for secondary containment, and one (1) automated chemical metering pump with a feed line system discharging into the well pump header prior to entry into the Chlorine Contact Chamber
Stand-by Power	A 275 kW standby diesel generator complete with automatic transfer switch and one (1) 948 L diesel fuel storage tank and concrete crib containment. Standby power provided is sufficient to maintain full operation of the facility
Notes	N/A

Well 17, Cross Street

Location	34 Cross Street, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 602045 m and Northing 4913788 m
WWR No.	5737406
Description	Drilled groundwater well, pumphouse and appurtenances
Source Type	Non-GUDI
Dimensions	600 mm diameter, 105.2 m deep
Equipment	A vertical turbine well pump rated at 130 L/s, 121 m TDH, located in the well pumphouse with a 250 mm diameter discharge line connected to the well pump header and magnetic flow meter prior to entry into the dedicated Chlorine Contact Pipe
	One sand separator rated at 130 L/s
	Continuous on-line free chlorine residual and turbidity analyzers for Well 17 located in the well pumphouse, including alarms to monitor continuous chlorine disinfection prior to entry into the dedicated Chlorine Contact Pipe including interlock between the continuous chlorine residual analyzer and the Well 17 vertical turbine well pump to shut down the vertical turbine well pump on low free chlorine residual
	A continuous on-line free chlorine residual and turbidity analyzer for Well 18 located in the well pumphouse, including alarms to monitor continuous chlorine disinfection prior to entry into the dedicated chlorine contact pipe including interlock between the continuous chlorine analyzer and the Well 18 vertical turbine pump to shut down the vertical turbine pump on low residual
	Appurtenances and process piping including a pump to waste connection, magnetic flowmeter and chemical injection points, prior to entry into the dedicated chlorine contact pipe
	Associated SCADA, electrical, mechanical and controls for an operable system
	Process piping, including magnetic flowmeter and chemical injection points, prior to entry into the dedicated Chlorine Contact Pipe
Chlorine Disinfection	A paced to flow disinfection system dedicated to Well 17, in a separate room shared with Well 18 works, in the well pumphouse, consisting of two (2) chlorine gas cylinders including weigh scales, automatic switchover regulators injector, an automated control valve and with a feed line and chlorine booster pump discharging into the Well 17 well pump header in the well pumphouse prior to entry into the dedicated Chlorine Contact Pipe
	A disinfection system for Well 18 in a separate room shared with Well 17 works pumphouse, consisting of two (2) chlorine gas cylinders including weigh scales, automatic switchover regulators, an injector, with a feed line discharging into the Well 18 pump header in the well pumphouse prior to entry into the dedicated Chlorine Contact Pipe
	432 m of dedicated Chlorine Contact Pipe, comprising of 600 mm diameter and 900 mm diameter, to provide the required CT prior to the first customer at the combined flow of 260 L/s from Well 17 and Well 18

Iron and Manganese Sequestering	A paced to flow iron and manganese sequestering system, in the well pumphouse, utilizing a sodium silicate sequestering agent, consisting of two 10,500 L capacity double walled storage tanks (one dedicated to Well 18), with vacuum monitoring for secondary containment, and two automated chemical metering pumps (one dedicated to Well 18), with a feed line system discharging into the Well 17 well pump header in the well pumphouse prior to entry into the dedicated Chlorine Contact Pipe
Stand-by Power	A 400 kW standby diesel generator, operated for either the Well 17 or Well 18 well pump and their associated systems (the other will be locked out), complete with automatic transfer switch and one 3,100 L capacity double walled diesel fuel storage tank, with vacuum monitoring for secondary containment. Standby power provided is sufficient to maintain full operation of Well 17 or Well 18 but not both

Well 18, Cross Street

Location	34 Cross Street, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 602013 m and Northing 4918140 m
WWR No.	5739442
Description	Drilled groundwater well, pumphouse and appurtenances
Source Type	Non-GUDI
Dimensions	600 mm diameter, 106.1 m deep
Equipment	<p>One vertical turbine well pump rated at 130 L/s at a TDH of 121 m located in the well pumphouse with a 250 mm diameter discharge line connected to 300 mm diameter yard piping discharging to process piping in the Well 17 pumphouse, including magnetic flowmeter, prior to entry into the dedicated Chlorine Contact Pipe</p> <p>Continuous on-line free chlorine residual and turbidity analyzers for Well 18, located in the Well 17 pumphouse, including alarms to monitor continuous chlorine disinfection prior to entry into the dedicated Chlorine Contact Pipe including interlock between the continuous chlorine residual analyzer and the Well 18 vertical turbine well pump to shut down the vertical turbine well pump on low free chlorine residual</p> <p>Appurtenances and process piping including a pump to waste connection, magnetic flowmeter and chemical injection points, prior to entry into the dedicated chlorine contact pipe</p> <p>Associated SCADA, electrical mechanical and controls for an operable system</p>
Chlorine Disinfection	<p>A paced to flow disinfection system dedicated to Well 18 in a separate room, shared with Well 17 works, in the Well 17 pumphouse, consisting of two (2) chlorine gas cylinders including weigh scales, automatic switchover regulators injector, an automated control valve and with a feed line and chlorine booster pump discharging into the Well 18 pump header in the Well 17 pumphouse prior to entry into the dedicated Chlorine Contact Pipe</p> <p>432 m of dedicated Chlorine Contact Pipe, comprising 600 mm diameter and 900 mm diameter, to provide the required CT prior to the first customer at the combined flow of 260 L/s from Well 17 and Well 18</p>

Iron and Manganese Sequestering	A paced to flow iron and manganese sequestering system in the Well 17 pumphouse, utilizing a sodium silicate sequestering agent, consisting of, under normal operating conditions, a 10,500 L capacity double wall storage tank, with vacuum monitoring for secondary containment, and an automated chemical metering pump with a feed line system discharging into the Well 18 well pump header in the well pumphouse prior to the entry into the dedicated Chlorine Contact Pipe
Stand-by Power	A 400 kW standby diesel generator, operated for either the Well 17 or Well 18 well pump and their associated systems (the other will be locked out), complete with automatic transfer switch and one 3,100 L capacity double walled diesel fuel storage tank, with vacuum monitoring for secondary containment. Standby power provided is sufficient to maintain full operation of Well 17 or Well 18 but not both
Notes	N/A

City of Barrie Water Distribution System

Pumping Stations

Anne Street North Booster Pump Station

Location	164 Anne Street North, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 602535 m and Northing 4916070 m
Equipment	Two (2) vertical turbine pumps rated at 67 L/s, 56 m TDH One (1) vertical turbine pump rated at 90 L/s, 60.3 m TDH
Standby Power	200 kW standby diesel generator (stationary)
Notes	N/A

Big Bay Point Booster Pump Station

Location	20 Big Bay Point Road, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 604960 m and Northing 4911520 m
Equipment	Two (2) centrifugal pumps rated at 100 L/s, 47 m TDH Two (2) centrifugal pumps rated at 150 L/s, 47 m TDH A continuous on-line chlorine residual analyzer, including alarms, to monitor and record free chlorine residuals prior to being pumped into the distribution system for Zone 3S
Standby Power	325 kW standby diesel generator (stationary)
Notes	N/A

Codrington Booster Pump Station

Location	64 Codrington Street, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 604815 m and Northing 4916510 m
Equipment	Three (3) vertical turbine pumps rated at 63 L/s, 51.8 m TDH A continuous on-line chlorine residual analyzer, including alarms, to monitor and record free chlorine residuals prior to being pumped into the distribution system for Zone 2N
Standby Power	None
Notes	N/A

Harvie Road Booster Pump Station

Location	70 Harvie Road, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 603850 m and Northing 4911175 m
Equipment	Four (4) vertical turbine pumps (3 duty, 1 standby) each rated at 133.3 L/s at 45 m TDH with a discharge line and flowmeter connected to the distribution system Three (3) continuous on-line chlorine residual analyzers including alarms to monitor and record free chlorine residual; one on the discharge line to Zone 3S, one on the line drawing from Well 17 and Well 18, and one drawing from the inlet line from Zone 2 South A storage reservoir (clear well) with a total volume of approximately 500 m ³ Appurtenances including pump control valve, and process piping Associated SCADA and instrumentation including three (3) chlorine residual analyzers and three (3) magnetic flowmeters, electrical, mechanical and controls for an operable system
Standby Power	A 450 kW stand-by diesel generator set complete with automatic transfer switch and a dual celled 2,500 L dual walled, indoor fuel storage tank with vacuum between tank walls
Notes	N/A

Innisfil Booster Pump Station

Location	380 Innisfil Street, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 604170 m and Northing 4913500 m
Equipment	Three (3) vertical turbine pumps rated at 70 L/s, 73.5 m TDH A continuous on-line chlorine residual analyzer, including alarms, to monitor and record free chlorine residuals prior to being pumped into the distribution system for Zone 2S.
Standby Power	None
Notes	N/A

Leacock Booster Pump Station

Location	319 Leacock Drive, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 604160 m and Northing 4913510 m
Equipment	One (1) vertical turbine pump rated at 20 L/s, 77 m TDH One (1) vertical turbine pump rated at 45 L/s, 77 m TDH Two (2) vertical turbine pumps rated at 75 L/s, 77 m TDH A continuous on-line chlorine residual analyzer, including alarms, to monitor and record free chlorine residuals prior to being pumped into the distribution system for Zone 3N
Standby Power	A 200 kW standby diesel generator (stationary)
Notes	N/A

Sunnidale Booster Pumping Station

Location	245 Sunnidale Road, Barrie ON
UTM Coordinates	NAD 83, Zone 17, Easting 602487 m and Northing 4916953 m
Equipment	Four (4) in-line vertical turbine pumps (three duty, one standby), each rated at 63 L/s for Zone 2 North supply. Two pumps have variable speed drives and two pumps have soft starters
Firm Pumping Capacity	189 L/s
Chlorination	Two gas chlorination systems complete with emergency cylinder valve closure system: one for Zone 2 North pressure zone; one for Zone 1 pressure zone. Chlorination rates are controlled by flow pacing (Compound Loop Control) and chlorine residual set points
	Two (2) injection points, one at the discharge header (Zone 2 North) and one at the Reservoir inlet/outlet pipe (Zone 1)
	Two (2) 150 pounds per day vacuum chlorinators, one for Zone 2 North pressure zone and one for Zone 1 pressure zone
	Two (2) chlorine booster pumps (one duty, one standby) for injecting chlorine solution at the Zone 2 North discharge header. Injection at the Reservoir inlet/outlet controlled by a solenoid valve.
	A dry type chlorine gas scrubber
Stand-by Power	One (1) 300 kW diesel generator set which provides standby power for the three (3) operating vertical turbine pumps, chlorination and building services
Notes	N/A

Storage Reservoirs**Anne Street North In-ground Reservoir**

Location	164 Anne Street North, Barrie ON
UTM Coordinates	NAD 83, Zone 17, +/- 3 m, Easting 602535 m and Northing 4916070 m
Description	An at-grade concrete reservoir with two isolation cells designed for fire storage, equalization storage and emergency storage
Capacity	Operating capacity of 15,890 m ³
Equipment	Two (2) continuous on-line chlorine residual analyzers, including alarms, to control the compound loop chlorine injection; one prior to re-entry into the distribution system for Zone 1 and one prior to being pumped into the distribution system for Zone 2N
	One (1) magnetic direct bury flowmeter on the reservoir common draw/fill line to Zone 1 and one (1) venturi direct bury flow transmitter on the discharge main to Zone 2N
	All additional piping and appurtenances for the above-noted works
	Associated SCADA, electrical, mechanical and controls for an operable system

Rechlorination	A compound loop controlled rechlorination system for the Zone 1 distribution system water consisting of two (2) chlorine gas cylinders (located in a separate room), with automatic switchover, weigh scale, gas chlorinator, regulators, injectors and automated control valve, complete with process piping to add chlorine at the Zone 1 discharge
	A compound loop controlled rechlorination system for the Zone 2N distribution system water consisting of two (2) chlorine gas cylinders (located in a separate room), with automatic switchover, weigh scale, gas chlorinator, regulators, injectors and automated control valve, complete with process piping to add chlorine at the Zone 2N discharge
Standby Power	None
Notes	N/A

Harvie Road At-Grade Water Reservoir

Location	70 Harvie Road, Barrie ON
UTM Coordinates	NAD 83, Zone 17, Easting 603890.00 m and Northing 4911170.00 m
Description	An at-grade concrete reservoir with six (6) isolation cells designed for fire storage, equalization storage and emergency storage
Capacity	Total capacity of 27,300 m ³
Equipment	Continuous on-line chlorine residual analyzer including alarms, to control the compound loop chlorine injection prior to re-entry into the distribution system
	Appurtenances include one magnetic flowmeter, drain to waste connection with isolation valve, and process piping
	Associated SCADA, electrical, mechanical and controls for an operable system
Rechlorination	A compound loop controlled rechlorination system consisting of two (2) chlorine gas cylinders, located in a separate room, with automatic switchover, weigh scale, gas chlorinator, regulators and process piping to the injectors
	An injector with an automated control valve and feed line discharging into the outflow header located in the valve room
Standby Power	None
Notes	N/A

Sunnidale Park Reservoir

Location	245 Sunnidale Road, Barrie ON
UTM Coordinates	NAD 83, Zone 17, Easting 602487 m and Northing 4916953 m
Description	Two (2) cells, each measuring 38.5 m x 45.5 m x 6.0 m depth and each providing a working capacity of 10,500 m ³
Notes	The two cells are capable of working independently or jointly

Elevated Storage Tanks

Bayfield Elevated Water Reservoir

Location	444 Bayfield Street, Barrie ON
UTM Coordinates	NAD 83, Zone 17, Easting 602834.00 m and Northing 4918140.00 m
Description	An elevated reservoir designed for fire storage, equalization storage and emergency storage
Dimensions	Total capacity of 4,536 m ³
Equipment	Continuous on-line chlorine residual analyzer, including alarms, to control the compound loop chlorine injection prior to reentry into the distribution system Appurtenances include one magnetic flowmeter and process piping Associated SCADA, electrical, mechanical and controls for an operable system
Rechlorination	A compound loop controlled rechlorination system consisting of two (2) chlorine gas cylinders, located in a separate room, with automatic switchover, weigh scale, gas chlorinator, regulators and process piping to the injectors An injector, chlorine booster pump with a feed line discharging into the inflow/outflow header located in the main valve room
Standby Power	None
Notes	N/A

Ferndale North Elevated Water Reservoir

Location	434 Ferndale Drive North, Barrie ON
UTM Coordinates	NAD 83, Zone 17, Easting 600840.00 m and Northing 4916060.00 m
Description	An elevated reservoir designed for fire storage, equalization storage and emergency storage
Dimensions	Total capacity of 5,700 m ³
Equipment	Continuous on-line chlorine residual analyzers, including alarms, to control the compound loop chlorine injection prior to reentry into the distribution system Appurtenances include one magnetic flowmeter, drain to waste connection with isolation valve and process piping Associated SCADA, electrical, mechanical and controls for an operable system
Rechlorination	A compound loop controlled rechlorination system consisting of two (2) chlorine gas cylinders, located in a separate room, with automatic switchover, weigh scale, gas chlorinator, regulators and process piping to the injectors An injector, chlorine booster pump with a feed line discharging into the inflow/outflow header located in the main valve room
Standby Power	None
Notes	N/A

Mapleview Elevated Water Reservoir

Location	65 Mapleview Drive, Barrie ON
UTM Coordinates	NAD 83, Zone 17, Easting 604350.00 m and Northing 4909684.00 m
Description	An elevated reservoir designed for fire storage, equalization storage and emergency storage
Dimensions	Total capacity of 5,455 m ³
Equipment	Continuous on-line chlorine residual analyzer including alarms, to control the compound loop chlorine injection prior to reentry into the distribution system Appurtenances include one magnetic flowmeter and process piping Associated SCADA, electrical, mechanical and controls for an operable system
Rechlorination	A compound loop controlled rechlorination system consisting of two (2) chlorine gas cylinders, located in a separate room, with automatic switchover, weigh scale, gas chlorinator, regulators and process piping to the injectors An injector, chlorine booster pump with a feed line discharging into the inflow/outflow header located in the main valve room
Standby Power	None
Notes	N/A

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
MDWL_Water_Map_2014-01-01	January 1, 2014

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 Corporation of the City of Barrie
Permit Number	014-201
Drinking Water System Name	Barrie Drinking Water System
Schedule B Issue Date	October 16, 2014

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:
- Has been prepared by a Professional Engineer;
 - Has been designed only to transmit water and has not been designed to treat water;
 - 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 – June 2012", as amended from time to time; and
 - 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 in writing 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 1200 mm;
 - 3.2.3 Results in the fragmentation of the drinking water system; or
 - 3.2.4 Connects to another drinking water system, unless:
 - 3.2.4.1 Prior to construction, the owner of the drinking water system seeking the connection obtains written consent from the owner's delegate of the other drinking water system being connected to; and
 - 3.2.4.2 The owner of the drinking water system seeking the connection retains a copy of the written consent from the owner of the other drinking water system being connected to as part of the record that is recorded and retained under condition 3.3.

- 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, prior to the watermain addition, modification, replacement or extension being placed into service; 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 adding, modifying or replacing the following components in the drinking water system:
- 4.1.1 Raw water pumps and treatment process pumps in the treatment system;
 - 4.1.2 Chemical metering pumps and chemical handling pumps;
 - 4.1.3 Coagulant feed systems in the treatment system, including the location and number of dosing points;
 - 4.1.4 Valves;
 - 4.1.5 Instrumentation and controls, and software associated with these devices;
 - 4.1.6 Filter media, backwashing equipment and under-drains in the treatment system;
 - 4.1.7 Chemical storage tanks (excluding fuel storage tanks) and associated equipment; or
 - 4.1.8 Spill containment works.

- 4.2** The drinking water system may be altered by adding, modifying, replacing or removing the following components in the drinking water system:
- 4.2.1 Treated water pumps and associated equipment;
 - 4.2.2 Re-circulation devices within distribution system reservoirs and elevated tanks; or
 - 4.2.3 Measuring and monitoring devices that are not required by regulation, by a condition in the Drinking Water Works Permit, or by a condition otherwise imposed by the Ministry of the Environment.
- 4.3** The drinking water system may be altered by replacing the following:
- 4.3.1 Raw water piping, treatment process piping or treated water piping within the treatment subsystem;
 - 4.3.2 Fuel storage tanks and spill containment works, and associated equipment; or
 - 4.3.3 Coagulants and pH adjustment chemicals, where the replacement chemicals perform the same function;
 - 4.3.3.1 Prior to making any alteration to the drinking water system under condition 4.3.3, the owner shall undertake a review of the impacts that the alteration will have on corrosion control or other treatment processes; and
 - 4.3.3.2 The owner shall notify the Director in writing within thirty (30) days of any alteration made under condition 4.3.3 and shall provide the Director with a copy of the review.
- 4.4** Any alteration of the drinking water system made under conditions 4.1, 4.2, or 4.3 must not result in:
- 4.4.1 An exceedance of a treatment subsystem rated capacity or a treatment subsystem component maximum flow rate as specified in the licence;
 - 4.4.2 The bypassing of any unit process within a treatment subsystem;
 - 4.4.3 A deterioration in the quality of drinking water provided to consumers;
 - 4.4.4 A reduction in the reliability or redundancy of any component of the drinking water system;
 - 4.4.5 A negative impact on the ability to undertake compliance and other monitoring necessary for operation of the drinking water system; or
 - 4.4.6 An adverse effect on the environment.
- 4.5** The owner shall verify in writing that the addition, modification, replacement or removal of drinking water system components in accordance with conditions 4.1, 4.2, and 4.3 has met the requirements of the conditions listed in condition 4.4.

- 4.6** The verifications and documentation required in condition 4.5 shall be:
- 4.6.1 Recorded on “Form 2 – Record of Minor Modifications or Replacements to the Drinking Water System”, as published by the Ministry of the Environment, prior to the modified or replaced components being placed into service; and
 - 4.6.2 Retained for a period of ten (10) years by the owner.
- 4.7** For greater certainty, the verification requirements set out in conditions 4.5 and 4.6 do not apply to any addition, modification, replacement or removal in respect of the drinking water system which:
- 4.7.1 Is exempt from subsection 31(1) of the SDWA by subsection 9.(2) of O. Reg. 170/03; or
 - 4.7.2 Constitutes maintenance or repair of the drinking water system.
- 4.8** 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 and absorbers;
 - 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 Venting for ozone treatment units;

- 5.1.12 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; or
- 5.1.13 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/or distribution of drinking water.
- 5.3** The emergency generators identified in condition 5.1.13 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 5.1.13.

Performance Limits

- 5.5** The owner shall ensure that a drinking water system component identified in conditions 5.1.1 to 5.1.13 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/m³ as amended; and
- 5.5.3 The noise emissions comply at all times with the limits set out in publication NPC-300, as applicable.
- 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 condition 5.5.3 is being achieved, through noise abatement equipment and/or operational procedures.
- 5.8** The verifications and documentation required in conditions 5.6 and 5.7 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, prior to the additional, modified or replacement equipment being placed into service.

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.

7.0 System-Specific Conditions

7.1 No site specific requirements.

8.0 Source Protection

8.1 No source water protection requirements.

