

	Ballantrae/Musselman's Lake and Stouffville Water Distribution Systems	Date Performed: 02-06-2018 & 02-14-2018 Date(s) Reviewed: 01-15-2019 Version: 4
	Operational Plan Quality Management System	
	QMS-APP-08-01 - Risk Assessment Outcomes	

February 6, 2018 Attendees: Rob Flindall, Peter Wyllie, Laura Smit, Mandy Paglia, Matt Sullivan, Peter Pound, Russ Corby, Jessica Deng
 February 14, 2018 Attendees: Brian Kavanagh, Peter Wyllie, Laura Smit, Russ Corby
 March 19, 2018: Review of Draft by Tavares Group Consulting completed
 January 15, 2019 Attendees: Brian Kavanagh, Peter Wyllie, Matt Sullivan, Russ Corby

Activity or Process Step	Description of Hazardous Event	Description of Hazard	Control Measures	Monitoring Procedures	Response Procedures	Controllable (Yes/No)	Likelihood	Severity	Detectability	Total (CPP Threshold >= 7)	Critical Control Point (Yes/No)	Critical Control Limits
Drinking Water Supply												
Supply of Water (Quantity) From York Region <i>* Highway 48 system part of Stouffville WDS with no redundancy. Due to uniqueness of situation, this zone has been assessed separately</i>	York Region owns and maintains the wells, pumps, and reservoirs required for the supply of the Town's potable water. York Region is an accredited Operating Authority and must comply with the DWQMS, including performing a risk assessment. Failure of any of these components can create long-term adverse effects to the source, requiring York Region to stop supply on a temporary or permanent basis. Short and long-term adverse effects to the quantity of supply include, but are not limited to: <ul style="list-style-type: none"> power failures 	Microbiological: <ul style="list-style-type: none"> E. Coli Total Coliform HPC Physical: <ul style="list-style-type: none"> Colour Turbidity 	No control measures by the Town. York Region has communication protocols in place in the event of a failure.	York Region SCADA system Resident complaints	Water restriction by-law Isolation of distribution system Emergency response escalation procedures Emergency supply of bulk water (bottled, trucks, etc.)	Ballantrae/Musselman's Lake						
						No	1	4	1	6	No	None
						Stouffville						
						No	1	4	1	6	No	None
*Stouffville (Highway 48)												
No	3	3	1	7	No	None						

Activity or Process Step	Description of Hazardous Event	Description of Hazard	Control Measures	Monitoring Procedures	Response Procedures	Controllable (Yes /No)	Likelihood	Severity	Detectability	Total CPP Threshold >= 7)	Critical Control Point (Yes/No)	Critical Control Limits
	<ul style="list-style-type: none"> equipment failure well levels scheduled & unscheduled maintenance long-term impacts to climate change (10 years or greater) shortfall in water supply extreme weather events sustained extreme temperatures Chemical spills impacting source water terrorist & vandalism actions sustained pressure loss 											
Supply of Water (Quality) from York Region	<p>The York Region owns and maintains the primary and secondary disinfection equipment required for the Town to meet MECP water quality standards.</p> <p>York Region is an accredited Operating Authority and must comply with the DWQMS, including performing a risk assessment.</p> <p>Failure of any of these components can create adverse effects to water quality. Adverse effects to water quality of the supply include, but are not limited to:</p> <ul style="list-style-type: none"> power failures equipment failure loss of secondary disinfection 	<p>Microbiological:</p> <ul style="list-style-type: none"> E. Coli Total Coliform HPC <p>Physical:</p> <ul style="list-style-type: none"> Colour Turbidity <p>Chemical:</p> <ul style="list-style-type: none"> List contained in O. Reg 169/03 	<p>No control measures by the Town.</p> <p>York Region has communication protocols in place in the event of a failure.</p> <p>York Region has source water protection plan in place to assess long- term supply requirements</p>	<p>Region SCADA system</p> <p>Routine water quality sampling. Not all parameters sampled on a regular basis</p> <p>Resident complaints</p>	<p>Isolation of distribution system</p> <p>Emergency response escalation procedures</p> <p>DWA or BWA as determined by the Medical Officer of Health</p> <p>Emergency supply of bulk water (bottled, trucks, etc)</p>	Ballantrae/Musselman's Lake						
						No	1	4	4	9	No	None
						Stouffville						
						No	1	5	4	10	No	None

Activity or Process Step	Description of Hazardous Event	Description of Hazard	Control Measures	Monitoring Procedures	Response Procedures	Controllable (Yes/No)	Likelihood	Severity	Detectability	Total (CPP Threshold >= 7)	Critical Control Point (Yes/No)	Critical Control Limits
	<ul style="list-style-type: none"> well levels scheduled & unscheduled maintenance long-term impacts to climate change (10 years or greater) extreme weather events sustained extreme temperatures Chemical spills impacting source water terrorist & vandalism actions sustained pressure loss 				Temporary suspend lake based supply (Stouffville WDS only)							
Distribution System Infrastructure												
Distribution Piping, Valves and Appurtenances – Mechanical Failure	Mechanical failure of distribution system appurtenances can create adverse effects to water quantity and quality. Adverse effects include, but are not limited to: <ul style="list-style-type: none"> scheduled & unscheduled maintenance extreme weather events sustained extreme temperatures terrorist & vandalism actions sustained pressure loss 	Routine and Unplanned repairs always pose a risk of: Microbiological: <ul style="list-style-type: none"> E. Coli Total Coliform HPC Physical: <ul style="list-style-type: none"> Colour Turbidity Chemical: <ul style="list-style-type: none"> List contained in O. Reg 169/03 	None	Routine inspection Resident complaints Redundancy (localized issue) Preventative Maintenance program Lifecycle replacement	Adverse Water Quality Standard Operating Procedure MECP Disinfection Procedure	Ballantrae/Musselman’s Lake						
						No	1	2	2	5	No	None
						Stouffville						
						No	3	2	2	7	No	None

Activity or Process Step	Description of Hazardous Event	Description of Hazard	Control Measures	Monitoring Procedures	Response Procedures	Risk Assessment						
						Controllable (Yes/No)	Likelihood	Severity	Detectability	Total (CPP Threshold >= 7)	Critical Control Point (Yes/No)	Critical Control Limits
Distribution Piping, Valves and Appurtenances – Tuberculation and sedimentation	Tuberculation and sedimentation can create adverse effects to water quantity and quality. Adverse effects include, but are not limited to: <ul style="list-style-type: none"> • scheduled & unscheduled maintenance 	Microbiological: <ul style="list-style-type: none"> • Biofilm • Iron eating bacteria • Total Coliform Physical: <ul style="list-style-type: none"> • Turbidity • Colour • Solids (suspended or dissolved) 	None	Routine water quality sampling	Pipe cleaning (i.e. flushing) Asset management (i.e. replacement or rehabilitation of iron pipe)	Ballantrae/Musselman's Lake						
						No	2	2	3	7	No	None
						Stouffville						
						No	2	2	3	7	No	None
<ul style="list-style-type: none"> • Ballantrae system has increased sedimentation in the McMullen & McFarland area in 2018 												
Distribution Piping, Valves and Appurtenances - Nitrification	Nitrification can create adverse effects to water quality. Adverse effects include, but are not limited to: <ul style="list-style-type: none"> • scheduled & unscheduled maintenance • sustained extreme temperatures 	Chemical: <ul style="list-style-type: none"> • Nitrogen containing compounds 	High dosage of chlorine from Region of York Monitoring of residuals	Monitor and maintain system, nitrification should not form.	Free chlorine disinfection Swabbing Flushing Maximum acceptable concentration (MAC) outlined in O. Reg 169/03. Town initiates response at half the maximum	Ballantrae/Musselman's Lake						
						Yes	1	3	3	7	Yes	5 mg/l
						Stouffville						
						Yes	1	3	3	7	Yes	5 mg/l

Activity or Process Step	Description of Hazardous Event	Description of Hazard	Control Measures	Monitoring Procedures	Response Procedures	Risk Assessment						
						Controllable (Yes/No)	Likelihood	Severity	Detectability	Total (CPP Threshold >= 7)	Critical Control Point (Yes/No)	Critical Control Limits
					acceptable concentration							
Pressure Reducing Valve	Pressure reducing valves are required between Stouffville Zones 2 & 3 to ensure high pressure does not cause damage to the water distribution system or private plumbing. <ul style="list-style-type: none"> • scheduled & unscheduled maintenance • terrorist & vandalism actions • sustained pressure loss 	Physical: <ul style="list-style-type: none"> • Turbidity • Colour • Property damage (high pressure) 	Preventative maintenance Lifecycle replacement	Monthly inspection of Zone 3	Repair/ replacement of PRV	Ballantrae/Musselman's Lake						
						N/A						
						Stouffville						
						No	2	2	3	7	Yes	100psi
Watermain Break	Watermain breaks can create adverse effects to water quality. Adverse effects include, but are not limited to: <ul style="list-style-type: none"> • long-term impacts to climate change (10 years or greater) • shortfall in water supply • sustained extreme temperatures • terrorist & vandalism actions • sustained pressure loss • Backflow 	Microbiological: <ul style="list-style-type: none"> • E. Coli • Total Coliform • HPC Physical: <ul style="list-style-type: none"> • Colour • Turbidity Chemical: <ul style="list-style-type: none"> • List contained in O. Reg 169/03 	None	Resident complaints General observation	QMS-SOP-15-01 – Unscheduled Repairs QMS-SOP-16-02 Adverse Water Quality Reporting MECP Disinfection Procedure Asset management (i.e. replacement of iron pipe)	Ballantrae/Musselman's Lake						
						No	1	2	3	6	No	None
						Stouffville						
						No	3	2	3	8	No	None
		Microbiological:	None		Asset Management	Ballantrae/Musselman's Lake						

Activity or Process Step	Description of Hazardous Event	Description of Hazard	Control Measures	Monitoring Procedures	Response Procedures	Controllable (Yes/No)	Likelihood	Severity	Detectability	Total (CPP Threshold >= 7)	Critical Control Point (Yes/No)	Critical Control Limits
Repairs to Water System Valves and Appurtenances	Repairs to water system valves and appurtenances can create adverse effects to water quality. Adverse effects include, but are not limited to: <ul style="list-style-type: none"> terrorist & vandalism actions Backflow 	<ul style="list-style-type: none"> E. Coli Total Coliform HPC Chemical: <ul style="list-style-type: none"> List contained in O. Reg 169/03 		Preventative Maintenance	Public Notification Timing of Repair	No	2	2	1	5	No	None
						Stouffville						
						No	2	2	1	5	No	None
Infrastructure Commissioning (new or replacement)	Watermain commissioning can create adverse effects to water quality. Adverse effects include, but are not limited to: <ul style="list-style-type: none"> terrorist & vandalism actions Backflow 	Microbiological: <ul style="list-style-type: none"> E. Coli Total Coliform HPC Chemical: <ul style="list-style-type: none"> List contained in O. Reg 169/03 	MECP Disinfection Procedure Commissioning Procedure (Town Standard)	QMS-SOP-16-01 Collection and Handling of Drinking Water Samples Oversight by Town Licensed Operator (OIC) New infrastructure physically separated from system	QMS-SOP-16-02 Adverse Water Quality Reporting	Ballantrae/Musselman's Lake						
						Yes	1	3	3	7	Yes	0 cfu/ml
						Stouffville						
						Yes	1	3	3	7	Yes	0 cfu/ml
Distribution System - Operational Activities												
Adverse Water Quality	Adverse water quality can be created by one or a combination of the activities outlined in this risk assessment. It can also be caused from failure of control measures and/or monitoring procedures.	Microbiological: <ul style="list-style-type: none"> E. Coli Total Coliform Chemical:	Water Quality Sampling and Testing	QMS-SOP-08-01 Deviations from Critical Control Points QMS-SOP-12-01 Inter-Municipal	QMS-SOP-16-02 Adverse Water Quality Reporting Maximum acceptable	Ballantrae/Musselman's Lake						
						Yes	2	4	2	8	Yes	Half the MAC
						Stouffville						

Activity or Process Step	Description of Hazardous Event	Description of Hazard	Control Measures	Monitoring Procedures	Response Procedures	Controllable (Yes /No)	Likelihood	Severity	Detectability	Total (CPP Threshold >= 7)	Critical Control Point (Yes/No)	Critical Control Limits
	<ul style="list-style-type: none"> • long-term impacts to climate change • shortfall in water supply • extreme weather events • sustained extreme temperatures • Chemical spills impacting source water • terrorist & vandalism actions • sustained pressure loss • Backflow 	<ul style="list-style-type: none"> • List contained in O. Reg 169/03 • Loss of Residual 		<p>Communication Protocol</p> <p>QMS-SOP-15-01 Unscheduled Repairs</p> <p>QMS-SOP-15-06 Water and Sewer Connections</p> <p>QMS-SOP-16-01 Collection and Handling of Drinking Water Samples</p> <p>QMS-SOP-16-02 Adverse Water Quality Reporting</p> <p>QMS-SOP-18-01 Contamination of the Drinking Water System</p> <p>QMS-SOP-18-02 Boil Water and Drinking Water Advisory</p>	<p>concentration (MAC) outlined in O. Reg 169/03. Town initiates response at half the maximum acceptable concentration (MAC)</p>	Yes	3	4	2	9	Yes	Half the MAC

Activity or Process Step	Description of Hazardous Event	Description of Hazard	Control Measures	Monitoring Procedures	Response Procedures	Risk Assessment						
						Controllable (Yes/No)	Likelihood	Severity	Detectability	Total (CPP Threshold >= 7)	Critical Control Point (Yes/No)	Critical Control Limits
				QMS-SOP-18-03 Cross Connections								
Operation of Valves – Valve Position incorrect	Incorrect valve position can create adverse effects to water quality and quantity. <ul style="list-style-type: none"> shortfall in water supply terrorist & vandalism actions 	Microbiological: <ul style="list-style-type: none"> E. Coli Total Coliform HPC 	QMS-FRM-15-03 - Water Shutdown Notification Information Training	QMS-FRM-15-03 - Water Shutdown Notification Information Training Lockout devices Valve turning/maintenance program	QMS-SOP-15-01 Unscheduled Repairs QMS-SOP-15-05 Valve Inspections	Ballantrae/Musselman’s Lake						
						Yes	3	2	4	9	Yes	Inoperative
						Stouffville						
						Yes	3	2	4	9	Yes	Inoperative
Temporary Connection Between Buildings	Temporary connections between buildings can create adverse effects to water quality and quantity <ul style="list-style-type: none"> long-term impacts to climate change sustained extreme temperatures terrorist & vandalism actions Backflow 	Microbiological: <ul style="list-style-type: none"> E. Coli Total Coliform 	MECP Watermain Disinfection Procedure,	QMS-SOP-16-01 Collection and Handling of Drinking Water Samples	Site specific requirements	Ballantrae/Musselman’s Lake						
						Yes	2	2	2	6	No	None
						Stouffville						
						Yes	2	2	2	6	No	None
Distribution System – Staff & Equipment												
		Microbiological:		Training		Ballantrae/Musselman’s Lake						

Activity or Process Step	Description of Hazardous Event	Description of Hazard	Control Measures	Monitoring Procedures	Response Procedures	Controllable (Yes/No)	Likelihood	Severity	Detectability	Total (CPP Threshold >= 7)	Critical Control Point (Yes/No)	Critical Control Limits
						Yes	No	Yes	No	Yes	No	Yes
Testing and Monitoring Equipment	Failure of equipment can lead to adverse water quality. <ul style="list-style-type: none"> Backflow terrorist & vandalism actions 	<ul style="list-style-type: none"> E. Coli Total Coliform Chemical: <ul style="list-style-type: none"> Chlorine Residual (free) 	Calibration of units by manufacturer redundancy	verification of units by Operators	Operational Plan System Procedure QMS-SYS-17	Yes	1	2	1	4	No	None
						Stouffville						
						Yes	1	2	1	4	No	None
Distribution System – Other Unclassified Hazardous Events												
Unauthorized Connection to system or appurtenances (i.e. Water theft)	Unauthorized connections can create adverse effects to water quality and quantity <ul style="list-style-type: none"> Backflow terrorist & vandalism actions 	Microbiological: <ul style="list-style-type: none"> E. Coli Total Coliform 	None	Resident complaints	QMS-SOP-15-02 Supply of Bulk Water QMS-SOP-18-03 Cross Connections Water by-law 2018-054 (as amended) Bulk water station available 24/7 with account setup Hydrant permit system	Ballantrae/Musselman's Lake						
						No	4	2	4	10	No	None
						Stouffville						
						No	4	2	4	10	No	None

The following potential hazardous events were identified by the MECP as requirements to consider in the DWQMS Risk Assessment. Each activity or process above were reviewed against the potential hazardous events and listed below if the activity or process is impacted by the potential hazardous event.

Long Term Impacts of Climate Change (all systems) – Climate change trends of 10 years or greater.

Water Supply Shortfall (all systems) – York Region required to implement water conservation and restrictions.

Extreme Weather Events (all systems) – 25, 50 and 100-year storm events.

Sustained Extreme Temperatures (all systems) – Temperatures greater than 35 Celsius or below minus 25 Celsius for a period of 14 days or more.

Chemical Spill impacting source water (all systems) – Accidental chemical spills at the water supply as reported by York Region.

Terrorist and Vandalism Actions (all systems) – Intentional sabotage of the drinking water supply and/or distribution systems.

Sustained pressure loss (Distribution Systems) – Pressure in the system drops below 140 kpa (20psi) for longer than 24 hours.

Backflow (Distribution Systems) – Any event that causes a foreign substance to enter the water distribution system as a result of pressure gradient.

Sudden Changes to raw water characteristics (Treatment Systems) – Not applicable for the Ballantrae/Musselman’s Lake or Stouffville Water Distribution Systems.

Failure of equipment or process associated with primary disinfections (Treatment Systems) – Not applicable for the Ballantrae/Musselman’s Lake or Stouffville Water Distribution Systems.

Failure of Equipment or process associated with secondary disinfection (Treatment Systems and Distribution Systems providing secondary disinfection) – Not applicable for the Ballantrae/Musselman’s Lake or Stouffville Water Distribution Systems.

Algal Blooms (Treatment Systems using Surface Water) – Not applicable for the Ballantrae/Musselman’s Lake or Stouffville Water Distribution Systems.

Document Change History

Revision Number	Date	Change	Revision Made By:
1	February 11, 2016	Updated from annual review	Peter W
2	December 31, 2016	Updated to match critical control procedure and remove CCPs for uncontrollable events	Laura S
3	May 17, 2018	Full Risk Assessment	Peter W
4	January 15, 2019	Risk Assessment Review	Peter W