

Drinking Water Quality Management Standard (DWQMS 2.0)

Town of Hanover Drinking Water System

Operational Plan (OP #085-401)

DRINKING WATER SYSTEM PROFILE INFORMATION

as of 17-JUN-2025

Drinking Water System Name: Town Of Hanover Drinking Water System
Drinking Water System Number: 210000167
Drinking Water System Category: Large Municipal Residential System (LMRS)
Municipality: Brockton
Physical Location: 101 Bruce 22 Road North, Walkerton, Ontario, N0G 2V0, Canada

OWNER INFORMATION

Owner Legal Name: Hanover, The Corporation Of The Town Of
Owner Address: 341 10th St, Hanover, ON N4N 1P5

Primary Contact Name: Andrew Wilken
Primary Contact Job Title: Director Of Development & Infrastructure
Primary Contact Phone: (519)3642780 x1280
Primary Contact Fax: (519)3646456
Primary Contact Email Address: awilken@hanover.ca

Alternate Contact Name: Ted Knapp
Alternate Contact Job Title: Chief Operator
Alternate Contact Phone: (519)3641016
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OPERATING AUTHORITY INFORMATION

Operating Authority Legal Name: Hanover, The Corporation Of The Town Of
Operating Authority Address: 341 10th St, Hanover, ON N4N 1P5

Primary Contact Name: Andrew Wilken
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Element 1: Quality Management System

Background:

The Drinking Water Quality Management Standard (DWQMS) was developed by the Ministry of the Environment, Conservation and Parks (MECP) as a part of the Municipal Drinking Water Licensing Program. The Town of Hanover is the Owner and Operating Authority of the Town of Hanover Drinking Water System and is responsible for establishing, maintaining and improving a Quality Management System (QMS), as documented in this Operational Plan.

Requirement:

The Operational Plan shall document a QMS that meets the requirements of the DWQMS.

The Operating Authority shall establish and maintain the QMS in accordance with the requirements of the DWQMS and the policies and procedures documented in the Operational Plan.

Procedure:

1. The Town of Hanover’s Operational Plan is established and maintained to ensure that safe, reliable drinking water is provided to all consumers of the Town of Hanover Drinking Water System.
2. The Operational Plan, along with policies and procedures, provides an understanding of the drinking water system, the responsibilities of the Owner and the Operating Authority of the system, regulatory and legislative requirements and ensures continual commitment in the provision of resources to provide safe drinking water.
3. The Operational Plan allows the Town of Hanover to continue to plan, implement, check and continually improve the drinking water system thereby ensuring ongoing confidence and security in the quality of the drinking water system.
4. The Operational Plan is to be reviewed once in a calendar year.

Associated documents:

- [Drinking Water Quality Management Standard](#)
- [Municipal Drinking Water Licensing Program](#)

Revision history:

#	yyyy-mm-dd	Description (describing last three revisions and/or all revisions of the past year)	Approved by
02	2019-01-01	Changes made to requirement to meet DWQMS 2.0 requirements and wording	Ron Cooper
03	2020-02-16	General review, minor updates and re-approval.	Ron Cooper
04	2021-03-16	Updated document format (streamlined document control features with revision history)	Ron Cooper

Element 2: Quality Management System Policy

Requirement:

The Operational Plan shall document a Quality Management System Policy (QMS Policy) that provides the foundation for the QMS, and:

- a) includes a commitment to the maintenance and continual improvement of the QMS,
- b) includes a commitment to the consumer to provide safe drinking water,
- c) includes a commitment to comply with applicable legislation and regulations, and
- d) is in a form that can be communicated to all operating authority personnel, the Owner and the public.

The Operating Authority shall establish and maintain a QMS that is consistent with the QMS Policy.

QMS policy:

The Operating Authority has established, is maintaining and continually improving a QMS that is consistent with the QMS Policy.

To achieve these goals, the Town of Hanover has committed to:

- establish, maintain and continually improve the QMS established for the Town of Hanover’s drinking water system,
- provide safe, high quality water to the consumer,
- comply with all applicable legislation and regulations,
- determine, obtain and provide resources needed to maintain and continually improve the infrastructure of the water system and high QMS standard,
- communicate openly and effectively with the Operating Authority, personnel and public on the QMS and matters related to drinking water quality.

The QMS Policy is endorsed by Top Management and the Owner. It is re-endorsed when there is a change in members of Council, or when there is a major change in the Operational Plan or when there is a change in personnel. Signed copies can be found at the following locations:

- The Civic Centre
- The Water Treatment Plant Office
- Public Works Shop
- On the Towns website (www.hanover.ca)

Associated documents:

Element 3 Commitment and Endorsement

Revision history:

#	yyyy-mm-dd	Description (describing last three revisions and/or all revisions of the past year)	Approved by
02	2019-01-01	Changes made to requirement to meet DWQMS 2.0 requirements and wording	Ron Cooper
03	2020-02-16	General review, minor updates and re-approval.	Ron Cooper
04	2021-03-16	Updated document format (streamlined document control features with revision history)	Ron Cooper

Element 3: Commitment and Endorsement

Requirement:

The Operational Plan shall contain a written endorsement of its contents by Top Management and the Owner.

Top Management shall provide evidence of its commitment to an effective QMS by:

- a) ensuring that a QMS is in place that meets the requirements of the DWQMS,
- b) ensuring that the Operating Authority is aware of all applicable legislative and regulatory requirements,
- c) communicating the QMS according to the procedure for communications,
- d) determining, obtaining or providing the resources needed to maintain and continually improve the QMS.

Proof of commitment and endorsement:

Commitment and endorsement are demonstrated by the Owner and Top Management in the following ways:

1) Owner

Written endorsement of the Operational Plan and its contents by Top Management, the Owner (Mayor/Council) is obtained by Council Resolution, requesting endorsement and demonstrated by approval in the Council minutes. The Council endorsement evidence is demonstrated using Council Resolution. Committing to the contents of the Operational Plan, the QMS Policy and to determine, obtain and provide the resources for the implementation, maintenance and continual improvement of the Operational Plan and its contents.

2) Top Management

Endorsement of the Operational Plan by Top Management is demonstrated by signatures of Top Management included on Form E3-01. Commitment is evidenced by:

- a) ensuring that a QMS is in place that meets the requirements of the DWQMS,
- b) ensuring that the Operating Authority is aware of all applicable legislative and regulatory requirements through the QMS Representative,
- c) communicating the QMS according to the E12 procedure for Communications
- d) determining, obtaining or providing the resources needed to maintain and continually improve the water system's infrastructure and the QMS.

Re-endorsement is required by:

- the Owner when there is a change in Mayor or Council members and
- Top Management when there is a major change in the Operational Plan or when there is a change in personnel.

The QMS Representative ensures the Operational Plan is reviewed once every Calendar Year and signed off using Form E3-01. Changes to it may be implemented immediately by QMS approval.

Associated documents:

E3-01 Commitment and Endorsement
Council Minutes regarding Operational Plan endorsement
Element 12 Communications
Element 20 Management Review

Revision history:

#	yyyy-mm-dd	Description (describing last three revisions and/or all revisions of the past year)	Approved by
06	2022-01-25	Removed Owner Signature from E3-01.	Ted Knapp
07	2022-07-25	Removed CAO/Clerk wording for CAO in top management	Ted Knapp
08	2025-07-30	Updated E3-01: Commitment and Endorsement to include title changes	Ted Knapp

E3-01: Commitment and Endorsement

Quality management system policy:

As decision-makers for the drinking water system and representatives of **Top Management** and the **Owner**, we are committed to:

- *provide **safe, high quality drinking water** to consumers,*
- ***comply with all applicable legislation and regulations, and***
- *maintain and **continually improve** the QMS.*

We endorse the contents of this Operational Plan and ensure that we:

- a) have **an effective QMS** in place that meets the requirements of the **DWQMS**,
- b) are **aware of all applicable legislative and regulatory requirements**,
- c) **communicate the QMS** according to our procedure for communications, and
- d) determine, obtain, or **provide the resources needed** to maintain and **continually improve** the QMS.

Signed this ____ day of _____, _____ at Hanover, Ontario.

CAO
Owner Representative

Director of Development and Infrastructure
Top Management

Chief Plant Operator / ORO Water Treatment
Operation Management

Public Works Foreman / ORO Distribution
Operation Management

This page's signatures are **updated within twelve months of changes** to Top Management and/or the Owner.

Element 4: QMS Representative

Requirement:

The Operational Plan shall identify a QMS Representative. Top Management shall appoint and authorize a QMS Representative who, irrespective of other responsibilities, shall:

- a) administer the QMS by ensuring that processes and procedures needed for the QMS are established and maintained,
- b) report to Top Management on the performance of the QMS and any need for improvement,
- c) ensure that current versions of documents required by the QMS are being used at all times,
- d) ensure that personnel are aware of all applicable legislation and regulatory requirements that pertain to their duties for the operation of the Subject System, and
- e) promote awareness of the QMS throughout the Operating Authority.

Procedure:

1. The QMS Representative is appointed and authorized by Top Management through the appointment document, ***E4-01 QMS Representative Appointment***.
2. The QMS Representative has the following ***responsibilities***:
 - a) Develop, implement and maintain the QMS:
 - The control of QMS documents and records as well as approval and implementation,
 - Conduct an annual review and update of the Operational Plan and all procedures and associated documentation,
 - Ensure an internal audit is completed once in a calendar year,
 - Utilize opportunities identified for continual improvement through best management practices, preventive and corrective actions.
 - b) Report on the effectiveness of the QMS to Top Management through:
 - Internal audits,
 - External audits, and
 - Management review.
 - c) Ensure that current versions of documents required by the QMS are in use at all times:
 - Remove old versions of documents and forms from electronic files and binders,
 - Annual review and updates of documents associated with the QMS,
 - Always use the template document or form to make changes to ensure it is the current copy,
 - The current revision number is identified in the revision history table.
 - d) Ensure that all personnel are aware of all current legislative and regulatory requirements that are relevant to the operation of the works:
 - Top Management will forward applicable information regarding legislative and regulatory requirements to the Water Treatment Plant Chief Operator and/or Public Works Foreman through internal memos or other communications,
 - Relevant updates are provided to staff at daily tailgate meetings or staff meetings and through Council reports,

- Provide training and updates of the QMS to the applicable personnel
 - Operating Authority
- e) Promote the QMS throughout the Town of Hanover Water System:
- The QMS Policy is posted at these locations within the Town of Hanover, the Civic Center, the Water Treatment Plant Office and the Public Works Shop Office and on the Town website,
 - The Operational Plan is communicated to the public on the Town’s website, www.hanover.ca, and
 - Relevant QMS information is communicated to the Owner, as per Element 12 through the Communications procedure.

Associated documents:

E4-01 QMS Representative Appointment.
 Element 12 Communications

Revision history:

#	yyyy-mm-dd	Description (describing last three revisions and/or all revisions of the past year)	Approved by
05	2023-03-23	Updated E4-01 to include all members of top management	Ted Knapp
06	2024-01-31	Updated delineation of “Top Management” to represent current Organizational Structure (EI.9)	Ted Knapp
07	2025-07-31	Updated title change of Top Management	Ted Knapp

E4-01 QMS Representative Appointment

The QMS Representative is appointed and authorized by Top Management to the role of QMS Representative for the Town of Hanover Drinking Water System. The appointment is documented using Form E4-01 DWQMS Appointment and endorsed by the members of Top Management.

The Town of Hanover has designated two individuals who share the duties as QMS Representatives.

Name: Ted Knapp

Position: Water Treatment Plant Chief Operator/Overall Responsible Operator (ORO)

Name: Andrew Dippel

Position: Water Distribution Foreman/Overall Responsible Operator (ORO)

Endorsed by:

Signature

Chief Administrative Officer

Director of Development and Infrastructure (Top Management)

Chief Plant Operator/ORO Water Treatment

Public Works Foreman/ORO Distribution

Element 5: Document and Records Control

Requirement:

The Operational Plan shall document a procedure for document and records control for the Town of Hanover Drinking Water System that describes how:

- a) documents required by the QMS are:
 - i. kept current, legible and readily identifiable
 - ii. retrievable
 - iii. stored, protected, retained and disposed of, and
- b) records required by the QMS are:
 - i. kept legible and readily identifiable
 - ii. retrievable
 - iii. stored, protected, retained and disposed of.

The Operating Authority shall implement and conform to the procedure for document and records control and shall ensure that the QMS documentation for the Subject System includes:

- a) the Operational Plan and its associated policies and procedures
- b) documents and records determined by the Operating Authority as being needed to ensure the effective planning, operation and control of operations, and
- c) the results of internal and external audits and management reviews.

Procedure:

1. The Town of Hanover's documented information for the QMS includes this operational plan and other information deemed necessary (e.g. Operations & Maintenance manuals, standard operating procedures, work instructions and forms) for the effectiveness of our QMS and to ensure the effective planning, operation and control of our operations.
2. Documented information also includes evidence of results achieved ("records"), and includes **records of**:
 - **risk assessment** outcomes,
 - **competence** (training, education and/or experience-related),
 - **on-call lists** (after-hours, emergencies),
 - **communications** (internal, external and with essential suppliers),
 - **infrastructure review** meeting minutes,
 - infrastructure **maintenance, rehabilitation and renewal**,
 - **sampling, testing and monitoring** (incl. equipment verifications and calibrations),
 - **emergency** training and testing,
 - **internal audits** and **external audits** (incl. accreditation audits and Ministry inspections),
 - **management reviews**,
 - **reports to the Owner** (e.g. annual & summary and budget reports),
 - **continual improvement** (incl. best practices, corrective and preventive actions).

3. For consistency, QMS-related and instructional documents maintain consistent **features**, including the following:
 - **identification** and description (e.g. title, revision date, such as in this document's header and revision history – listing the last three revision descriptions and/or all changes of the last year).
 - **format** (e.g. legible, and using a standard format for instructions)
 - **media** (e.g. available electronically and/or on paper)
 - **reviewed** and approved for **currency**, suitability, adequacy
 - Staff annually review the Operational Plan and Operations & Maintenance Manuals
 - Any employee can request new documents or changes to existing documents. The QMS Rep evaluates the request and ensures integrity of the QMS when approving changes or new documents (respecting document control features described above).
 - The QMS Representative, along with members of Top Management (as applicable), is responsible for effectively communicating changes and updates to documents.
4. Related to controlling documents and records, we ensure they are available **where and when needed** and are adequately **protected** (e.g. from loss of confidentiality, improper use, or loss of integrity).
5. Please refer to **Appendix "A"** for a listing of documents and records of internal and external origin, their locations and retention times, as applicable.
6. We **ensure** that our **documents** and **records** are:
 - **distributed and accessible**, where required (e.g. at the Water Treatment Plant and/or QMS Rep's office)
 - easily **retrieved** (e.g. whether in hard copy binders or from electronic locations)
 - **used**, as required (e.g. latest QMS version)
 - **stored, preserved, and legible** (e.g. no pencil or other erasable marker; clearly identifying person recording)
 - changes **controlled** (e.g. through QMS Representative or Supervisors, who approve changes)
 - **retained** for as long as retention timelines dictate (e.g. properly dated and stored by record type)
 - **disposed of** once their retention requirements have been fulfilled
 - **records are disposed** as per the Town of Hanover's **Records Retention bylaw No. 2675-10**.
7. External documents, such as those issued through government regulations and approvals, are controlled, and identified to ensure our personnel have access to such compliance obligations. We ensure these requirements are integrated into our documents and record-keeping so that we can provide evidence that we have met these obligations.

Associated documents:

Town of Hanover's TOMRMS filing system
Appendix "A" Documents and records listing
Records Retention bylaw No. 2675-10

Revision history:

#	yyy-mm-dd	Description (describing last three revisions and/or all revisions of the past year)	Approved by
03	2020-02-16	General review, minor updates and re-approval.	Ron Cooper
04	2021-03-16	Removed redundancy between previously separate procedures for document and records control. Added Appendix "A" instead of having tables embedded in this section and removed the requirement for the Document Change Form.	Ron Cooper
05	2026-05-11	Added The Town of Hanover's by-law to associated documents and explained how records are disposed of as per the by-law in section 6	Ted Knapp

Element 6: Drinking Water System

Requirement:

The operational plan shall document, as applicable:

- a) for the subject system:
 - i. the name of the Owner and operating authority,
 - ii. if the system includes equipment that provides primary disinfection and/or secondary disinfection:
 - A. a description of the system including all applicable treatment system processes and distribution system components,
 - B. a Treatment System process flow chart,
 - C. a description of the water source, including:
 - I. general characteristics of the raw water supply
 - II. common event-driven fluctuations, and
 - III. any resulting operational challenges and threats.
 - iii. if the system does not include equipment that provides primary disinfection or secondary disinfection:
 1. a description of the system including all distribution system components, and
 2. a description of any procedures that are in place to maintain disinfection residuals.
- b) if the subject system is an operational subsystem, a summary description of the municipal residential drinking water system it is a part of including the name of the operating authority(ies) for the other operational subsystems.
- c) if the subject system is connected to one or more other Drinking Water Systems owned by different Owners, a summary description of those systems which:
 - i. indicates whether the subject system obtains water from or supplies water to those systems,
 - ii. names the Owner and operating authority(ies) of those systems, and
 - iii. identifies which, if any, of those systems that the subject system obtains water from are relied upon to ensure the provision of safe drinking water.

The Operating Authority shall ensure that the description of the Drinking Water System is kept current.

Procedure:

1. General information:

The Town of Hanover Drinking Water System is owned by the Town of Hanover, as represented by members of Council, and operated by Town of Hanover Public Works staff. Staff are certified to provide and supply potable water to the consumers of the Town of Hanover. The facilities consist of a Class II direct filtration water treatment plant having an approved capacity of 15,406 m³/day and a Class II water distribution system. The population served is 7,688 residents, and the following is a summary of the water distribution system components:

- 62.25 km of distribution main
- 3,200 water connections (active accounts)
- 286 hydrants (not including private hydrants)

- 501 valves (not including curb stop service valves)

2. Description of source water:

2.1 Ruhl Lake

1. Ruhl Lake is a spring-fed, 2.63 ha. gravel-based lake located in a 39.7 ha (98-acre) parcel of forested land owned by the Town of Hanover on the 3rd Concession of Brant Township. Access to this area is restricted to Certified Operators and has diverted runoff.
2. The maximum depth is approximately 11 metres and the average depth is between 3.7 – 5.5 metres.
3. Raw water quality can be characterized as having levels of:

Turbidity	0.59 – 1.55	NTU
True Colour	4 – 11	TCU

These results were taken over an average per year based on non-regulatory quarterly samples from 2016 to 2020. The temperature fluctuates between 1° Celsius in the winter months to 25° Celsius in the summer months.

4. Raw water is presently drawn from Ruhl Lake, through a 350 mm cast intake pipe. It extends approximately 58 metres into the lake with its opening located 1.5 m above lake bottom approximately 6 m below lake surface.
5. The water passes through three (3) screens (one coarse 6mm vertical steel bars with 12.5 spacing, one medium screen 6 mm square steel mesh screening and one fine screen 3 mm steel mesh screening), before entering the pump house.
6. The pump house has two (2) electrically driven low lift pump having a capacity of 114 L/s.
7. The raw water is pumped to the WTP (Water Treatment Plant) through approximately 1.5 kilometres of 350mm diameter cast pipe (relined in 2007).
8. A 100kW diesel generator in the pump house provides emergency standby power.

2.2 Well 1

Well 1 is a 33.5 m deep well located east of the water treatment plant off County Road 22, with 53 L/s, vertical turbine pump. Well water is pre-chlorinated prior to being filtered and then gets treated through the ultraviolet (UV) reactors prior to going to the clear well and then enters distribution system. This well is considered Groundwater Under Direct Influence (GUDI) of surface water and has high iron content.

2.3 Well 2

Is 54.9 m deep, located on the southeast side of Marl Lake, with a 53 L/s vertical turbine pump discharging to filter #3 for removal of iron and manganese. It is blended with Well #1 water then receives the same treatment as Well #1 with a standby 60kW diesel generator in the pump house providing emergency standby power.

Note: Permit to Take Water – 4777-CK5SAT combines both Well 1 and Well 2.

Application for renewal of the PTTW is required before it expires on October 13, 2032.

3. Common event -driven fluctuations and resulting operational challenges:

The following is a summary of common event-driven fluctuations that may affect normal operating conditions for the drinking water system:

- Vertical turnover in the spring and fall at Ruhl Lake
- Spring flood from snow melt or heavy rains affects all sources
- Algae blooms and high south winds in the summer months at Ruhl Lake
- Taste and odour issues April to late December
- Cold water temperatures in the winter months, chemical adjustments must be made
- Lake used by migratory birds and other wildlife

Natural events listed above (e.g. lake turnover, spring floods, heavy rains, algae blooms, high winds) tend to cause increases in raw water turbidity, which requires operational adjustments in the treatment process. In high turbidity events, we need to ensure that the coagulation, clarification and filtration processes are effective so that disinfection can be achieved as intended.

To confirm our treatment processes are achieving their intended outcomes for consistently high quality and safe drinking water, we have critical control points that are continuously monitored for filter effluent turbidity, primary disinfection, and secondary disinfection.

Taste and odour issues in drinking water tend to increase in warmer temperatures from algae growth, requiring additional attention and adjusted treatment processes on a seasonal basis.

Source water temperature changes require the treatment processes to be adjusted so that drinking water is properly disinfected; and source water bacteriological sampling (related to presence of wildlife and bacteria) is carried out to ensure treatment processes can always be effective.

4. Threats:

Potential sources of raw water contamination in Ruhl Lake includes trespassers, and high rainfall causing pesticide runoff. Since there is only a single intake line for the WTP, there is also the risk of a collapsed or plugged intake line. The pump house is located on a secluded, unpopulated area of agricultural countryside, so the potential for vandalism or damage by fire is a concern. Spring flooding of all low areas around and may include pump house.

5. Disinfection:

Primary disinfection

- UV System for primary disinfection and taste and odour control
- Is located downstream of the package filters
- Two (2) UV reactors (one duty and one standby)
- Each unit is rated at maximum flow rate of 180L/s to provide a minimum UV dose of 40mJ/cm²

Secondary disinfection

- One chlorinator, complete with two (2) vacuum regulators and cylinders, booster pumps and scale for post chlorination at UV system discharge line
- One chlorinator complete with two (2) vacuum regulators and cylinders, booster pumps and scale for post chlorination at discharge line.

6. Treatment system:

Water from all sources is pumped to Treatment Facilities located Lot 65 Concession 2, Brant, Brockton Municipality, and County of Bruce. The Town's Drinking Water Works Permit (#085-201) includes an up-to-date drinking water system description and lists all of the treatment system equipment and components.

Elevated storage tanks:

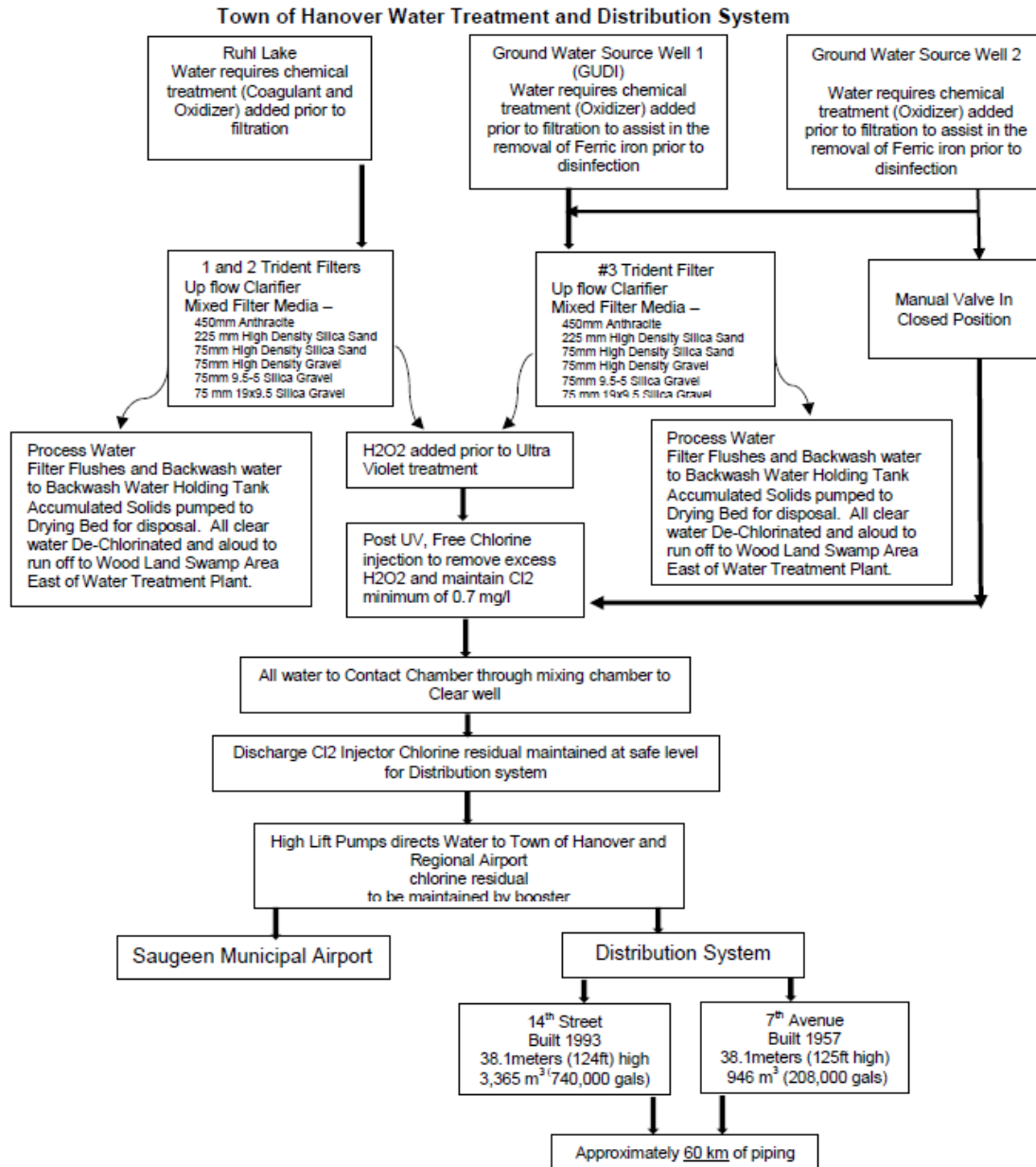
The request for water is controlled by water storage levels in the elevated towers within the grid system. A request for a high lift pump to run is generated when the water levels in either tower is the same as or less than the 'TOWER.LO.SP'. The WTP high lift pumps directly from the WTP clear well into the 350 mm pressurized main from plant to town. The request is cancelled when either tower water level reaches 'TOWER.HI.SP'. The 14 St. Tower is equipment with an automated online chlorine analyzer to check the chlorine residual.

Water quality in distribution system:

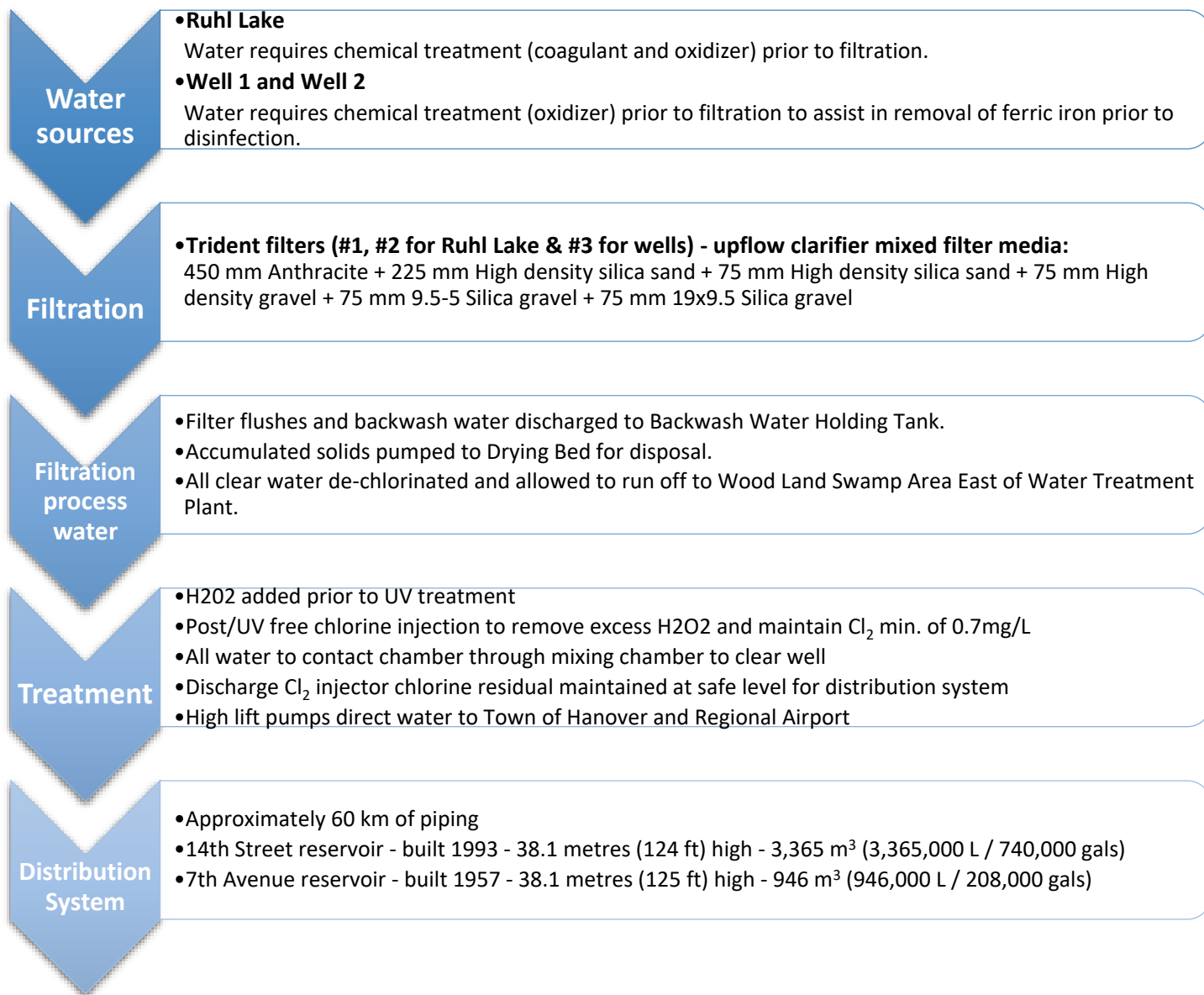
Daily residuals are taken throughout the distribution system and recorded. If free chlorine residuals encountered in this activity is below critical control limit ("CCL", e.g. 0.2 mg/L), a flushing procedure is initiated to bring the residuals up above the CCL and above, reflecting normal levels for the area.

Town of Hanover Drinking Water System

The following process flow diagram is taken from the Town of Hanover's latest Drinking Water Works Permit (#085-201) Schedule D.



SCADA signals from process analyzers are displayed or used to control system, generate critical and non-critical alarms. An alarm condition from the devices with CCP's identified will shut down the entire system until the alarm is acknowledged and reset by an operator. Other signals provide a digital readout on operating screens or provide data to Historian for trending display purposes.



Revision history:

#	yyyy-mm-dd	Description (describing last three revisions and/or all revisions of the past year)	Approved by
03	2020-02-22	Revision of flowchart as per OFI NSF	Ron Cooper
04	2021-03-16	Expanded on section 3 of this procedure to better reflect the common event-driven fluctuations experienced from recurring natural events and resulting operational challenges. Removed the previous listing of treatment equipment, and instead, included a reference to the Town's Drinking Water Works Permit – which includes an up-to-date listing. Updated the flow diagrams included on last three pages to link with the one included in the latest version of the Town's Drinking Water Works Permit and make them easier to read and understand.	Ron Cooper
05	2021-04-13	Updated the figures in the table in s.2.1 Ruhl Lake with data from 2016-2020 (replacing data from 2010 and earlier).	Ron Cooper
06	2024-01-29	Updated PTTW number and expiry date.	Ted Knapp

Element 7/8: Risk Assessment & Outcomes

Requirement:

The Operational Plan shall document a risk assessment process that:

- a) Considers potential hazardous events and associated hazards, as identified in the Ministry of the Environment, Conservation and Parks' (MECP's) document titled "Potential Hazardous Events for Municipal Residential Drinking Water Systems", dated February 2017 as it may be amended. A copy of this document is available at www.ontario.ca/drinkingwater.
- b) identifies additional potential hazardous events and associated hazards,
- c) assesses the risks associated with the occurrence of hazardous events,
- d) ranks the hazardous events according to the associated risk,
- e) identifies control measures to address the potential hazards and hazardous events,
- f) identifies critical control points,
- g) identifies a method to verify, at least once every calendar year, the currency of the information and the validity of the assumptions used in the risk assessment,
- h) ensures that the risks are assessed at least once every thirty-six months, and
- i) considers the reliability and redundancy of equipment.

The Operating Authority shall perform a risk assessment consistent with the documented process, and document:

- a) the identified potential hazardous events and associated hazards,
- b) the assessed risks associated with the occurrence of hazardous events,
- c) the ranked hazardous events,
- d) the identified control measures to address the potential hazards and hazardous events,
- e) the identified critical control points and their respective critical control limits (CCL's),
- f) procedures and/or processes to monitor the CCL's,
- g) procedures to respond to deviations from the CCL's, and
- h) procedures for reporting and recording deviations from the CCL's.

Definitions:

CCL- Critical Control Limit, the point at which CCP response procedure is initiated.

CCP- Critical Control Point, an essential step or point in the Subject System at which control can be applied to prevent or eliminate a drinking water health hazard or to reduce it to an acceptable level.

Consequence- the effect, result or outcome of a hazardous event.

Control measure – includes any processes, physical steps or other contingencies that have been put in place to prevent or reduce a hazard before it occurs.

Extreme weather- a significant storm/weather event that is considerably different from the average or usual weather pattern; weather events that draw staff resources from water services, leaving it understaffed and unable to respond to standard emergencies.

Natural disaster- a major adverse event resulting from natural processes of the earth that causes great damage or loss of life; examples include floods, earthquakes and other geologic processes.

Procedure:

1. The risk assessment team

- 1.1 The risk assessment team requires a good knowledge of the system and all aspects from operation and maintenance, management and design. For this reason, it is recommended

that the assessment team should include people with a wide-range knowledge of the system.

- 1.2 The team should include, when available, the following: Chief Operator/ORO, Public Works Foreman, QMS Representatives, Director of Development and Infrastructure, additional members may include Water Operators and Water Distribution Operators.
 - 1.3 All information regarding the risk assessment shall be recorded on a copy of the E8- 01 Risk Assessment Outcomes table, the form used for this process.
 - 1.4 Validation of the completed risk assessment is required by all members of the risk assessment team in attendance using Form E10-01 Staff Training Form.
 - 1.5 This is conducted on an annual basis prior to the Management Review meeting or more frequently if a significant process change or upgrade has occurred.
 - 1.6 The completed risk assessment shall be made accessible to Top Management and Owner.
- 2. Review process of the hazards**
- 2.1 At a minimum of once every calendar year, the QMS Representative will assemble the risk assessment (RA) team to ensure a review of the risk assessment is completed and ensure that the information and assumptions remain current and valid.
 - 2.2 The process described in this procedure will be followed, and any questions or deviations from the procedure will be documented on the RA table E8-01 (see **Appendix “B”**).
 - 2.3 Input from staff who aren't part of the RA team can be considered when updated risk assessment information is reviewed with all staff.
 - 2.4 When reviewing the currency of the risk assessment information, the following items are considered:
 - Potential hazardous events and associated hazards from the MECP's document titled "Potential Hazardous Events for Municipal Residential Drinking Water Systems",
 - Process changes, DWQMS updates, and MECP's best practices,
 - Reliability and redundancy of equipment,
 - Emergency situations that have occurred (e.g. Adverse Water Quality Incidents "AWQI's", large-scale watermain breaks),
 - Deviations from critical control points,
 - Incident debriefs ("after action reports"), and
 - Non-conformances or non-compliances.
 - 2.5 Risks identified that need further information or confirmation become an action item and the QMS Rep tracks these through the RA table's working copy.
 - 2.6 The RA team must sign-off on the E10-01 Staff Training Form that they participated in the RA table review or on the RA update.
 - 2.7 The QMS Rep has the responsibility to finalize the RA table and communicate the changes.
 - 2.8 In the year the thirty-six-month review is carried-out, the annual review does not also take place.
- 3. Thirty-six-month review**
- 3.1. Every 36 months, the QMS Representative assembles the Risk Assessment team to conduct a more comprehensive review of the risk assessment. The risk assessment methodology is followed.

- 3.2. The 36-month review is more detailed than the annual one, reviewing the risk assessment’s content line by line – ensuring the information is correct, the risks related to the occurrence and severity of hazardous events are correctly rated, and reflective of the current situation.
- 3.3. The annual review is to ensure the information contained is current, and risk ratings make sense (updating assumptions used to reflect current situations). The annual review can incorporate the more detailed review, and this would satisfy the requirement as well.

4. Risk assessment methodology

Identification of hazardous events and associated hazards

- 4.1 A review of each process and aspect of process within the drinking water system by the RA team must be completed to identify hazardous events and the resulting hazards that could impact the drinking water system.
- 4.2 To identify hazardous events and hazards, considerations may include:
 - 4.2.1 All aspects of the work,
 - 4.2.2 Routine and non-routine activities, and/or
 - 4.2.3 Foreseeable unusual conditions.
- 4.3 This information is recorded in the hazardous events and hazards section of E8-01 DWQMS Risk Assessment Outcomes (see **Appendix “B”**).

5. Risk assessment categories

- 5.1 Each hazardous event identified shall be ranked by the RA team using the evaluation criteria.
 - **The Likelihood of the Hazard Occurring** rated on a scale of 1-being rare, 2- unlikely, 3-possible, 4-likely and 5-very likely using the chart below.
 - **Severity of Hazard Occurring** (consequence) rated on a scale of 1-being significant, 2- minor, 3-moderate, 4-major and 5-catastrpohic major using the chart below.
 - **Detectability of Hazard** rated on a scale of 1-very detectable, 2- moderately, 3- normally detectable, 4-detectable poorly and 5-undetectable using the chart below.

5.2 The criteria used to evaluate risk is ranked on a scale from 1-5 with the following criteria:

Likelihood of hazard	Severity of hazard occurring	Detectability of hazard	Rating
Rare: May occur in exceptional circumstances or has not occurred.	Insignificant: Insignificant impact, little disruption to normal operation – low risk to public health.	Very detectable: Very easy to detect, instantaneous, SCADA monitored.	1
Unlikely: Could occur at some time, historically has occurred annually or less than annually.	Minor: Minor impact for small population, some manageable operation disruption, some increase in operational requirements, potential of some health-related issue, but not life threatening.	Moderately detectable: alarm present but not in SCADA, may require operator to walk by and notice alarm; problem is indicated promptly by lab test results.	2
Possible: Has occurred once or more per year.	Moderate: Minor impact for small population, significant modification to normal operation but manageable. Increased monitoring and operational requirements, potential of some health-related issue, but not life threatening.	Normally detectable: No alarm present, visually detectable on rounds or regular maintenance.	3

Likelihood of hazard	Severity of hazard occurring	Detectability of hazard	Rating
Likely: Has occurred on a monthly to quarterly basis.	Major: Major impact for small population, systems significantly compromised and abnormal operation if at all. Potential of health issues even life threatening.	Poorly detectable: visually detectable but not inspected on a regular basis; would not be detected before a problem was evident; lab tests that are not done on a regular basis.	4
Very Likely: One or more occurrences on a monthly or more frequent basis.	Catastrophic: Major impact for large population, complete failure of all systems. High potential of death.	Undetectable: cannot detect.	5
Calculating the risk priority number: Risk = Likelihood + Severity + Detectability			

5.3 Level of risk is classified as follows:

Level of risk	Value
Very high	10 or higher
High (threshold)	8-9
Moderate	6-7
Low	0-5

The reliability and redundancy of equipment, control measures, monitoring and response procedures shall be considered when evaluating hazardous events. The team then identifies points where control may be applied to eliminate or minimize those hazards known as critical control points.

5.4 Responsibilities and timing for verifying the currency of the information and validity of assumptions used in the risk assessment

The responsibility, timing, verification of the information and validity of assumptions used in the Risk Assessment (RA) are the responsibility of the QMS Representative's. Action items resulting from the RA table review are tracked using meeting minutes in combination with the previous RA table. These records are the responsibility of the QMS Rep.

5.5 The approval process required to finalize the RA table

The QMS Rep has the authority to finalize the RA table and communicate the changes; approval has been granted through Element 4 by Top Management to "develop, implement and maintain the QMS".

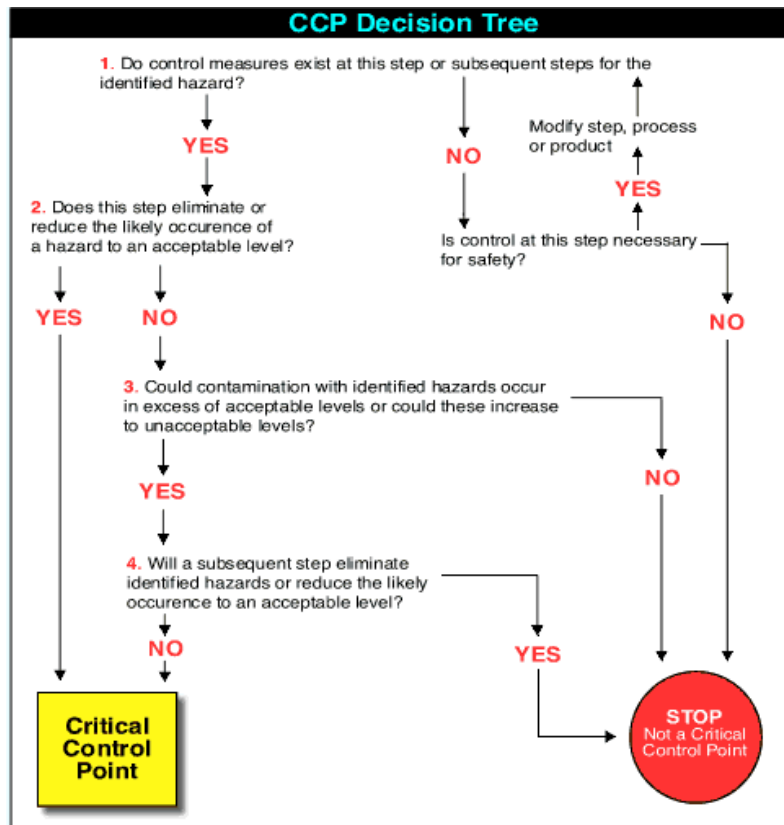
6. Identification of Critical Control Points

6.1 Critical Control Points (CCP's) are points at which control can be applied to prevent, eliminate or reduce a drinking water health hazard to an acceptable level.

6.2 CCP are identified by the RA team. The identification process is shown in **Figure 1 Critical Control Point decision tree**.

6.3 The RA team can add or remove CCP's upon discussion, depending on the level of control and internal decisions and is documented in the E8-01 DWQMS Risk Assessment Outcomes table (see **Appendix "B"**).

Figure 1: Critical Control Point decision tree



6.4 For each CCP, the following information is recorded in DWQMS E8-02 DWQMS Critical Control Points and Critical Control Limits (see **Appendix “C”**), and includes references to:

- monitoring measures, to describe what is monitored to indicate that the process step is within specified critical control limits (CCL’s),
- response procedures to describe the response to the deviation from the CCL’s, and
- any checks or systems available to detect hazards or potential for hazards. This includes continuous monitoring, visual inspection and periodic sampling. Monitoring can be completed by control measures to ensure CCP’s stay within desired limits.

7. Identification of risk management control measures

For each hazardous event, the control measures that are in place to prevent hazardous events or associated hazards from occurring shall be identified. Refer to E8-01 DWQMS Risk Assessment table (see **Appendix “B”**) for more information on monitoring and response measures.

8. Procedures for deviations from critical control points

E8-02 DWQMS Critical Control Points and Critical Control Limits (see **Appendix “C”**) identifies the response procedures when deviations from Critical Control Limits (CCL’s) are experienced. Each of the response procedures identify who responds, appropriate investigative, response and

corrective measures to take so that the hazard is eliminated or minimized, and actions taken to prevent recurrence of the deviation. Each procedure also identifies to whom the incident shall be reported and where details are recorded.

Associated documents:

Appendix “B” E8-01 DWQMS Risk Assessment Outcomes

Appendix “C” E8-02 DWQMS Critical Control Points and Critical Control Limits

Revision history:

#	yyyymm-dd	Description (describing last three revisions and/or all revisions of the past year)	Approved by
03	2020-01-21	OFI minor typo and MOE blurb on hazards added	Ron Cooper
04	2021-03-06	Merged Element 7/8 (with previous Element 7, 7-01 and previous Element 8) to remove redundancy between previous documents. Replaced the previous CCP identification process figure. Updated the wording in s.8 of this procedure and updated the associated documents to be enclosed in Appendix “B” and “C”.	Ron Cooper
05	2025-07-30	Updated Top Management titles	Ted Knapp

Element 9: Organizational Structure, Roles, Responsibilities and Authorities

Requirement:

The Operational Plan shall:

- a) describe the organizational structure of the Operating Authority including respective roles, responsibilities and authorities,
- b) delineate corporate oversight roles, responsibilities and authorities in the case where the Operating Authority operates multiple Subject Systems,
- c) identify the person, persons or group of people within the management structure of the organization responsible for undertaking the Management Review described in Element 20,
- d) identify the person, persons or group of people, having Top Management responsibilities required by this Standard, along with their responsibilities, and
- e) identify the Owner of the Subject System.

The Operating Authority shall keep current the description of the organizational structure including respective roles, responsibilities and authorities, and shall communicate this information to Operating Authority personnel and the Owner.

Procedure:

The organizational structure, as it relates to the drinking water system and key QMS roles, is documented in this section. The Town of Hanover members of Council are the Owner. The Town of Hanover Water Treatment Department and the Public Works staff are the Operating Authority for the Town's Drinking Water System.

The QMS Representative schedules and organizes the Management Review. The Owner Representative, Top Management and Operation Management undertake the Review as described in Element 20.

The Management Review Team is comprised of:

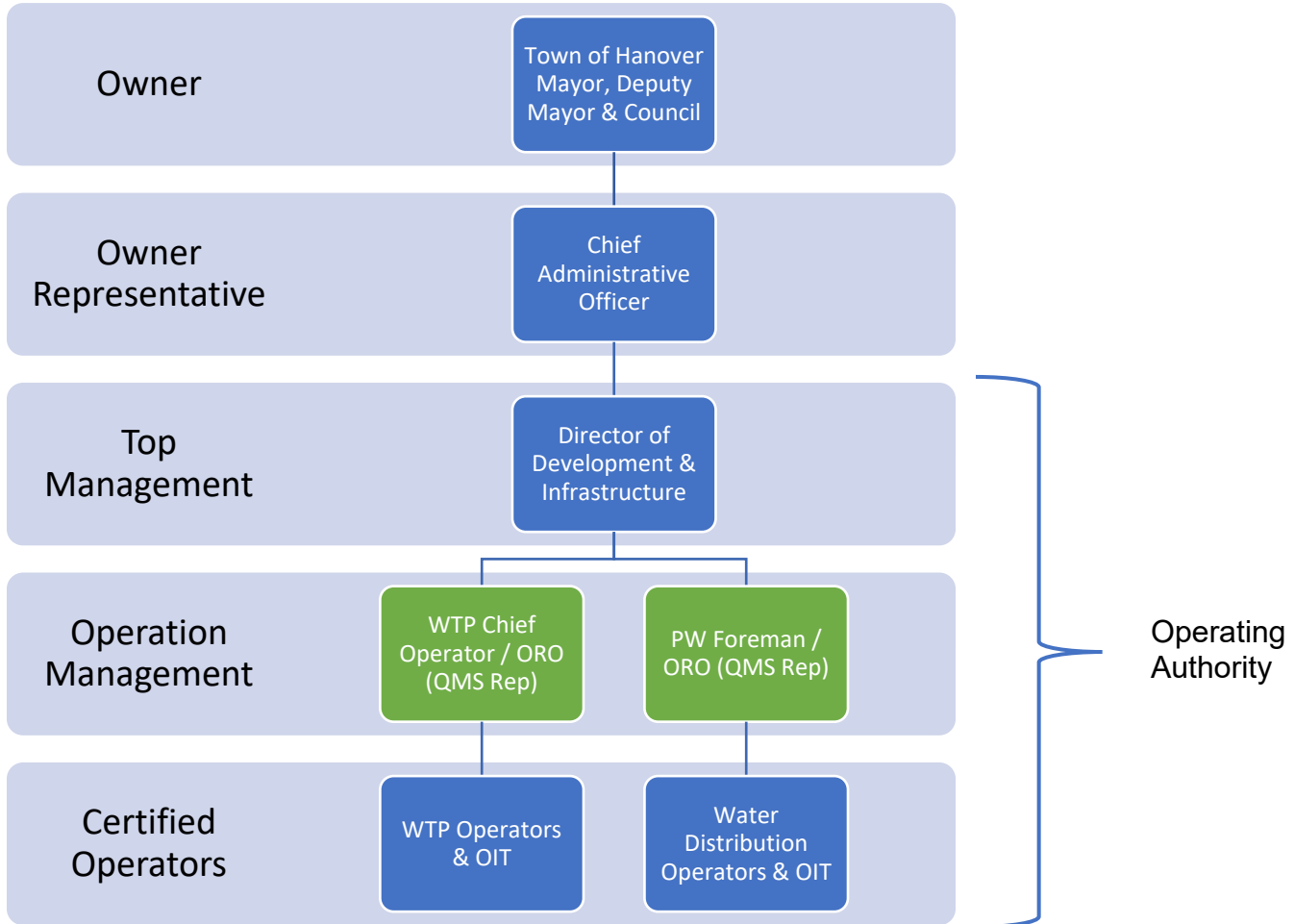
- Director of Development and Infrastructure (Top Management)
- WTP Chief Operator/ORO (Operations Management)
- Public Works Foreman/ORO (Operations Management)

The QMS Representative and alternate are documented in E4-DWQMS-QMS Representative.

Key drinking water system roles, responsibilities and authorities are documented in this section, in the table that follows the organizational structure.

Organizational Structure

The organizational structure as it relates to the Town of Hanover Drinking Water System is as follows:



Roles, responsibilities and authorities

Roles	Responsibilities	Authorities
Mayor and Council (Owner)	<ul style="list-style-type: none"> Represent the Town of Hanover Drinking Water System to end users Provision of human and financial resources to deliver safe drinking water Meet compliance with all legislation and regulations 	<ul style="list-style-type: none"> Prescribe requirements and meet obligations for the operation and compliance for the drinking water for the Town of Hanover Drinking Water Supply
Chief Administrative Officer (Owner Representative)	<ul style="list-style-type: none"> Attend meetings with Council Owner Representative for Drinking Water System Advocate for human and financial resources required to provide safe 	<ul style="list-style-type: none"> Communicate reports and operational issues to the Owner Administration of labour agreement(s) Sign-off of expenditures Designate responsibilities as

Roles	Responsibilities	Authorities
	<p>drinking water and be in comply all legislation and regulations</p>	<p>appropriate</p>
<p>Director of Development & Infrastructure (Top Management)</p>	<ul style="list-style-type: none"> • Communicate water system performance to Council • Responsible for hiring and training staff for the Water and Public Works Department • Responsible for ensuring fiscal and regulatory compliance for operations of safe drinking water from the municipal water supply system • Facilitate a Management Review • Participate in Emergency Response exercise and de-briefing with staff • Participate in Infrastructure Review process • Participate in the Risk Assessment team • Responsible for maintaining currency of documents in accordance with QMS policy 	<ul style="list-style-type: none"> • Communicate operational issues to the Owner • Authority to ensure staff is in place to manage the water supply system, develop administrative and technical policy, evaluate, and prioritize long-term utility needs. • Direct Senior staff in day-to-day activities; communicate scheduled construction activities as they affect water system operations and maintenance • Allocation of resources • Sign-off of expenditures • Designate responsibilities as appropriate
<p>WTP Chief Operator / ORO (Operation Management)</p>	<ul style="list-style-type: none"> • Designated as the Overall Responsible Operator (ORO) for the Water Treatment Plant • Responsible for the supervision of daily operations and staff at the Water Treatment Plant. • Oversight of process operation/controls, scheduling maintenance, scheduling staff, ensuring that employees' certifications and minimum training requirements are up to date, providing status reports to the Director of Development and Infrastructure • Ensures that standard operational procedures are followed as documented • Monitor water quality and demand • Participate in Emergency Response exercise and de-briefing with staff • Participate in Infrastructure Review process • Participate in the Risk Assessment team 	<ul style="list-style-type: none"> • Authorized as WTP Chief Operator to direct the duties of the plant operators and supervise any on site contractors • QMS Representative • Ensures that all operations are following current regulations • Purchasing of process chemicals, lab supplies, testing services and equipment parts
<p>Public Works Foreman / ORO (Operation Management)</p>	<ul style="list-style-type: none"> • Overall Responsible Operator for Distribution • Direct staff in day to day operations and maintenance activities in distribution • Supervise, train and develop staff • Assist with the preparation/review of 	<ul style="list-style-type: none"> • Direct the duties of the Public Works staff/distribution operators and supervise any on site contractors • Ensure that all operations are following current regulations • Purchasing of distribution equipment, repairs and stocking of parts

Roles	Responsibilities	Authorities
	DWQMS Standard Operating Procedures; adhere to compliance with applicable legislation and regulations <ul style="list-style-type: none"> • Participate in Management Review Meeting, Emergency Response exercise • Participate in Infrastructure Review process • Participate in the Risk Assessment team 	
QMS Representative	<ul style="list-style-type: none"> • Maintain QMS as specified in DWQMS Procedures • Facilitate Management Reviews with Top Management • Facilitate Emergency Response exercise and de-briefing with staff • Participate in Infrastructure Review process • Report to Top management the effectiveness of the QMS • Ensure all personnel are aware of all current legislation and regulatory requirements relevant to their duties with water system • Stay up to date on changes to relevant legislation and regulatory requirements 	<ul style="list-style-type: none"> • Authorized to communicate water quality issues to the Director of Development and Infrastructure/Top Management • Identify needs for improvement in DWQMS • Designate responsibilities as appropriate for DWQMS
Water Operators & OIT	<ul style="list-style-type: none"> • Perform specified duties as per training and/or direction of Superiors • Maintain operational parameters of the water system • Maintain and repair machinery and equipment as required • Operator in Charge, as required 	<ul style="list-style-type: none"> • Operate and maintain the drinking water system under direction of the Operator in Charge

Revision history:

#	yyyy-mm-dd	Description (describing last three revisions and/or all revisions of the past year)	Approved by
07	2024-01-29	Updated descriptions of who is included in management review team to reflect previous changes made to organizational structure.	Ted Knapp
08	2025-07-31	Updated Top Management titles	Ted Knapp
09	2026-05-28	Removed Chief Administrative Officer from Management Review Team	Ted Knapp

Element 10: Competencies

Requirement:

The Operational Plan shall document:

- a) competencies required for personnel performing duties directly affecting drinking water quality,
- b) activities to develop and/or maintain competencies for personnel performing duties directly affecting drinking water quality, and
- c) activities to ensure that personnel are aware of the relevance of their duties and how they affect safe drinking water.

The Operating Authority shall undertake activities to:

- a) meet and maintain competencies for personnel directly affecting drinking water quality and shall maintain records of these activities, and
- b) ensure that personnel are aware of the relevance of their duties and how they affect safe drinking water, and shall maintain records of these activities.

Procedure:

1. This section describes the process for identifying, developing and maintaining required competencies for personnel performing duties directly affecting the drinking water system operations and water quality. Additionally, it describes activities to ensure personnel are aware of the relevance of their duties. Employee and training records show evidence of activities to meet and maintain the competencies described in the procedure and to ensure personnel awareness.
2. This procedure covers all personnel performing duties within the Town of Hanover Drinking Water System that affects drinking water quality.
3. Competencies required for roles directly affecting drinking water quality are defined in the table:

Role	Required competency
Chief Administrative Officer	<ul style="list-style-type: none"> • Experience as a Senior Level Manager with Administrative, Budgeting and Leadership qualities • Training in Emergency Management, Legislation
Director of Development and Infrastructure (Top Management)	<ul style="list-style-type: none"> • Senior Level Manager experience with advanced theoretical and working knowledge of Water Treatment, Construction, applicable regulations and Emergency Management
WTP Chief Operator / ORO (Operation Management)	<ul style="list-style-type: none"> • The Overall Responsible Operator (ORO) shall have a minimum Class II Water Treatment certificate • Experience as a Water Treatment Operator / Distribution maintenance and construction • Valid Driver's Licence • Training in Emergency Management, Legislation, Budgeting • Working knowledge of the DWQMS standards, procedures, and documentation • Tracking training and competencies using Operator Training Excel file for Treatment.
Public Works Foreman / ORO (Operation Management)	<ul style="list-style-type: none"> • The Overall Responsible Operator (ORO) shall have a minimum Class II Water Distribution certificate • Experience as an Operator/Distribution maintenance and construction • Valid Driver's Licence • Training in Emergency Management, Legislation, Budgeting • Working knowledge of the DWQMS standards, procedures, and documentation • Tracking training and competencies using Operator Training Excel file for Distribution.
QMS Representative	<ul style="list-style-type: none"> • Working knowledge of the DWQMS standards, procedures and documentation • Training in Emergency Management, Legislation

Role	Required competency
Water Operators & OIT	<ul style="list-style-type: none"> • Minimum OIT level certificate, working toward obtaining a Class II Water Treatment or Class II Distribution certificate. • Participate in mandatory in-house training annually including but not limited to; sampling, record keeping, watermain disinfection, and responding to main breaks. • An understanding of the DWQMS, water treatment process, SCADA systems, chemistry, math, water regulations and identifying, reporting, and responding to adverse drinking water conditions as required by regulations. • Following procedures, lab analyses and interpreting results. • Conducting pump maintenance and repair • Able to follow directions

4. Meeting DWQMS competencies:

When hiring new Operators, the Town of Hanover gives preference to candidates with basic certification. New employees shall be required to provide supporting documentation for certification, where applicable and with hiring references. The new employee must meet competencies within 6 months of their hiring date.

Competency is demonstrated by acquiring the appropriate education, training and skills required for the relevant position.

Only personnel who meet requirements and demonstrate competencies can be assigned duties that directly affect drinking water quality.

5. Identification of training requirements

Training needs are identified by job role and certification requirements. Each Operator is responsible for updating their own training records and identifying training opportunities and relaying that information to their Supervisors.

As changes to legal requirements, new technology and/or processes change, updated training will be provided to all necessary employees and training records updated accordingly.

New employees will be required to complete all training listed on Form 30-01, *New Employee Training*, within the timelines specified in the form.

Certification renewal dates are incorporated into the employees' training records. Training may be provided on or off site by qualified employees or contracted out.

6. Employee DWQMS orientation

DWQMS awareness training is held as required when documents or procedures are updated or a significant change in procedure. All staff must sign off as being informed. Operator's certifications are posted on the WTP and PW Workshop Offices' walls.

Associated documents:

Employee certification and training records
 Form 30-01 New Employee Training

Revision history:

#	yyyy-mm-dd	Description (describing last three revisions and/or all revisions of the past year)	Approved by
06	2024-01-25	Updated Water Operators required competency to include mandatory annual in-house training.	Ted Knapp
07	2025-07-31	Updated Top Management titles	Ted Knapp
08	2026-05-28	Added section 5 with required training for new employees and New Employee Training form to associated documents	Ted Knapp

Element 11: Personnel Coverage

Requirement:

The Operational Plan shall document a procedure to ensure that sufficient personnel meeting identified competencies are available for duties that directly affect drinking water quality.

Definitions:

OIC – Operator in Charge

ORO – Overall Responsible Operator

Procedure:

1. Staff coverage is aligned with the requirements of the [Safe Drinking Water Act, 2002](#), [O. Reg. 128/04 Certification of Drinking Water System Operators and Water Quality Analysts](#) and [O. Reg. 170/03 Drinking Water Systems](#) and with the collective agreement between the employees and the Town of Hanover.
2. Once every calendar year, an on-call schedule for water and distribution is prepared and shared with all staff, ensuring 24/7 coverage for regular hours and after hours, as outlined below.

Regular hours:

Operators are designated Operator in Charge (OIC) when they are appointed to the water plant on a daily basis, and scheduled weekdays from 7:30 a.m. until 4:00 p.m.

The distribution operators work Monday - Friday from 7:00 a.m. until 3:30 p.m. A policy has been implemented ensuring that at least one operator is on standby at all times, unless otherwise arranged with the Owner.

After hours

Water Distribution

After hour emergency calls are taken by the on-call staff (519-881-8061), who assesses the problem and calls out the appropriate personnel.

Water Treatment

The on-call operator is designated Operator in Charge (OIC) if they have a Class I or higher certificate (OIT's cannot be OIC's) – for the entire week (Thursday 8:00 am to Thursday 8:00 am).

The plant is equipped with alarms on all plant process equipment, pumps, and chemicals. Alarms are monitored by the SCADA system, which transfers alarms to the operator on call. Operators will address the alarm issue by visiting the plant within a reasonable amount of time. Failure to respond will result in direct calls to cell phones of other staff. In the event of an emergency, all operators report to the water plant.

3. The Town of Hanover's Drinking Water System is a Class II Water Treatment and Class II Distribution system, and therefore, the overall responsible operator (ORO) must also hold a minimum Class II Certificate or higher for Water Treatment and/or Distribution (depending on their area of responsibility).
 - 3.1. When required, the ORO can designate an alternate.

- 3.2. An operator with a certificate one class lower than the class of the subsystem may assume the ORO responsibility for up to 150 days a year as back-up when the ORO with the required qualifications is absent or unable to act.
- 4. Operators-in-charge must hold a Class I Certificate or higher for Water Treatment or Distribution (depending on their area of work). A professional engineer without a valid certificate can be designated OIC for 180 days in a 24-month period.
 - 4.1. An operator-in-training cannot be an operator-in-charge.
 - 4.2. The time spent by an operator in an operator-in-charge role must be tracked.
- 5. Staff shortage scenarios can occur in the event of a strike, lockout or pandemic situation. Managers who are certified operators may operate the water system in these staff shortage scenarios.
 - 5.1. In a pandemic situation, the Town’s Emergency Plan for pandemic response is activated.
 - 5.2. The collective agreement stipulates that during the life of this agreement there will be no strikes, picketing, slowdown or stoppage of work, either complete or partial and the corporation agrees that there will be no lockouts.
 - 5.3. In the event of a short staffing scenario (e.g. pandemic), O. Reg. 128/04 further clarifies rules and expectations in personnel coverage that the Water & Wastewater division would employ to ensure safe drinking water and regulatory requirements are consistently met using resources outside of regular Town Employees. Refer to O.Reg 128/04 “Emergency Situations” Section 32 and Section 33.

Associated documents:

- [Safe Drinking Water Act, 2002](#)
- [O. Reg. 128/04 Certification of Drinking Water System Operators and Water Quality Analysts](#)
- [O. Reg. 170/03 Drinking Water Systems](#)

On-call schedule for water and distribution
 Town of Hanover Emergency Plan
 Collective agreement

Revision history:

#	yyyy-mm-dd	Description (describing last three revisions and/or all revisions of the past year)	Approved by
02	2019-01-14	Changes made to requirement to meet DWQMS 2.0 requirements and wording	Ron Cooper
03	2020-02-16	General review, minor updates and re-approval.	Ron Cooper
04	2021-03-16	Merged Element 11 (with previous E11-01 and E11-02) to remove redundancy between documents.	Ron Cooper
05	2023-03-03	Added section 5.3 to include changes made to O.Reg 128/04 regarding staffing shortages in emergency situations. Adjusted on call rotation to current specifications.	Ted Knapp

Element 12: Communications

Requirement:

The Operational Plan shall document a procedure for communications that describes how the relevant aspects of the QMS are communicated between Top Management and:

- a) the Owner
- b) Operating Authority personnel
- c) Suppliers that have been identified as essential under Plan (a) of Element 13
- d) the Public

Procedure:

1. Internal communication

- 1.1 The Operational Plan is made available to all Town of Hanover personnel involved in the provision of safe drinking water at the Municipal Civic Centre, Public Works Shop, the Water Treatment Plant and on the Town’s website at www.hanover.ca
- 1.2 QMS awareness training on the Operational Plan is carried-out once every year with staff and any new hires and documented through Form E10-01 Staff Sign off Sheet.
- 1.3 Existing employees are notified of any change to the QMS through internal training sessions or tailgate morning meetings and signed off Form E10-01 Staff Sign off Sheet.
- 1.4 Internal training sessions are organized by the QMS Representative as needed to identify and review new or changed documentation and ensure that personnel understand the content.
- 1.5 Attendance is documented through the sign-in sheets Form E10-01 Staff Sign Off.
- 1.6 Communication between staff and Top Management is managed by the QMS Reps.
- 1.7 Communication between Top Management and the Owner is managed through the Director of Development and Infrastructure, who provides updates on the QMS at Council meetings, such as information documented as a result of Management Review Meetings, Infrastructure Reviews and budgets prepared and anything else that requires Council approval.

2. External communication

- 2.1 The quality, legislative requirements and standards for essential suppliers and services are communicated to all suppliers and service providers through purchasing process (request for tenders, request for quotes, requests for proposals, etc.).
- 2.2 This information will also be made available to the public via the Town of Hanover website at www.hanover.ca, or by other means upon request.
- 2.3 There are Standards Operating Procedures (SOP) that set out the reporting of Adverse conditions to agencies; SOP OP-14 AWQI Reporting and Form OP-19 Adverse Notification Checklist.

Associated documents:

- SOP OP-14 AWQI Reporting
- Form OP-19 Adverse Notification Checklist
- Form E10-01 Staff Sign off Sheet

Revision history:

#	yyyy-mm-dd	Description (describing last three revisions and/or all revisions of the past year)	Approved by
05	2021-03-16	Added references to infrastructure reviews and budgets in communications with owner.	Ron Cooper
06	2024-01-29	Updated SOP and Form referenced.	Ted Knapp
07	2025-07-31	Updated Top Management titles	Ted Knapp

Element 13: Essential Supplies and Services

Requirement:

The Operational Plan shall:

- a) identify all the supplies and services essential to the delivery of a safe drinking water and shall state, for each supply or service, the means to ensure its procurement, and
- b) include a procedure by which the Operating Authority ensures the quality of essential supplies and services, in as much as they may affect drinking water quality.

Definitions:

AWWA – American Water Works Association

ANSI – American National Standards Institute

Essential – Can directly affect the delivery of safe drinking water if not in place

NSF- National Sanitation Foundation Internal; a public health and safety company

Procedure:

The information related to essential suppliers and service providers is reviewed annually as a part of the Operational Plan review, ensuring currency of information and communicating any updates to essential suppliers, service providers, staff and top management. The Essential Supplies and Service Providers table lists method for procurement and quality requirements for each.

The Town’s **Municipal Drinking Water Licence**, Schedule B – Section 14.0 Chemicals and Materials stipulates that: *All chemicals and materials used in the alteration or operation of the drinking water system that come into contact with water within the system shall meet all applicable standards set by both the American Water Works Association ("AWWA") and the American National Standards Institute ("ANSI") safety criteria standards NSF/60, NSF/61 and NSF/372. (some exceptions are listed in section 14.3 of the licence)*

The Town’s **Drinking Water Works Permit** describes conditions under which drinking water system alterations are permitted – and these shall also be ensured with providers of supplies / services.

Requirements for essential supplies and services are communicated through procurement process:

- 1. The information gathered confirms suppliers have received and are supplying current documentation for the Water Services to use for Suppliers and Service Providers.
- 2. Staff verify on an ongoing basis that product shipments meet the quality requirements. When deliveries of products are non-conforming, they are not accepted and are returned to the supplier.

Essential Supplies and Service Providers Table

Essential supply or service	Method for procurement	Quality requirements
Laboratory services	<ul style="list-style-type: none"> • Notification to MECP of new lab • Sample containers and chain of custody forms provided by lab • Water samples by Town Operator with completed chain of custody (COC) • Results e-mailed to the Town per COC 	<p>Accredited lab, licensed by the MECP (listed at: List of Licensed Laboratories Ontario.ca)</p> <p>Drinking water test approved</p>

Essential supply or service	Method for procurement	Quality requirements
Treatment chemicals	<ul style="list-style-type: none"> Min. inventory of chemicals at all times Delivery schedule set / agreed by supplier Proper transport / delivery preventing spills and releases Certificate of analysis (C of A) and product SDS accompanying deliveries 	SDS and C of A confirming strength, composition, NSF 60 certification Operator verifies conformity prior to receiving chemicals.
Parts & equipment	<ul style="list-style-type: none"> Back-up equipment and parts in stock Distribution parts of varying sizes and lengths in stock Packing slip confirming products delivered meet certification requirements 	NSF 61 certification NSF 372 certification (for parts that can contain lead) Operator verifies conformity prior to receiving delivery.
Calibration services	<ul style="list-style-type: none"> Scheduled once every 12 months Analytical equipment checked, maintained and calibrated as necessary Reagents used for verifications by staff are unexpired. 	Analytical equipment manufacturer's technician Certificate of equipment performance provided
UV system	<ul style="list-style-type: none"> UV system checked, maintained, serviced as necessary 	Equipment manufacturer technician
Generator services	<ul style="list-style-type: none"> Scheduled once every 12 months More frequently tested by Operators 	Generator maintenance tech Certified Operators
Reservoir & elevated storage	<ul style="list-style-type: none"> Reservoir inspection, integrity checked, maintained, serviced as necessary MECP disinfection procedures followed 	Reservoir and elevated storage technicians Certified Operators verify
Fuel supply	<ul style="list-style-type: none"> Minimum inventory of fuel at all times Delivery schedule set / agreed by supplier 	Proper fuel type, volume, timing communicated

Associated documents:

SOP OP-19 Adverse Notification Checklist

Drinking Water System Emergency Response Plan – Emergency Contact List

Water Treatment Inventory List

Water Distribution Inventory List

Revision history:

#	yyyy-mm-dd	Description (describing last three revisions and/or all revisions of the past year)	Approved by
04	2021-03-16	Removed reference to procedure that no longer exists (E13-01...procedure). The essential supplier contact information is retained with the DWS Emergency Response Plan.	Ron Cooper
05	2021-07-14	Added the Essential Supplies and Services table included above to describe methods for procurement and quality requirements.	Ron Cooper
05	2023-10-26	Included WTP and Distribution Inventory Lists as associated Documents to formalize list as part of the Operational Plan.	Ted Knapp

Element 14: Review and Provision of Infrastructure

Requirement:

The Operational Plan shall document a procedure for reviewing the adequacy of the infrastructure necessary to operate and maintain the Subject System that:

- a) considers the outcomes of the risk assessment documented under Element 8, and
- b) ensures that the adequacy of the infrastructure necessary to operate and maintain the Subject System is reviewed at least once every Calendar Year.

The Operating Authority shall implement and conform to the procedure and communicate the findings of the review to the Owner

Definitions:

Capital budget a capital budget that is a 5-year forecast capital plan

Operating budget an annual operating budget

Financial plan a 5-year budget workbook used to forecast expenditures and revenues and to develop rates, used as a tool for planning the annual operation and capital budget

Procedure:

1 Infrastructure review

- 1.1. On an on-going basis, the Director of Development and Infrastructure reviews the adequacy of the Town of Hanover Drinking Water System infrastructure in Supervisors Meetings called by the Director of Development and Infrastructure with both the Chief Water Operator/ORO for Water Treatment Operations and the Public Works Foreman for the Distribution system in attendance.
- 1.2. The above Supervisors Meetings review operations and the adequacy of the infrastructure to operate and maintain the water system by reviewing information, such as:
 - Operational performance indicators such as adverse water quality incidents, alarms, operational issues, water loss, water main breaks,
 - Risk assessment outcomes,
 - Drinking water quality trends,
 - MECP inspection reports,
 - Staff suggestions, planned maintenance on roads, sewers, water system.
- 1.3 The objectives of the infrastructure review are:
 - To determine if the current programs, infrastructure condition and budgets are adequate in maintaining the system,
 - If necessary, make recommendations for repair or replacement and operating capital budget increases based on the review of the above listed criteria.
- 1.4 This information is to be used to adjust the water services rates and therefore the proposed annual operating and capital budgets; and,
 - Identify deficiencies and action items to address the deficiencies, including personnel responsible for delivering the action items and the proposed timelines for their

implementation.

2. Provision of infrastructure:

2.1. The methods by which repair or replacement recommendations are communicated to Council are:

- The capital and operating budget,
- A one-time funding request by report to Council (for immediate needs),
- Preventative maintenance program,
- Quarterly WTP Operations Report,
- County capital programs (e.g. county road projects).

2.2. The infrastructure capital projects are contracted to engineering consultants and/or construction contractors.

2.3. As built drawings and asset information are to be provided to the Director of Development and Infrastructure following the completion of each project to ensure the infrastructure database and Town records and maps are current.

Associated documents:

Operating and Capital Budget Financial Plan
Infrastructure Studies and Master Plans
Water Rates Structure
Purchasing By-law
Infrastructure Meeting minutes

Revision history:

#	yyyy-mm-dd	Description (describing last three revisions and/or all revisions of the past year)	Approved by
03	2020-02-16	Wording changes under Infrastructure Review in 14-01	Ron Cooper
04	2021-03-16	Merged Element 14 (with previous E14-01) to remove redundancy between documents.	Ron Cooper
05	2025-08-11	Updated Top Management titles.	Ted Knapp

Element 15: Infrastructure Maintenance, Rehabilitation and Renewal

Requirement:

The Operational Plan shall document:

- a) a summary of the operating authority's infrastructure maintenance, rehabilitation and renewal programs for the subject system, and
- b) a long-term forecast of major infrastructure maintenance, rehabilitation and renewal activities.

The Operating Authority shall:

- a) keep the summary of the infrastructure maintenance, rehabilitation and renewal programs current,
- b) ensure that the long-term forecast is reviewed at least once every calendar year,
- c) communicate the programs to the owner, and
- d) monitor the effectiveness of the maintenance program.

Procedure:

1. The Town of Hanover Drinking Water System's maintenance, rehabilitation and renewal programs are summarized in Operations & Maintenance Schedules for both Distribution and Water Treatment Operations. These are included in Operations & Maintenance manuals.
 - 1.1. The maintenance program is documented for assets, including hydrants, curb stops, valves, water mains, filters, pumps, UV, wells, water tower and pump houses; it is maintained by the Public Works Foreman and the Chief Operator/ORO. Maintenance is performed in line with the manufacturer recommendations or best practices where applicable.
 - 1.2. Standard Operating Procedures (SOP's) are available for some of the maintenance activities; water staff can consult the applicable SOP, if required to complete the maintenance activity.
 - 1.3. Planned maintenance is performed as directed by the Foreman or Chief Operator who assigns planned work to staff accordingly.
 - 1.4. Planned and unplanned maintenance performed is communicated to the Foreman and Chief Operator through various reporting forms and records retained.
2. **Rehabilitation and renewal**
 - 2.1. The Director of Public Development and Infrastructure has the responsibility and authority to develop an infrastructure rehabilitation or renewal program as per Element 14 Review and Provision of Infrastructure.
3. **Communication to council**
 - 3.1. All maintenance, rehabilitation and renewal costs are considered by Council in the approval of the operating and capital budget as per Element 14 Review and Provision of Infrastructure.
4. **Effective monitoring**
 - 4.1. The effectiveness of the preventative maintenance program is evaluated through the regular Supervisors Meetings. The summary report addresses the following preventative

maintenance activities:

Distribution

- Hydrant inspection
- Leak detection
- Watermain breaks
- Water main flushing
- Water main replacement/construction
- Valve inspection

Water Treatment Operations

- Deviations from CCP
- Adverse events
- SCADA alarms
- Filter, pump run times
- Maintenance costs/time

Associated documents:

Element 14 Review and Provision of Infrastructure
Operations & Maintenance Schedules

Revision history:

#	yyyy-mm-dd	Description (describing last three revisions and/or all revisions of the past year)	Approved by
03	2020-02-16	General review, minor updates and re-approval.	Ron Cooper
04	2021-03-16	Updated references to the Operations & Maintenance Schedules (from Appendix B to Operations & Maintenance manuals), and updated reference from 14-01 to Element 14.	Ron Cooper
05	2025-08-11	Updated Top Management titles.	Ted Knapp

Element 16: Sampling, Testing and Monitoring

Requirement:

The Operational Plan shall document:

- a) a sampling, testing and monitoring procedure for process control and finished drinking water quality including requirements for sampling, testing and monitoring at the conditions most challenging to the subject system,
- b) a description of relevant sampling, testing or monitoring activities, if any, that take place upstream of the subject system, and
- c) a procedure that describes how sampling, testing and monitoring results are recorded and shared between the Operating Authority and the Owner, where applicable.

Definitions:

Lab – SGS Laboratory or “Lab” under contract

Monitoring – data collection and analysis

OIC- Operator in Charge

ORO – Overall Responsible Operator

Sampling – the process of collecting water samples for laboratory or field analysis

Testing – the laboratory analysis of a sample

THM’s- Trihalomethanes

HAA’s – Haloacetic acids

Procedures:

1. All sampling programs carried out on the Town of Hanover Drinking Water System is coordinated by the Chief Operator, ORO and meets the requirements of O. Reg. 170/03 Drinking Water Systems.
 - 1.1. The frequency of all required samples shall be collected in accordance with O.Reg. 170/03.
 - 1.2. All sampling, testing, and monitoring activities shall be conducted in accordance with O.Reg. 170/03.
 - 1.3. Chlorine residual testing is conducted following the Standard Operating Procedure SOP-OP-04 Sampling for Chlorine Residual.
2. **Sampling locations**
 - 2.1. The Chief Operator ORO shall determine all sampling locations for chlorine residuals and bacteriological samples. All locations shall provide a representative sample of the water system in that area. Additionally, all locations shall have an easily accessible, cold, hard water tap with a removable aerator.
 - 2.2. On an annual basis, the Chief Operator, ORO shall review the water quality sampling program for changes required due to current population and legislative requirements, to ensure the legally required number of samples are being collected. The Chief Operator, ORO shall review and update bacteriological sample locations and forward any changes to the Lab.
 - 2.3. The THM sampling location must be selected in accordance with Schedule 13 of O.Reg. 170/03.

- 2.4. HAA's sampling location are at the point of entry of the Water Treatment plant.
- 2.5. Lead sampling locations are to be selected based on the criteria set out in Schedule 15.1 of O.Reg. 170/03/ All residential and non-residential sampling locations shall be volunteered by the occupant.

3. Water mains after maintenance

- 3.1. When an existing water main has been repaired, sampling, testing and monitoring shall be performed as per SOP WD-01 Watermain Break.

4. New Water main service commissioning

- 4.1. New water main or service installation and commissioning must follow the recent version of the MECP Water main Disinfection Document for 100mm in diameter or larger. On water mains or services smaller than 100mm in diameter, bacteriological samples are to be collected at the discretion of the Public Works Foreman.
- 4.2. Bacteriological samples collected for commissioning are to be collected by qualified contractors, consultants, or Water Service Operators and processed at a qualified external Lab.
- 4.3. Results are sent to the Director of Development and Infrastructure for review in accordance with specifications
- 4.4. When testing specifications are met the Director of Development and Infrastructure will email a written authorization to the contractor or consultant stating specifications have been met and final connection to the water distribution system can be made.

5. Reporting results within Water Services

- 5.1 Chlorine residual readings collected by the Water Service Operators shall be recorded in the Daily Summary Worksheet and computer.
- 5.2 The Chief Operator shall review all results against legislated requirements and initial Daily Summary Worksheet to confirm its review.
- 5.3 Weekly and monthly summaries will be reviewed and initialed by the Chief Operator, ORO or designate to verify compliance with the regulations
- 5.4 The Chief Operator, ORO shall review and initial result analysis collected and analyzed by the Lab within that one-week timeframe to verify compliance with regulations.
- 5.5 If there are any trends identified that require further investigation, the investigation is the responsibility of the Chief Operator, ORO.
- 5.6 For Schedule 15.1 lead results the Chief Operator or designate enters results into the corresponding Excel file and summaries of which are sent to the MECP Inspector for inspections.

6. Reporting results to the Owner

- 6.1. Chief Operator, ORO prepares an annual drinking water report, entitled "Annual Report". This report is a compilation of the year's sampling, testing and monitoring program any adverse occurrences and all chemical analysis conducted on drinking waters system. This report is communicated to Council annually as required by the O.Reg. 170/03.
- 6.2. All regulated bacteriological and chemical analysis conducted on the water system is

communicated to Council annually as required by O.Reg. 170/03.

7. Results and record-keeping

- 7.1 All sampling, testing and monitoring results collected and generated by the Lab are to be reported to the Chief Operator ORO and Director of Development and Infrastructure.
- 7.2 The Operations Records binder includes two sections, for: Microbiology results (weekly), and Microbiology (non-reportable samples and new watermain commissioning).
- 7.3 All results are provided to the Town by email, filed and retained as per the records retention in Element 5.

8. Adverse reporting

- 8.1. Adverse conditions shall be immediately verbally reported to the Chief Operator, ORO and then the Director of Development and Infrastructure as per O.Reg. 170/03.
- 8.2. Adverse conditions shall be handled in accordance with the Adverse Water Quality Incident Report SOP OP-14.

9. Challenging conditions

- 9.1. Challenging conditions are identified in Element 6 of the Operational Plan. The identified conditions do not impact routine sampling, testing and monitoring activities.

Associated documents:

Ontario Regulation 170/03
 SOP WD-01 Watermain Break Repair
 SOP-WT-04 Chlorine Residual Sampling
 SOP WT-14 AWQI Reporting

Revision history:

#	yyyy-mm-dd	Description (describing last three revisions and/or all revisions of the past year)	Approved by
06	2022-08-29	Updated Associated Documents.	Ted Knapp
07	2024-01-29	Updated Associated Documents.	Ted Knapp
08	2025-08-11	Updated Top Management titles.	Ted Knapp

Element 17: Measurement and Recording Equipment Calibration and Maintenance

Requirement:

The Operational Plan shall document a procedure for the calibration and maintenance of measurement and recording equipment.

Scope:

This procedure is applicable to measuring and recording equipment used by the Town of Hanover Water Department for the measuring and recording of data specifically related to the sampling, testing and monitoring activities conducted on the water system. This does not cover water metering or upstream monitoring.

This procedure covers the following equipment:

- Hach Colorimeter II (total and free chlorine test kits, pH meter)
- Hach Turbidimeter (handheld)
- Hach 1720 Turbidimeter (continuous)
- Hach TU5300 Turbidimeter (continuous)
- Prominent Chlorine Analyzers (daily verified and calibrated when out 5%; annual calibration by qualified third party)

It is the responsibility of the external service, such as leak detection and laboratory services, to maintain their required test equipment.

Procedure:

1. Verification, calibration and maintenance schedule

- 1.1. The QMS Representative is responsible for creating and maintaining the verification, calibration and maintenance schedule. Operations & Maintenance Schedules included as part of the Operations & Maintenance manuals – include the CT list of equipment.
- 1.2. The schedule shall identify the type of equipment, the frequency, calibration and maintenance and location of calibration certificates.
- 1.3. The frequency of calibration shall be at least that which is required by O.Reg 170/03 or suggested by the manufacturer, whichever is most frequent.
- 1.4. The Town's Municipal Drinking Water License stipulates that anything related to the CT monitoring system is checked and calibrated as necessary at least once every 12 months.
- 1.5. If monitoring equipment is dropped or damaged the equipment shall be verified and/or calibrated and repaired, if required, prior to being put back into service.
- 1.6. The operator may perform more frequent verification or calibration at their discretion, based on test results.
- 1.7. The QMS Representative is responsible for ensuring verification, calibration and maintenance requirements when new measuring equipment is identified and added to the schedule.

2. Verification, calibration and maintenance procedures

- 2.1. Verification, calibration and maintenance of all equipment are to be performed as per the manufacturer's instructions and written in SOP WT-16 and SOP WT-17.

- 2.2. When equipment is outside of the calibration standards or requires maintenance, it is to be taken out of service immediately and reported to the Chief Operator, ORO immediately. The Chief Operator will arrange for re-calibration, maintenance and/or replacement.
- 2.3. Equipment/Owners manuals can be found in the Equipment Manuals bookcase in the Water Treatment Office.

3. Recording results

3.1. Total and Free Chlorine Test Kits

- 3.1.1. Verification results shall be recorded on the Daily Summary Worksheet Results from previous months are filed in the Operations Binder.
- 3.1.2. External calibration records are filed in the Operations Binder under “Calibration and Service Reports” for the appropriate year.

3.2. pH Meters

- 3.2.1. External calibration records are filed in the Operations Binder under “Calibration and Service Reports” for the appropriate year

3.3. Handheld Turbidimeter

- 3.3.1. Verification results shall be recorded on the Monthly Turbidimeter Verification Forms OP17-04 Calibration Sheets. Results from previous months are filed in the Operations Binder for the appropriate year in the WTP Office.
- 3.3.2. External calibration records are filed in the Operations Binder under “Calibration and Service Reports” for the appropriate year.

3.4. Continuous Turbidimeter

- 3.4.1. External calibration records are filed in the Operations Binder under “Calibration and Service Reports”.
- 3.4.2. Recorded daily on Daily Summary Worksheet

Associated documents:

Drinking Water Works Permit Schedule A “Instrumentation and Control” section – instruments list
 Measurement and Recording Equipment manuals
 Operations & Maintenance Schedules (included as part of Operations & Maintenance manuals)
 Records of maintenance, verifications and calibrations

Revision history:

#	yyyy-mm-dd	Description (describing last three revisions and/or all revisions of the past year)	Approved by
04	2021-03-16	Merged Element 17 (with previous E17-01) to remove redundancy between documents. Updated reference to O&M schedules in Operations & Maintenance manuals and added s.1.4.	Ron Cooper
05	2021-04-13	Added reference to DWWP Schedule A “Instrumentation and Control” section for list of instruments (especially related to CT monitoring system).	Ron Cooper
06	2022-08-29	General review and updated wording, SOPS and forms	Ted Knapp

Element 18: Emergency Management

Requirement:

The Operational Plan shall document a procedure to maintain a state of emergency preparedness that includes:

- a) a list of potential emergency situations or service interruptions,
- b) processes for emergency response and recovery,
- c) emergency response training and testing requirements,
- d) Owner and Operating Authority responsibilities during emergency situations,
- e) references to municipal emergency planning measures as appropriate, and
- f) an emergency communication protocol and an up-to-date list of emergency contacts.

Scope:

This procedure is applicable to the potential emergency situation that could result in the loss of “Water Services” ability to maintain the supply of safe drinking water to its customers

Should a drinking water system related emergency go beyond the scope of this procedure, the Town’s Municipal Emergency Plan shall take precedence.

Procedure:

1. Identifying potential emergency situations or service interruptions

- 1.1. Potential emergency situations and service interruptions are identified through the risk assessment process and documented in Appendix “B” E8-01 Risk Assessment Outcomes as hazardous events.
- 1.2. Other sources of information for identifying potential emergencies include:
 - 1.2.1. Management Review,
 - 1.2.2. MECP inspections,
 - 1.2.3. Internal / External audits,
 - 1.2.4. Insurance company reviews,
 - 1.2.5. Occurrence of past emergencies, and
 - 1.2.6. News reports about emergencies in other systems and staff input.

2. Emergency response and recovery

- 2.1. Appendix “B” E8-01 Risk Assessment Outcomes and the supporting information in Appendix “C” E8-02 Critical Control Points and Critical Control Limits identify highest system risks, critical control points, critical control limits, control measures, response and recovery procedures for each hazardous event.
- 2.2. Water Services’ emergency response plan consists of Emergency Response Standard Operating Procedures that address the following situations:
 - 2.2.1. ERP-08 Spill at Ruhl Lake
 - 2.2.2. ERP-09 Water Treatment Line Rupture

- 2.2.3.ERP-12 Generator Failure
- 2.2.4.ERP-15 Loss of SCADA,
- 2.2.5.ERP-18 Back Flow/Cross Connection,

2.3. Emergency Response SOP's cover the following information:

- 2.3.1. Assessing the situations,
- 2.3.2. Protecting consumers, employees, visitors, equipment, vital records and other assets,
- 2.3.3. Communication methods with the community, personnel and responders,
- 2.3.4. Address the emergency,
- 2.3.5. Shut down and start-up of operations, and
- 2.3.6. Restoring of operations.

2.4. The roles and responsibilities of the responding Water Department Operator and the OIC are defined in each Emergency Response SOP.

2.5. Overall emergency response and recovery shall be the responsibility of the ORO.

2.6. Following major incidents an incident debriefing session shall take place, which includes a discussion on:

- 2.6.1. Why did this incident happen?
- 2.6.2. What went well in the incident response?
- 2.6.3. What didn't go well in the incident response?
- 2.6.4. What are lessons learned / opportunities for improvement?

2.7. The Owner shall be notified in the event that water quality poses an acute health risk to the consumers and a boil water advisory or drinking water advisory must be issued.

3. Emergency communications and contacts

3.1. Emergency Response SOP's establish communication requirements specific to each emergency.

3.2. An emergency contact list, priority contacts, is available to the on-call staff and the OIC via the on-call binders. The on-call binders are in the possession of the on-call staff and OIC at all times during off hours, a hard copy is located in the WTP office.

4. Emergency response training

4.1. All Water Department personnel shall receive emergency response training every year, as per the E10 DWQMS Competencies.

4.2. Water Department personnel identified with specific response roles receive additional training to cover their additional responsibilities as per E10 DWQMS Competencies.

4.3. This training shall include, but not limited to, a review and test of the Emergency Response SOP's and a discussion of emergencies that have occurred since the previous training.

4.4. New staff are to receive emergency response training within twelve months of hiring. The Water Department Chief Operator and Public Works Foreman have the overall responsibility for their area to ensure that appropriate training is provided to new staff.

5. Emergency response testing

- 5.1. Testing of responders' awareness of Emergency Response SOP's will take place once a calendar year, on one event and may be in the form of a desktop exercise and/or mock scenarios, where applicable, as per Maintenance Schedule.
- 5.2. Testing the effectiveness of the Emergency Response SOP may occur in the following manner:
 - 5.2.1. Actual events that take place in the system,
 - 5.2.2. Via incident debriefing sessions following larger scale emergency situations, or
 - 5.2.3. Conducting mock scenarios
- 5.3. Incident debriefing sessions will be recorded.
- 5.4. Mock scenarios are recorded through Supervisors' meeting minutes.
- 5.5. This testing shall be managed, arranged and recorded by the QMS Representatives.
- 5.6. One Emergency Response SOP shall be evaluated and modified based on the recommendations made by way of the training, mock scenarios or incident debriefing once a calendar year.
- 5.7. Once in a calendar year testing of one Emergency Response SOP shall be tested and evaluated by the Water Services and Top Management.
- 5.8. Records of emergency response testing are kept in the form of meeting minutes.

6. Distribution of procedures

- 6.1. Emergency Response Procedures will be included in the SOP Binder for both Treatment and Distribution.

7. Document review

- 7.1. The Emergency Response SOP's will be reviewed annually and signed off by the QMS Rep.
- 7.2. The Emergency Contact List contained in the Drinking Water System Emergency Response Plan will be updated when there is a change:
 - 7.2.1. In staff, and
 - 7.2.2. Essential Suppliers and Service Providers' contact information.

Associated documents:

- Appendix "B" E8-01 Risk Assessment Outcomes
- Appendix "C" E8-02 Critical Control Points and Critical Control Limits
- Drinking Water System Emergency Response Plan – Emergency Contact List
- Element 10 Competencies
- Annual emergency training and test records (meeting minutes)

Revision history:

#	yyyy-mm-dd	Description (describing last three revisions and/or all revisions of the past year)	Approved by
04	2021-03-16	Merged Element 18 (with previous E18-01) to remove redundancy between documents. Updated appendices' references related to risk assessment, CCP's / CCL's, added 2.6.1-2.6.4 and edited 7.2. Added DWS Emergency Response Plan-Emergency Contact List as associated document.	Ron Cooper
05	2021-04-13	Added s.5.8 about records of emergency training and testing kept in the form of meeting minutes.	Ron Cooper
06	2022-08-29	Updated wording and ERP list	Ted Knapp

Element 19: Internal Audits

Requirement:

The Operational Plan shall document a procedure for internal audits that:

- a) evaluates conformity of the quality management system with the requirements of the DWQMS,
- b) identifies internal audit criteria, frequency, scope, methodology and record-keeping requirements,
- c) considers previous internal and external audit results, and
- d) describes how quality management system corrective actions are identified and initiated.

The Operating Authority shall implement and conform to the procedure and shall ensure that internal audits are conducted at least once every calendar year.

Procedure:

1. Internal audits are only conducted by persons approved by the QMS Representative and having the following qualifications:
 - 1.1. Completed Internal Audit Course and/or led by someone with the Internal Audit Course, and
 - 1.2. Auditors shall provide proof of competency prior to conducting an audit.
2. Internal audits are conducted on each element of the Standard at least once in a Calendar Year. Typically, the internal audit focuses on the calendar year time period since the previous audit.
3. The scheduling of the internal audit shall be maintained by the QMS Rep; the options for auditing are as follows:
 - 3.1. A full 21 element audit completed at one time, or
 - 3.2. On an element basis and shall include the element to be audited by the assigned Auditor. The QMS Rep shall schedule the audit with the internal auditor, the auditees and Top management.
4. The Auditor creates a timetable to manage interviews and distribute to the QMS Rep.
5. Internal audits are conducted using the DWQMS, defining the processes and programs being audited, the audit criteria (i.e. staff interviews, documents to review, applicable manuals and standards).
6. **Conducting the Opening Meeting**
 - 6.1. The Internal Auditor chairs the opening meeting to confirm the purpose of the audit including:
 - 6.1.1. Identifying the objectives and the scope,
 - 6.1.2. Confirm the audit timetable including the date and time for closing the meeting, and
 - 6.1.3. A short summary on the audit activities to be undertaken.
 - 6.2. At least one (1) member of Top Management must attend the opening meeting.

7. Conducting the Audit

- 7.1. The Auditor reviews the DWQMS, process- and program-related documented information during the document review portion of the Internal Audit. Such information includes the following:
 - 7.1.1. Operational Plan,
 - 7.1.2. SOP's,
 - 7.1.3. QMS records,
 - 7.1.4. Previous internal and external audit results, and
 - 7.1.5. Corrective and preventive actions initiated since the previous audits.
- 7.2. The Internal Auditor reviews additional documents and reports not provided prior to the audits, observe activities, records and interview personnel as necessary to ensure the QMS has been effectively implemented.
- 7.3. Internal audits are conducted using the DWQMS as a basis for the audit checklist and is used to document evidence of conformity to requirements.
- 7.4. In order to conform to time restraints, audits are always based upon sampling processes, systems, operations and documents. Not every single document, operation system or process or piece of information can be audited. The sample size selected by the audit is appropriate for the size and scale of the operations and information available. Objective evidence collected by the auditors is based upon the sampling.

8. Reporting audit results

- 8.1. The auditor verbally communicates the preliminary results at the closing meeting of the internal audit, including any non-conformities identified, opportunities for improvement and positive findings noted by the Auditor.
- 8.2. The Auditor submits a completed written report to Top Management and the QMS Rep. The report shall include:
 - 8.2.1. Any non-conformities that identify discrepancies between the QMS and the DWQMS, or between the QMS and how it is actually implemented, including a reference to the applicable section of the standard,
 - 8.2.2. Positive findings,
 - 8.2.3. Opportunities for improvement noted during the audit, and
 - 8.2.4. Completed audit checklists.
- 8.3. Non-conformities are to be recorded on a continual improvement response (CIR) form.
- 8.4. The QMS Rep tracks internal audit CIR's on the CIR Tracking Summary.
- 8.5. The conclusions presented in the report represent the auditor's opinions, in light of the objectives, scope of the work and any limiting conditions noted in the audit report. Conclusions presented are based solely on information obtained from the QMS Representative and staff.
- 8.6. The Internal Audit Report shall be completed within 4 weeks of the audit date.

9. Audit follow-up

- 9.1. Each CIR initiated should be assigned to a lead person to ensure the issue is resolved so that the same issue doesn't reoccur.
- 9.2. The QMS Rep is responsible for:
 - 9.2.1. Follow-up with all corrective actions issued from the internal audit, and
 - 9.2.2. Notifying the auditor when the CIR's have been completed.

10. Record-Keeping Requirements

- 10.1. All internal audit reports are filed and retained in accordance with Element 5 Document and Records Control.
- 10.2. CIR's shall be completed, tracked, signed-off and filed in accordance with Element 5 Document and Records Control.

Associated documents:

Element 5 Document and Records Control
 Element 21 Continual improvement
 Records of auditor training
 Previous Audit Reports, internal and external

Revision history:

#	yyyy-mm-dd	Description (describing last three revisions and/or all revisions of the past year)	Approved by
03	2020-02-16	Non-specified, general update.	Ron Cooper
04	2021-03-16	Merged Element 19 (with previous E19-01) to remove redundancy between documents. Removed the reference to a DWQMS-based checklist (entirely based on the standard), as audit reports include these. Removed document numbers from CAR's and CAR tracking from 19-xx section, as these are Element 21 documents. Updating these references to Element 21.	Ron Cooper
05	2023-02-23	Removed requirement for Internal Auditor to have completed 2 previous audits as per OFI on 2022 Internal Audit.	Ted Knapp

Element 20: Management Review

Requirement:

The Operational Plan shall document a procedure for Management Review that evaluates the continuing suitability, adequacy and effectiveness of the Quality Management System and that includes consideration of:

- a) incidents of regulatory non-compliance
- b) incidents of adverse drinking water tests
- c) deviations from critical control point limits and response actions
- d) the effectiveness of the risk assessment process
- e) internal and third-party Audit results
- f) results of emergency response testing
- g) operational performance
- h) raw water supply and drinking water quality trends
- i) follow-up on action items from previous management reviews
- j) the status of management action items identified between reviews
- k) changes that could affect the quality management system
- l) consumer feedback
- m) the resources needed to maintain the quality management system
- n) the results of the infrastructure review
- o) operational plan currency, content and updates
- p) staff suggestions

Top Management shall implement and conform to the procedure and shall:

- a) ensure that a Management Review is conducted at least once every Calendar Year
- b) consider the results of the Management Review and identify deficiencies and actions items to address the deficiencies
- c) provide a record of any decisions and action items related to the Management Review including the personnel responsible for delivering the action items and the proposed timelines for their implementation
- d) report the results of the Management Review, the identified deficiencies, decisions and action items to the Owner

Procedure:

1. Management Review preparation:

- 1.1. Management review shall be conducted, as a minimum, once in a Calendar Year.
- 1.2. Top Management shall perform the Management Review; Top Management is defined in E9-02. Management Reviews shall be conducted during a meeting of the following Top Management participants:
 - 1.2.1. The Chief Administrative Officer (CAO)(Owner Representative),
 - 1.2.2. The Director of Development and Infrastructure (Top Management),
 - 1.2.3. The Chief Plant Operator (ORO)(QMS Representative)(Operation Management), and

1.2.4. Public Works Foreman (Distribution ORO)(Operation Management)(QMS Representative).

1.1.1. Other participants may be added at the discretion of the Management Review Committee.

1.2. The meeting is chaired by QMS Representative or Alternate.

1.2.1. The QMS Rep schedules the Management Review meetings and arranges for attendees. Time shall be set aside by the participants to ensure a thorough review of the QMS is conducted.

1.2.2. The QMS Rep prepares an agenda for the meeting (including Element 20 items a) to p)).

1.2.3. The QMS prepares a report summarizing the information for each of the Element 20 items a) to p).

2. Review process:

2.1. Each input item shall be reviewed to identify if, where and when improvement to the QMS and its procedures are required.

2.2. The QMS Rep shall make note of any changes, deficiencies or action items required during the course of the review. All action items shall identify an individual responsible and the proposed timelines for implementation.

3. Review output

3.1. Minutes from the Management Review are recorded and maintained as per the Documents and Record Control. The minutes shall be prepared by the QMS Rep and circulation to all attendees. The minutes shall include items a) to p) of Element 20 Management Review, and:

3.1.1. The date and time of the Management Review and the names of the participants and attendees,

3.1.2. Significant discussions related to the summary information provided in the report,

3.1.3. Any identified deficiencies,

3.1.4. A list of action items, along with the individual responsible and the timeline for their completion,

3.1.5. Recommendations for any resources needed from maintenance or improvement of the QMS

3.2. A Council report, summarizing the meeting, outlining the deficiencies and identifying the action items shall be provided to Council annually.

Associated documents:

Management Review meeting minutes

Reports to council summarizing the Management Review meeting, deficiencies, and action items

Revision history:

#	yyyy-mm-dd	Description (describing last three revisions and/or all revisions of the past year)	Approved by
04	2021-03-16	Merged Element 20 (with previous E20-01) to remove redundancy between documents. Added references to Management Review meeting minutes and to Reports to council.	Ron Cooper
05	2023-11-02	Updated roles of "Top Management" and "Operation Management" to reflect organizational structure.	Ted Knapp
06	2025-08-11	Updated Top Management titles.	Ted Knapp

Element 21: Continual Improvement

Requirement:

The Operational Plan shall document a procedure for tracking and measuring continual improvement of its quality management system by:

- a) reviewing and considering applicable best management practices, including any published by the Ministry of the Environment, Conservation and Parks and available on www.ontario.ca/drinkingwater, at least once every thirty-six months,
- b) documenting a process for identification and management of quality management system Corrective Actions that includes:
 - i. investigating the cause(s) of an identified non-conformity,
 - ii. documenting the action(s) that will be taken to correct the non-conformity and prevent the non-conformity from re-occurring, and
 - iii. reviewing the action(s) taken to correct the non-conformity, verifying that they are implemented and are effective in correcting and preventing the re- occurrence of the non-conformity.
- c) documenting a process for identifying and implementing Preventive Actions to eliminate the occurrence of potential non-conformities in the quality management system that includes :
 - i. reviewing potential non-conformities that are identified to determine if preventive actions may be necessary,
 - ii. documenting the outcome of the review, including the action(s), if any, that will be taken to prevent a non-conformity from occurring, and
 - iii. reviewing the action(s) taken to prevent a non-conformity, verifying that they are implemented and are effective in preventing the occurrence of the non- conformity.

The operating authority shall strive to continually improve the effectiveness of its quality management system by implementing and conforming to the procedure.

Definitions:

BMP – Best Management Practices

CAR – Corrective Action Response

CIR – Continual Improvement Response

OPI – Opportunity for Improvement

PAR – Preventive Action Response

Procedure:

1. Continual improvement is achieved through the use of:
 - a) Consideration of best management practices,
 - b) Corrective actions to address non-conformities within the QMS,
 - c) Preventive actions to prevent a potential non-conformity.
2. Continual improvement may be initiated via the following avenues:
 - a) Internal and external audits,

- b) Adverse Water Quality Incidents (AWQI's),
 - c) Customer complaints,
 - d) MECP inspections and best practices,
 - e) Risk assessment reviews, infrastructure reviews, management reviews,
 - f) Training sessions and incident debriefings,
 - g) Document reviews and staff feedback,
 - h) Preventive actions.
3. Within four weeks of receipt of MECP inspection report and external audit reports, the QMS Rep shall hold a meeting with Top Management through Supervisors' Meetings to review any issues or recommendations identified through the MECP inspection reports and external audit reports.
4. Continual Improvement Reports (Form E21-01) are completed for all non-conformities and non-compliances identified through audits or inspections. These CIR's and identified opportunities for improvement are tracked in the E21-01 Continual Improvement Report tracking spreadsheet.
- 5. Tracking continual improvement responses**
- a) The CIR tracking spreadsheet tracks the status of each item and a person responsible for completing the actions.
 - b) If a problem is encountered completing actions, these are recorded in the CIR tracking spreadsheet in the "action taken or comment" section.
 - c) For items that were identified as non-conformities or non-compliances, the QMS Rep evaluates whether the actions taken were effective and notes the date on which this was carried out in the CIR tracking spreadsheet.

Associated documents:

E21-01 Continual Improvement Report (CIR) tracking spreadsheet

Form E21-01 Continual Improvement Report

Revision history:

#	yyyy-mm-dd	Description (describing last three revisions and/or all revisions of the past year)	Approved by
03	2020-02-17	OFI as per NSF audit more explanation of procedure for BMP, IMP, CAR and DRF.	Ron Cooper
04	2021-03-16	Merged Element 21 (with previous E21-01) to remove redundancy between documents. Added references to Continual Improvement tracking (more inclusive of CAR, PAR, OFI's), and to Appendix "F" Form E21-01 Continual Improvement.	Ron Cooper
05	2021-07-14	Removed "Appendix F" from the Form E21-01 Continual Improvement Report reference.	Ron Cooper

Appendix "A" Documents and records listing

Internal Documents (created by Town of Hanover)

Document Title	Document # (if applicable)	Date	Location (Person Responsible) or File Path
Operational Plan	085-401	2021-07-14	WTP & PW Offices (QMS Rep)
Operations & Maintenance (O&M) Manuals (incl. equipment manuals)			WTP & PW Offices (QMS Rep)
O&M Standard Operating Procedures, Work Instructions, Forms			WTP & PW Offices (QMS Rep)
Water Emergency Plan			WTP & PW Offices (QMS Rep)
Operations Maintenance Schedule			WTP & PW Offices (QMS Rep)
Distribution Maintenance Schedule			WTP & PW Offices (QMS Rep)
On-call and vacation schedules			WTP & PW Offices (QMS Rep)
Water & Wastewater Services Rules & Regulations By-law	2839-14	2014-01-01	Hanover.ca (linked)
Other related by-laws			

<i>External Documents (created by external organizations)</i>			
Document Title	Document # (if applicable)	Date	Location, Person Responsible or File Path
Drinking Water Quality Management Standard	DWQMS 2.0	2017	ontario.ca/page/drinking-water
Accreditation certificate			WTP Office, (NSF issues, QMS Rep)
Municipal Drinking Water Licence – Town of Hanover Drinking Water System	085-101	2021-03-31	WTP Office and Civic Centre (MECP issues, QMS Rep)
Drinking Water Works Permit – Town of Hanover Drinking Water System	085-201	2021-03-31	WTP Office and Civic Centre (MECP issues, QMS Rep)
Permit to Take Water – Well No. 1, Well No. 2	4777-CK5SAT	2022-10-13	WTP Office and Civic Centre (MECP issues, QMS Rep)
Financial Plan	085-301		Hanover.ca
Town of Hanover First Engineers' Report by Delcan	Hard Copy	2001-01	Civic Centre
MECP submission First Engineer Report by Delcan	Hard Copy	2001-03	Civic Centre
Town of Hanover Water Distribution System Pressure Analysis by Delcan	Hard Copy	2002-01	Civic Centre
Safe Drinking Water Act, 2002	SDWA, 2002	S.O. 2002, Ch. 32	ontario.ca/laws/statute/02s32
O. Reg. 128/04 Certification of Drinking Water System Operators and Water Quality Analysts	O. Reg. 128/04	NA	ontario.ca/laws/statute/02s32
O. Reg. 169/03 Ontario Drinking Water Quality Standards	O. Reg. 169/03	NA	ontario.ca/laws/statute/02s32
O. Reg. 170/03 Drinking Water Systems	O. Reg. 170/03	NA	ontario.ca/laws/statute/02s32
O. Reg. 205/18 Municipal Residential Drinking Water Systems in Source Protection Areas	O. Reg. 205/18	NA	ontario.ca/laws/statute/02s32
O. Reg. 248/03 Drinking Water Testing Services	O. Reg. 248/03	NA	ontario.ca/laws/statute/02s32 Press tab here to add more rows

<i>Record Name</i>	<i>Filing Method</i>	<i>Location (Link if electronic)</i>	<i>Retention Period (years)</i>	<i>Maintained by</i>
Operational Plan – as audited	Electronic	Water Ops folder	10 years	QMS Rep, WTP Office
Risk assessment outcomes	Electronic	Water Ops folder	10 years	QMS Rep, WTP Office
Competence / training	Electronic	Water Ops folder	E + 3 years (E = Operator's last day)	QMS Rep, WTP Office
Communications-related: staff meetings, consumer calls (e.g. water quality), public information (e.g. water bill inserts), interested parties, essential suppliers, MECP	Electronic / hard copy	Water Ops binders (re: water quality)	7 years	QMS Rep, WTP Office
Council and corporate records (purchasing, budgets, reports to Council)	Hard copy and electronic	Finance / Clerks	7 years (permanent for Council reports)	Finance, Clerks depts.
Infrastructure records (as-built drawings, distribution system map, DWWP records – Forms 1, 2, 3)	Hard copy and electronic	Water Ops folder	Permanent: as-builts 10 yrs: maps, forms	QMS Rep, Civic Centre
Infrastructure maintenance (incl. calibrations, generators, WTP, distribution: hydrants, valves, locates, mainbreaks)	Hard copy and electronic	Work Order System / Water Ops binders	15 years	QMS Rep, WTP Office, PW Workshop
Infrastructure review meeting minutes	Hard copy and electronic	Water Ops folder	10 years	QMS Representative
Logbooks (WT and Distribution)	Hard copy	Water Ops folder	6 years	QMS Rep, WTP Office, PW Workshop
O&M records / stats: inspections, rounds, flows, chlorine, turbidity, min / max / avg., run hours, well levels)	Hard copy and electronic	Water Ops binder	15 years	QMS Rep, WTP Office
Sampling, testing, monitoring (chains of custodies, SCADA data / trends / printouts, test results)	Hard copy and electronic	Water Ops folder	15 years	QMS Rep, WTP Office
Emergency preparedness training and testing	Hard copy and electronic	Water Ops folder	10 years	QMS Rep, Civic Centre, WTP Office, PW Worksh.
Audit reports (internal, external, Ministry inspections)	Hard copy and electronic	Water Ops folder	10 years	QMS Rep, Civic Centre
Management review minutes	Electronic	Water Ops folder	10 years	QMS Rep, Civic Centre
Annual & Summary reports	Electronic	Water Ops folder	15 years	QMS Rep, Civic Centre
Continual improvement (completed forms, AWQI reports)	Electronic	Water Ops folder	10 years	QMS Representative

Appendix “B” E8-01 Risk Assessment Outcomes

Last 36-month update: June 13, 2024Last calendar year review: October 16, 2025

Facility	Hazardous Event	Consequence	Control and Monitoring Measures	Severity	Detectability	Likelihood	Risk Priority #	CCP	CCL	Response and Mitigation
1. All raw water sources – Ruhl Lake, Well #1, #2, RTU's	i. Back-up generator failure	Loss of supply	SCADA Alarms generator failure Operator responds to alarm	4	1	2	7	No	No	Operator responds and contracts generator supplier for assistance ERP-12 Generator Fail
	ii. Farming accidental spill or chemical contamination	Contamination of source water or water components	Obtain water supply from wells, implement water restrictions if necessary Spill response kits, training of staff to mitigate	5	4	1	10	No	No	Procedure ERP-08 Spill at Ruhl Lake Source Water Intake Shutdown Intake – stop producing water until plume passes Conduct sampling on raw / process / treated water if necessary Contact MECP SAC / MOH, ORO-Director of Development and Infrastructure and all major industries
	iii. Long-term impacts of climate change / Water supply shortfall due to drought, raw water piping break	Increase / decrease of water levels demand / Decrease or no water (no fire protection) / Economic or social impacts	SCADA alarms: low flow, high turbidity Water conservation – restrictions, location of pumping station Properly-sized water towers, water conservation education, planning for infrastructure growth	4	1	3	8	No	No	Operator responds to alarms; Visual inspection of filters, well sites, Ruhl Lake. SOP WD-01 Watermain Break, ERP-09 Water Line Rupture. Isolate problem area, increase other water supply. Education programs, proper planning for future policies in place for water restrictions
	iv. Extreme weather events – e.g. tornado, ice, heavy wind	Power failure Damage / loss of services	Essential suppliers list Reserves Alternate water sources	4	1	3	8	No	No	Completed in part of everyday operations
	v. Sustained extreme temperatures – e.g. freezing, heat wave	Increased repairs Increased consumption of resources	Education of public, training	3	1	3	7	No	No	Training, infrastructure upgrades, education Frozen Water Policy (PW-001) located in the “I Drive” on the Town of Hanover Network
	vi. Power failure	Operational issues	SCADA alarms An Operator responds and generator backup automatically kicks in.	1	1	4	6	No	No	All automated ERP-06 Power Outage Operator responds

Facility	Hazardous Event	Consequence	Control and Monitoring Measures	Severity	Detectability	Likelihood	Risk Priority #	CCP	CCL	Response and Mitigation
	vii. Terrorism and vandalism	Contamination of water system, system failure, increased security / repair / replacement costs	Security measures alarms, auto shutdown Increased water quality Monitoring chemicals, bio-hazards monitoring Emergency response plans	5	3	1	9	No	No	Emergency response plans Training
2. Treatment	i. Sudden changes in raw water characteristics (seasonal / weather) -and- Algal bloom	High influent turbidity Taste & odour issues Poor water quality Increased cost to treat	SCADA alarms for turbidity, filters, shutdown of the plant, influent turbidity analyzer, Operators respond: change, clean, backwash filters more frequently; increased dosing of chemical Aesthetic treatment for taste and odour.	2	1	5	8	Yes	Yes	<u>CCL: 1 NTU turbidity limits</u> Automated continuous monitoring for turbidity, chlorine, and filters Water sources can be switched Treatment can be adjusted seasonally
	ii. Loss of coagulant	High turbidity	SCADA alarms and shutdown of the plant (if filter effluent turbidity exceeds 0.3 NTU for 15 minutes or more) 95% each month; operator responds, rectifies issue.	2	3	1	6	Yes	Yes	<u>CCL: 0.3 NTU 95% of the time filter effluent</u> Operator restores the service of coagulant to system
	iii. Clear well contamination / filter media breakthrough / underdrain failure	High turbidity Loss of media to clear well	SCADA alarms for high turbidity, visual daily inspections of filter, Operator responds and investigates, turbidimeters checked / calibrated	3	1	2	6	Yes	Yes	<u>CCL: 0.3 NTU 95% of the time filter effluent</u> Check for underdrain failure, operator responds
	iv. Failure of up-flow clarifier screen	Loss of plastic media Filter short runs	Visual daily inspection of filter	3	1	1	5	No	No	Operator responds, isolates filter, calls ORO
	v. Excessive filter flows	Design issue Can't handle high filter flow. Reportable Exceedance.	SCADA alarm for high flow-through filters Operator responds to investigate Filter 1 & 2: 44.15 L/s each; Filter 3: 90 L/s	2	1	1	4	Yes	Yes	<u>CCL: Filter 1&2: 44.15 L/s each; Filter 3: 90 L/s</u> Operator would respond to alarms, isolate system and make appropriate repairs / adjustments. Report AWQI.
	vi. Backwash pump failure	Loss of filter backwash	SCADA alarm and shutdown of the plant Operator responds and rectifies the issue	1	1	1	3	No	No	Operator responds, places back-up pump into service, gets first pump fixed.
	vii. Failure of disinfection processes / equipment	Water availability decreases until issue rectified	SCADA alarms for: low or high chlorine, UV, equipment failure, turbidity SCADA shutdowns plant, operator responds	2	1	3	6	Yes	Yes	<u>CCL: SCADA setpoints for disinfection</u> Operator responds to SCADA alarm (based on setpoints), rectifies the issue and restores service to the plant.

Facility	Hazardous Event	Consequence	Control and Monitoring Measures	Severity	Detectability	Likelihood	Risk Priority #	CCP	CCL	Response and Mitigation
	viii. RTU Communication failure with sources	Loss of supply	SCADA alarms to Operator Visually detected	3	1	2	6	No	No	Operator responds and shuts down source to investigate. Relies on other sources or tower levels until mitigated.
	ix. Fire at WTP	Electrical panel fire Panel failure	SCADA alarms to Operator Equipment redundancy Smoke detectors	5	1	1	7	No	No	Operator responds, calls 9-1-1
	x. Technological – Loss of PLC	Failure to start / stop equipment Compliance with 72 hr records	Visual inspection Operator to remain on duty to manually operate plant if required	4	1	2	7	No	No	Call SCADA support for immediate assistance.
	xi. Technological – Loss of SCADA	Loss of control	Daily rounds	4	1	2	7	No	No	Call SCADA support for immediate assistance. Monitor towers using MCC panel Shutdown plant
	xii. Technological – Loss of dialer	No notification of critical alarms status to operators	Visual inspection Daily rounds	3	3	1	7	No	No	Ensure PLC still functional by testing alarms, review alarm ticker to ensure no alarms occurred while system was no monitored, station operator on site until issue is resolved. Call SCADA support for assistance.
	xiii. Both high lift pumps failure	Critical alarm – plant shutdown Loss of water quantity	SCADA alarms, shutdown of the plant Operator responds and rectifies the issue	5	1	1	7	No	No	Operator responds to alarm, addresses problem, or call for repair and rely on tower levels until operation can be restored.
	xiv. High effluent turbidity	Adverse water entering the distribution system	SCADA alarm shuts down WTP high lift pumps (online effluent turbidity analyzer) Operator gets alarm call-in and responds	2	1	2	5	Yes	Yes	Check online analyzer using benchtop kit clean unit if reading high. Check filter operation (visual inspection of bed).
	xv. Chlorine gas leak	Operator safety Hazardous environment	Chlorine alarms to Operator Alarms in Cl ₂ room and office Exhaust fans automated	3	1	1	5	Yes	Yes	Call second operator Operator rectifies issue SOP OP-05 Chlorine Gas Tank Change-out
	xvi. Cybersecurity Threats	Loss of Data Loss of process control	Daily rounds Public Complaint SCADA alarms	4	2	1	7	No	No	Call SCADA support for immediate assistance Shut plant down manually until issue is resolved

Facility	Hazardous Event	Consequence	Control and Monitoring Measures	Severity	Detectability	Likelihood	Risk Priority #	CCP	CCL	Response and Mitigation
3. Distribution	i. Watermain failure prior to/under 7 th Avenue bridge	Quantity loss Pressure loss in distribution Water may not surface to detect leak	SCADA alarm for low water tower level. Alarm would go to Treatment cell phone and Operator responds.	4	2	2	8	Yes	Yes	Operator responds to the alarm, calls distribution on call, isolates the appropriate valves. Action taken is that of a watermain break and needs to refer to SOP WD-01 Watermain Break . Rely on tower levels until repair can be made.
	ii. Watermain break	Pressure loss in distribution Isolation of water	SCADA alarm for low tower level. Alarm would go to Treatment cell phone and Operator responds.	2	2	3	7	Yes	Yes	Operator responds to the alarm, calls distribution on call, isolates the appropriate valves. Action taken is that of a watermain break and needs to refer to SOP WD-01 Watermain Break .
	iii. Sustained pressure loss in defined area.	Quantity – loss of flow and positive pressure in water system	SCADA alarms for low tower levels Customer complaint	2	2	3	7	No	Yes	Isolate area if issue is due to a leak, Sample bacteriological samples as needed, repair and repressure the system flush to ensure proper chlorination
	iv. Low chlorine residual in distribution system and dead ends	Water quality issues Adverse water quality	Daily residual sampling Routine samples Flushing	2	2	2	6	Yes	Yes	Locate area and flush hydrants / lines SOP WD-09 Water Hydrant Flushing Program
	v. Backflow / Cross-connection	Contamination of water system	Daily rounds, weekly sampling, chlorine residuals Customer calls	4	3	1	8	No	No	Isolate and flush as needed SOP WD-09 Water Hydrant Flushing Program Prevention program for backflow / cross-connection recommended
	vi. Frozen water service	Disruption of water service	First complaint or sign of freeze-up initiates Frozen Water Policy Customer calls	2	1	3	6	No	No	Contact distribution. Begin steps for Frozen Water Policy (PW-001) located in the "I Drive" on the Town of Hanover Network
	vii. High turbidity, colour, taste & odour	Water quality issues and complaints	UV AOP System Routine sampling / annual flushing Customer calls	2	1	2	5	No	Yes	Operator responds to complaint. Locate area and flush lines. SOP WD-09 Water Hydrant Flushing Program
	viii. Air relief valve failure	System leaks, air in line, collapse	Annual visual inspection Air relief valve maintenance	2	3	2	7	No	No	Inspection program highlights issues. Repair failing equipment as necessary

Appendix “C” E8-02 Critical Control Points and Critical Control Limits

Hazardous event	CCP	CCL	Critical Control Monitoring	Response Procedure
Sudden changes in raw water characteristics (seasonal / weather, algal bloom)	0.30 NTU on filter effluent for 300 seconds 0.55 NTU plant effluent	Filter effluent 0.30 NTU or less >95% of the time Filter effluent 1.0 NTU over 15 minutes	Online turbidity analyzers with SCADA set to shut down operation at CCP levels. Dialer automatically phones operator.	High filter effluent requires flushes or backwashes. Water can be filtered to waste manually. Monthly reports showing filter effluent exceeds CCL is reportable.
Loss of Coagulant	0.30 NTU on filter effluent for 300 seconds 0.55 NTU plant effluent for 300 seconds	Filter effluent 0.30 NTU or less >95% of the time Filter effluent 1.0 NTU over 15 minutes	Online turbidity analyzers with SCADA set to shut down operation at CCP levels. Dialer automatically phones operator.	Repair issues with dosing pumps or feed lines from coagulant tank. Begin dosing filters and filter to waste until turbidity is normal. Loss of coagulant is reportable if coagulant issue cannot be restored.
High Effluent or Clearwell Turbidity	0.55 NTU plant effluent for 300 seconds UV Dose based on UVT min 40 mJ/cm ² for 2 minutes	Filter effluent 1.0 NTU over 15 minutes UV dose 23.2 mJ/cm ² over 10 minutes	Online turbidity analyzers with SCADA set to shut down operation at CCP levels. Dialer automatically phones operator. UV Reactors shut down at 38 mJ/cm ² for 2 minutes	Determine cause of high turbidity. Pump Clearwell to reservoir until turbidity returns to acceptable levels. Filter effluent over 1.0 NTU for 15 minutes or longer is a reportable event. Water passing through UV's below minimum dose for over 10 minutes is a reportable event.
Excessive Filter Flows	Well #1 and #2: 53 L/s for 300 seconds Ruhl Lake: 70 L/s for 15 seconds Filter #1 and #2: 1.20 m for 300 seconds Filter #3: 1.79 m for 300 seconds	Well #1 and #2: 53.05 L/s Ruhl Lake: 88.3 L/s Filter #1 44.15 L/s, Filter #2 44.15 L/s, Filter #3 90.00 L/s	Flow meters for sources have high flow alarm, shuts down source at CCP limits. Filter level high shuts down filter.	Determine cause of high flow. Do not run source until flow can be maintained within specs. Investigate filter influent valves and media. High flow from a source over CCL is reportable if pumped outside of Permit to take water specs.
Failure of Disinfection Process Equipment	Low chlorine in Clearwell 1.00 mg/L for 60 seconds, Effluent 1.00 mg/L for 120 seconds	Clearwell Chlorine 0.50 mg/L Filter effluent 1.0 NTU UV dose below 23.2 mJ/cm ²	All equipment required for CT connected to SCADA will alarm and shut down plant if disinfection is compromised. Dialer automatically phones operator.	Determine cause of equipment failure. Refer to SOP's and ERP's. Water that is not of acceptable levels can be sent to reservoir until levels returned. Effluent from filters or plant that is over CCL limits is

Hazardous event	CCP	CCL	Critical Control Monitoring	Response Procedure
	UV Dose based on UVT min 40 mJ/cm ² 0.55 NTU plant effluent for 300 seconds	for 10 minutes		reportable.
Chlorine Gas Leak	Chlorine Gas alarm in chlorine room 4 ppm Low chlorine in Clearwell 1.00 mg/L for 60 seconds, Effluent 1.00 mg/L for 120 seconds	Clearwell Chlorine 0.50 mg/L	All equipment required for CT connected to SCADA will alarm and shut down plant if disinfection is compromised. Dialer automatically phones operator.	Repair chlorine leak with back up operator on site. Pump Clearwell to reservoir until chlorine residuals return to acceptable levels. Water with chlorine lower than 0.50 mg/l leaving the plant does not meet required level for CT and is reportable.
Watermain Failure on 7 th Avenue main feed to Distribution System or sustained pressure loss	7 th Ave Tower and 14 th St Tower 7.0 m	Guideline is 20 psi in system potential cause for backflow if towers are unable to provide positive pressure.	SCADA alarms with low tower. Consumer complaints or pressure reduction to prompt monitoring.	Restore supply issue relying on water storage to maintain pressure. Potential for activation of the Emergency Response Plan to provide water for consumers if pressure cannot be restored.
Low Chlorine in Distribution System	0.30 mg/L	0.05 mg/L	14 th St Tower chlorine analyzer Flushing program Consumer complaint investigation	Main is flushed using SOP WD-09 Water Hydrant Flushing Program until chlorine reaches normal levels for the area. A chlorine recording of 0.05 mg/L is a reportable adverse.
High Distribution Turbidity	3 NTU	5 NTU	Flushing program Consumer complaint response	Main is flushed using SOP WD-09 Water Hydrant Flushing Program until turbidity reaches normal levels for the area.
Watermain Break Class 1	Use Appendix C - Flow chart in MECP Watermain Disinfection Procedure to determine if the Main Break is class 1 or 2	Flow not maintained moves Class 1 to a Class 2	OIC on site of watermain break is deemed responsible for proper classification using MECP Watermain Disinfection Procedure	Use Appendix E - Category 1 Flow chart in MECP Watermain Disinfection Procedure SOP WD-01 Watermain Break
Watermain Break Class 2	Maintaining flow	Reportable Adverse if: Repair involves more than	OIC on site of watermain break is deemed responsible for proper classification using MECP Watermain	Use Appendix F - Category 2 Flow chart in MECP Watermain Disinfection Procedure to determine if the

Hazardous event	CCP	CCL	Critical Control Monitoring	Response Procedure
		one length of pipe. Contamination is suspected. Air gap not maintained.	Disinfection Procedure.	MECP is to be notified. SOP WD-01 Watermain Break