

OPERATIONAL PLAN

Ear Falls Drinking Water System

Revision 1

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DWQMS Matrix

The DWQMS Matrix provided below indicates how the PLAN requirements of Ontario's DWQMS are addressed by the Corporation of the Township of Ear Falls (Township). DWQMS Elements are addressed through a combination of documentation which includes Operational Plans and procedures. This matrix is intended to facilitate the understanding of the reader with respect to the structure of the Township's QMS. Additionally, this matrix will facilitate internal and external auditing processes.

DWQMS Element	Document Title
1 – Quality Management System	Operational Plan [EFDWS-OP]
2 – QMS Policy	Operational Plan [EFDWS-OP]
3 – Commitment and Endorsement	Operational Plan [EFDWS-OP]
4 – QMS Representative	QMS Representative Policy [QMS-4]
5 – Document & Records Control	Document & Records Control Procedure [QMS-5]
6 – Drinking-Water System	Operational Plan [EFDWS-OP]
7 – Risk Assessment	Risk Assessment Procedure [QMS-7]
8 – Risk Assessment Outcomes	Risk Assessment Outcomes [QMS-8]
9 – Organizational Structure, Roles, Responsibilities and Authorities	Organizational Structure, Roles, Responsibilities, and Authorities [QMS-9]
10 – Competencies	Competencies Policy [QMS-10]
11 – Personnel Coverage	Personnel Coverage Policy [QMS-11]
12 – Communications	QMS Communication Procedure [QMS-12]
13 – Essential Supplies and Services	Essential Supplies and Services Procedure [QMS-13]
14 – Review and Provision of Infrastructure	Review and Provision of Infrastructure Procedure [QMS-14]
15 – Infrastructure Maintenance, Rehabilitation and Renewal	Operational Plan [EFDWS-OP]
16 – Sampling, Testing and Monitoring	Sampling, Testing and Monitoring Procedure [QMS-16]
17 – Measurement and Recording Equipment Calibration and Maintenance	Measurement and Recording Equipment Calibration and Maintenance Procedure [QMS-17]
18 – Emergency Management	Emergency Management Procedure [QMS-18]
19 – Internal Audits	Internal Audit Procedure [QMS-19]
20 – Management Review	Management Review Procedure [QMS-20]
21 – Continual Improvement	Continual Improvement Procedure [QMS-21]

1 Quality Management System

The Drinking Water Quality Management System (QMS) for the Ear Falls Drinking Water System is documented in this Operational Plan as part of the efforts to ensure that clean and safe drinking water is reliably supplied to all customers served by this system. The development and continual improvement of the Operational Plan will help to ensure that all regulatory requirements are met and that consumers can be confident that their drinking water will be protected through the effective application of the QMS. This Operational Plan was developed to meet the Ministry's Drinking Water Quality Management Standard.

2 Quality Management System Policy

The Corporation of the Township of Ear Falls, hereafter referred to as the Township, owns, operates, maintains, and manages the Ear Falls Drinking Water System. The Township is committed to the following:

- 1) Providing the consumer with clean, safe drinking water;
- 2) Meeting or exceeding all applicable legislative and regulatory requirements; and,
- 3) Maintaining and continually improving our quality management system.

3 Commitment and Endorsement

The Corporation of the Township of Ear Falls, supports the implementation, maintenance, and continual improvement of a Quality Management System for the Ear Falls Drinking Water System, as documented in this Operational Plan. The Township acknowledges the need for and supports the provision of sufficient resources to maintain and continually improve the QMS. For the purposes of the QMS, the undersigned persons shall represent the Township of Ear Falls as the system Owner and Top Management. The undersigned persons hereby endorse this Operational Plan:

Name & Title:	Signature:
Kimberly Ballance Clerk Treasurer Administrator The Township of Ear Falls	
Brigitte Jetté Manager of Water and Wastewater Operations The Township of Ear Falls	

4 QMS Representative

Refer to the *QMS Representative Policy* [QMS-4].

5 Document & Records Control

Refer to the *Document and Records Control Procedure* [QMS-5].

6 Drinking-Water System

6.1 System Overview

The Ear Falls Drinking Water System provides a potable water supply to the community of Ear Falls. The system is composed of the Low Lift (Raw Water) Pumping Station (LLPS), the Ear Falls Water Treatment Plant (EFWTP, a Class II water treatment facility with a design rated capacity of 4,550 m³/day) and the Ear Falls water distribution system (a Class I water distribution system). The Ear Falls Drinking Water System is owned by the Corporation of the Township of Ear Falls and serves as its own the accredited operating authority.

The source water for the treatment process is drawn from a surface water source (English River) located within the Township. Potential pathogenic organisms are removed from the raw water by coagulation, flocculation, clarification, filtration, and free chlorine disinfection processes. This multiple barrier approach helps to ensure consistently safe and clean drinking water.

6.2 Source Water Characteristics and Event-Driven Fluctuations

General characteristics for the source water (English River) are provided below:

Parameter	Result Ranges (February 1, 2017 – April 30, 2023) ¹
Turbidity (NTU)	1.19 – 20.30
UV Transmittance (%)	46.8– 55.8
pH	7.1 – 8.4
Alkalinity (mg/L as CaCO ₃)	12 – 48.9
E. Coli (MPN/100mL)	0 – 276
Total Coliforms (MPN/100mL)	0 – >2420

1. UV Transmittance Result Ranges are from September 1, 2020 – April 30, 2023.

Event-driven fluctuations in the source water and subsequent operational challenges are summarized as follows:

- (1) Low water levels in the English River are known to impact source water supply and water production. Between the months of January to June the water levels in the English River are typically too low for the raw water pumps to maintain their prime following a shutdown of water production.

Operating guidelines have been established to prevent the shutdown of water production during times of low water levels. Specifically, water production is continuous when water levels in the English River approach or fall below 355.4 m ASL. This practice requires continuously adjusting raw water flow rates to correspond to community demand. Significant maintenance activities that require a shutdown of water production are also deferred, where reasonably practicable, to occur at a time when water levels in the English River are higher.

In situations when there is a loss of water production during periods of low water levels in the English River, a comprehensive contingency plan is in place to instruct operations personnel about how to resume water production by either manually re-priming the system or by supplying water to the treatment facility using a portable water pump. Future capital improvements may be undertaken to better prevent the raw water pumps from losing prime during periods of low water levels in the English River.

- (2) A deterioration in source water quality may be associated with annual spring run-off and significant rainfall events. Such situations may require timely adjustments to treatment processes and dosages.

Monitoring processes, control measures and response procedures are available to minimize the operational challenges posed by sudden changes to raw water characteristics.

- (3) Seasonal changes in water temperature may impact treatment performance as it concerns chemically-assisted filtration and disinfection processes. Higher water temperatures are also associated with increased biological activity in the source water, resulting in high turbidity, colour, micro-organism counts, algal blooms and the potential for taste and odour problems.

Generally, seasonal changes pose only minor challenges, and these challenges can be anticipated and may require adjustments to treatment processes or chemical dosages.

- (4) A limited number of potential pollution sources are known to affect the English River at and around the intake. Potential sources of upstream contamination include various camps and refuelling activities. The area is influenced by some recreational activities and is susceptible to natural bacteriological contamination by wildlife.

Monitoring processes (e.g., routine, or additional regulatory sampling and water quality testing, continuous monitoring), control measures (including normal treatment barriers) and emergency response procedures are available to minimize the operational challenges posed by a source water contamination event.

- (5) Algal blooms in the source water and at upstream locations pose a potential concern and have occurred in the past. Such events could interfere with treatment processes and associated toxins may pose a risk of treated water contamination. Monitoring processes, control measures and response procedures are available to minimize the operational challenges posed by algal blooms.

6.3 Treatment Processes

6.3.1 Source Water Intake & Pumping

Source water is obtained from the English River at the outflow from Lac Seul. Raw water is drawn through a screened intake crib structure and a 300 mm diameter intake pipe extending from approximately 58 m offshore to the Low Lift Pumping Station. Three (3) raw water pumps located at the LLPS are available to transfer source water to treatment units at the Ear Falls Water Treatment Plant. Generally, only one raw water pump is in use during water production. The rate of water production and flow is determined by community demand and the capacity of the facility.

6.3.2 Coagulation, Flocculation and Clarification

A coagulant (polyaluminum chloride) and a flocculant (polymer) are added to the incoming raw water upstream from the two (2) solids contact clarifiers. The coagulant chemical feed system consists of two (2) chemical metering pumps in duty/standby configuration complete with automatic switchover capability and two (2) 5,500 L chemical solution tanks with spill containment. The flocculant chemical feed system consists of two (2) chemical metering pumps and one (1) 750 L chemical solution tank with spill containment. Coagulant and flocculant dosing at the facility is paced to the raw water flow rate, and both systems are configured to automatically stop water production in the absence of chemical flow.

The coagulated water solution is then introduced to the mechanically mixed 3.7 m diameter flocculating centre chamber of the respective 7.6 m diameter solids contact clarifiers. In the centre chamber gentle mixing promotes the formation of floc masses. Water then flows into the clarifier proper, and its velocity is reduced to allow for the separation of floc and supernatant. Process water flows outward and upward through a maintained floc (sludge) blanket until supernatant overflows into effluent launders and is directed to a splitter box. From the splitter box flow is directed to two two-compartment dual media high-rate gravity filters. Generally, both clarifiers operate in parallel during water production.

Small volumes of process sludge that accumulate at the bottom of the respective clarifiers are periodically removed from the units through the process of 'desludging'. During this automated process, a valve at the bottom of the clarifier opens for a short duration and allows sludge to be discharged from the clarifiers to the waste holding tank. The desludge control set points can be adjusted by operators, and desludges can also be manually activated. Desludging is a critical component of the overall treatment process that prevents sludge from accumulating and potentially overflowing into the clarifier effluent launders, which would in turn compromise the integrity of the filtration process.

6.3.3 Filtration

Most of the particulate matter that was present in the raw water will become an insoluble floc and be removed in the solids contact clarifiers. During normal operation, however, some floc passes from the clarifiers to the filters. Impurities that were not captured and settled as floc in the clarifiers are removed by passing water through a dual media filter composed of anthracite and silica sand. Filtrate is then directed through an integral backwash water storage tank located above the filter units. Once the tank is full, excess filtrate overflows into a launder and is directed to the treated water storage reservoir.

There are two (2) two-compartment dual media high-rate gravity filters at the Ear Falls WTP, each filter providing a surface area of 5.25 m². Each filter includes filter-to-waste piping, complete with valves and operational control instrumentation. Generally, all four (4) filter units operate in parallel during water production.

Filters are periodically cleaned by reversing the flow of water (backwashing) through the filter using the backwash water stored in a tank above the filters. After the backwash, filtered water is directed to the waste holding tank (rinsing-to-waste) until a pre-determined amount of time has passed and the water meets specific water quality objectives.

6.3.4 Disinfection

Sodium hypochlorite is used to achieve both primary and secondary disinfection at the Ear Falls Water Treatment Plant. Primary disinfection ensures that any potentially pathogenic organisms that remain after previous treatment processes are destroyed or inactivated. To achieve primary disinfection, a super-chlorinated solution is applied to the filtrate upstream from the treated water storage reservoirs. Consistent disinfection is ensured by the continuous monitoring of the disinfectant residual in treated water leaving the facility.

Secondary disinfection requirements are achieved by adding enough free chlorine at the WTP to maintain a residual throughout the water distribution system. The purpose of this procedure is to prevent the growth of biofilm within the distribution system and to protect the water from re-contamination as it flows through the community.

The sodium hypochlorite disinfection system at the Ear Falls WTP is housed in a separate room. It consists of two (2) chemical metering pumps in duty/standby configuration, complete with automatic switchover capability and one (1) 228 L chemical solution tank. The sodium hypochlorite dosing at the facility is paced to the filtrate water flow rate.

6.3.5 pH Adjustment

The Ear Falls Drinking Water System adheres to a *Corrosion Control Plan* to control the lead release in residential and non-residential plumbing, and the use of a pH/alkalinity adjustment chemical is required to ensure that finished water pH is maintained between 7.6 and 8.0. To maintain water pH, sodium hydroxide is added to the filtered water upstream from the treated water reservoirs.

The sodium hydroxide chemical feed system consists of two (2) chemical metering pumps in duty/standby configuration complete with automatic switchover capability and one (1) 2,000 L solution tank with spill containment. The sodium hydroxide dosing at the facility is paced to the filtrate water flow rate.

6.3.6 Treated Water Storage and Delivery

Following filtration and the application of disinfectant and pH adjustment chemicals, filtrate is directed to a treated water storage reservoir with a useable capacity of 447 m³ and equipped with internal baffle walls. The baffle walls promote the mixing of disinfectant with the water. Disinfected water is then held in the reservoir for enough time to achieve primary disinfection.

Three (3) high lift pumps located at the Ear Falls WTP are available to transfer water from the treated water storage reservoirs to the Ear Falls water distribution system and standpipe. The flow and disinfectant residual are continuously monitored in treated water leaving the facility.

6.3.7 Process Waste Residuals Management

Residuals generated from the water treatment process are also managed at the Ear Falls WTP. Clarifier sludge discharge, backwash wastewater and rinse-to-waste water are directed to the waste holding tank at the Ear Falls WTP. Two submersible wastewater pumps are available to transfer the waste residuals to the sanitary sewer system.

6.3.8 Emergency Power and Instrumentation

One (1) 125 kVA portable standby diesel generator set is reasonably available to supply emergency power to the treatment facility. Power transfer occurs via a manual transfer switch. The severity of a power failure at the Ear Falls WTP is mitigated by the presence of the community standpipe.

Critical process instrumentation at the Ear Falls Water Treatment Plant includes one (1) raw water flow measuring device, one (1) filtered water flow measuring device, one (1) treated water flow measuring device, four (4) online filtrate turbidimeters, one (1) filtrate pH and free chlorine residual analyzer, one (1) treated water pH and free chlorine residual analyzer and three (3) water level indicators for measuring the water level in the treated water reservoir, standpipe and wastewater tank. These instruments are integrated with the main programmable logic controller and the facility's SCADA system. Alarm conditions are routed by the SCADA system to a programmable autodialer for transmission. The Ear Falls WTP also includes a programmable logic controller for filter control which is not integrated with other automation systems.

6.4 Distribution System Components

The Ear Falls water distribution system is comprised of four different types of infrastructure: watermains, service connections, gate isolation valves and hydrants. The majority of these watermains in the system are ductile iron, and initial sections were first installed in 1967. Subsequent extensions were carried out using PVC and polyethylene pipe materials. The table below shows the size of watermains, the total length of pipe in the distribution system and their material.

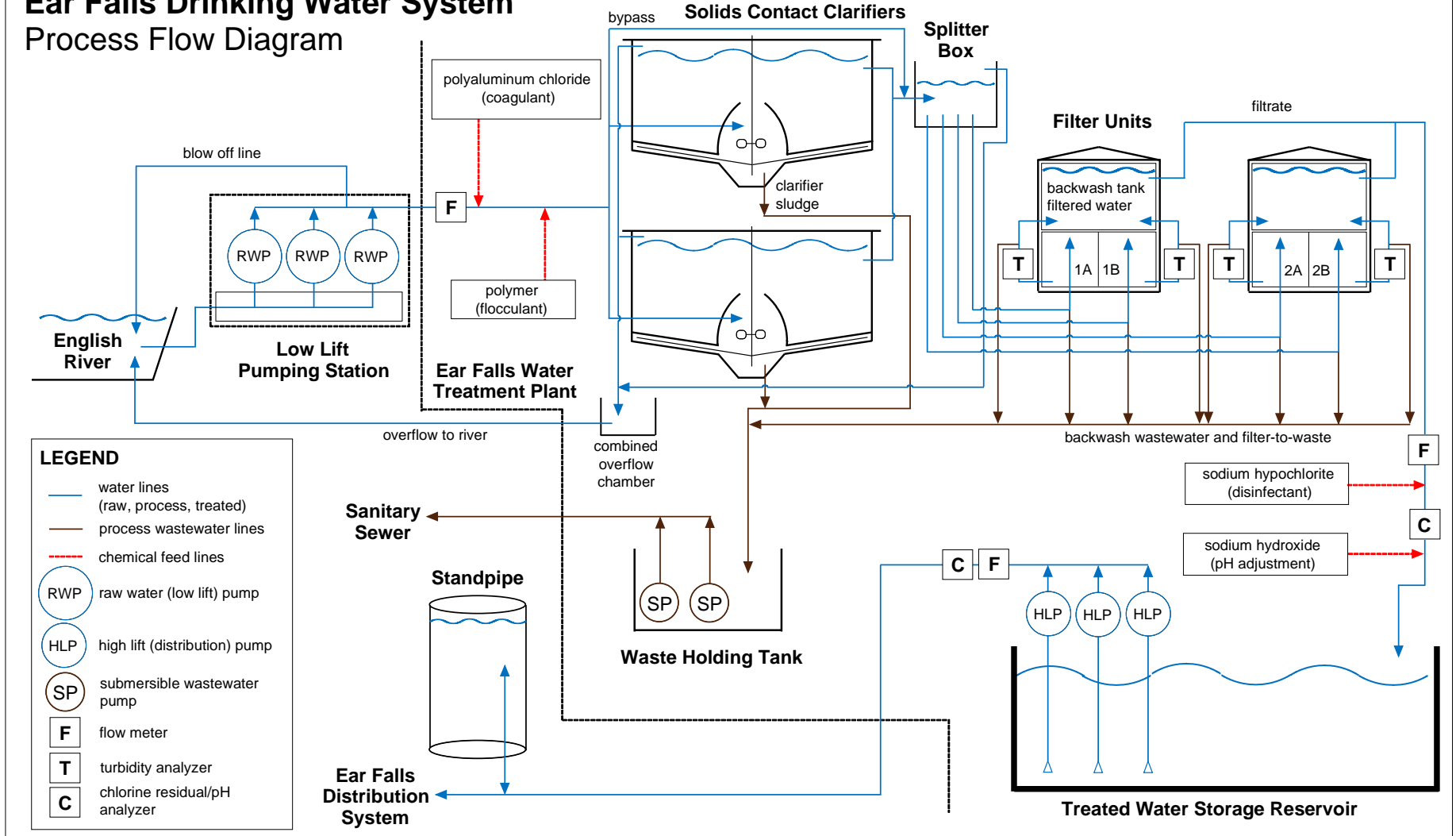
Construction Material	Diameter (mm)	Total Length (m)
Ductile Iron	200	8380.24
Ductile Iron	300	2520.96
Ductile Iron	400	68.67
HDPE	200	4645.16
HDPE	250	250
PE60	150	58.32
PE60	200	1559.19
PVC	200	924.92

The distribution system also includes a standpipe with a capacity of 4,091 m³. The standpipe balances system pressure and provides additional water storage. An altitude valve at the standpipe provides a safeguard against overfilling.

6.5 Process Flow Diagram

A process flow diagram of the treatment process is provided on the following page, followed by diagrams of the water distribution system.

Ear Falls Drinking Water System Process Flow Diagram



Publication Date: September 6, 2023
Revision Level: 1
Internal Reference: EFDWS-OP
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7 Risk Assessment

Refer to the *Risk Assessment Procedure* [QMS-7].

8 Risk Assessment Outcomes

8.1 Interpretation of the Risk Assessment Outcomes

The risk assessment outcomes were determined using the *Risk Assessment Procedure* [QMS-7]. This procedure contains all the information necessary to interpret the *Risk Assessment Outcomes* for the Ear Falls Drinking Water System [QMS-8]. The risk assessment outcomes include the following:

- (1) Potential hazardous events and associated hazards;
- (2) Assessed risks associated with the occurrence of hazardous events, including considering the likelihood, severity, and detectability of the event;
- (3) Ranked hazardous events;
- (4) Identified control measures for potential hazards and hazardous events;
- (5) Critical control points and their respective critical control limits; and,
- (6) Response procedures for hazardous events, that include responding to, recording and reporting deviations from critical control limits.

8.2 Monitoring Critical Control Limits

Various monitoring processes are in place to monitor critical control limits and to identify deviations from those limits. Critical control limits and other parameters associated with critical control limits are monitored by the following processes:

- (1) Continuous monitoring and alarm systems (e.g., instrumentation and trending associated with filtrate turbidity, free chlorine residual, flow, etc.). Alarm systems notify operators when critical control limits or other alarm set points have been breached;
- (2) Routine regulatory sampling (e.g., weekly microbiological analyses, quarterly chemical analyses, annual chemical analyses, etc.);
- (3) Routine water quality testing (e.g., daily tests for free chlorine and turbidity, routine process water quality tests);
- (4) Operational checks, where operators collect and interpret data (e.g., pump hours, flows, instrumentation readings, compliance data) and inspect facilities on a daily basis;

- (5) Additional operational checks associated with planned maintenance, where certified operators conduct more detailed inspections of facilities on a monthly basis; and,
- (6) Notification from external parties (e.g., notification that a chemical contamination event has occurred, notification of a large fire in the community, a water quality complaint that results in the identification of a cross-connection, etc.).

8.3 Critical Control Limit Deviations

Procedures outlining how to respond to, report and record deviations from critical control limits exist as a series of *Emergency Response Procedures*. Specifically, *Emergency Response Procedures* contain step-by-step response instructions, including instructions related to communication protocols and recordkeeping requirements.

All critical control limit deviations are recorded in the facility logbook but may also be recorded within Adverse Water Quality Incident documentation, call-out records, customer complaint records and operational spreadsheets.

9 Organizational Structure, Roles, Responsibilities and Authorities

Refer to the *Organizational Structure, Roles, Responsibilities & Authorities Policy* [QMS-9].

10 Competencies

Refer to the *Competencies Policy* [QMS-10].

11 Personnel Coverage

Refer to the *Personnel Coverage Policy* [QMS-11].

12 Communications

Refer to the *QMS Communication Procedure* [QMS-12].

13 Essential Supplies and Services

Refer to the *Essential Supplies and Services Procedure* [QMS-13].

14 Review and Provision of Infrastructure

Refer to the *Review and Provision of Infrastructure Procedure* [QMS-14].

15 Infrastructure Maintenance, Rehabilitation, & Renewal

15.1 Planned Maintenance, Rehabilitation, & Renewal

The Township maintains a program of scheduled inspection and maintenance of infrastructure for which it is operationally responsible. Maintenance activities are developed according to manufacturer instructions, regulatory requirements, industry standards. Records of planned maintenance activities are controlled in accordance with the *Document and Records Control Procedure* [QMS-5]. The major components of the infrastructure maintenance, rehabilitation and renewal programs in place for the Ear Falls Drinking Water System are described below.

- (1) The *Planned Maintenance Activities* Standard Operating Procedure documents a comprehensive program that is carried out by operational personnel at the Ear Falls Drinking Water System on a monthly or less frequent basis. This procedure dictates planned inspection and maintenance activities associated with infrastructure components including pumps, valves, chemical feed systems, treatment equipment, emergency response equipment, heating systems, lighting, and other components necessary to ensure a safe and reliable supply of drinking-water.

This procedure also facilitates infrastructure rehabilitation and renewal, as it requires the identification and reporting of deficiencies. Identified deficiencies may be addressed through operational budgets, particularly as it concerns the rehabilitation and renewal of smaller infrastructure components such as chemical feed systems and valves.

- (2) The *Measurement and Recording Equipment Calibration and Maintenance Procedure* documents certain planned calibration and maintenance activities that are specific to instrumentation. The associated *Calibration and Maintenance Records* are used to indicate a variety of maintenance activities, such as instrument inspection, cleaning and quality assurance. Generally, such activities are carried out by operations staff on a monthly basis.
- (3) Concerning distribution system components, the water distribution system is flushed and hydrants are operated and inspected on an annual basis. Major distribution system and hydrant deficiencies identified during this program are used to plan for future maintenance activities.
- (4) The Township monitors and coordinates additional maintenance activities that include infrastructure inspection, maintenance or servicing that occur on a recurring but less frequent basis. Examples of such activities include flow meter calibration verification, backflow prevention device testing, reservoir cleaning and inspections, thermal imaging inspections, emergency generator servicing and load testing, the replacement of various critical components, etc.

- (5) The annual infrastructure review and budgeting processes are the main methods through which infrastructure rehabilitation and renewal occurs. Specifically, the outcomes of the infrastructure review represent the main inputs into annual budget. The integration of annual budgeting and infrastructure review processes represents a continuous and cohesive effort to identify deficiencies and plan for infrastructure rehabilitation and renewal.

15.2 Unplanned Maintenance

Unplanned maintenance tasks related to the treatment component of the Ear Falls Drinking Water System result from equipment or infrastructure failures. Unplanned maintenance is authorized by the Overall Responsible Operator. Documentation of these unplanned maintenance tasks are recorded in the facility logbook. Measures to prepare for and expedite unplanned maintenance tasks in these scenarios include equipment interchangeability and redundancy, spare parts inventories and the availability of relevant operations and maintenance manuals.

Unplanned maintenance tasks, infrastructure repair and renewal related to distribution system components of the Ear Falls Drinking Water System are typically performed by the Township of Ear Falls' Public Service and Operations Department, in conjunction with representation from the Water and Wastewater Department. Measures to prepare for and expedite unplanned maintenance tasks include the cataloguing of the distribution system, maintaining a parts inventory and having access to repair procedures.

15.3 Program Monitoring

To ensure that the planned maintenance program remains effective, the *Planned Maintenance Activities SOP* and the *Measurement and Recording Equipment Calibration and Maintenance Procedure* are reviewed and updated annually. The review accounts for changes to infrastructure and allows an opportunity to refine and continually improve the maintenance program, particularly as it involves incorporating new best practices.

15.4 Program Communication

The Township's infrastructure maintenance, rehabilitation, and renewal programs for the Ear Falls DWS are communicated to Owner on annual basis as a component of the communication of management review results. Significant planned and unplanned infrastructure maintenance, rehabilitation and renewal activities are also described in monthly operational reports submitted to the Owner Representative.

16 Sampling, Testing & Monitoring

Refer to the *Sampling, Testing, & Monitoring Procedure* for the Ear Falls Drinking Water System [QMS-16].

17 Measurement and Recording Equipment Calibration and Maintenance

Refer to the *Measurement and Recording Equipment Calibration and Maintenance Procedure* [QMS-17].

18 Emergency Management

Refer to the *Emergency Management Procedure* [QMS-18].

19 Internal Audits

Refer to the *Internal Audit Procedure* [QMS-19].

20 Management Review

Refer to the *Management Review Procedure* [QMS-20].

21 Continual Improvement

The Township is committed to continually improving the effectiveness of its Quality Management System. Continual improvement is facilitated by the management review and internal auditing processes, which include the identification of QMS deficiencies and the assignment of preventive and corrective actions.

Refer to the *Continual Improvement Procedure* [QMS-21].

22 Revision History

Date	Revision	Comments
May 18, 2023	0	Initial publication of Operational Plan.
September 6, 2023	1	Updates and Review following LST Audit.

Schedule C – Director’s Directions for Operational Plans (Subject System Description Form) Municipal Residential Drinking Water System

Fields marked with an asterisk (*) are mandatory.

Owner of Municipal Residential Drinking Water System *
The Corporation of the Township of Ear Falls

Subject Systems

Name of Drinking Water System (DWS) *	Licence Number *	Name of Operating Subsystems (if applicable)	Name of Operating Authority *	DWS Number(s) *
1. Ear Falls Drinking Water System	287-101		The Corporation of the Township of Ear Falls	210000256

Contact Information for Questions Regarding the Operational Plan

Primary Contact

Last Name *	First Name *	Middle Initial
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Secondary Contact

Last Name	First Name	Middle Initial
Title	Telephone Number	Email Address
	ext.	