



**Drinking Water Quality Management System  
(Distribution System)**

## TABLE OF CONTENTS

DWQMS Element 1 - Quality Management System .....	5
DWQMS Element 2 - Quality Management System Policy .....	7
DWQMS Element 3 - Commitment and Endorsement .....	8
DWQMS Element 4 - QMS Representative.....	9
DWQMS Element 5 - Documents and Records Control .....	10
DWQMS Element 6 - Drinking Water System .....	12
6.1 Owner and Operator of the System .....	12
6.2 Number of Customers .....	13
6.3 Description of Pipes .....	13
6.4 Reservoir .....	13
6.5 Additional Equipment .....	13
DWQMS Element 7 and 8 - Risk Assessment and Risk Assessment Outcomes .....	14
DWQMS Element 9 - Organizational Structure, Roles, Responsibilities & Authorities .....	15
9.1 Organizational Chart .....	15
9.2 Roles and Responsibilities .....	16
DWQMS Element 10 - Competencies .....	18
DWQMS Element 11 - Personnel Coverage .....	20
11.1 Guidelines for On Call Personnel .....	20
11.2 Duties that require a Licensed Water Operator .....	20
11.2.1 Must be performed by a Licensed Operator .....	20
11.2.2 Requires the On-Site Supervision of a Licensed Operator .....	20
11.2.3 Does not require a Licensed Operator .....	20
DWQMS Element 12 - Communications .....	21
DWQMS Element 13 - Essential Supplies and Services .....	22
13.1 Essential Suppliers .....	22
13.2 Essential Services .....	23
DWQMS Element 14 - Review and Provision of Infrastructure .....	24
14.1 Condition Ratings .....	24
14.2 Works and Operations .....	25
DWQMS Element 15 - Infrastructure Maintenance, Rehabilitation and Renewal .....	26
15.1 Inventory .....	26

15.2 Replacement Value .....	28
15.2.1 General .....	28
15.2.2 Water Distribution System .....	28
15.2.3 Summary .....	29
15.3 Service Life .....	29
15.3.1 General .....	29
15.3.2 Water Distribution System .....	29
15.4 Renewal Requirements .....	30
15.4.1 General .....	30
15.4.2 Water Distribution System .....	31
DWQMS Element 16 - Sampling, Testing and Monitoring .....	33
16.1 Sampling .....	33
16.2 Testing .....	33
16.3 Monitoring .....	33
DWQMS Element 17 - Measurement & Recording Equipment Calibration & Maintenance .....	34
DWQMS Element 18 - Emergency Management .....	35
18.1 Potential Emergencies .....	35
18.2 Emergency Contacts and Phone Numbers .....	35
DWQMS Element 19 - Internal Audits .....	37
DWQMS Element 20 - Management Review .....	38
DWQMS Element 21 - Continual Improvement .....	39

## **LIST OF APPENDICES**

Appendix A – WO 0005, WO 0009, WO 0010, WO 0011, WO 0012, WO 0013, WO 0014,  
WO 0015, WO 0016, WO 0017, WO 0018, WO 0019, WO 0020, WO 0023,  
WO 0027, WO 0028, WO 0029, WO 0030, WO 0031

Appendix B – By-Law No. 1560

Appendix C – OCWA Service Agreement

Appendix D – Water Distribution Layout

Appendix E – Water Main Conditions

Appendix F – Risk Assessment

## DWQMS Element 1 - Quality Management System

### Overview

This Operational Plan provides documentation for the Quality Management System (QMS) for the Town of Marathon's Water Distribution System in accordance with the requirement of the Drinking Water Quality Management Standard.

The Marathon distribution system has approximately 1,379 residential and 142 commercial / industrial connections servicing a population of approximately 3,900 people. From the pump houses, water is pumped to the distribution system and a 4,950 m<sup>3</sup> in-ground storage reservoir. The reservoir is used to balance system pressure, regulate pump use and provide water during power outages. The water is delivered via a system of various sized diameter water mains consisting of cast iron, high density polyethylene, ductile iron, PVC, and steel totaling approximately 32 km in length. There are a total of 308 fire hydrants located throughout the distribution system.

A program is in place for inspecting and exercising valves. Conducted in the early summer months any repairs to defective valves are then completed in the fall (please refer to Appendix A; WO 0014).

Several activities are in place to address day to day operations of the water main distribution system (please refer to Appendix A; WO 0013, WO 0017 and WO 0018).

There is also a program in place for inspecting and operating hydrants. A limited replacement strategy is in place to phase out the older lead based hydrants. There are contingency plans in place for the flushing and the thawing of a frozen fire hydrants (please refer to Appendix A; WO 0015 and WO 0016). Access to hydrants is restricted. Permission must be obtained from the Town. The Town oversees the taking of water from a hydrant using a backflow preventor and meter.

Consumer water usage, including industrial and commercial water users, is not fully metered. The voluntary pilot program which commenced in November 2004 is ongoing. This program consisted of 16 meters being installed at various locations throughout the distribution system. One meter is installed at a commercial consumer, one at a multi-residential consumer and 14 others at single family dwellings. All consumers are currently charged a flat rate.

The owner has undertaken efforts to identify, quantify and reduce sources of apparent water loss (refer to the summer lawn water restrictions which is supported by Appendix B - Bylaw No. 1560) and/or established a leak detection/minimization program.

The operating authority (Ontario Clean Water Agency) is diligent in notifying town personnel of a potential issue within the distribution system when it is observed that pump volumes are higher than usual. The distribution system pressure was monitored to alert the operator of conditions which may have lead to loss of pressure below the value under which the system is designed to operate.

The potable water is supplied by the Town's groundwater wells which are operated by the Ontario Clean Water Agency (OCWA) under a service agreement dated January 2009 (please refer to Appendix C).

## DWQMS Element 2 – Quality Management System Policy

The following quality policy applies to all Town employees with responsibilities related to the Water Distribution System. The policy is displayed in the Town Administration Office and on the Town website <http://www.marathon.ca>

### TOWN OF MARATHON POLICY

<b>SECTION: WORKS AND OPERATIONS</b>	<b>PAGE 1 OF 1</b>
<b>POLICY: DRINKING WATER QUALITY MANAGEMENT SYSTEM (DWQMS)</b>	<b>POLICY NO: WO0026</b>

**PURPOSE:**

The purpose of this policy is to highlight the commitment to having safe and potable water for the residents of the Town of Marathon.

**SCOPE:**

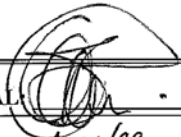
This policy applies to all employees of the Town of Marathon who have responsibilities as it relates to the Water Distribution System.

**POLICY STATEMENT:**

The Town of Marathon owns, maintains and operates the water distribution system.

The Town is committed to:

1. Ensure the consistent supply of safe, high quality drinking water;
2. Comply with all relevant legislation and regulations;
3. Continually review and improve the Quality Management System; and
4. Openly communicate with the public concerning matters of drinking water quality and quantity.

New <input checked="" type="checkbox"/> Revised <input type="checkbox"/>	APPROVAL: 
SUPERSEDES POLICY DATED: _____	DATED: <u>Aug 6/09.</u>

**DWQMS Element 3 - Commitment and Endorsement**

This Operational Plan documents the Drinking Water Quality Management System for the Town of Marathon’s Water Distribution System. This Operational plan has been reviewed and is endorsed and supported by the Town of Marathon Mayor, Chief Administrative Officer/Clerk, and the Works and Operations Manager.

The aforementioned management ensures that communication of the QMS will be carried out in accordance with the DWQMS communication procedure as described in element 12 of this Operational Plan.

THE CORPORATION OF THE TOWN  
OF MARATHON

\_\_\_\_\_  
Date of Signing

By: \_\_\_\_\_  
Rick Dumas  
Mayor

\_\_\_\_\_  
Date of Signing

By: \_\_\_\_\_  
Brian Tocheri  
CAO/Clerk

\_\_\_\_\_  
Date of Signing

By: \_\_\_\_\_  
Jim Zimmerman  
Works and Operations Manager

## **DWQMS Element 4 - QMS Representative**

The role of the Quality Management System Representative is added to the responsibilities of the Works and Operations Manager for the Town of Marathon's Water Distribution System.

The responsibilities of the QMS representative include:

- Promote and insure the use of the QMS for all relevant activities related to the water distribution system,
- Ensure all relevant employees are aware of applicable regulatory and legislative requirements relevant to the water distribution system,
- Maintain, amend, and develop the QMS as needed,
- Report to Top Management on any issues relating to the QMS, and
- Ensure the current versions of documents and plans required by the QMS are in use.

## **DWQMS Element 5 - Documents and Records Control**

### **OPERATIONS MANUALS**

Operators and maintenance personnel have ready access to operations and maintenance manuals. Manuals for the distribution system are maintained at the municipal public works garage.

The operations and maintenance manuals contain plans, drawings and process descriptions sufficient for the safe and efficient operation of the system.

The plans / drawings for distribution subsystems include water mains, valves, hydrants, and other appurtenances associated with the distribution system. Plans / drawings may depict the entire system as a whole or individual treatment systems as separate drawings. These plans / drawings can be found in the plans room, located at Town Hall.

The operation and maintenance manuals are reviewed on a periodic basis. Old manuals are shredded and disposed of.

### **LOG BOOK RECORDS**

Logs for the distribution and supply subsystem(s) of the drinking water system contained the required information. Various logbooks pertaining to the distribution system are maintained and kept at the municipal public works garage. Logbook entries were made in chronological order. The record system allowed the reader to unambiguously identify the person who made the logbook entry. Entries in the logbook were made only by appropriate and authorized personnel. Records or other record keeping mechanisms confirmed that operational testing not performed by continuous monitoring equipment was being done by a certified operator, water quality analyst, or person who suffices the requirements of Ontario Regulation 170 / 037.5. For every required operational test and every required sample, a record was made of the date, time, location, name of the person conducting the test and result of the test (results are often kept in the electronic files located on the central computer system). The operator operator-in-charge (OIC) or the operator with overall responsibility for the system (ORO) ensures that records were maintained of all adjustments made to the processes within his or her responsibility. Logs are kept for at least five (5) years. Log books for the distribution system are maintained at the public works garage.

Old records are shredded and disposed of.

## ELECTRONIC RECORDS

Electronic records are kept on the central drive which is backed up daily. The central file system's, general structure is as follows:

M: \ 4-5 (Works and Operations)

4-5-15 (Water)

4-5-15-01 DWL Program

4-5-15-02 Fuel Oil Spills

4-5-15-03 Lead Sampling

4-5-15-04 Marathon Groundwater Wells

4-5-15-05 MOE Reports

4-5-15-06 OCWA Capital and Operating Documentation

4-5-15-07 OCWA Reports

4-5-15-08 Sodium Levels

4-5-15-09 Water Flow Data

4-5-15-10 Water Meters

4-5-15-11 Water Sampling

4-5-15-12 Water Turn OFF\_ON Activity

4-5-15-99 Miscellaneous

Old electronic records are erased.

## **DWQMS Element 6 – Drinking Water System (Distribution)**

### 6.1 Owner and Operator of the System (Distribution)

OWNER: The Corporation of the Town of Marathon

OPERATOR OF THE SYSTEM: Ontario Clean Water Agency (OCWA) is the operator authorities for the Reservoir and the Booster Stations (Penn Lake Heights and Industrial Park) while Public Works Water Distribution Operators are responsible for the pipes, hydrants, and connections (curb stops).

THE FACILITIES:

#### Description of the Distribution Facilities

For the purpose of the Drinking Water Licensing, the Facilities are comprised of the following:

- Penn Lake Heights Subdivision Booster Station and Reservoir and the Industrial Park Booster Station

#### Street addresses of the Facilities

The street addresses of the Facilities are as follow:

Penn Lake Heights Subdivision Booster Station and Reservoir: Part No. 2, 3 & 4 of TW 264 (55R-6696), 22936 T.B.F.

Industrial Park Booster Station: Part 6 of Registered Plan 55R-11788

All properties in the Thunder Bay District

WHO RUNS THE TREATMENT PLANT?

The Ontario Clean Water Agency (OCWA) runs the treatment plant. The water source being treated is a groundwater aquifer which is located under the Town of Marathon. The Corporation of the Town of Marathon retains the Ontario Clean Water Agency (OCWA) to provide management, operation, and maintenance services, as described in Schedule C of the Service Agreement dated January 2009.

## 6.2 Number of Customers

The Marathon distribution system has approximately 1,379 residential and 142 commercial/industrial connections servicing a population of approximately 3,900 people.

## 6.3 Description of Pipes

The water is delivered via a system of various sized diameter water mains consisting of 7,125 m of Cast Iron, 18,439 m of Ductile Iron, 2,435 m of high density polyethylene (HDPE), 3,933 m of PVC, and 255 m of Steel piping totaling approximately 32 km in length. There are a total of 308 fire hydrants located throughout the distribution system (refer to Appendix D for the Water Distribution Layout).

## 6.4 Reservoir

The purpose of the Marathon Reservoir is to balance system pressure, regulate, pump and provide water during power outages, and to provide fire protection to the municipality. It has a storage capacity of 4,950 m<sup>3</sup>. It is primarily of concrete construction with clean stone surrounding the structure for ground water drainage. Construction of the reservoir was done in 1985.

At the reservoir the Chlorine Low Residual is set to 0.25. The High and Low Reservoir Levels are set to 4.85 m and 3.5 m respectively. There is an abnormal system pressure gauge that detects high and low psi. In regards to generator back up, there is a generator fault indicator which indicates when there is generator failure. In addition to all these apparatus', also there are pump failure alarms, fire pump running alarm, high sump alarms, intrusion alarms, and a scada failure alarm.

## 6.5 Additional Equipment

The distribution system also contains the Penn Lake Height Booster Station. This station is in place for one reason.

The station boosts the water pressure to feed the distribution pipes to the Penn Lake Heights subdivision which includes the Marathon Public School. This is required to overcome head pressure from the elevated height of the subdivision.

The distribution system also contains the Industrial Park (I.P.) Booster Station. This station is in place for two main reasons.

First, the station boosts the water pressure to feed the distribution pipes to the industrial section and cemetery. This is required to overcome head pressure from the elevated height of the industrial section.

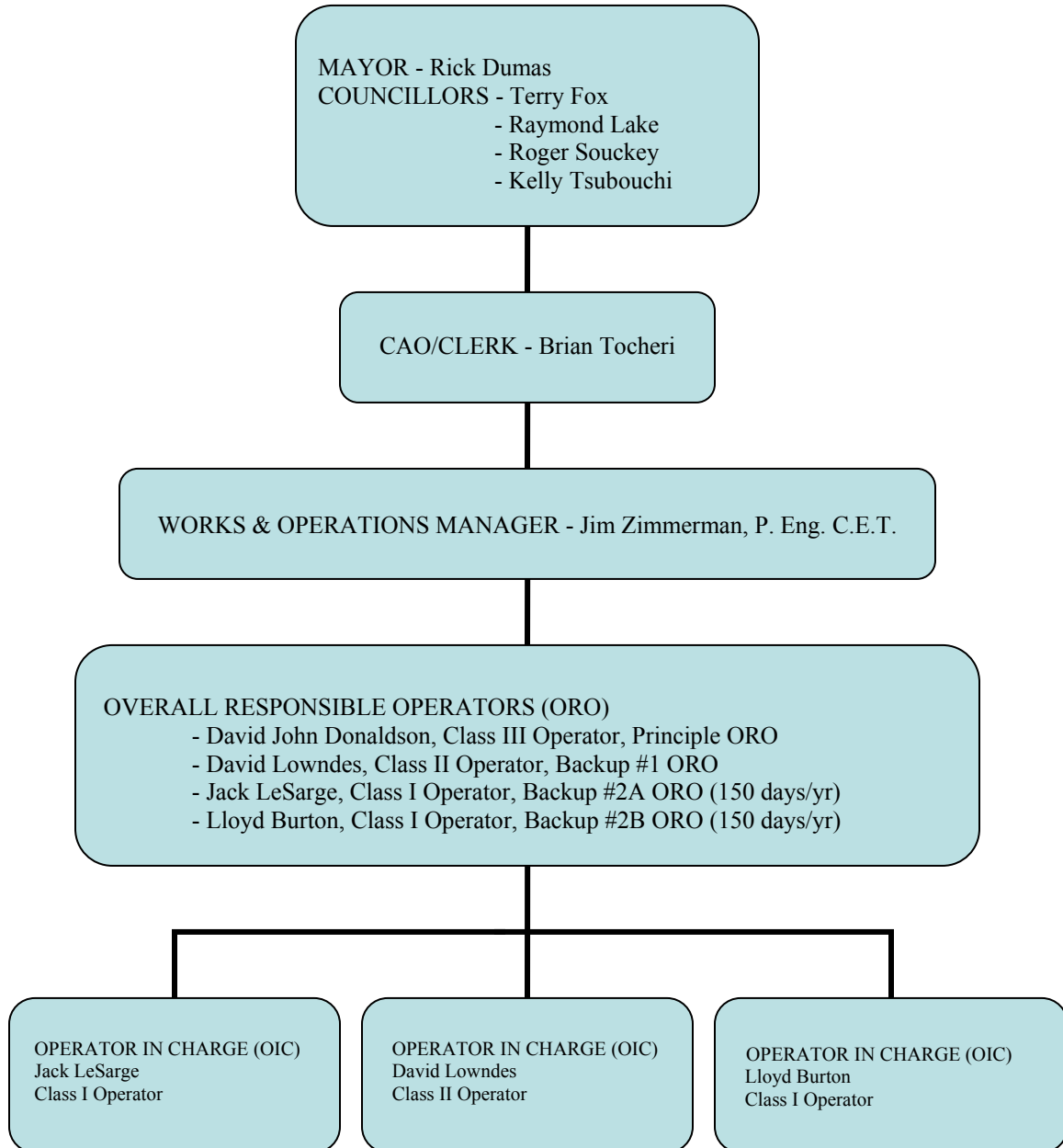
Secondly, the chlorine level is topped off at the booster station to ensure minimum residuals are maintained at all times in the Industrial Park.

## **DWQMS Element 7 and 8 - Risk Assessment and Risk Assessment Outcomes**

(refer to Appendix F)

# DWQMS Element 9 - Organizational Structure, Roles and Responsibilities and Authorities

## 9.1 Organizational Chart



## 9.2 Roles and Responsibilities

The Town of Marathon has a guideline in place for system responsibility for licensed water operators (please refer to Appendix A; WO 0005). The Town also has a contingency plan to ensure that there is an operator in charge for the water distribution system (please refer to Appendix A; WO 0012). The responsibilities for the positions illustrated above pertain to the water distribution system and the QMS is outlined below.

### **System Owner – Mayor and Council – Top Management**

#### Roles and Responsibilities

- Overall responsibility for providing safe drinking water to the Town of Marathon,
- Responsibility for the water distribution system and the water treatment plant (operated by OCWA),
- Ensure that compliance is achieved for all regulations and legislation applicable to the water systems, and
- Overall responsibility for the implementation of the QMS.

### **Chief Administrative Officer/Clerk – Top Management**

#### Roles and Responsibilities

- Oversees administration, and
- Ensures system owners' direction is followed.

### **Works and Operations Manager – Top Management**

#### Roles and Responsibilities

- Responsibility for the supervision for all public works operations and personnel,
- Oversight of the water distribution system,
- Oversight of OCWA operation of water treatment plant and fulfillment of contract with the Town of Marathon,
- Ensure the distribution QMS is implemented,
- Involved in undertaking the management review
- Oversight of the maintenance of the distribution system, and
- Principle contact in emergency situations pertaining to public works.

## **Overall Responsible Operator (ORO)**

### Roles and Responsibilities

- Overall operational responsibility for the system,
- Must hold a license that is applicable to the type of facility and that is of the same class as or higher than the class of the facility unless otherwise stated in the provisions,
- Typically directs operators on operating decisions beyond the knowledge skill and experience of other operators, and
- Expected to be able to respond immediately to an emergency.

## **Operator in Charge (OIC)**

### Roles and Responsibilities

- Essentially responsible for the day to day operations of the subsystem,
- Set operational parameters or direct or instruct/direct other operators on same,
- Operate processes safely, in accordance with manuals,
- Make adjustments as needed,
- Ensure specific records are maintained, and
- Ensure equipment is properly monitored and maintained, and records prepared.

## **DWQMS Element 10 – Competencies**

Required and desirable competencies for personnel are presented in the outline below.

### **Works and Operations Manager**

#### Required Competencies

- Employee management experience / training,
- Training / experience with distribution systems and procedures.

#### Desired Competencies

- Engineering experience / training and licensed water operator distribution experience / training.
- Business management experience / training.

### **Internal Auditor for the DWQMS**

#### Require Competencies

- Successful completion of the internal auditing for the Drinking Water Quality Management Standard Course.

#### Desired Competencies

- Experience in performing internal audits on DWQ Management Systems.
- Auditor's accreditations.

### **Overall Responsible Operator (ORO)**

#### Required Competencies

- Water distribution Class I (150 days / yr) or II certification.
- Experience with maintenance and operation of water distribution systems.
- WHMIS training.

#### Desired Competencies

- Water distribution Class II certification.
- Supervision training and experience.

### **Operator in Charge (OIC)**

#### Required Competencies

- Water distribution Class I certification.
  - The hours required are based on the highest class of system an operator works in (35 hours / year or a total of 105 hours / 3 years)

- The training may be completed during any period during the three year period an operator holds a certificate. For example, an operator in a Class II system such as the Towns must complete 35 hours of training per year. The operator may take 105 hours the first year of the certificate and 0 hours in years two and three. The average for the three years meets the required 35 hour minimum.
- Mandatory course is counted towards this training
- Operators holding both distribution and treatment certificates do not need to complete double the amount of hours. Hours of training will be accepted for both distribution and treatment.
- An operator may substitute on-the-job practical with continuing education. An operator **cannot** substitute continuing education with on-the-job.
- Only course approved by the ministry and posted on the ministries approved course list may be used to meet the continuing education requirement. Other courses will not be accepted or only accepted as on-the-job practical training.
- The same course cannot be taken more than once during the three year renewal period.
- Part-time operators must take the full number of hours since all operators, whether they work full-time or part-time, need the same level of skills and knowledge to protect the safety of drinking water.
- An operator may use conferences to meet up to 25% of the continuing education requirement. Excess conference attendance may be used to meet the on-the-job practical training.
- It is important to note that Training Plans are reviewed annually as part of the budget planning process for the next year.
- Table 4 Annual Training Requirements (Director Approved)

System Class	Continuing Education	On-the-Job Practical	Total
Limited System - Ground	7 hours	13 hours	20 hours
Limited System - Surface	7 hours	13 hours	20 hours
Class I	7 hours	23 hours	30 hours
<b>Class II</b>	<b>12 hours</b>	<b>23 hours</b>	<b>35 hours</b>
Class III	14 hours	26 hours	40 hours
Class IV	14 hours	36 hours	50 hours
Water Quality Analyst	7 hours	13 hours	20 hours

- Experience with maintenance and operation of water distribution systems.
- WHMIS training.

#### Desired Competencies

- Supervision training and experience.

## **DWQMS Element 11 – Personnel Coverage**

### 11.1 Guidelines for On Call Personnel

The following information will act as guidance to those persons involved as a liaison between members of the public and the Corporation after regular operating hours. One should remember that the original intent of this function is to be an after hour EMERGENCY contact for residents and travelers.

Upon notification of an emergency pertaining to the Water Distribution System, the on call personnel is to contact the proper person(s) as would be required for the nature of the incident or emergency.

### 11.2 Duties that require a Licensed Water Operator

An operator is defined as a person who “adjusts, inspects or evaluates a process that controls the effectiveness or efficiency of a facility, and includes a person who adjusts or directs the flow, pressure or quality of the water within a water distribution facility.” The Town has four (4) licensed operators - Jack LeSarge, David Lowndes, and Lloyd Burton are regularly available for call-outs; however, David John Donaldson may be contacted in an emergency if none of the other three operators are available.

The following list outlines water-related work that may need to be performed and who is qualified for that work:

#### *2.1 Must be performed by a Licensed Water Operator*

- Operation of pumps
- Opening / closing of valves
- Addition of chlorine to the distribution system
- Operation of pumps within pumping stations
- Use of hydrants for flushing or removing stale water

#### *2.2 Requires the On-Site Supervision of a Licensed Operator*

(May be performed by non licensed personnel under the immediate supervision of a licensed operator)

- Connection of a watermain (including the re-connection of a repaired watermain)
- Performance of wet taps or conducting of dry taps
- Work performed on an isolated portion of a watermain (construction or repair of the watermain)

#### *2.3 Does not require a Licensed Operator*

- Opening and closing of hydrants for non-operational purpose (taking water (provided check valve and meter have previously been installed by a licensed water operator) , fire fighting, fire flow testing)

## **DWQMS Element 12 – Communications**

For details concerning supplier assessment, please refer to guideline WO 0027.

## DWQMS Element 13 – Essential Suppliers and Services

For details concerning supplier assessment, please refer to guideline WO 0028.

### 13.1 Essential Suppliers

*\* It is important to note that the Town of Marathon does not do any calibrations nor does it have a set procedure for assessing the quality of its suppliers and services as they pertain to the water distribution system.*

#### Maintenance Suppliers

Emco Western Suppliers  
Contact: Lyle Lemay  
933 Tungsten St.  
Thunder Bay, ON  
1-888-496-5555

Mueller Canada  
Contact: Don Webb  
496 Raquette St.  
Winnipeg, MB  
1-204-895-3312

Wolseley Group  
Contact: John Rasmussen  
1149 Roland St.  
Thunder Bay, ON  
1-888-860-0039

A1 Hydrants  
Contact: Rick  
550 Coronation Dr.  
Scarborough, ON  
1-416-282-1665

George O. Hill Supply  
Contact: Randy O'Neil  
710 Balmoral St.  
Thunder Bay, ON  
1-807-623-4447

#### Testing Water Quality

A.L.S. Laboratories  
Contact: Alice Chony  
1081 Barton St.  
Thunder Bay, ON  
1-800-668-9878

### 13.2 Essential Services

The Town of Marathon retains the Ontario Clean Water Agency (OCWA) to provide management, operation, and maintenance services, as described in Schedule C of the Service Agreement dated January 2009 (refer to Appendix C for more information).

Ontario Clean Water Agency            or  
PO Box 807  
41 Howe St.  
Marathon, ON  
P0T 2E0  
Ph. (807) 229-1186  
Fax (807) 229-1979

Ontario Clean Water Agency  
PO Box 819  
101 King St.  
Longlac, ON  
P0T 2A0  
Ph. (807) 876-1141  
Fax (807) 876-2560

## DWQMS Element 14 – Review and Provision of Infrastructure

The information utilized to assess the condition of the infrastructure assets included Watermain break records, where available, and other historical information regarding the materials and methods of construction.

### 14.1 Condition Ratings

On the basis of the available records, a condition rating system was developed for all underground infrastructure components (please refer to appendix E for further details). In the absence of more specific data concerning the condition of these assets, the condition rating is based on the age of the components and the material of construction. A straightforward condition rating system was developed for the ease of understanding and so that it could be easily applied and adjusted in the future. The rating system is comprised of four distinct ratings as follow:

- **#1 – Excellent:** In general, these components were constructed within the last 10 years and are comprised of the most modern and durable materials. It is likely that they have a remaining service life of 70 years or more, on average.
- **#2 – Good:** These components were likely constructed 10 to just over 30 years ago and are in good condition with a remaining service life of 50 years or more, on average.
- **#3 – Fair:** In general, these components are greater than 30 years old and many may even be more than 50 years old, however, they are believed to be in reasonable condition although they will likely require replacement within approximately 25 to 30 years.
- **#4 – Poor:** In general, these components are greater than 50 years old and are known to be in poor condition. It is believed that these components have reached the end of their useful service life and should be replaced as soon as possible and likely within the next five years.

In terms of the water distribution system, watermains constructed in the last 10 to 15 years are generally PVC, those constructed from the early 1970's to the 1990's were ductile iron and those constructed prior to the early 1970's were of cast iron. In general, the PVC watermains are in excellent condition, the ductile iron watermains are in good condition, and the cast iron watermains are in either fair or poor condition. For the watermain condition rating system, it was necessary to rely on the age and material of construction and information provided.

The Town has done an excellent job in recent years of renewing the infrastructure systems in the older sections of Town. In most cases, these renewal efforts have been instigated by problems with deteriorating cast iron watermains. There are still some limited areas that can be considered in poor condition and require replacement in the very near future, but the extent of areas that are characterized by a condition rating of “4 – Poor”, is significantly less than it was five or six years ago. These areas generally have

older cast iron watermains that are likely to exhibit leakage and are nearing the end of their useful life.

The municipal water system is more difficult to analyze since the pipelines are always full of pressurized water. It is therefore not possible to conduct CCTV inspections of these pipelines unless they are taken out of service, which is generally not practical. However, the Town will be vigilant in trying to identify areas of leakage in the system, and maintaining detailed records of maintenance activities. In addition, it has been recommended that leak detection surveys be conducted at regular intervals to identify any problem areas. These leak detection efforts will be focused on areas with cast iron watermains until such time as those are replaced. Once the ductile iron watermains approach 40 years of age or more, leak detection efforts will be focused on them. Similarly, once the PVC watermains approach 40 to 50 years old, leak detection surveys will be conducted approximately every 5 to 10 years to identify any problems areas.

#### 14.2 Works and Operations

The following is a yearly schedule of activities as it pertains to the drinking water system.

<b>Month</b>	<b>Activity</b>	<b>Frequency</b>
April	Hydrant Maintenance	Yearly
August	Turn Valves	Start
September	Turn Valves	Continue
October	Turn Valves	End

## DWQMS Element 15 – Infrastructure Maintenance, Rehabilitation, and Renewal

### 15.1 Inventory

#### *Water Distribution System*

The Town of Marathon owns two booster stations and one ground level reservoir. In addition, the Town’s water distribution system includes approximately 32 km of watermain; 308 hydrants; 427 valves; and 1,521 water services.

The watermains supplying the Town’s customers range in size from 50 mm to 500 mm diameter. Table 15-2 provides a breakdown of the total pipe length by diameter. Approximately 93% of mains (by length) have a diameter in the range of 150 mm to 250 mm.

Table 15-3 summarizes the breakdown of total length by pipe material. Approximately 57% of mains (by length) are ductile iron. Cast iron and PVC mains account for 22% and 12%, respectively, of the total length.

Similarly, Table 15-4 summarizes the breakdown of total length by pipe age. It is apparent that 71% of the watermains (by length) were constructed since 1980. In other words, the water distribution system is relatively young, having an average age of approximately 29 years.

Table 15-1  
Replacement Cost of the Water Distribution Components  
Town of Marathon

COMPONENTS		QUANTITY / CAPACITY	UNIT COST	REPLACEMENT COST (million \$)
Reservoir		4,950 m <sup>3</sup>	\$1,700,000 ea	<b>\$1.7</b>
Booster Station <sup>1</sup>				
	Zone 2	4.5 ML/d	\$1,300,000 ea	\$1.3
	Industrial Park	0.2 ML/d	\$200,000 ea	\$0.2
			<b>Sub – Total</b>	<b>\$1.5</b>
Watermains <sup>2</sup>		32 187 m	\$370 / m	<b>\$11.9</b>
Hydrants		308	\$4,000 ea	<b>\$1.2</b>
Water Services		1,521	\$1,500 ea	<b>\$2.3</b>
		<b>Total Replacement Cost</b>		<b>\$18.6</b>

1. The capacity of each booster station is indicative of the firm capacity (ie. The largest pump is assumed to be reserved for back-up).
2. Average unit cost including valves.

Table 15-2  
Watermain Sizes  
Town of Marathon

DIAMETER (mm)	LENGTH (km)	% OF TOTAL
<150	0.4	1%
150	14.8	47%
200	10.4	33%
250	4.0	13%
300	2.0	6%
350	0.1	0%
500	<u>0.1</u>	<u>0%</u>
<b>Total</b>	<b>31.8</b>	<b>100%</b>

Table 15-3  
Watermain Materials  
Town of Marathon

MATERIAL	LENGTH (km)	% OF TOTAL
PVC	4.1	13%
Ductile Iron	17.8	56%
Steel	0.2	1%
HDPE	2.2	7%
Cast Iron	7.6	24%
<b>Total</b>	<b>31.9</b>	<b>100%</b>

Table 15-4  
Watermain Ages  
Town of Marathon

DECADE	LENGTH (km)	% OF TOTAL
1940 – 1949	4.8	15%
1950 – 1959	1.3	4%
1960 – 1969	1.6	5%
1970 – 1979	1.8	6%
1980 – 1989	16.5	52%
1990 – 1999	0.3	1%
≥2000	5.7	18%
<b>Total</b>	<b>32.0</b>	<b>100%</b>

## 15.2 Replacement Value

### 2.1 General

There are several ways to estimate the value of water distribution system including: original book value; appreciated book value; market value; and replacement cost. For the purpose of quantifying life cycle costs, the replacement cost is deemed to be the most appropriate.

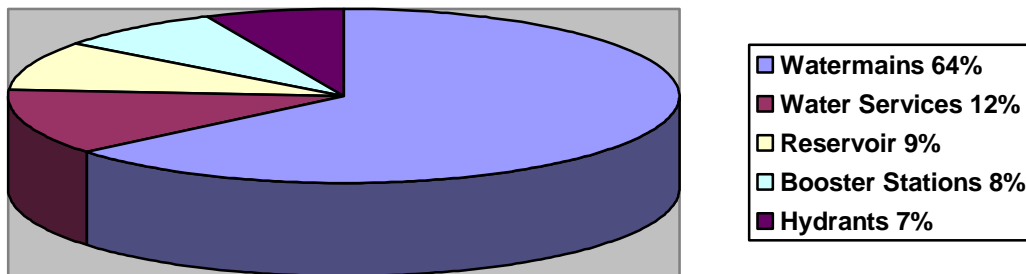
The replacement cost for the water distribution system is based on cost data compiled by R.V. Anderson Associates Limited from several sources, including recent tenders, surveys and other studies. These estimates do not include any road restoration costs necessitated by the replacement of underground components. Furthermore, Walker engineering provided a recent tender from the Town that included linear water assets in order to benchmark the replacement cost estimates.

The cost estimates presented were deemed to be sufficiently accurate for the initial development of an asset management plan. However, a more detailed analysis is required in order to estimate the replacement cost for individual components. A detailed cost estimate should account for restoration requirements, staging of construction, site constraints, economic factors, etc.

### 2.2 Water Distribution System

Figure 15-1 illustrates the replacement cost for each water system component based on the inventory and unit cost summarized in Table 15-1. The estimated replacement cost of the water distribution system is approximately \$18.6 million. It is apparent from Figure 15-1 that the replacement cost of watermains is approximately 64% of the total replacement cost of the water system.

Figure 15-1  
Replacement Cost for Water Distribution System Components (\$18.6 million)  
Town of Marathon



### 2.3 Summary

The total replacement cost of the water distribution system is approximately \$18.6 million. Since the current population in the Town is approximately 3,900, the replacement cost of the water distribution system is approximately \$ 4,776 per capita.

## 15.3 Service Life

### 3.1 General

The service life of the water distribution system components are variable depending upon several factors, such as: construction materials; quality of construction; environmental conditions; and maintenance. In simple terms, the service life of a component is defined as the time period that the component provides an acceptable level of service. The economic service life is defined as the time period when the present worth of the maintenance cost is equal to the present worth of the replacement cost.

The rate of deterioration of water distribution system components is also variable. Some components deteriorate in a linear manner, while in other cases they deteriorate in an exponential manner. In a few cases, components will deteriorate rapidly right after construction (typically due to poor construction) and then the rate of deterioration over the balance of its service life.

A service life has been identified in Table 15-5 for the Town's water distribution system components. As a result, the remaining life of the system component can be estimated by subtracting the age of the component from its service life.

### 3.2 Water Distribution System

Table 15-6 summarizes the service life assumed for the water distribution system components. It is recognized that the mechanical and electrical components of the booster stations have a shorter life expectancy than the structural components.

Table 15-5  
Service Life for the Water Distribution System Components  
Town of Marathon

COMPONENT	EXPECTED SERVICE LIFE
In Ground Reservoir	60 Years
Water Booster Stations:	
• Structural (70% of value)	60 Years
• Mechanical & Electrical (30% of value)	30 Years
Water Mains, Hydrants, Valves & Services	80 Years

Table 15-6 summarizes the decade of original construction for the pumping stations and reservoir. It is apparent that all of the water facilities have been constructed since the 1950's.

The Town's current inventory includes the decade of construction for watermains. However, the inventory does not include the decade of construction of hydrants and water services. Therefore, it has been assumed that the number of hydrants and water services has increased in proportion to the length of watermain installed.

Table 15-6  
Historical Growth of Water Distribution System  
Town of Marathon

FACILITY	DECADE OF CONSTRUCTION							
	1940-1949	1950-1959	1960-1969	1970-1979	1980-1989	1990-1999	2000-2006	Total
Reservoir #1					1			<b>1</b>
Water Booster Stations								<b>2</b>
• Zone 2					1			
• Industrial Park							1	
Watermain Length (km)	4.8	1.3	1.6	1.8	16.5	0.3	5.7	<b>32</b>
Hydrants <sup>1</sup>	46	12	15	17	160	3	55	<b>308</b>
Water Services <sup>1</sup>	227	61	75	84	787	16	270	<b>1521</b>

1. It is assumed that these components were installed at the same rate as the watermain installation.

#### 15.4 Renewal Requirements

##### *4.1 General*

Table 15-7 summarizes the average annual investment required for the renewal of the Town's water distribution system. The average annual investment is based on the replacement cost and the assumed service life for each of the system components. The average annual investment in renewal should be at least \$0.27 million for the water supply system.

Based on Table 15-7, the weighted average service life for the water distribution system is 73 years. In other words, the Town should renew at least 1.45% of their water distribution system each year in order to maintain it in perpetuity.

The projected replacement costs for each decade over the next 100 years are presented in Section 15.4.2.

#### 4.2 Water Distribution System

Figure 15-2 illustrates the projected replacement costs for the water distribution system over the next 100 years based on the replacement cost for the components (Table 15-1); the service life for the components (Table 15-5); and the age of the components (Table 15-6).

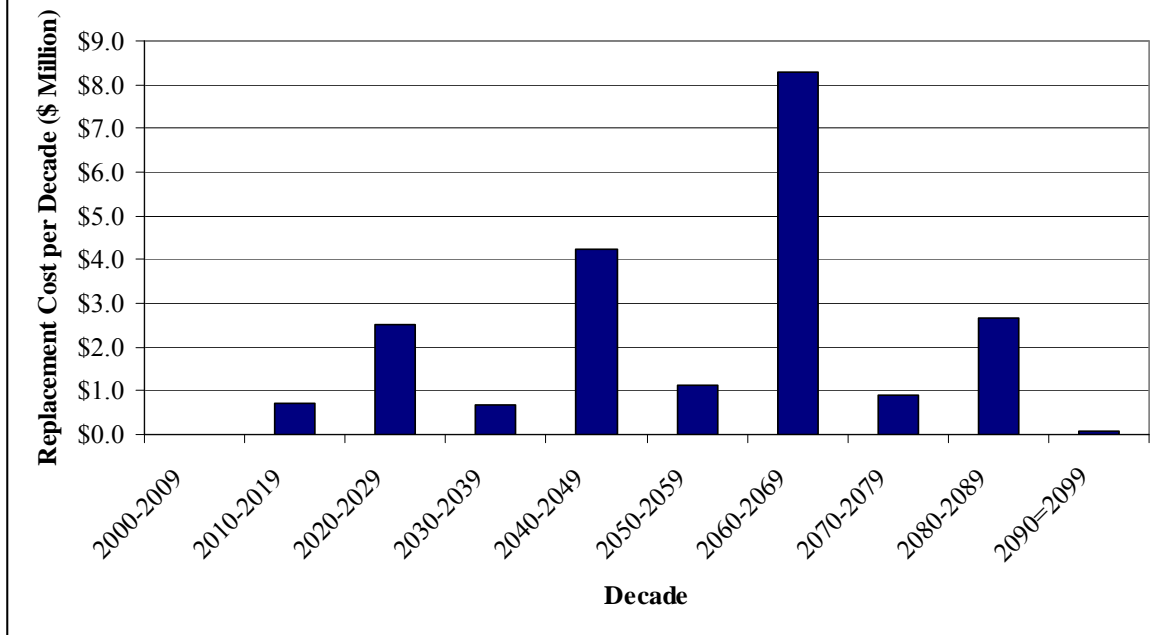
It is difficult to quantify the backlog in renewal needs without conducting a detailed condition assessment of the infrastructure. As previously outlined in Section 15.3.2, it has been assumed that there is no significant backlog in renewal of the mechanical and electrical components of the water booster stations.

Figure 15-2 indicates that the next decade does not require a significant investment in the water distribution system, as would be expected due to the young age of most of the components. However, it is apparent from Figure 15-2 that replacement costs are expected to increase significantly over the next 70 years.

Table 15-7  
Average Annual Renewal Cost for Water Distribution System  
Town of Marathon

		REPLACEMENT COST (million \$)	SERVICE LIFE (years)	AVERAGE ANNUAL INVESTMENT (\$)
Reservoir		\$1.7	60	\$30,000
Water Booster Stations	Structural (70%)	\$1.05	60	\$20,000
	M&E (30%)	\$0.45	30	\$20,000
Watermains		\$11.9	80	\$150,000
Hydrants		\$1.2	80	\$20,000
Water Services		\$2.3	80	\$30,000
	<b>Total</b>	<b>\$18.6</b>		<b>\$270,000</b>
		<b>Weighted Avg.</b>	<b>73</b>	

**Figure 15-2**  
**Projected Renewal Cost for Water Distribution System**



## **DWQMS Element 16 – Sampling, Testing and Monitoring**

The Corporation of the Town of Marathon retains Ontario Clean Water Agency (OCWA) to provide management, operation and maintenance services, as described in Schedule C of the Service Agreement, in respect of the Facilities (the “Services”).

### 16.1 Sampling

In terms of Sampling, as per the Service Agreement signed January 2009, the Ontario Clean Water Agency (OCWA) is responsible for routinely conducting water sampling in accordance with Environmental Laws, including the Water Treatment Facility’s Certificate of Approval(s), with exception of Schedule 15.1 of O. Reg. 170 (Lead).

### 16.2 Testing

In regards to Testing, as per the Service Agreement signed January 2009, the Ontario Clean Water Agency (OCWA) is responsible for routinely conducting water testing in accordance with Environmental Laws, including the Water Treatment Facility’s Certificate of Approval(s), with exception of Schedule 15.1 of O. Reg. 170 (Lead).

Lead testing is conducted by the licensed distribution water operators employed by the Town of Marathon. The lead testing is conducted in accordance with Schedule 15.1 of O. Reg. 170. The lead testing results are reported by an accredited laboratory.

### 16.3 Monitoring

In relationship to the Monitoring, OCWA is responsible for leak detection monitoring of ground water reservoirs for levels and pressures. Constant monitoring is performed at the Reservoir and the Industrial Park Booster Station by prominent online analyzers.

## **DWQMS Element 17 – Measurement and Recording Equipment Calibration and Maintenance**

It is important to note that the Town of Marathon does not typically do calibrations as it relates to the water distribution system.

The Corporation of the Town of Marathon retains Ontario Clean Water Agency (OCWA) to provide management, operation and maintenance services, as described in Schedule C of the Service Agreement, in respect of the Facilities (the “Services”).

The Ontario Clean Water Agency (OCWA) is responsible for ensuring that daily operations comply with and fulfill the requirements of Environmental Laws. By inspecting equipment at booster stations, reservoirs and rechlorination facilities, OCWA ensures proper operation of disinfection systems, pumps, chemical systems, online monitors and standby power as it relates to the water distribution system.

OCWA is also responsible for the routine maintenance of the facilities. Their duties include carrying out a routine lubrication program which includes greasing and oiling as required; performing routine maintenance duties to equipment by following preventative maintenance procedures; maintaining an inventory of all key equipment and tools; ensuring the security of the Facilities by locking doors and gates; and cleaning the Facilities and grounds maintenance.

In terms of record keeping, OCWA, acting reasonably, is responsible for ensuring the efficient operation of the Facility’s processes. OCWA will maintain records regarding the operation of the Facility in compliance with Environmental Laws.

## DWQMS Element 18 – Emergency Management

### 18.1 Potential Emergencies

Potential emergency situations or service interruptions were identified through a risk assessment procedure. Table 18-1 presents a list of potential emergency situations applicable to the Town’s water distribution system (please refer to Appendix A and C for more information about the potential emergencies).

Table 18-1  
Potential Emergencies  
Town of Marathon

EMERGENCY	CONTINGENCY PLAN REFERENCE
Bacterial Contamination of Distribution System	WO 0009
Power Outage	WO 0009
Water Main Break	WO 0010
Pressure Loss	WO 0011
Frozen Fire Hydrant	WO 0016
Toxic Chemical Spill	WO 0019
Chlorine Residual Loss	Refer to OCWA Contract

The referenced contingency plans outline how Works and Operations will assess the situation, protect consumers, and restore operation of the distribution system. They also outline responsibilities and communication procedures to be followed.

It is important to note that though the Town of Marathon does have contingency plans in place that contingency plans for Bacterial Contamination, Chlorine Residual Loss, Power Outage and Vandalism are also documented by the Ontario Clean Water Agency (OCWA).

### 18.2 Emergency Contacts and Phone Numbers

A list of emergency contacts is posted on the Town’s website, and at the Town’s office. The primary contact during emergencies pertaining to the water distribution system is the Works and Operations Manager, **(807) 229-1340 ex. 2229**.

Table 18-2  
Emergency Contacts and Phone Numbers  
Town of Marathon

CONTACT	PHONE NUMBER
Works and Operations Manager	(807) 229-1340 ex. 2229
Mayor	(807) 229-1340 ex. 2224
Town of Marathon	(807) 229-1340
(On call Manager)	(807) 229-6125 (After Hours)

MOE Spills Action Centre	1-800-268-6060
OCWA Contact for Treatment Plant	(807) 229-6324 or (807) 229-6292
MOE Regional Office (Northern Ontario Region)	(807) 475-1315
Fire Department	1-888-402-1111 (Dispatch)
Police	911 – Emergency or (807) 229-0220 (O.P.P. Office)
Thunder Bay District Health Unit	1-888-294-6630 or (807) 625-5900

## **DWQMS Element 19 – Internal Audits**

A procedure to carry out the annual internal audit has been developed, implemented, and is to be maintained. The procedure can be found within Appendix A under guideline WO 0029, attached to this operational plan.

Records of the results of previous internal audits are maintained as per the procedure.

## **DWQMS Element 20 – Management Review**

A procedure to perform an annual management review has been developed, implemented and is to be maintained.

Results of the management review are recorded as meeting minutes.

The procedure can be found within Appendix A under guideline WO 0030, attached to this operational plan.

## **DWQMS Element 21 – Continual Improvement**

The Town of Marathon, through the DWQMS, is committed to adhering to and improving the quality management system on a continual basis.

A procedure has been developed to outline the process for identifying areas of improvements and for implementing the necessary changes.

Please refer to guideline WO 0031, found in Appendix A for more details.

# **APPENDIX A**

# **APPENDIX B**

# APPENDIX C

# APPENDIX D

# APPENDIX E

# APPENDIX F

# APPENDIX G