

Nova Scotia Environment

**A Guide to Assist Nova Scotia
Municipal Water Works Develop
a Comprehensive Operations Manual**



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The main purpose for this document is to provide guidance to managers and operators regarding the development of a comprehensive operations manual for water treatment and water distribution facilities in Nova Scotia.

Drinking water facilities in Nova Scotia

Municipal public drinking water supplies in Nova Scotia are operated under an approval from Nova Scotia Environment (NSE). Typically, an approved system will be classified as either a:

- 1 Water Treatment (WT) facility; or
- 2 Water Distribution (WD) facility.

Depending upon the source of the drinking water supply—groundwater (well) or surface water (spring, lake or river)—the operation of the facility must meet specific standards for water quality and operations, as well as apply best management practices. Owners of approved water treatment and water distribution systems in Nova Scotia are required to develop and maintain a comprehensive operations manual for their facility.

What is an operations manual?

Many elements go into the day-to-day operation of water treatment and water distribution facilities. Operators read, interpret, and make adjustments to ensure that equipment and processes are working properly. They sample and test the water to control chemical feed devices and employ a variety of instruments to measure water quality. Operators may be required to use special power tools to make repairs to valves, pumps and other equipment. Computerized systems and automated controls are applied and relied on to monitor equipment, store water quality results, make process control decisions, schedule and record activities and develop reports.

An operations manual is a key tool that, when used properly by facility staff, details how a facility operates to provide quality service to all users of the system. When effectively implemented, a comprehensive operations manual will:

- Document and prioritize standard operating procedures (SOPs) that staff are expected to follow under normal operating conditions.
- Identify contingency plans that may need to be employed under circumstances when the facility is not operating under normal conditions.
- Detail the emergency notification procedures to implement in the event of an emergency situation.

The operations manual will also serve as a training tool for new staff. Seasoned employees may also need to refer to the manual occasionally as a reminder and to find solutions to problems.

The operations manual provides an overview of the facility and creates an important record of guidelines, procedures, standards and expectations for the facility.

What an operations manual is not!

Although an operations manual may contain maintenance and safety information, it is intended to guide staff when making process determinations and to address process-related issues.

An operations manual is not:

- 1 an equipment maintenance manual; or
- 2 an occupational health and safety manual.

Facilities usually have a set of equipment manuals on site providing the operator with detailed information on maintenance, replacement parts and manufacturer contact information. It's often a good idea to include some of the information from these manuals in the operations manual to lessen the need to constantly cross-reference between manuals.

Similarly, health and safety details may be inserted into the operations manual. However, the facility should have a separate manual dedicated to safety.



Why is an operations manual required?

In most cases, having an operations manual is a requirement of a facility's Approval to Operate. When used in conjunction with the facility's approval, the operations manual becomes a critical document that clearly defines how a facility needs to run on a daily basis or in emergency situations. When an operations manual is properly developed and followed, liability concerns are mitigated and staff can more effectively demonstrate their due diligence in operations.

Because of the critical nature of the operations manual, the Approval to Operate places a number of duties on the facility owner, namely:

- maintain a copy of the operations manual, complete with contingency plan and emergency notification procedures, on site at all times;
- ensure all employees have been apprised of the operations manual, contingency plan and emergency notification procedures;
- review and update the contingency plan and emergency notification procedures on a yearly basis;
- document in the annual report what changes were made as a result of the yearly review and how the information was communicated to utility staff;
- ensure that the operations manual is kept up-to-date.

Who develops the operations manual?

Developing a comprehensive operations manual is an important step for any facility. The manual defines staff expectations and duties, and guides them in procedures to provide consistency in operations.

The owner of the facility should dedicate a competent individual to lead the development of an operations manual. However, it basically comes down to deciding if the manual will be created by either:

- 1 internal staff (managers, operators, administrative staff, etc.); or
- 2 external service provider (consultant).

A third option may be to utilize internal staff to draft the manual while using an external service provider to do the word processing and printing.

It is important to remember that the operations manual becomes the core document from which new procedures are developed and existing ones are revised when necessary. Once developed, the operations manual needs to be a “living document,” meaning that it should be easily accessible to make revisions when necessary.

Internal Staff

Developing an operations manual internally is usually a team effort and requires collaboration and involvement of:

- management;
- operations staff; and
- administrative staff.

When using internal staff, the facility owner should assign someone as the project manager to lead the development of the operations manual. The project manager will need to take many variables into consideration as the manual development process gets underway. For example:

- access to baseline information;
- ability to identify what is needed and the detail required; and
- word processing and compilation capabilities.

Manager

There are several key reasons why management should be involved in the manual development:

- They have access to baseline information (e.g., as-built drawings, contact information, etc.).
- They know the roles and responsibilities of staff.
- They control the allocation of staff time and funding required for the development and ongoing review/revision of the manual.

Operator

The operations manual is a tool to ensure consistent operations and quality service. As such, operations staff should be fully engaged in the development, assessment and revision of the operations manual. Several reasons include:

- Seasoned operators know how the facility works and can ensure that procedures in the manual reflect how the facility normally operates.
- In many cases, industry-developed SOPs are modified by the operator and these modifications need to be documented.
- Operators know the routines and can ensure that any information needed by a new or replacement operator is included in the manual.

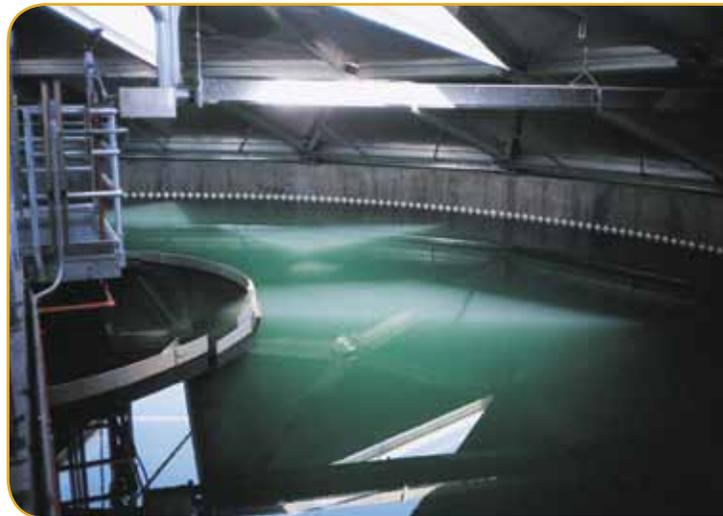
Administrative Staff

Although many operators are very competent when it comes to word processing and compilation of reports, these tasks may be more effectively done by administrative staff.

External Consultant

If the decision is made to hire a consultant then the company will likely have their own method to create and layout the manual. The facility owner may want to review examples of other manuals the consultant has developed to ensure that the final product will be acceptable to staff.

Staff at the facility will likely be asked to provide detailed information to the consultant during the development process. They may be asked to detail current policies, procedures and practices. They may also be asked to provide the consultant with process details such as flow, size, equipment used, etc. It is critical that staff provide the consultant with credible and verified information in order for the manual to be effective for the facility.



What goes into an operations manual?

The operations manual will be unique for every facility in Nova Scotia. The development of a customized manual needs to consider many factors including: the type of treatment, the size and complexity of the water distribution system, the contingencies to plan for, who to contact during an emergency, etc.

Municipal water utilities should also consider different uses for the manual. Besides guidance for operators this may include:

- use of key pages as information handouts for elected officials, tour groups, etc.; and
- specific parts of the manual to provide to the regulator.

An effective operations manual should, at a minimum, include the following elements:

- Cover Page
- Table of Contents
- Introduction and General Information
- Key Rounds and/or Process Checks
- Process Operations
 - Standard Operating Procedures
 - Contingency Plans
- Emergency Notification Procedures
- Operations Manual Implementation

The operations manual should be developed using understandable and simple language. It needs to include sufficient information to guide operators to make process adjustments, but at the same time it should not be overly technical as this may confuse the user.

The manual should be kept up-to-date to be representative of the current facility operation.

Getting Started

This project should not be viewed as a daunting task. Rather, it should be considered as an exercise that will:

- 1 Enhance the general knowledge of facility operations for all those involved.
- 2 Provide site-specific training on the facility operation.
- 3 Serve as a performance measure to demonstrate excellence in operations.

Hold an Initial Team Meeting

By holding an initial team meeting, the project manager has the opportunity to communicate the importance of the task itself and the need to work together as a team. Once everyone has an understanding of the project, they can determine all the deliverables and how to best proceed. Some may volunteer to do certain tasks; the project manager may need to delegate other tasks. Timeframes for the deliverables should be set.

The team can discuss how the manual should look and how detailed the content needs to be. Depending on the extent of the water treatment and/or water distribution systems, the team should consider whether they need to develop a:

- Water Treatment Operations Manual
- Water Distribution Operations Manual
- Water Treatment and Water Distribution Operations Manual

If the water treatment facility is operated separately from the water distribution system, separate manuals should be developed. This usually applies to medium- and large-sized systems. Smaller systems often produce a manual that combines both treatment and distribution as they usually have the same operators working in both.

Gather Baseline Information

There may already be a lot of information available to assist with the manual development:

- Policies
- Current procedures and practices
- As-built drawings
- Civic addresses
- Historical operations data
- Contact lists

Lay-out the Operations Manual

It's important to bring together facility policies, procedures, and practices in an organized manner in the operations manual, as well as any other relevant information that the team feels is important enough to include. Most manuals use a layout that includes categories and sub-categories to make the manual user-friendly. The order in which they should be presented in the operations manual is best determined by those who will be using it.

In the following example, process SOPs are listed prior to contingencies but can be presented differently if determined by the project team. The following illustrates an example for the use of categories and sub-categories for a Pre-Treatment process:

Pre-Treatment

(overview of the pre-treatment process)

Intake Crib

(details — location, screen size, etc.)

- SOP — Inspection and Debris Removal (checks, cleaning, etc.)
- Contingency — Reduced Flow Rate (valves changes, unit repair, recording of incident, etc.)

Low Lift Well

(details — location, volume, etc.)

- SOP — Operational Checks (meter readings, etc.)
- Contingency — Low Flow from Well (valve changes, line flushing, etc.)

Fine Screen

(details — checks, frequency, etc.)

- SOP — Debris Removal (unit bypassing, final disposal, etc.)
- Contingency — Plugged Screen (valve changes, equipment needed, safety concerns, etc.)

Main Category

In the example, “Pre-Treatment” is the main category. It shows a number of sub-categories under it—Intake Crib, Low Lift Well, and Fine Screen.

An overview of main categories can be used as a location in the operations manual to provide a brief description of the types of processes applied under the category.

Operators will not need to reference the overview page very often as they will be familiar with the processes, the location and the safety concerns. However, this overview, when kept brief—one or two pages—can serve as an information handout for visitors to the facility. Using pictures is an excellent way to enhance the document. Staff must keep security concerns in mind when developing information pages that may be provided to the public—no document should be released to the public unless it’s been approved by someone with such authority.

FOR EXAMPLE

The source water for the Maritime Municipal Water Treatment Plant is Fogarty Lake. Pre-treatment processes remove debris, such as sticks, leaves, fish and crustaceans prior to the flow being directed to other treatment areas. Pre-treatment protects equipment from unnecessary wear and reduces the treatment demands. This facility uses an intake crib, a low lift well and a fine screen to remove these materials.

The intake crib is located approximately 75 metres north of the intake well building and draws water from a depth of 12.5 metres.

The low lift building is the brown brick structure located at the extreme end of the property near the lake just inside the fence. Both the low lift well and the fine screen units are located in this building.

The flow passes through the intake crib in the lake. The crib is designed to prevent large debris from entering the intake piping. The crib traps articles that may be larger than 15 cm (6") in size. Water from the lake then enters the low lift well. Heavy particles such as sand, small stones and crustaceans accumulate in the well, which are removed occasionally to maintain well capacity. The water flows from the low lift well through a fine screen that blocks particles larger than 1 cm (1/2") in size.

All debris from the fine screen unit is gathered weekly and disposed of in a landfill.

Gloves are required when handling any of the debris or equipment used in the pre-treatment section. Hand washing/sanitizing stations are located in the building and should be used before leaving the area.

Sub-Category

A sub-category will be used as an overview for the process itself. It should include any information that an operator should be aware of for the process operation. This part of the manual is a good place to describe how the specific unit operates and the controls that are applied.

Standard Operating Procedures and Contingency Plans

Standard operating procedures (SOPs) and contingencies provide more detailed information and instructions to the operator. They need to provide as much detail as possible for the person to completely accomplish the task given to them. However, that doesn't mean that it needs to be several pages in length and very wordy. Usually a list of actions — using bullets or numbers — will serve as a sufficient guide to an operator.

Developing a Working Copy

There will likely be several people involved in developing the operations manual with each person focused on specific tasks. The team members will need to review a draft of the document to ensure that the flow of the manual is easy to understand and contains sufficient detail. Creating a first draft will serve as a working copy for everyone involved to review and provide recommended revisions to all parts of the document, including those sections they hadn't seen before. Each person involved should have their own copy of the first draft in order to make notes prior to the next team meeting.

As this is a working copy, it is often more cost-effective to not include pictures and diagrams, or to print the working copies in colour. However, there should be an indication in the document where a picture or diagram will be included for the team members to comment on.

If determined appropriate, the draft can be used by other operations staff during the manual development process as a way to obtain comments and suggestions. It should be made clear that the draft is not to be copied or shared with non-staff without permission of the project manager as the contents have not been finalized.

From First Draft to Final Working Copy

The project manager should schedule team meetings as required. A team meeting may not be required to review each and every draft. However, when a final copy has been developed, the team should meet to review it. This will provide an opportunity for every team member to have been fully involved in the process and to bring forward their suggestions. The team should be in agreement with the final working copy.

This document now becomes the operations manual for the facility and copies should be placed in strategic locations as determined by the team. An electronic version of the final working copy should be maintained by the project manager and a backup of this document should be kept on file.

All operations staff should be made aware of the existence of the operations manual and how to access it when required.

An effective operations manual should, at a minimum, include the following elements:

- Cover Page
- Table of Contents
- Introduction and General Information
- Key Rounds and/or Process Checks
- Process Operations
 - Standard Operating Procedures
 - Contingency Plans
- Emergency Notification Procedures
- Operations Manual Implementation

The order listed above is recommended for document flow, however, the order in which they are developed is best determined by the team.



Cover Page

Sometimes overlooked, a cover page provides important detail to someone reviewing the document. From information on a cover page, a reader should be able to clearly identify:

- the facility for which the manual will detail the operations;
- who owns and/or is responsible for the facility; and
- how current the information in the manual is.

Figure 1 illustrates these points for a water treatment facility.

Table of Contents

A Table of Contents (TOC) lists the sections of the manual in the order in which they appear. The TOC includes the titles of the first-level headings (e.g., section titles) and often includes second-level and third-level headings. Each content item should be identified with a page number for easy reference.

The TOC usually appears after the cover page and before the lists of figures and tables and/or introduction pages. See Appendix A for a comprehensive sample TOC for a water treatment and water distribution system.

Figure 1
Example of an Operations Manual Cover

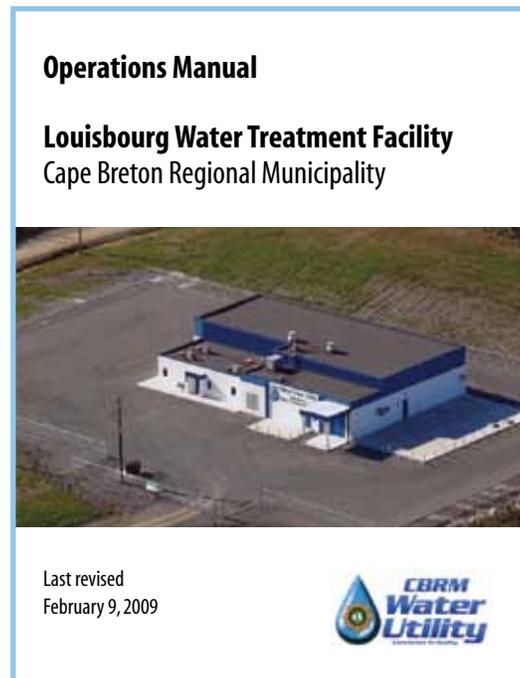


Photo and water utility logo courtesy of Cape Breton Regional Municipality, Engineering and Public Works Department

Introduction and General Information

As previously mentioned, the key users of the manual are operations staff. This section provides an opportunity to give the reader an overview of the management and ownership of the facility including:

- Mission Statement
- Policies
- Organizational Chart
- Contact Lists

MISSION STATEMENT

A Mission Statement is a brief description of the purpose of an organization. Many municipal water utilities have developed their own mission statement as an effective communication tool for new and existing staff to clearly instill in them the reason as to “why we exist.”

POLICIES

Most organizations have policies in place for their workplace. For example, policies such as non-smoking workplace and equal opportunity employer may exist. The policies themselves should not be included in the operations manual, but listed in a manner to provide operations staff with information on how to access them if required.

ORGANIZATIONAL CHART

An organizational chart is a valuable piece of information for an operations manual as it provides a diagram to illustrate the relationship between staff members. Operations staff can easily reference the chart to determine reporting requirements, as well as to understand linkages to other positions.

CONTACT LISTS

At times, operations staff will need to contact other staff, contractors or other organizations regarding an operational issue or concern. Most municipal water utilities have contact lists; inserting them in the operations manual provides access to telephone and fax numbers when needed.

Key Rounds and/or Process Checks

A “rounds sheet” is often a one-page document used to assist operations staff in process oversight and details the required checks for the facility. When inserted into an operations manual, staff can access this sheet for photocopying or printing purposes. Figure 2 is an example of a Daily Rounds Sheet.

A weekly or monthly calendar can also be used to identify regular tasks, such as sampling days; these can be inserted into this section of the manual for information purposes.

Process Operations

From an operational perspective, this section is the critical part of the document; it should include the following information:

- Process Descriptions
- Standard Operating Procedures (SOPs)
- Contingency Plans

PROCESS DESCRIPTIONS

An overview description of a specific process should be inserted prior to the inclusion of operational procedures for the different processes at the facility. Most operators will have a clear understanding of the purpose of the process and its key elements. When developed, the process descriptions can also be used as handouts for elected officials, tour groups, etc.

STANDARD OPERATING PROCEDURES

Effective and efficient operations depend upon staff making operational decisions based on knowledge, experience and use of industry best practices. Standard operating procedures (SOPs) describe the procedures applied at a facility under normal operating conditions. Excellence in operations is best illustrated by ensuring that:

- site-specific SOPs are developed for the facility; and
- they are implemented and followed by operations staff.

Facility managers should work with their operator(s) to prioritize the operational procedures that need to be documented and effectively implemented at the facility. Some SOPs can be simple and straightforward and will only require occasional review. Other procedures may require more detail to ensure the safe operation of a process and to lessen the opportunity for failure. See Appendix B for a template and sample SOP.

Figure 2
Example of a Daily Rounds Sheet

| Daily Checks | | | | | | | |
|------------------------------|------------------------------------|------|-----|-------|-----|-----|-----|
| Week of: | August 17, 2009 to August 23, 2009 | | | | | | |
| | Mon | Tues | Wed | Thurs | Fri | Sat | Sun |
| Intake Screen | | | | | | | |
| Low Lift Level | | | | | | | |
| Pump #1 Hours | | | | | | | |
| Pump #2 Hours | | | | | | | |
| Flow Meter Reading | | | | | | | |
| Coagulant Pump | | | | | | | |
| Coagulant Tank Level | | | | | | | |
| Rapid Mix Operation | | | | | | | |
| Flocculator Operation | | | | | | | |
| Filter #1 Backwash | | | | | | | |
| Filter #2 Backwash | | | | | | | |
| Filter #3 Backwash | | | | | | | |
| Filter #4 Backwash | | | | | | | |
| Filter #1 Turbidity | | | | | | | |
| Filter #2 Turbidity | | | | | | | |
| Filter #3 Turbidity | | | | | | | |
| Filter #4 Turbidity | | | | | | | |
| Combined Turbidity | | | | | | | |
| Chlorine Pump Operation | | | | | | | |
| Backup Chlorine Pump | | | | | | | |
| Sodium Hypo Tank Level | | | | | | | |
| Chlorine Residual (online) | | | | | | | |
| Chlorine Residual (portable) | | | | | | | |
| Operator (initials) | | | | | | | |
| Notes | <hr/> <hr/> <hr/> | | | | | | |

There may already be SOPs detailed in manufacturer or regulatory documentation that needs to be adhered to for warranty or regulatory reasons. The number of SOPs and the detail required needs to be determined by those familiar and knowledgeable of the facility itself. Once the priority SOPs have been determined and developed, additional SOPs should be developed as needed and added to the operations manual.

Table 1 provides a list of typical SOPs for a municipal water utility.

The SOPs should be developed in a format that allows for revisions to be made as required. Sometimes several short, related procedures can be combined into one more comprehensive SOP. Make sure the wording of the SOP allows the reader to clearly comprehend the details—be clear and concise.

Table 1 Typical SOPs for a Municipal Water Utility

| Category | Sub-Category | Standard Operating Procedures |
|-------------------------------------|---------------------------------|--------------------------------|
| Facility Operations Overview | General Tasks/Information | Daily Rounds |
| | | Site Security |
| | | Record Keeping |
| | | Reporting Procedures |
| | | Cross-Contamination Prevention |
| | Sampling | Sampling |
| | Facility Control System (SCADA) | Logging On |
| | | Monitoring Process |
| Alarm Conditions | | |
| Controls | | |
| Source Water | Source Water Protection | Property Monitoring |
| | | Property Maintenance |
| | Control Structure | Maintenance |
| Intake and Pretreatment | Raw Water | Valve Operation |
| | | Screening |
| | Flow Measurement | Meter Calibration |
| | Pump Operation | Switching Duty Pump Operation |
| | | Pump Adjustments |

| Category | Sub-Category | Standard Operating Procedures |
|--|-------------------------|-----------------------------------|
| Chemical Treatment (SOPs for each chemical used in process) | Taste and Odour Control | Taking Delivery of Product |
| | | Chemical Application to Process |
| | | Handling and Storage |
| | pH Control | Taking Delivery of Product |
| | | Chemical Application to Process |
| | | Handling and Storage |
| | Solids Removal | Taking Delivery of Product |
| | | Chemical Application to Process |
| | | Handling and Storage |
| | Alkalinity Control | Taking Delivery of Product |
| | | Chemical Application to Process |
| | | Handling and Storage |
| | Disinfection | Taking Delivery of Product |
| | | Chemical Application to Process |
| | | Handling and Storage |
| Coagulation and Flocculation | Mixing | Mixer Adjustment |
| | | Dosage Determination |
| | | Chemical Pump Adjustment |
| | | Hydraulic Flow Control to Process |
| | Sampling | Sampling |
| Clarification | Unit Operation | Hydraulic Flow Control to Process |
| | | Solids Removal from Process |
| | Waste Disposal | Solids Handling |

| Category | Sub-Category | Standard Operating Procedures |
|--------------------------|-------------------------------------|--|
| Filtration | Unit Operation | Hydraulic Flow Control to Process |
| | | Backwash — Automatic |
| | | Backwash — Manual |
| | | Filter-to-waste |
| | | Turbidity Monitoring |
| | | Turbidity Meter Calibration |
| | | Level Measurement and Calibration |
| | Waste Disposal | Solids Handling |
| Process Residuals | Solids Handling | Waste Equalization and Mixing |
| | | Thickening |
| | | Lagoon Treatment |
| | | Drying |
| Disinfection | Primary Disinfection | Ultra-Violet System Operation |
| | | Lamp Replacement |
| | | CT Calculation |
| | Secondary Disinfection | Dosage Determination and Control |
| | | Chlorine Residual Monitoring |
| | | Chlorine Residual Meter Calibration |
| Water Storage | Treated Water — On Site | Water Storage Operational Control |
| | | Turbidity Meter Calibration |
| | | Chlorine Residual Monitoring |
| | | Level Measurement, Control and Calibration |
| | Treated Water — Distribution System | Water Storage Operational Control |
| | | Turbidity Meter Calibration |
| | | Chlorine Residual Monitoring |
| | | Level Measurement, Control and Calibration |

| Category | Sub-Category | Standard Operating Procedures |
|---------------------------|----------------|-------------------------------|
| Water Distribution | Pressure Zones | Monitoring System Pressure |
| | | Pumps and Pressure Control |
| | Piping System | Leak Detection |
| | | Hydrant Operation and Testing |
| | | Hydrant Winterization |
| | | Service Connections |
| | | Chlorine Residual Boosting |
| | | Water Main Flushing/Swabbing |
| | | Water Main Disinfection |
| | Mapping | Pressure Zones |
| | | Hydrant Locations |
| | | Water Main Break Locations |
| | | Dead-End Locations |
| | | Service Connections |



Using a customized SOP template is recommended to illustrate key parts of an effective SOP:

- Ownership
- Implementation
- Authorization
- Application

The template in Appendix B can be used to customize SOPs for your facility.

Figure 3 illustrates the key component areas of the SOP template provided.

Ownership can be easily included by inserting the official name of the owner and/or logo into the template.

Implementation information, such as the SOP number, revision number, and the date the SOP was issued are all ways to clearly indicate that the SOP is to be implemented at all times during normal operations and to track changes.

Authorization of the SOP can be done simply by identifying the individual(s) involved in developing and approving the SOP. This brings a level of credibility to the procedure and also clearly indicates the importance of implementation. The initial development is usually done by someone with operational experience of the process; authorization can be by the manager or by the operator in overall direct responsible charge (ODRC).

Application of the SOP is done through the procedure details. The SOP needs to clearly guide the operator through the details and/or steps required — from beginning to end.

Figure 3
Example of a SOP Template

| | | |
|---|---|-------------------------|
| Standard Operating Procedure | (insert crest/logo here) | SOP: No. 1 |
| | Name of treatment facility | Revision: No. 1 |
| | | Issue date: dd/mm/yyyy |
| | | Number of pages in SOP: |
| Enter type of facility (WT/WD/WWT/WWC) | | |
| SOP developed by: Name of person who developed SOP | SOP approved by: Name of person who approved SOP | |
| Enter title of SOP | | |
| Briefly describe the purpose of this SOP. | | |
| Procedure | | |
| <ul style="list-style-type: none"> • These points will guide an operator through a specific procedure that is applied under normal operations. • If steps need to be taken in a specific order, this should be made clear, such as “this needs to be done in the following order:” <ol style="list-style-type: none"> 1 Identify the first step; 2 Then the second, and so on; and 3 A point to illustrate the task is complete. • You may need to continue with points after a specific order of tasks has been detailed. | | |
| Safety Practices | | |
| <ul style="list-style-type: none"> • Identify any safety precautions that may be required to complete this procedure. | | |
| Notes | | |
| <ul style="list-style-type: none"> • It may be necessary to include notes regarding things like how to record the activity or key contact information if assistance is required during the activity. | | |

CONTINGENCY PLANS

Occasionally an event happens to disrupt normal operations. For these situations, contingency plans should be in place to provide clear guidance to staff to effectively address operations.

As with the development of SOPs, management should work with staff knowledgeable of the facility to identify what contingency plans to develop and include in the operations manual. How past events were dealt with can serve as a guide. To ensure that contingencies are properly documented, discussions should also be held with local emergency response representatives, such as the fire department and emergency management office (EMO).

Including contingency plans in the operations manual will ensure that staff know:

- About the existence of specific contingency plans.
- Where to turn to access the details in a time that may be stressful to them. It will ease their stress level just knowing that they are properly addressing the event.

Table 2 provides a list of typical contingency plans for a municipal water utility.

Table 2 Typical Contingency Plans for a Municipal Water Utility

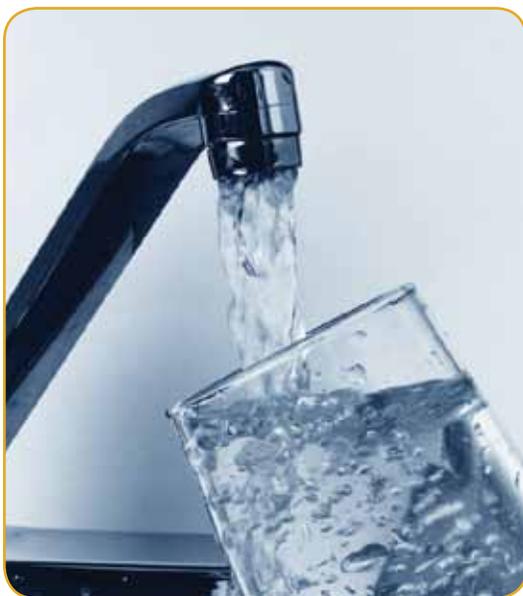
| Category | Contingency Plan |
|-----------------------------|------------------------------------|
| General Facility Operations | Security Threats |
| | Visits by Regulators |
| | Visits by Media |
| | Vandalism |
| | System Alarm Response |
| | Power Failures |
| | Injury to Worker |
| | Failure of Monitoring/SCADA System |
| | Switching to Manual Operation |
| | Failure of Communication System |
| | Fire |
| | Flood |

| Category | Contingency Plan |
|--|--|
| Source Water | Raw Water Contamination |
| | Dealing with Trespassing Issues |
| | Failure of Control Structure |
| | Loss of Water Source |
| | Source Water Storage — Low/High Flow |
| | Fish Passage |
| Intake and Pretreatment | Plugged Screens |
| | Ice Jam at Intake |
| | Raw Water Pump Failure |
| Chemical Treatment (for each chemical used) | Chemical Spill/Release: Containment, Reporting, Disposal |
| | Employee Exposure |
| Coagulation and Flocculation | System Failure |
| Clarification | System Failure |
| Filtration | High Turbidity Event |
| | Turbidity Meter Failure |
| | Loss of Head |
| | Excess Filter Run Time |
| | Automatic Backwash Failure |
| Process Residuals | Overflow from Equalization Tank |
| | Failure of Thickening Equipment |
| | Overflow from Lagoon |
| | Run-off from Drying Beds |
| | Failure of Drying Beds |
| Disinfection | Low UV Intensity |
| | Failure of Disinfection Equipment |
| | Failure of Continuous Chlorine Residual Monitor |
| | Loss of Chlorine Residual |
| | Activating a Boil Water Advisory |

| Category | Contingency Plan |
|-----------------------------------|---|
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| | High Reservoir Level/Overflow |
| | Failure of Reservoir Level Monitoring System |
| | Failure of Continuous Chlorine Residual Monitor |
| | Structural Failure of Reservoir |
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| | High System Pressure |
| | Water Main Breaks |
| | Pumping |
| | Hydrants and Valves |
| | Low Chlorine Residual |
| | Poor Water Quality Incidents |
| | Water Main Disinfection While Under Repair |

Using a customized contingency plan template is recommended for the same reasons as explained in the SOP development section. The contingency plan, although very similar to a SOP, should be visually different for easier access and reference by staff.

The template in Appendix C can be used to customize contingency plans.



Emergency Notification Procedures

In addition to SOPs and contingency plans, the operations manual should include emergency notification procedures to activate the contingency plan. This section should include a description of the procedures for processing emergency calls, signals or information. The procedure should identify the following:

- What is to be reported and with what urgency.
- By whom is it to be reported.
- To whom is it to be reported.

Emergency notification procedures should be operational 24 hours per day and should include detailed notification lists for the following:

- The office, home and/or 24-hour telephone numbers for activating the contingency plan with staff, the Response Commander, local management and, if applicable, regional or national management.
- Other numbers that must be included are the Environmental Emergencies Reporting Centre number 1-902-426-6030 or 1-800-565-1633 and applicable municipal authorities, such as the police and fire services.
- Other numbers which should be considered include:
 - Regulator
 - Medical Officer of Health
 - Hospital
 - Ambulance
 - Contractors (include purchase order numbers, if applicable)
 - Security
 - Media (for boil water advisories)
 - Government assistance contacts (e.g., CANUTEC for a spill)
 - Response equipment and material suppliers (include purchase order numbers, if applicable)

Operations Manual Implementation

For effective implementation of the operations manual, a minimum of one hard copy should reside at each location assigned for operators of the facility. Management and administrative staff should also maintain both electronic and hard copies of the document. Documentation should also be available to verify that operations staff has been:

- given access to the operations manual;
- provided an opportunity for their review of the contents of the manual; and
- instructed as to the details of the SOPs, contingencies and emergency notification procedures for the facility.

Many facilities include a simple sheet at the end of the manual for inserting the names and signatures of staff, as well as the date they reviewed the manual. All staff signing an acknowledgement form should clearly understand that they are in agreement with following the documented procedures for the facility.

Documentation should also include the dates of any reviews and/or revisions made to the manual in order to meet the requirements of the Approval to Operate.

Ongoing Assessment and Review

The final working copy should be considered a “living document,” meaning that operational changes may take place and the document revised in order to reflect current operations. This doesn’t necessarily mean that each and every time a minor change is applied that the document has to be reproduced. The document should be revised as soon after a change is made if the change is related to the facility’s Approval to Operate, or as a result of a non-compliance issue.

The project manager, or designate(s), should review the operations manual at least once per year — more often if required. The facility’s Approval to Operate requires this annual review, particularly to update the Contingency Plans and Emergency Notification Procedures. The annual review will determine if existing information continues to be relevant or not, and will identify any gaps since implementing the final working copy. All employees are to be apprised of any updates. The municipal water utility is responsible for including information on this review in its annual report to Nova Scotia Environment.

Ongoing assessment, review and revision will help ensure that the facility continues to operate effectively and efficiently for years to come.

Summary

This document provides an overview of the components required in a comprehensive operations manual. The operations manual is not only important for regulatory purposes; it's an important way for every municipal water utility to organize its standard operating procedures and contingency plans to deliver quality service throughout the year.

It should be noted that the basic contingency plans referenced in this guide are designed for routine challenges, such as power failures, large water main breaks, information technology failures, etc. Municipal water utilities are reminded of their obligations to have emergency response plans for major challenges, such as a hurricane, forest fire, or airplane crash into the source. Business continuity plans are required for extreme challenges such as a pandemic.

In the event of an influenza pandemic, municipal water utilities could face critical shortages of personnel. Labour shortages would affect production, distribution, water quality testing, vehicle repair, administration and payroll systems. In addition, labour shortages in transportation, energy, communications and other sectors could lead to insufficient power, parts, supplies and water treatment chemicals, as well as failure of communications networks. Municipal water utilities may also need to establish procurement systems that enable cash payment for necessary supplies.

Ensuring continuity of operations for drinking water systems is essential to maintaining the health and economy of all communities. Municipal water utilities are responsible for preparing, to the best of their ability, how they will maintain their operations when faced with a variety of challenges.

Concluding Remarks

For more information visit our website at www.gov.ns.ca/nse/water or contact:

Nova Scotia Environment
PO Box 442
Halifax, NS B3J 2P8

Tel: (902) 424-3600
Fax: (902) 424-0501



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Appendix B Standard Operating Procedures

Template

| | | |
|---|--|--|
| Standard Operating Procedure | (insert crest/logo here) Name of treatment facility | SOP: No. 1 Revision: No. 1 Issue date: dd/mm/yyyy Number of pages in SOP: |
| Enter type of facility (WT/WD/WWT/WWC) | | |
| SOP developed by: Name of person who developed SOP | SOP approved by: Name of person who approved SOP | |
| Enter title of SOP | | |

Briefly describe the purpose of this SOP.

Procedure

- These points will guide an operator through a specific procedure that is applied under normal operations.
- If steps need to be taken in a specific order, this should be made clear, such as “this needs to be done in the following order:”
 - 1 Identify the first step;
 - 2 Then the second, and so on; and
 - 3 A point to illustrate the task is complete.
- You may need to continue with points after a specific order of tasks has been detailed.

Safety Practices

- Identify any safety precautions that may be required to complete this procedure.

Notes

- It may be necessary to include notes regarding things like how to record the activity or key contact information if assistance is required during the activity.

Example

| | | |
|-------------------------------------|----------------------------------|---|
| Standard Operating Procedure | Upper Novatown | SOP: No. 15 Revision: No. 1 Issue date: 23/08/2009 Number of pages in SOP: 2 |
| Cape Place Water Treatment Facility | | |
| SOP developed by: John Nova | SOP approved by: Nancy Scotia | |
| Manual Switching to Standby Power | | |

The diesel generator in the Process Control Area is to be run manually once per month for a minimum of one hour to ensure that the generator will operate in an emergency situation. The following procedure is to be used when running the generator in manual mode.

Procedure

- Prior to running diesel generator, check:
 - Oil level
 - Cooling system level
 - Battery cell levels (use only distilled water if they are to be filled)
- Wear hearing protection
- Turn pump selector switch to “off” position
- Start diesel by disconnecting the main breaker on the MCC panel
- In approximately one minute the transfer switch (beside main breaker) will activate
 - If the switch does not activate, turn the main breaker back on and call for a repair to be done to the transfer switch and return system to normal settings
 - If the switch does activate, the generator start-up process will begin
- Shortly after the transfer switch has activated, the diesel will start
- Once the motor has come to full speed, the RPM meter will read 1750 and the pump selector switch can be turned to the “on” position
- Complete the Diesel Operation sheet on the clipboard, monitoring all the data indicated
- After one hour, return to normal operation by activating the main breaker switch to its normal position
- The diesel will continue running for several minutes to cool down before it will shut off
- Sign and date the Diesel Operation sheet
- Ensure that all settings are back to normal

Safety Practices

- Wear hearing protection at all times while the diesel generator is in operation
- Dispose of oily cloths in garbage bin located by the entrance door (away from heat source)
- Wear eye protection and gloves when opening battery covers and adding distilled water to the battery

Notes

- If at any time the system fails to function according to the procedure, contact the plant supervisor and report the problem. This will ensure that maintenance can be determined and the problem repaired as soon as possible.

Appendix C Contingency Plans

Template

| | | |
|---|----------------------------|---|
| Contingency plan | (insert crest/logo here) | Contingency: No. 1 |
| | Name of treatment facility | Revision: No. 1 |
| | | Issue date: dd/mm/yyyy |
| | | Number of pages in contingency: |
| Enter type of facility (WT/WD/WWT/WWC) | | |
| Contingency developed by: Name of person who developed SOP | | Contingency approved by: Name of person who approved SOP |
| Enter title of contingency | | |

Briefly describe the circumstances when this contingency plan would need to be put into effect. Note that a contingency differs from a standard operating procedure (SOP) as it is applied at times when a facility is not operating under normal conditions. SOPs direct staff for normal operations.

Procedure

- These points will guide an operator through a specific contingency plan.
- If steps need to be taken in a specific order, this should be made clear, such as “this needs to be done in the following order:”
 - 1 Identify the first step;
 - 2 Then the second, and so on; and
 - 3 A point to illustrate the task is complete.
- You may need to continue with points after a specific order of tasks has been detailed.

Safety Practices

- Identify any safety precautions that may be required to complete the contingency.

Notes

- It may be necessary to include notes regarding things like how to record the activity or key contact information if assistance is required during the activity.

Example

| | | |
|---|--|---|
| Contingency plan | Upper Novatown | Contingency: No. 21 Revision: No. 1 Issue date: 23/08/2009 Number of pages in contingency: 2 |
| Cape Place Water Treatment Facility | | |
| Contingency developed by: John Nova | Contingency approved by: Nancy Scotia | |
| Chlorine Cylinder Leak — Major (Inside Chlorine Room) | | |

A major leak is when a cylinder is ruptured or the valve is broken during handling. A minor leak would exist if the leak was detected at a fitting and can be easily repaired using the tools and supplies provided in the vicinity of the chlorine room.

For major leak issues, immediately call the chlorine supplier at _____.

The following procedure is to be applied in the event of a major chlorine leak.

Procedure

- Call the chlorine supplier at the phone number listed above
- Leave the room and shut off the ventilation equipment to contain the leak
- Call the Fire Department at _____ to advise them of a chlorine leak and that assistance may be required and for them to come to the site
 - If there are three people or more on site, advise the Fire Department that you currently have:
 - 1 contained the chlorine leak
 - 2 an adequate number of trained staff available
 - 3 self-contained breathing apparatus (SCBA) for everyone needing to enter the leak area
 - 4 an approved repair kit
 - Advise them that an attempt will be made to stop any further leakage
 - Ensure they are aware of the correct address and on site location of the chlorine room and that they need to come to the site
- Contact the facility manager and report the major leak and proceed under their advisement to either follow the rest of this procedure or in another manner identified by them
- If approved by the manager, a minimum of two staff must don a SCBA, ensuring proper fit and enter the room taking the repair kit with them (the kit is located beside the eye wash station)

- The third person is to have a telephone and position themselves in a safe location but be within eye contact at all times with the two staff members in the chlorine room
- If the leak is liquid and not gas an attempt must be made to position the cylinder in a manner that the rupture is leaking chlorine gas only
- Apply the proper repair part from the kit and secure the cylinder to limit further movement
- Both people must leave the room immediately if:
 - The cylinder has been secured and no further leaks need to be addressed
 - Either of the SCBAs has sounded an alarm indicating a low supply of oxygen
- If staff have left the room to replace oxygen cylinders, they can both re-enter together to complete the repair
- Only ventilate the room under the direction of the Fire Department
- Continue to follow all directions given by the person in charge from the Fire Department
- Call the chlorine supplier and request immediate pickup of the cylinder
 - Document communication with the supplier and get a confirmation number from them
- All staff involved in the major leak are to document the incident after the Fire Department has determined the area to be safe
- Continue to monitor and document the leak conditions until the faulty cylinder has been removed from site

Safety Practices

- Only enter leak area when wearing SCBA
- Wear protective clothing
- Use only the repair tools and equipment from the kit

Notes

- If a shift change occurs during the emergency, all staff involved will remain on site and continue to assist with the emergency and only leave if directed by management

