

Water Utility Standard Operating Procedures and Contingency Plans Guidance

Foreword:

The purpose of this document is to provide guidance to water utilities to initiate the development of standard operating procedures (SOPs) and contingency plans for their facilities. This document should not be used to assess the acceptability or completeness of a water utility's SOPs and contingency plans. The list of suggested standard operating procedures and contingency plans contained in this document are meant to serve as a starting point. Each utility will have unique needs that will require additional or different SOPs and contingency plans.

For more specific guidelines on contingency plans including format, level of detail and the necessary technical content requirements, Nova Scotia Environment and Labour's *Contingency Planning Guidelines* (September 2004) should be reviewed.

There are many other sources of information available on water utility SOP and contingency planning. The American Water Works Association has guidance material on the subject. As well, a search of the Internet can yield additional information.

Introduction:

Effective and efficient operations of a water utility depend upon staff making operational decisions based on knowledge, experience and use of industry best practices. Excellence in operations is best illustrated by:

- Implementing ***standard operating procedures*** to ensure consistency when the facility is in normal operational mode; and
- Ensuring that staff knows what to do when normal operations have been disrupted, by following a ***contingency plan*** for use under specific situations during an emergency.

Operations Manual

Operations manuals assist in the enhancement of operations and for meeting regulatory compliance with the terms and conditions of the facility's Approval to Operate. Operations manuals should include:

- An overview of the entire system and its operations;
- A general description of individual process operations including the distribution system;
- Site-specific standard operating procedures; and
- Contingency plans.

It is recommended that all water utilities develop an operations manual. For municipal water treatment and water distribution facility it is a requirement of their Approval to Operate that they produce an Operations Manual for their system.

Operations manuals should be reviewed on a regular basis and updated as needed to ensure that staff has access to current and relevant information and procedures.

Facility Overview

An important component of an operations manual is the facility overview. It should include some basic detail including but not limited to:

- Location of the facility;
- Design flow;
- Water withdrawal information;
- Approval to operate information;
- Staff list and contact numbers;
- Process flow diagram; and
- Service area.

This is not a comprehensive list and facilities should include anything relevant for their specific location.

Description of Individual Process Operations

An operations manual should contain descriptions of each of the individual unit processes. The description needs to provide whatever information the operator should know about each of the unit processes including, but not limited to:

- Location of the unit
- Number of units;
- Size and/or capacity;
- Operational limits and acceptable ranges for unit; and
- Specific safety information (i.e. if the unit is in a confined space).

This is not a comprehensive list and management/operations staff should determine site-specific information.

Determining SOP Requirements

Facility managers need to work with their operator(s) to prioritize the operational procedures that need to be documented, communicated and implemented. They need to provide guidance to operations staff based on industry best practices to ensure consistency in operations.

Some SOPs can be simple and straightforward and will only require occasional review. Others may require more detail to ensure the safe operation of a process and to lessen the opportunity for failure. Some SOPs may already be detailed in manufacturer or regulatory documentation and need to be followed for warranty or regulatory compliance reasons. The number of procedures and the detail required should be determined and developed by staff knowledgeable of the facility.

It is recommended that the SOPs in the operations manual follow a 'Source to Tap' approach through the facility.

Table 1 is intended to provide a 'general outline' that can be used to begin the development of a list of SOPs that would be typical for water utility operation. It would be impossible to list all of the SOPs a facility would require due to the varying nature of the processes at each facility.

Facility staff can determine the priority SOPs that are initially required. Once documented, additional SOPs can be developed as needed and added to the facility documentation. The SOPs should be developed in a way that allows for revisions when and if required.

Table 1 – Typical SOPs for a Water Utility

Category	Sub-Category	Standard Operating Procedure	
Facility Operations Overview	General Tasks/Information	Daily Rounds	
		Site Security	
		Record Keeping	
		Reporting Procedures	
		Cross-Contamination Prevention for Operators	
		Sampling	
		Emergency Response	
Intake & Pre-treatment	Facility Control System	Operating the control system and SCADA	
		Raw Water	Valve Operation
			Screening
		Flow Measurement	Meter Calibration
		Pump Operation	Switching Duty Pump Operation
Increasing/Decreasing Pumping Operation			
Chemical Treatment (SOPs for each chemical used in process)	Taste & Odour Control	Taking Delivery of Product	
		Application of Chemical	
		Handling & Storage of Chemical	
	pH Control	Taking Delivery of Product	
		Application of Chemical	
		Handling & Storage of Chemical	
	Solids Removal	Taking Delivery of Product	
		Application of Chemical	
		Handling & Storage of Chemical	
	Alkalinity Control	Taking Delivery of Product	
Application of Chemical			

Category	Sub-Category	Standard Operating Procedure
		Handling & Storage of Chemical
		Taking Delivery of Product
	Disinfection	Application of Chemical
		Handling & Storage of Chemical
		Changing Mixer Operational Settings
		Application of Chemical
Coagulation & Flocculation	Mixing	Dosage Determination - Jar Testing
		Flow Control
	Sampling	Sampling Procedure
		Flow Control Operation
Sedimentation	Unit Operation	Solids Removal Operation
		Flow Control Operation
		Automatic Backwash Operation
Filtration	Unit Operation	Manual Backwash Operation
		Turbidity Meter Measurement and Calibration
		Level Measurement & Calibration
		Ultra-Violet System Operation
		Lamp Replacement
Disinfection	Primary Disinfectant	Level Measurement, Control & Calibration
		Dosage Control
	Secondary Disinfectant	Chlorine Residual Monitoring
		Chlorine Residual Meter Measurement and Calibration
		Storage Operational Control
		Turbidity Meter Measurement and Calibration
	Treated Water – On Site	Chlorine Residual Monitoring
		Level Measurement, Control & Calibration
Water Storage		Storage Operational Control
	Treated Water – Distribution System	Chlorine Residual Monitoring
		Chlorine Residual Measurement and Calibration
		Level Measurement, Control & Calibration
		Monitoring Pressure
	Pressure Zones	Pumps & Pressure Control
Distribution System		Leak Detection
	Piping System	Hydrant Operation & Testing
		Hydrant Winterization

Category	Sub-Category	Standard Operating Procedure
		Service Connections
		Chlorine Residual Boosting
		Flushing a Main
		Swabbing a Main
		Pressure Zones
	Mapping	Major Main Break Locations
		Dead-End Locations
		Service Connections

SOP Template

SOPs should be developed in a manner that is consistent, clear and concise. A standard template can assist utilities in this area. Appendix A has an example of an SOP template and a sample SOP that may be used at a facility.

Determining Contingency Plan Requirements

Facility managers need to work with their operator(s) to prioritize the contingency plans that need to be documented, communicated and implemented. They need to provide guidance to operations staff based on knowledge, experience and use of industry best practices. It is important that contingency plans are developed to deal with any unforeseen event or emergency that may arise with the operation of a water utility. There may be liability issues if during an emergency situation staff does not know what to do when they are reasonably expected to know what to do. By providing staff with documented contingency plans, the ability to access them when required and the tools to deal with a possible problem, the utility has positioned itself well to ensure that unforeseen problems will be limited.

A contingency plan is similar to a SOP in that it provides the operator with a procedure to follow, however, it is not part of normal operations. It is possible that a facility that is operating effectively and efficiently may never need to activate a contingency plan. However, events beyond the control of staff can occur and it is important that the operator have access to up to date contingency plans so they can act quickly and correctly during such an event.

Contingency plans may be part of a 'Source to Tap' operations manual, whereby a contingency plan may follow an SOP or process description. Some facilities may choose to develop a separate contingency plan manual. Either way it is imperative that operations staff are aware of the contingency plans and know where to access them in case of an emergency.

Table 2 is intended to provide a 'general outline' that can be used to begin the development of a list of contingency plans that would be typical for water utility operation. This list is meant to be a starting point as it would be impossible to list all of

the possible contingencies that may be required due to the varying nature of water utilities across the province.

Table 2 – Typical Contingency Plans for a Water Utility

Category	Contingency Plan
General Facility Operations	Security Threats
	Visits by Regulators/Media Relations
	Vandalism
	System alarm response
	Power failure
	Injury to worker
	Failure of monitoring/SCADA system
	Failure of communication system
Fire	
Source	Raw water contamination
Intake & Pre-treatment	Plugged screens
	Ice jam at intake
	Raw water pump failure
Chemical Treatment (for each chemical used)	Chemical spill/release including containment, reporting and disposal
	Employee exposure
Coagulation & Flocculation	System failure
Sedimentation	System failure
Filtration	High turbidity event
	Loss of head
	Filter run exceeds set run time
	Failure of individual online turbidity meters
Disinfection	Activating boil water advisory
	Loss of disinfectant residual
	Failure of equipment
	Failure of online chlorine residual monitor
Water Storage	Low reservoir level
	Reservoir overflowing
	Failure of online chlorine residual monitor
	Failure of reservoir level monitoring equipment
Distribution System	Loss of system pressure
	High system pressure
	Water main breaks
	Water quality incidents

Contingency Template

When developing a Contingency Plan, it is important to be clear, consistent, and concise. The format of the contingency plan should be visibly different than a SOP (i.e. use of different colours for heading backgrounds), especially if it is in the same manual. A standard template can assist utilities in this area. Appendix B has an example of a contingency plan template and a sample contingency that may be used at a facility.

Appendix A – SOP Template and Example SOP

Standard Operating Procedure	Municipality	SOP: ##
		Revision: ##
		Issue Date: dd/mm/yy
		Pages: ## in SOP
Name of Treatment Facility		
SOP Developed By:		SOP Approved By:

Name of SOP (Bold & Underlined)

Description of SOP (only if required)

Procedure:

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Notes:

Standard Operating Procedure	Capertown	SOP: #4
		Revision: #1
		Issue Date: 12/07/04
		Pages: 1
John Allan Cameron Water Treatment Facility		
SOP Developed By:		SOP Approved By:
John Doe		Jane Doe

Manual Switching To Standby Power

The diesel generator in the Process Control Area will need to be manually switched from automatic setting. This will be done every 2 weeks, usually on Thursdays to ensure that it is in operational condition for when it's needed during an emergency situation. The following procedure is to be followed.

Procedure:

- Before running diesel check:
 - " Oil level;
 - " Cooling system level; and
 - " Water in batteries (use only distilled water to maintain proper level);
 - " Wear hearing protection;
- If either or both of the pumps are in operation, turn pump selector switch to "off" position;
- Start diesel generator by disconnecting the 'Main Breaker' on the MCC panel;
- In approximately 1 minute the 'Transfer Switch' in the panel beside the main breaker will activate:
 - " If the switch doesn't activate, turn the main breaker back on and call in a repair order for the transfer switch;
 - " If the switch does activate, complete the procedure;
- Diesel generator will start. After about 1 minute the motor should be up to full speed and the pump selector switch can be turned to 'on' if it was switched to 'off';
- Complete the 'Diesel Operation' sheet on the clipboard, monitoring all data indicated;
- Run for 1 hour. To return to normal operation, activate the 'Main Breaker' switch;
- After about 1 minute, the 'Transfer Switch' will activate back to the 'normal' position;
- Diesel will continue to run for about 4-5 minutes for cool-down;
- Sign and date the 'Diesel Operation' sheet after completing all the data;
- Ensure that all settings are back to normal.

Notes:

If at any time the system fails to function according to the above 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 B – Contingency Plan Template and Example Contingency Plan

Contingency Plan	Municipality	Contingency: ##
		Revision: ##
		Issue Date: dd/mm/yy
		Pages: ## in SOP
Name of Treatment Facility		
SOP Developed By:		SOP Approved By:

Name of Contingency (Bold & Underlined)

Description of Contingency (only if required)

Procedure:

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Notes:

Contingency Plan	Capertown	Contingency: #2
		Revision: #1
		Issue Date: 23/08/04
		Pages: 2
John Allan Cameron Water Treatment Facility		
SOP Developed By:		SOP Approved By:
John Doe		Jane Doe

Chlorine Cylinder Leak – Major (Inside Room)

A major leak is when a cylinder is ruptured or the valve is broken during handling or changing a cylinder. A minor leak would be if there were a leak around a fitting that can be easily repaired using the tools and supplies provided in the vicinity of the chlorine room.

For extreme leak issues, immediately call the Chlorine Hotline at 1-800-_____

The following procedure is to be followed in the event of a major chlorine cylinder leak that has occurred during the handling or changing of a cylinder and it is felt that the leak can be addressed locally.

Procedure:

- Leave the room and shut off ventilation equipment to contain the leak;
- Call the Fire Department at 369-3432 and advise them of a chlorine leak and that assistance may be required;
 - If there are 3 people on-site, advise the Fire Department that you have currently have adequate staff and self-contained breathing apparatus and that you have a repair kit. If staff are trained in use of the cylinder repair kit, advise the Fire Department that all staff have been trained in application of the repair kit and that an attempt will be made to stop any further leakage if approved by the facility manager.
 - The Fire Department is to be advised of the exact location where the leak is and how to get to the site.
- Call the facility manager's cell phone and report the condition.
- With manager's approval, a minimum of two staff must don a SCBA; ensure proper fit prior to entering the room with the repair kit. The repair kit is located beside the emergency eye-wash station;
- Without manager's approval, staff must wait for the Fire Department to respond and control the situation.
- The third person is to have the portable phone and must position themselves in a safe location and be in eye contact at all times with the two people attempting the repair.
- The two staff may only enter when everyone is in position and the Fire Department has confirmed that it is responding;
- If the leak is liquid, if possible, position the cylinder in a manner that the rupture is leaking chlorine gas;
- Apply the proper repair part from the kit and secure the cylinder to limit further movement;
- Both people must immediately leave the room if:
 - The cylinder has been secured and no further leaks need to be addressed;

- Either of the air packs has sounded an alarm indicating a low supply of oxygen.
- No further entry is allowed unless both staff have replaced oxygen cylinders with fully charged ones;
- Wait for the Fire Department and ventilate the chlorine room only if directed by them.
- Continue to follow all directions given by the person in charge from the Fire Department;
- Call Chlorine Inc. at 1-800-_____ to report the ruptured cylinder and request immediate pickup and record a confirmation number;
- All staff are to document the incident immediately after the Fire Department has determined the area to be safe;
- Continue to document issues until back to normal operation.

Notes:

If a shift change occurs during the emergency, all staff will remain on site and continue to assist with the emergency. Staff involved in containing the chlorine leak can only leave if directed otherwise by management.