03.16.2016

MEMO

To
Board of Commissioners

From
General Manager, William Neal

CC
Office Manager

Re
Emergency Response Planning

Comments:

Please find two documents attached to this memo: Emergency Response Planning Guide for Public Drinking Water System (Planning Guide) and Chapter 6 of the North Beach Water District Water System Plan.

WAC 246-290-415 requires public water systems to have an Emergency Response Plan (ERP) as an element of its Water System Plan. It also requires public water systems to employ reasonable security measures to protect the raw water intake facilities, water treatment processes, storage facilities, pump-houses, and distribution systems from possible damage or intruders.

In compliance with WAC 246-290-415 NBWD included an ERP element to Chapter Six of its Water System Plan (WSP) revision. The Department of Health recently approved the WSP.

The Planning Guide is designed to assist public water system to not just comply with the WAC 246-290-415 ERP requirement but to provide a very comprehensive plan that can be more useful in preparing for, dealing with, and recovering from an emergency situation.

I look forward to your comments during the March Board meeting on how you would like me to proceed on this planning effort.

WAC 246-290-415:

(1) The purveyor shall ensure that the system is operated in accordance with the operations and maintenance program as established in the approved water system plan required under WAC 246-290-100 or the small water system management program under WAC 246-290-105.

(2) The operations and maintenance program shall include the following elements as applicable:

(a) Water system management and personnel;
(b) Operator certification;
(c) Comprehensive monitoring plan for all contaminants under WAC 246-290-300;
(d) Emergency response program;
(e) Cross-connection control program; and
(f) Maintenance of service reliability in accordance with WAC 246-290-420.

(3) The purveyor shall ensure that the system is operated in accordance with good operations procedures such as those available in texts, handbooks, and manuals available from the following sources:

NORTH BEACH WATER DISTRICT

Tel 360.665.4144
Fax 360.665.4641

Po Box 618
Ocean Park, WA 98640

www.northbeachwater.com
customerservice@northbeachwater.com

(a) American Water Works Association (AWWA), 6666 West Quincy Avenue, Denver, Colorado 80235;
(b) American Society of Civil Engineers (ASCE), 345 East 47th Street, New York, New York 10017-2398;
(c) Ontario Ministry of the Environment, 135 St. Clair Avenue West, Toronto, Ontario M4V1B5, Canada;
(d) The Chlorine Institute, 2001 "L" Street NW, Washington, D.C. 20036;
(e) California State University, 600 "J" Street, Sacramento, California 95819;
(f) Health Research Inc., Health Education Services Division, P.O. Box 7126, Albany, New York 12224; and
(g) Any other standards acceptable to the department.

(4) The purveyor shall not establish or maintain a bypass to divert water around any feature of a treatment process, except by written approval from the department.

(5) The purveyor shall take preventive or corrective action as directed by the department when results of an inspection conducted by the department indicate conditions which are currently or may become a detriment to system operation.

(6) The purveyor of a system using surface water or GWI shall meet operational requirements specified in Part 6 of this chapter.

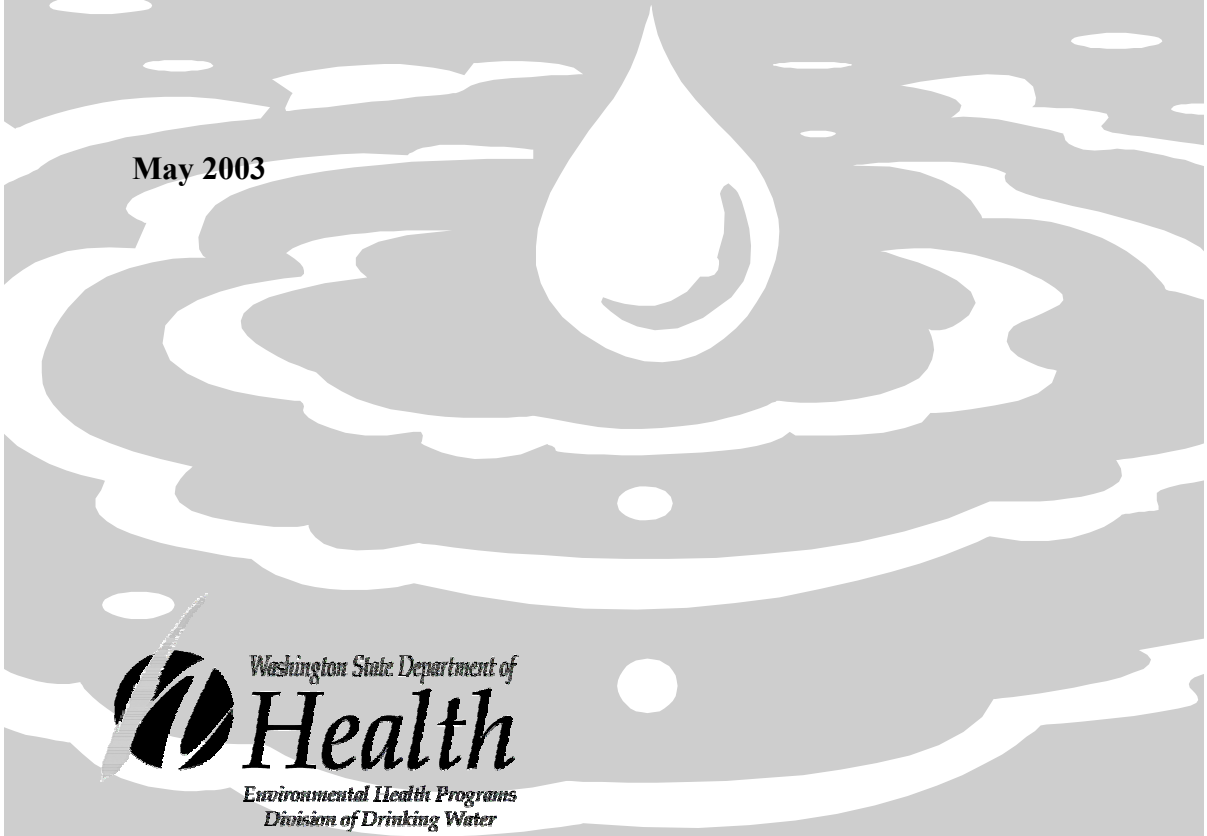
(7) The purveyor shall have a certified operator if required under chapter 70.119 RCW and chapter 246-292 WAC.

(8) The purveyor shall at all times employ reasonable security measures to assure the raw water intake facilities, water treatment processes, water storage facilities, and the distribution system are protected from possible damage or compromise by unauthorized persons, animals, vegetation, or similar intruding agents. Such measures include elements such as locks on hatches, fencing of facilities, screening of reservoir vents or openings, and other recommendations as may be found in the current edition of the *Recommended Standards for Water Works, A Committee Report of the Great Lakes - Upper Mississippi River Board of State Public Health and Environmental Managers*.

(9) All purveyors utilizing groundwater wells shall monitor well levels from ground level to the static water level on a seasonal basis, including low demand and high demand periods, to document the continuing availability of the source to meet projected, long-term demands. Purveyors shall maintain this data and provide it to the department upon request.

(10) All operation and maintenance practices shall conform to Part 5 of this chapter.

Emergency Response Planning Guide for Public Drinking Water Systems



May 2003

Washington State Department of Health

Environmental Health Programs
Division of Drinking Water

DOH PUB. #331-211

Emergency Response Planning Guide for Public Drinking Water Systems

May 2003

For more information or additional copies of this report contact:

Training and Outreach Section
Division of Drinking Water
Department of Health
PO Box 47828
Olympia, WA 98504-7828
(360) 236-3164

Mary Selecky
Secretary of Health

Bill White
Assistant Secretary, Environmental Health

Gregg Grunenfelder
Director, Division of Drinking Water

Contents

Part 1: Guidance and Instructions

Introduction: Protecting public health

Safe and reliable drinking water is vital to every community. Emergency response planning is an essential part of managing a drinking water system.

Most public water systems have had routine operating emergencies such as pipe breaks, pump malfunctions, coliform contamination, and power outages. These are manageable if the water system has an emergency response plan that can be put into action quickly.

More serious non-routine emergencies may result from intentional acts of sabotage, chemical spills, floods, earthquakes, windstorms, or droughts. These can drastically affect the system and the community that depends on it.

Each emergency has unique effects on different parts of a water system. Floods can cause widespread bacterial contamination, earthquakes can damage sources and distribution systems, and storms can disrupt power supplies. The common element is that each emergency may threaten the system's ability to deliver safe and reliable drinking water.

Emergency response planning is a process by which water system managers and staff explore vulnerabilities, make improvements, and establish procedures to follow in an emergency. It is also a process that encourages people to form partnerships and get to know one another. Preparing a response plan and practicing it can save lives, prevent illness, enhance system security, minimize property damage, and lessen liability.

The requirement for an emergency response plan

The operations and maintenance section of the state rule, Chapter 246-290-415 (2)(d) WAC, requires public water systems in Washington to have an emergency response plan as part of a water system plan or small water system management program. It also requires that systems employ reasonable security measures to protect the raw water intake facilities, water treatment processes, storage facilities, pump-houses, and distribution systems from possible damage or intruders.

This guidance document can be used to help meet the requirement for developing an emergency response program. Other methods or formats can also be used to meet the emergency response program requirement.

How to use this document

Developing an emergency response plan can take a lot of time and effort. The purpose of this document is to make the job easier and help create a plan that works for your water system. The document is intended for use by any water system and may be modified to fit the specific needs of each system. Larger water systems should use it only as a starting point, because the complexity of larger systems requires more detail. Smaller water systems should consider each section and use what is relevant for the type, size, and complexity of the system.

The document has two main parts with identical structure. Part 1 discusses important emergency response planning elements and provides instructions and examples to help complete Part 2, which is a template for creating your own plan. You can also use Part 1 as an educational tool to help system staff understand the key components needed for a well thought-out plan. The document is available electronically on the Web at: http://www.doh.wa.gov/ehp/dw/Security/Publications.htm

You may use Part 2 in its original form or modify it to meet your system's needs. Since the completed Part 2 may contain sensitive information, **do not** submit it to the Department of Health (DOH) and make sure to keep it stored in a safe and secure location. It is recommended you have one copy stored on-site and one off-site to ensure the document is available in the event you are unable to access your offices or facilities. DOH may request some of the information contained in a completed Part 2 as part of a water system plan or small water system management program.

Section 1.
Emergency response mission and goals

Stating a mission and goals for emergency response is an important first step because it helps a water system focus on the important aspects of the plan. The mission statement and goals should reflect the system's obligation to protect the health and safety of its customers, staff, and assets – and be able to maintain or restore safe and reliable drinking water. Developing partnerships with key response agencies should be reflected in the goals.

System personnel should begin by understanding what needs to be accomplished during an emergency. Protecting your customers' health is paramount. If the water has been contaminated, you must notify customers quickly. Then you must resolve the situation at hand and restore safe and reliable water throughout the system.

Example: Emergency response mission and goals

Mission statement for emergency response	In an emergency, the mission of the XYZ water system is to protect the health of our customers by being prepared to respond immediately to a variety of events that may result in contamination of the water or disruption of supplying water.
Goal 1	Be able to quickly identify an emergency and initiate timely and effective response action.
Goal 2	Be able to quickly notify local, state, and federal agencies to assist in the response.
Goal 3	Protect public health by being able to quickly determine if the water is not safe to drink or use and being able to immediately notify customers effectively of the situation and advise them of appropriate protective action.
Goal 4	To be able to quickly respond and repair damages to minimize system down time.

The mission and goals are always the same, but your response procedures should be flexible because every emergency is different and may require a specific sequence of response actions to protect lives and minimize damages. In any event, there are a series of general steps that a water system should take:

1. Confirm and analyze the type and severity of the emergency.
2. Take immediate actions to save lives.
3. Take action to reduce injuries and system damage.
4. Make repairs based on priority demand.
5. Return the system to normal operation.

Section 2.
System Information

In any emergency, a water system needs to have basic information available for both system personnel, and external parties such as emergency responders, repair people, the media, and others. The information needs to be clearly formatted and readily accessible so system staff can quickly find it and provide it to those who may be involved in responding to the emergency. Providing this information in advance is an important step in forming partnerships.

Basic information that should be presented in the emergency response plan are the system's ID number, system name, system address or location, directions to the system, population served, number of service connections, system owner, and information about the person in charge of managing the emergency. Below is an example of how to present the information.

Example: System information

System identification number	19900	
System name and address	XYZ Water System 1000 Anywhere Street XYZ, WA 98000	
Directions to the system	North on route 6 to exit 88. Take right and head west for 2.9 mile to XYZ drive. Take a left onto XYZ drive and go .5 miles. Office is on the left. Pump-house and treatment facilities are .2 miles past office on the right.	
Basic description and location of system facilities	The XYZ water system has two groundwater wells of 180' and 223' depth and one surface water source with treatment. The wells pump through the pump-house and chlorination treatment facilities into two storage reservoirs, one at the north end and one at the south end of the system, which feed the distribution system. The north reservoir is located at the end of J street and the south reservoir is located and the intersection of Olive Street and 2nd Street.	
Location/Town	XYZ	
Population served and service connections from Division of Drinking Water records.	650 people	225 connections
System owner (the owner should be listed as a person's name)	Town of XYZ	
Name, title, and phone number of person responsible for maintaining and implementing the emergency plan.	Marsha Ready Manager	(360) 232-2323 Phone (360) 790-2323 Cell (360) 799-8999 Pager

The information in this table is a starting point. The system may have unique circumstances, or it may have a geographical range that expands over a large area requiring additional information. In any case, make sure the information is clear, accurate, and easily located.

In addition to this basic information, the water system should have a detailed map of the distribution system and a plan for how to communicate if phones and radios don't work. For example, arrange places to meet and designate less technical ways to share and distribute information.

Section 3.
Chain of Command – Lines of Authority

When an emergency occurs, there can be confusion, lack of coordination, and poor communication. Timely and effective response can minimize the effects of an emergency. Often, the initial response sets the tone for the entire emergency.

Having a chain of command that defines clear lines of authority and responsibilities for system personnel during an emergency speeds up response time and helps eliminate confusion. System personnel need to know who to report the emergency to, who manages the emergency, who makes decisions, and what their own responsibilities are.

The first response step in any emergency is to notify the person at the top of the chain of command – the person responsible for managing the emergency and making key decisions. This lead person will assess the situation and initiate a series of response actions based on the type and severity of emergency. Larger systems may have a variety of persons involved in the chain of command. However, a small system may only have one or two people in the chain of command. It is likely that very small systems may only have one person, usually the water system operator, in their chain of command. In these cases make sure each responsibility is clearly defined so the person does not forget it during an emergency.

In addition to an individual having the lead responsibility, other key responsibilities that should be assigned to system personnel include the following tasks:

- Handle incoming phone calls and administrative support.
- Provide information to the public and media.
- Contact the customers.
- Assess the system's facilities and operations in the field.
- Organize and carry out repairs.

Example: Chain of command – lines of authority

Name and title	Responsibilities during an emergency	Contact numbers
Marsha Ready Water System Manager	Responsible for overall management and decision making for the water system. The Water System Manager is the lead for managing the emergency, providing information to regulatory agencies, the public and news media. All communications to external parties are to be approved by the water system manager.	Phone: (360) 232-2323 Cell: (360) 790-2323 Pager: (360) 799-8999
John J. Dunbar Water System Operator	In charge of operating the water system, performing inspections, maintenance and sampling and relaying critical information, assessing facilities, and providing recommendations to the water system manager.	
Freddy Filter Water Treatment Plant Operator	In charge of running water treatment plant, performing inspections, maintenance and sampling and relaying critical information, assessing facilities, and providing recommendations to the water system operator or manager.	
Mary Marshall Office Administrator	Responsible for administrative functions in the office including receiving phone calls and keeping a log of events. This person will provide a standard carefully pre-scripted message to those who call with general questions. Additional information will be released through the water system manager.	
Jerry Mander Field Staff	Delivers door hangers and supports water system operator.	

Section 4.
Events that Cause Emergencies

Why do emergencies happen? There are a variety of reasons including:

- Natural disasters.
- Accidents.
- Deliberate acts of vandalism or terrorism.
- System neglect or deferred maintenance.

An emergency may affect the entire water system or only isolated sections. You should evaluate a variety of events regarding their potential effects on the water system and its infrastructure. Each type of event can cause different types of damage to system components or contamination resulting in a disruption in service. These evaluations should be reflected in the water system's vulnerability assessment and procedures for responding to specific events that are discussed later in this document.

Natural Disasters

Consider common natural disasters when developing an emergency response plan, including:

Earthquakes: Damage resulting from the earth shifting along geologic faults resulting in shaking and settling of the ground can cause severe structural damage to virtually all water system facilities, including sources, transmission and distribution lines, storage reservoirs, and pump-houses. The Nisqually earthquake in February 2001, although not severe, caused problems for water systems in western Washington. Distribution pipes and service lines broke, storage reservoirs shifted, and buildings were damaged. Although no major outages were reported, it was a serious reminder that these things can and do happen.

Waterborne Illness in Walkerton, Ontario (2000)

What happened: Storm washes bacteria-laden cow manure into poorly planned and maintained well. Water pumped to taps throughout the town of Walkerton. Operational problems included inconsistent treatment of the water, falsification of water quality tests, mislabeling samples, and failure to notify public health officials in order to avoid regulators.

Results: Seven deaths, 2,300 illnesses from *E.coli* and c*ampylobacter* poisoning.

The fix: More than $11 million spent in reconstructing town's water system and installing temporary filtration.

Judicial inquiry: To find out what went wrong and to examine overall water safety. Found that water system operators were not trained to adequately operate a water system, and they falsified records and water quality tests.

Fallout: Class action suit for as much as $70 million. Government implements new water regulations. Careers ruined.

Cost: Study estimates financial cost of the tragedy at $155 million. Seven lives lost and many ongoing illnesses.

Emergency response plans should evaluate what facilities are at risk during an earthquake, what can be done to mitigate impacts (for example, strapping down reservoirs), and what actions can be taken to respond to such an event. It is also important to have backup communication plans, because radios and cell phones may not work after an earthquake.

Floods: Floods are a common event in the Pacific Northwest. They can cause widespread contamination as turbid waters carry bacteria that can overflow sources, transmission lines, treatment facilities, and pumping facilities. Floods can also ruin electrical components and telemetry systems.

It is important for a water system to assess its vulnerability to flooding. Consider damage to roads and bridges where distribution or transmission lines are located. Washout of roads or bridges not only damage pipes but also can interfere with repair. If the risk for a flood is high, the water system should plan for and consider mitigating actions to protect facilities and equipment.

Another consideration is identification of alternative transportation routes to get in and out of the area.

High winds: Pacific Northwest storms often generate winds in excess of 50 miles an hour and have exceeded hurricane-force sustained winds of 74 miles an hour or greater from time-to-time. These storms often disrupt power and damage water system facilities.

Ice Storms: There are occasional ice storms in the Pacific Northwest, such as the one that hit in December 1996. This fierce storm caused major power outages and froze water pipes. The ice slowed the ability of crews to get to areas to make repairs.

Drought: Droughts are an issue in the Pacific Northwest and can have devastating effects on water supplies. During normal years, peak summer demands can double and even triple water use. These same demands during low water years, such as in the summer of 2001, can lead to water shortages. Drought severity is affected by a combination of environmental factors, all of which change over time, including rainfall, temperature, snow pack, and length of drought. Compared to other natural disasters, drought has a relatively slow onset and is easier to anticipate.

Waterborne diseases: Organisms such as *Giardia* and *Cryptosporidium* can contaminate water supplies and cause waterborne diseases. The 1993 Milwaukee, Wisconsin *Cryptosporidium* outbreak killed more than 100 people and sickened more than 400,000. Another incident occurred in Walkerton, Ontario where an E. coil outbreak killed seven people and sickened over 2,300 (see sidebar on previous page). Both of these cases illustrate that proper operations, management, and planning are truly a matter of life-or-death.

Human-caused events

Human-caused events that can result in a water system emergency include chemical spills, vandalism, terrorism, cyber-attack, fires, construction accidents, and basic neglect of maintaining the system.

Vandalism: Vandalism is generally a spur-of-the-moment act using materials at hand rather than pre-planned or pre-meditated activities. Vandals often break into systems, damage facilities, and paint graffiti. These acts are relatively easy to prevent by enhancing security, increasing lighting, installing locks on doors and hatches, and putting up security fencing.

Terrorism: Acts of terrorism are conducted by someone whose intent is to instill fear or induce harm to people and facilities. Acts of terrorism are a very real threat in America. Even though it may seem unlikely, it would only take one well-staged event to undermine confidence in drinking water safety. Being prepared and knowing what to look for are crucial elements of preventing an attack on the system.

There are many potential threats to drinking water systems, including chemical, biological or radiological contamination as well as damage to infrastructure and computer systems. In most cases, contamination using biological or chemical agents would cause the most concern for a drinking water system. Although it would be difficult to effectively contaminate a large water supply with these agents or cause major damage, the possibility should not be taken lightly. The threat is real, and drinking water systems need to enhance security around facilities and be prepared to respond.

System neglect: System neglect, often referred to as deferred maintenance, is a major cause of emergencies. System components that are aging and need replacement go without attention for so long that they fail, causing an emergency. Drinking water systems need to continuously evaluate facilities and replace them before a massive failure occurs. In one case, a drinking water system continuously put off repairing its major transmission line that traversed a hillside in town. The line finally failed and caused an immense slide, destroying a number of homes and causing significant damage.

Cross Connections: A cross connection is an actual or potential physical connection between a public water system and any source of non-potable liquid, solid, or gas that could potentially contaminate water supply through a backflow process. Cross connections usually occur unknowingly when someone makes a connection in the system. Backflow is the reverse flow of water or other substances into the public water system. Under backflow conditions, unprotected cross-connections can provide a path for biological, chemical, or physical contaminants to enter the water supply. These contaminants can lead to waterborne disease outbreaks, chemical poisonings, and sometimes death. Backflow usually occurs when there is a loss of pressure somewhere in the system causing water to reverse itself.

Security Breach in Glen Rose, Texas (2002)

The incident: One night, someone cuts a fence around one of the town's reservoir sites, climbs a 25-foot 200,000-gallon tank, and opens a locked hatch. City unable to quickly determine if a public health threat exists.

Actions taken: EPA alerted, along with FBI, Texas Department of Health, Natural Resource Commission, and Department of Homeland Security. EPA assembles a response team of drinking water experts to evaluate the water supply. Water in the tanks isolated, and analysis conducted to determine if water is safe to drink. Investigation begun to determine if this is terrorist activity.

Questions: What kinds of sampling should be conducted? Who has the expertise to do the analysis? How long does it take to get test results?

Analysis conducted: Traditional drinking water parameters, hazard characterization (HAZCAT), radiation, warfare agents. Forensics include light/polarized microscopy, infrared analysis, electron microscopy, and x-ray diffraction.

Difficult issues: Fire fighting vulnerability from low volume, identifying sensitive customers, maintaining acceptable water pressure, customers unhappy with the length of the incident.

Results: All lab tests negative. City, state agencies, and EPA discuss findings and conclude the water is not a threat to health.

Tank drained, cleaned, disinfected, and placed back on-line after ten days.

Construction accidents: Construction accidents sometime fall into the category of a routine operating emergency. For example, when a contractor damages a water line and the system needs to be shut down for repair. If the response is not timely and effective, this kind of incident can turn into a serious emergency. The system may loose pressure, resulting in serious backflow incidents that contaminate the water. The utility must be aware of construction in and around the system and be prepared to respond quickly to an accident if it happens.

Chemical spills: Many chemicals that are routinely transported can harm humans directly or by contaminating air or water. No drinking water system is safe from a hazardous chemical spill and the resulting contamination. Spills can come from motor vehicles, trains, airplanes, boats, or fixed containers. They can occur at any time without warning, and many solvents are able to leach through PVC pipes. In one 1981 incident, a small crop duster spraying a dangerous herbicide crashed into a central California river upstream from a water intake for a city water supply, resulting in a major emergency.

Water systems should evaluate the potential for chemical spills in their wellhead protection programs and use that information for emergency response planning.

A water system may be vulnerable to many natural and man-made disasters. Understanding these vulnerabilities is an important part of emergency planning. In preparing a plan, you may not consider it necessary to do an extensive analysis of a rare event such as a tornado in the Pacific Northwest. However, analyzing the impacts of an earthquake, flood, or storm is important because they happen quite often in Washington. Consider the probability of an event and its likely effect on the water system. Then focus on the actions needed to reduce impacts and respond in a timely and effective manner.

Example: Events that cause emergencies

Type of event	Probability or risk (High – Med – Low)	Comments
Earthquake	High	Had minor earthquake damages in February 2001 quake.
Flood	Low	System not located in an area vulnerable to flooding.
High winds	High	System is vulnerable to high wind events. Power is disrupted.
Ice storm	Med	Minor damage caused in December 1996. Broken pipes and damaged pump house.
Drought	Med	Need to plan for decrease I well yield during dry summers.
Terrorism	Low	Need to be trained on suspicious activity
Construction accident	Med	Construction crews often hit pipes.
Chemical spill	Low	Complete wellhead protection plan.

Section 5.
Severity of Emergencies

Emergencies usually have a wide range of severity. Defining categories of severity can significantly aid in determining appropriate response actions. Knowing the severity of the emergency and being able to communicate it to others will help system personnel keep their response balanced and effective.

Making a decision on severity should be collaborative among system personnel, but is ultimately made by the person in charge of the emergency. The person in charge may also choose to coordinate with external parties, especially if partnerships have been formed in advance of the event. The information for making the decision will accumulate over time, and may result in the level of severity being changed.

An assessment of severity, once decided, must be communicated immediately to all those dealing with the emergency. Make sure staff have cell phones, pagers, and/or radios when they are in the field. Remember to have an alternative method of communicating if cell phones and pagers won't work.

In classifying the severity of an emergency, define as many levels and descriptions as you find useful. The following is a four-level example for a water system supplied by groundwater that has been used in many settings. This is just an example; you may choose to classify emergencies in some other way. Smaller systems may prefer a three-level scheme; some larger systems may want to use five or more levels.

Level I – Normal (Routine) Emergency: The system experiences a normal emergency, such as a line break or power outage. System personnel are able to handle the problem with minimal outside assistance. In this situation is not likely that public health will be immediately jeopardized. Although it is important to begin responding, system personnel should have no difficulty remaining calm and thoroughly working through the situation. Normal events can usually be resolved within 24 hours.

Example: Level I emergency

Description: The XYZ water system considers the following as level I emergencies:

- Distribution line breaks.
- Short power outages.
- Minor mechanical problems in pump-houses.
- Other minor situations where it is not likely that public health will be jeopardized.

The system has specific response activities identified for these types of emergencies, including proper sampling, disinfection, and pressure testing activities. System personnel are advised and are directed to work on the problem and are usually capable of resolving the problem within 24 hours. If it is determined that the problem will take longer than 24 hours to resolve and storage is likely to be drawn down below a safe operating level, the situation will be elevated to level II.

Level II – Minor Emergency (Alert Status): The system experiences minor disruption in supply or has indications of possible contamination where it may need to coordinate with DOH and consider issuing a health advisory to customers. In these types of emergencies, public health may be jeopardized, so it is important for system personnel to be on alert and initiate a quick response. Minor emergencies can usually be resolved within 72 hours.

Example: Level II emergency

Description: The XYZ water system considers the following to be level II emergencies:

- Disruption in supply such as a transmission main line break, pump failure with a potential for backflow, and loss of pressure.
- Storage is not adequate to handle disruption in supply.
- An initial positive coliform or E. coli sample.
- An initial primary chemical contaminant sample.
- A disruption in chlorine/chemical feed from the groundwater sources.
- A minor act of vandalism.
- Drought, with a noticeable and continuing decline of water level in the well.

Level III – Significant Emergency: The system experiences significant mechanical or contamination problems where disruption in supply is inevitable and issuance of a health advisory is needed to protect public health. Major emergencies should be reported to DOH as soon as possible to determine the best available means to protect customers' health. System personnel are directed to the situation, and outside entities are notified to aid in the response. Major emergencies may require more than 72 hours to resolve.

Example: Level III emergency

Description: The XYZ water system considers the following as level III or actual emergencies:

- A verified acute confirmed coliform MCL or E. coli/fecal positive sample requiring immediate consideration of a health advisory notice to customers.
- A confirmed sample of another primary contaminant requiring immediate consideration of a health advisory notice to customers.
- A loss or complete malfunction of the water treatment facilities for the surface water source, including chlorination.
- A major line break or other system failure resulting in a water shortage or requiring system shutdown.
- An act of vandalism or terrorist threat such as intrusion or damage to a primary facility.
- An immediate threat to public health of the customers and an advisory is required.
- Severe drought significantly affecting well yield.

Level IV – Catastrophic Disaster/Major Emergency: The system experiences major damage or contamination from a natural disaster, an accident, or an act of terrorism. These incidents usually require immediate notification of local law enforcement and local emergency management services. Immediate issuance of health advisories and declaration of water supply emergencies are critical to protect public health. These events often take several days or weeks to resolve before the system returns to normal operation.

Example: Level IV emergency

Description: The XYZ water system considers the following events to be level IV or major emergencies:

- Earthquake that shuts down the system or impacts sources, lines, etc.
- Act of terrorism possibly contaminating the water system with biological or chemical agents.
- Flood that infiltrates system facilities and sources.
- Chemical spill within 2000 feet of the system's sources.
- Storm that significantly damages power grid and system facilities.
- Mudslide or other earth shift that causes failure of transmission or loss of water in well.

Section 6.
Emergency Notification

During most emergencies, it will be necessary to quickly notify a variety of parties.

Preparation for such notification has three essential components:

- Assigning responsibility to oversee and carry out the notifications.
- Assembling comprehensive call-up lists with names and contact numbers.
- Writing out procedures for quickly disseminating information to appropriate parties.

If you don't have readily available notification information or the means to deliver it, you run the risk of losing valuable response time. This may make the difference between minor and major damages. Having well-formed partnerships will help during these times.

In addition to phone, email, and media for notification, consider forming partnerships with local community groups, scout troops, and school clubs to assist in delivering information when needed.

Water system managers from relatively small systems should poll customers to determine the best method of communicating. It is also a good idea to give customers some general safety information regarding what to do in case of an emergency before one happens.

Notification call-up list

Call-up lists should be comprehensive, including local law enforcement, DOH Division of Drinking Water regional office, Department of Ecology spill response, local mayors and city officials, local health officials, safety officials, local emergency responders ,water testing laboratories, and service/repair providers. A list of priority customers, such as hospitals, nursing homes, clinics, and schools should also be maintained for immediate notification. The template in Part 2 has comprehensive lists to assist you. You may modify them as necessary.

Notification procedures

Once you have your list completed it is important to describe the procedures you will use to quickly distribute information to appropriate parties. These procedures describe how to make notifications to specific parties, who is responsible for conducting the notifications, who assists in the notifications, and what methods are used to complete them. In addition, specific procedures on how to issue a health advisory should be defined so that you are prepared to do so in the event that your water supply is unsafe for drinking or use. Issuing a health advisory should be done by the water system when there is reason to believe the water is unsafe. DOH staff members are available for consultation in making this decision.

Other procedures to define include:

- Notifying system personnel who may be on-call or off-duty.
- Notifying customers, priority customers, and industrial customers.
- Alerting local law enforcement, drinking water officials, local health officials, and water testing laboratories when appropriate.
- Contacting service and repair contractors.
- Contacting neighboring water systems for assistance, if necessary.
- Arranging for alternative water supplies such as bottled water.

Example: Procedures for notifying system customers of potential water shortage

Who is responsible:	The water system manager is ultimately responsible for making the decision to notify customers regarding a potential water shortage and the need for water use restrictions. The water system manager should consult with field staff to make the decision. Once the decision is made procedures for notification will be initiated.
Procedures:	• Water system manager confers with key staff to verify problems. • Water system manager organizes staff to develop the message to be delivered to the customers. • Water system manager consults with state drinking water staff regarding the problem. • Water system manager with assistance from staff prepares door hangers, signs and radio message. • Water system operator continues to investigate problem and make repairs as necessary. • The water shortage notification will be distributed by: 1. Field staff placing “water shortage notices” on doors and along travel routes. 2. Staff will place signs on main travel routes into the community. 3. Water system manager contacts KYGO am radio and requests issuance of the water shortage notice and request to curtail water use. 4. Administrative support person will provide a pre-scripted message to phone callers and log in each phone call. • Water system operator continuously updates the water system manager on water shortage. • Once water shortage is resolved, re-notify customers.

Section 7.
Water Quality Sampling

Many types of emergencies can jeopardize the quality of water and potentially sicken those using the water. Because the most important goal for any water system is to protect human health, the system must know how to act quickly and make decisions on whether to issue a health advisory. Sampling and obtaining results from a lab takes time.

If there is reason to believe that the water has been contaminated, the water system manager should consult with DOH and consider issuing a health advisory as soon as possible – often before conducting water quality sampling.

Contamination of drinking water, whether intentional or unintentional, comes in many forms, which are classified in four general categories:

- Inorganics such as metals or cyanide.
- Organics such as pesticides or volatile compounds.
- Radionuclides.
- Pathogenic microorganisms or microbial organisms.

If the water system is experiencing an emergency caused by a natural event or intentional act and contamination is suspected, system personnel may be faced with making a decision about what contaminants to test for and how to get the tests performed quickly.

All systems must have a coliform monitoring plan, as required by drinking water regulations, that designates sampling sites, procedures, laboratory requirements, and contact numbers. This plan should be an integral part of your emergency response plan. If you already have emergency sampling sites and procedures established in this plan, simply reference it in the emergency response plan.

As you prepare your emergency response plan, consider the following tests:

Coliform Bacteria: In the event of an emergency, testing for coliform is a standard first test, and if coliform is detected it is a signal that the system may be contaminated. Coliform bacteria are organisms that are present in the environment and in the feces of all warm-blooded animals, including humans. Coliform bacteria generally do not cause illness, but their presence indicates that other disease-causing organisms (pathogens) may be in the water system. Most pathogens that contaminate water supplies come from the feces of humans or animals. Testing drinking water for all possible pathogens is complex, time-consuming, and expensive. It is, however, relatively quick, easy, and inexpensive to test water for coliform bacteria. Public water systems must test for coliform bacteria regularly.

Hetertrophic Plate Count (HPC): This test provides information regarding the numbers of bacteria that may have been introduced into the water. HPC counts greater than 500 signal the need to be wary. Very high levels (1000 – 10,000 and greater) would suggest a problem that needs immediate evaluation.

Chlorine Residual: In chlorinated systems, this test indicates if materials introduced into the water have created a demand for the chlorine, leaving lower-than-normal or no residual and signaling the need for further evaluations. Samples need to be taken at the distal end of the distribution system (the point farthest from the start of the distribution system).

Chlorine Demand: In systems that do not routinely chlorinate, this test reveals unusual demands on the oxidizing capability of the added chlorine, indicating the presence of a contaminant that warrants further investigation.

Nitrate/Nitrite: This test is relatively easy to perform. It is important to know whether these acute contaminants are present at levels that could harm infants.

Total Organic Carbon (TOC): Relatively simple to perform, this test measures normal expected levels range from 0.2 to 4.0 mg/L for surface water and 0.01 to 2.0 mg/L for groundwater. Higher levels may indicate the presence of organic materials that could pose a health concern.

Total Halogenated Organic Carbon (TOX): Relatively simple to perform, this test measures the halogenated organic substances, including disinfection by-products such as trihalomethanes and haloacetic acids. High levels suggest that contamination has occurred or that organic materials have been added to enable formation of disinfection byproducts.

Cyanide: This test is not easily performed, but should be done immediately if cyanide contamination is suspected. Cyanide is very toxic, causing death upon ingestion.

If contamination is suspected, your DOH Division of Drinking Water regional office is available to help you identify what testing should be done. You can also contact your local health department for assistance if needed. It is important to know where water testing laboratories are located near you and their hours of operation. Be sure to locate laboratories that are available 24 hours a day 7 days a week because contamination can happen at any time. It is also a good idea to include the contact information for the state testing lab in your emergency notification list.

If you suspect someone intentionally sabotaged the system or contaminated the water, this may be a crime scene. Call your local law enforcement and DOH Division of Drinking Water regional office, and be sure not to disturb any potential evidence.

Example: Water quality sampling

Sampling parameter	Do we have procedures? Yes/No	Basic steps to conduct sampling (sites, frequency, procedures, lab requirements, lab locations, lab contacts, lab hours, etc.)
Coliform Bacteria	Yes	Update plan for emergency sampling
Hetertrophic Plate Count (HPC)	No	Develop procedures
Chlorine Residual	Yes	Evaluate procedures
Chlorine Demand	Yes	Evaluate procedures
Nitrate/Nitrite	Yes	Evaluate procedures
Total Organic Carbon (TOC)	No	Develop procedures
Total Halogenated Organic Carbon (TOX)	No	Develop procedures
Cyanide	No	Develop procedures

Section 8.
Effective Communication

Effective communications is a key element of emergency response. Make sure you have a well thought out communications strategy in place as part of your emergency response plan. If you haven't planned ahead by the time a crisis hits, it's too late. How you communicate with your employees, customers, and the media can affect the outcome of the situation.

Developing partnerships with others in your local emergency response network, establishing relationships with your customers and the media, and creating communication tools such as fact sheets and media releases ahead of time will help you communicate efficiently and successfully during a crisis. For example, establish positive media relations before an emergency. Make an effort to meet with reporters in your local area to share information about your water system and how they could receive information should an emergency occur. Also contact your local emergency response organization if one exists and determine what assistance they can provide during an emergency.

During an emergency, the media, your customers, and others will have many questions. Be prepared by organizing basic facts about the crisis and your water system. Assemble a team of players quickly, including a main spokesperson and one or more people to answer customer calls.

Expect your customers to be concerned or upset during a drinking water emergency. How you communicate with people is as important as the content of the information you are delivering. Body language, tone of voice, and expressions of sympathy all play an important role in how the information is received. When an emergency occurs, the news media may be on-scene quickly, requesting information that will inevitably go to the public. Appoint a spokesperson to communicate to the media. Make sure the spokesperson is credible, accessible, in a position of authority, and trained in media interview techniques.

Develop key messages to use with the media that are clear, brief, and accurate. Make sure your messages are carefully planned and have been coordinated with local and state officials. If your messages are different you'll want to know that and be prepared to explain why.

Make sure field and office staff know how to deal with the media and questions from customers and the public. It may be necessary to establish protocols for both field and office staff to respectfully defer questions to the spokesperson.

Small water systems that have limited staff should remember that your DOH Division of Drinking Water regional office is available to assist in developing and communicating messages to the media and the public. This can be especially helpful when staff need to focus on sampling or repairs.

Communication Tips

Do:

- Be prepared.
- Designate a spokesperson.
- Provide complete, accurate, and timely information.
- Tell the truth.
- Express empathy.
- Acknowledge uncertainty and offer to get back with more information later.
- Document your communications.

Do not:

- Speculate on the cause or outcome of an incident.
- Blame or debate.
- Minimize or brush off concerns of customers.
- Treat inquiries from interested parties as an annoying distraction from the real business of emergency response.

Example: Designate a spokesperson and alternates

Spokesperson	Alternate 1	Alternate 2
Marsha Ready, Manager	Mary Marshall, Office Admin.	John J. Dunbar, Operator

Example: Key messages

Develop possible messages in advance, and update them as the emergency develops:

- We are taking this incident seriously and doing everything we can to resolve it.
- Our primary concern is protecting our customers' health.
- Another important concern is keeping the system operational and preventing damage.
- What we know right now is _____
- The information we have is incomplete. We will keep you informed as soon as we know more.
- We have contacted state and local officials to help us respond effectively.
- If you think you may be ill or need medical advice, contact a physician.
- We are sampling the water and doing tests to determine whether there is contamination.
- Etc.

Health Advisories

During events when water quality and public health are in question, it may be necessary to issue a health advisory. The term *"Health Advisory"* means advice or recommendations to water system customers on how to protect their health when drinking water is considered unsafe. These advisories are issued when the health risks to the consumers are sufficient, in the estimation of the water system or state or local health officials, to warrant such advice.

Health advisories usually take the form of a drinking water warning or boil water advisory. Communication during these times is critical. DOH Division of Drinking Water staff are committed to working closely with water systems to determine if an advisory is needed. Health advisories should always be well thought out and provide very clear messages.

Health advisories can be challenging and time consuming for the water system and public health partners. They are also inconvenient for water system customers. However, these advisories are necessary in order to protect public health. In determining whether to issue a health advisory, there are many things to consider and questions to answer, usually in a short time period. This is another important reason that water systems should form partnerships in advance of these events. If there are well-formed partnerships, it will be much easier to obtain information, make decisions, and get the information out to the public.

DOH has put together a number of tools, including fact sheets, brochures, door hangers forms, and template to help water systems be prepared to issue a health advisory. Learn about health advisories and how to issue them before you actually need to. It will make the process much smoother. Learn more about the coliform health advisory packet by visiting the Drinking Water Web site at: http://www.doh.wa.gov/ehp/dw/Coliform/coliform.htm

Section 9.
The Vulnerability Assessment

It is essential that water systems identify and assess the vulnerability of each system component for both natural and human-caused emergencies. Vulnerability assessments have been a part of water system planning for a long time. Assessing water system vulnerability for earthquakes, floods, other natural events, and vandalism is common. Community water systems serving populations greater than 3,300 persons are now being required by the Environmental Protection Agency to identify vulnerabilities to intentional acts of terrorism. This document uses the term vulnerability assessment to mean the process by which the water system evaluates each water system component for weaknesses or deficiencies that may make the system susceptible to damage or failure during a natural or human-caused emergency.

In conducting the vulnerability assessment, the water system must estimate how the system and its facilities may be affected in emergency situations. Another integral part of the vulnerability analysis is to assess facilities for security enhancements that may guard against unauthorized entry, vandalism, or terrorism. This overall effort forms the basis for determining what preventive actions or improvements are needed and identifying response actions to take in the event of an emergency.

A vulnerability assessment is essentially a four-part process:

1. Identify and map the water system's components, including sources, treatment facilities, pump-houses, storage reservoirs, transmission lines, distribution lines, key valves, electrical power connections, communication systems, telemetry control, and computer systems.
2. Evaluate the potential and possible effects of various types of emergencies (earthquake, vandalism, etc.) on the components. You may also want to assess the impact on the system's operations personnel from both a safety standpoint and the added stress of working in these conditions.
3. Define the system's expectations or set performance goals for system components in each event.
4. Identify improvements that can be made and mitigating actions the system can take to lessen the impact of the events.

Assessing system facilities

When conducting an assessment, it is important to involve all appropriate personnel because they are the best source of information on the system's history, operating conditions, and vulnerable components. Partners, including public health agencies, can also provide valuable insight. Many questions need to be asked:

- What components are aging and unreliable?
- Are prolonged power outages a high probability?
- Does the system have design flaws that make it more susceptible?
- What components are susceptible to vandalism?

- What security measures are in place?
- Are the sources and storage reservoirs fenced?
- Are entry gates and doors locked?

There are many ways to organize the assessments. One method is to identify the types of emergencies that are preventable and unpreventable as you assess each component. Preventable causes such as aging equipment, poor maintenance, poor system design, lack of security measures such as fencing and lighting, spare parts, high risk or ill advised land usage near a water sources are all factors that can be managed to prevent water system emergencies. Make sure to consider the land usage near your water sources when you describe your vulnerable areas. Contaminant sources such as septic tanks near your water sources may be managed through source protection measures. For example, relocating a septic system out of a sanitary radius or relocating livestock away from the source are important activities to consider.

Unpreventable causes are those that are beyond control of the water system. Earthquakes, droughts, floods, vandalism, terrorism, and power outages are a few examples. These events can be anticipated, and some mitigating actions can be taken to lessen the impact. However, every emergency is unique and you can never anticipate everything that may happen. As you complete your assessment, pay particular attention to understanding how to respond to the event by developing a series of quick response actions that will help protect public health and lessen the overall impact.

Integrating water system security considerations

Historically water system security and emergency response planning have focused on vandalism, contamination, and natural disasters. However, after recent terrorist attacks, the idea of what constitutes a threat to drinking water supplies has changed. There is new emphasis on enhancing water system security to guard against vandalism and intentional acts of sabotage. A critical step in enhancing water system security is integrating security considerations into the vulnerability assessment. This exercise helps to expand the identification of threats and define specific safeguards that can be taken to guard against attack.

There are many things to consider when evaluating the security of a water system. What are the most probable threats to the system? Is it a hostile employee, vandal, terrorist, or random cyber attack? These potential threats have different effects and consequences and require different mitigating actions.

In addition to using a variety of water system personnel to assist in conducting the overall vulnerability assessment, you may want to include a representative from local law enforcement. A fresh view from the law enforcement perspective may help identify something you have overlooked. Also, look into larger community emergency response planning efforts to assist you.

Another important security consideration is protecting sensitive information about the water system. The last thing you want to do is give potential vandals or terrorists access to information on your system's vulnerabilities and emergency response procedures. Identify sensitive information and protect it.

To help small and medium size water systems assess security, the Association of State Drinking Water Administrators and the National Rural Water Association have developed security vulnerability self assessment guides. These self assessments are designed to help water systems assess their facilities and identify security measures. They can be obtained over the Internet at: http://www.asdwa.org/ or http://www.nrwa.org/. You can also visit the DOH Division of Drinking Water web site for information at: http://www.doh.wa.gov/ehp/dw/Security/Tools.htm

Identifying vulnerabilities, improvements, and mitigating actions

The table on the next page shows a simple way to consider your system, identify the vulnerability of each component, and define what improvements or mitigating actions can lessen the impact.

Once a vulnerability assessment has been completed, use the information for financial planning or budgeting processes. Prioritize the system improvements and security enhancements identified in the vulnerability assessment and determine how and when they can be funded. Are there some that justify a rate increase? Can they be funded from reserves? Consider these important questions as you finalize the vulnerability assessment and emergency response plan.

Example: Facility vulnerability assessment and improvements identification

System component	Description and condition	Vulnerability	Improvements or mitigating actions	Security improvements
Source	Two 150' deep groundwater wells supply the system. They are located within a few hundred feet of town and its developed areas. The sources are in excellent condition.	The wells are most vulnerable to contamination from above ground activities because they are only 150' deep. The well houses are not highly secure so they could be vulnerable to acts of vandalism.	Implement wellhead protection program.	Upgrade well houses: Install fencing, and deadbolts. Secure well houses to foundation and install lighting around well house.
Storage	Storage reservoirs are in sound condition, but reservoir hatches could be accessed and locks could be broken.	Vandals could access reservoir hatches. Also, the reservoir could be prone to shaking and settling resulting from an earthquake.	Provide earthquake strapping to secure reservoir to the foundation.	Install fencing, lighting, and signage to protect against unauthorized entry and access to reservoir hatches.
Treatment	There is a chlorination system in each well/pump-house. Both are in sound operating condition.	Chlorination systems are subject to power outages and vandalism if a pump-house is vandalized. Tanks are not secured and may tip over during an earthquake.	Purchase a back-up generator and have it wired in or have system wired with a jack where a back-up generator could be rented and plugged in. Secure tanks with earthquake straps.	Install fencing, lighting, and signage to protect against unauthorized entry.
Pump-house and pumping facilities	The pump-house and pumping facilities are in good condition.	Pump-house does not have security fencing or lighting and is prone to vandalism.		Install fencing, lighting, and signage to protect against unauthorized entry.
Computer and telemetry system	Computer and telemetry systems are located in the water systems main office. All systems are in good operating condition.	Main office does not have adequate security measures. Also, computers should be better protected against cyber attack or hacking.		Install lighting and security system to guard against theft and vandalism. Hire consultant to secure computers and telemetry.

Section 10.
Response Actions for Specific Events

Develop a detailed response plan for each type of emergency event that the system may experience. In any event there are a series of general steps that a water system should take:

1. Confirm and analyze the type and severity of the emergency.
2. Take immediate actions to save lives.
3. Take action to reduce injuries and system damage.
4. Make repairs based on priority demand.
5. Return the system to normal operation.

Knowing the various elements of emergency response planning and keeping in mind these general steps will help you develop response actions for specific events.

Establishing response actions for specific events

There are numerous events which may cause an emergency that are dictated by the system's size, complexity, type of source, and geographic location. As discussed before, likely causes of emergencies in our state that a system should consider are power outages, transmission or distribution line breaks, chlorine treatment failure, surface water treatment malfunction, source pump failures, microbial (coliform, E. coli) contamination, chemical contamination, acts of terrorism, vandalism, loss of water in the well, drought, floods, ice storms, earthquakes, and hazardous spills in the vicinity of sources or distribution lines. In any of these situations your priority is the protection of people using the water. Be observant of what is going on around you, and if you suspect vandalism or terrorism, contact local law enforcement and make every effort to preserve evidence.

These are only starting points, since each system is unique and may encounter additional situations that are important to be prepared for. Use partnerships to assist in this effort. The following table presents a way to identify an event, summarize the assessment, set forth immediate response actions, define what notifications need to be made, and describe important follow-up actions.

Example: Power outage

Assessment	The XYZ water system is vulnerable to power outages, experiencing an average of three outages per year that last several hours. The system does not have a back-up generator but has a connection so that a generator can be rented and plugged into the system. Most of the time, storage is able to supply the system for several hours until power is restored.
Immediate actions	1. Assess whether the outage is likely to last more than 6 hours. If no, be on alert for changing conditions and monitor storage tanks. If yes, complete the following steps: 2. Call on availability of back-up generator at JJ's Rentals. 3. Obtain generator if available. 4. Connect generator to system and resume operations. 5. Implement water shortage response actions to inform customers to cut back on water usage until power is restored.
Notifications	1. Power Company – Let them know that a public water system is experiencing an outage and the generator will be turned on until power is restored. 2. JJ's Rentals – Obtain generator 3. Customers – cut back on water usage until power is restored.
Follow-up actions	1. Turn off and disconnect back-up generator 2. Return system to general power supply 3. Inspect reservoirs and pumping facilities to ensure proper operation. 4. Return generator to JJ's.

Section 11.
Alternative Water Sources

Water contamination or disruption of supply may require that the water system get water from an alternative source to meet basic community needs. All public water systems should plan ahead to provide alternate safe water during an emergency, if feasible. It is important to evaluate potential alternative water supplies ahead of time to ensure the water is safe and the supply is available.

Sources that the water system may use when the primary and seasonal sources cannot meet demands are defined as "emergency sources." They are used only when required by extreme, and mostly unpredictable, circumstances. Alternative sources might include emergency or back-up wells, surface water sources, or springs. A water system that anticipates use of an emergency source should plan and take action well in advance of any need. As part of the emergency response planning, the water system should test these sources and work with DOH to obtain approval as an emergency source.

Another important consideration is whether the water system can establish an intertie with an approved water supply that might benefit both systems in an emergency. Discuss this possibility with adjacent water systems. Other alternatives include bottled water suppliers or a local tanker truck that could bring in water for various uses.

Example: Intertie to adjacent water supply system

Water systems within one-quarter mile of our system	Feasibility of connecting
There is one water system located within one-quarter mile of the XYZ water system. The XYZ distribution system is within 1000 feet of the other water system.	The system has discussed installing an intertie with the adjacent water supply. The system is willing, but at this time cannot assist financially. The cost of the project is about $10,000 to install pipe and an intertie connection. Unless the other system can assist financially it is not feasible for the XYZ system to construct the intertie until 2006.

Example: Alternate source(s) of water

Alternative sources	Names	Phone	Availability	Is the water safe for drinking?
Bottled water suppliers	Bottled Water Inc.	(360) 222-2222	Up to 1000 gallons in 1 gallon jugs within 24 hours	Yes
Tanker trucks in the area available to deliver bulk water	Fred Jones, local dairy truck	(360) 333-3333	5000 gallons in less than 6 hours	No

Section 12.
Curtailing Water Use

An emergency may require reducing water usage, so you should identify curtailment measures in advance. Possible measures include restrictions on landscape watering, car washing, filling of swimming pools and hot tubs, and other nonessential activities such as cleaning driveways and sidewalks. There can be various combinations of voluntary and mandatory measures. The water system should develop and formally adopt measures through ordinance, resolution, or by-laws.

As part of this effort, consider ways to inform customers about the need to curtail water use. Examples include door-to-door postings, phone contact, posting of signs in visible community areas, and contacting the news media. Curtailment messages should be pre-scripted to ensure proper messages are delivered.

Example: Curtailing water use

Water curtailment measures	Actions
Restrict outside water usage including watering lawns, washing cars, etc. Request curtailment of inside usage.	• Upon making the decision that curtailment is needed: • Draft door hanger with curtailment messages. • Post on customer doors. • Contact KYGO AM news to announce curtailment message. • Monitor system usage and spot check meter usage if time is available. • Continue message as long as curtailment is warranted.

Section 13.
Returning to Normal Operation

As the emergency passes and you regain control, the system must prepare to return to normal operating condition. This may be a very simple or very complex process, depending on the type and severity of the emergency. Returning to normal operation may simply mean the system restores power and the back-up generator is disconnected. Or it could mean the system has to obtain the proper number of satisfactory coliform tests and disinfect the system in order to lift a health advisory.

Many factors might need to be considered before you decide to return to normal operation. For example:

- Has the system been repaired to the point that it can meet demand?
- Has the system operator made a safety and operational inspection of all system components?
- Has the system been properly flushed, disinfected and pressure tested?
- Has the water been adequately tested in accordance with sampling regulations?
- Does the water meet standards?
- Is there adequate staff to operate and manage the system?
- Do federal, state, and local agencies support returning to normal operation?
- Have you developed the proper public messages?

The emergency response plan should include a discussion of the follow-up actions and staff responsibilities that the system must take before returning to normal operation.

Example: Returning to normal operations

Action	Description and actions
Inspect, flush, and disinfect the system,	Water system operator and support staff inspect all system facilities, ensure all water quality tests have been done and the system has been flushed and disinfected if necessary. Water system operator makes a report to the water system manager. Water system manager makes decision on current condition of system.
Verification of water quality	Water system manager verifies water quality sampling results.
Coordinate with DOH	Water system manager coordinates with DOH on system condition and water quality results.
Notify customers	Water system manager meets with water system operator and communications lead to write notice to customers. Water system manager directs communications lead to distribute public notice.

Section 14.
Training and Rehearsals

Training

Emergency response training is essential. Training educates system personnel about emergency situations and resulting effects on water systems and also provides an opportunity to practice responses. Any training should have a purpose, appropriately selected personnel, and qualified instruction and supporting materials.

Training can be conducted in a variety of ways, including attending training classes or bringing in experienced trainers for on-site training and exercises. On-site exercises with experienced trainers are very useful, as they involve activities that are specific to the water system. Personnel can practice emergency communications, isolating parts of the system, inspecting system components, and learning what to look for in case of a security breach. It is also important to train staff on risk communications or how to communicate with the media and customers during an emergency.

When planning training, consider the system's size, the type and complexity of its components, staff needs, and operational needs. Periodic training reinforces previous efforts, as people often forget things that they don't use very often. It also provides an opportunity to train new staff and learn about new problems, new techniques, and changes in equipment. Be aware of current and upcoming training topics, especially hot topics that tend to come around as a result of a specific event.

Example: Training

Identify staff position training needs and expectations.

Position	Training needs and expectations
Water System Manager	Emergency response communications, emergency response planning, issuing health advisories
Water System Operator	Emergency response communications, emergency response planning, suspicious activity training
Field support	Emergency response communications, suspicious activity training
Administrative Support	Emergency response communications, emergency response planning,

Emergency rehearsals

Emergency rehearsals, sometimes referred to as "table-top exercises" are valuable tools to make sure employees are always prepared to respond. Ideally, rehearsals are set up by the

water system manager and are unannounced to employees. During these rehearsals, employees are required to conduct actual responses. They make phone or radio calls, perform inspections, respond to inquires, and do other tasks. Get assistance from partners such as local health jurisdictions and local emergency response people.

Practicing for an emergency is the only real way to thoroughly evaluate the emergency response plan and the system's ability to implement it. The final step of a rehearsal is to evaluate and discuss the results. Conduct a staff meeting to go over the results and get input from those involved in the rehearsal. Then make modifications or set up training to be better prepared.

Example: Emergency rehearsals

Schedule for drills, tabletop exercises, and other ways to practice emergency response:

Event	Description	People and organizations involved	Date
Rehearsal	Conduct actual emergency drill	Water system staff	Unannounced
On-site training drills	Conduct specific drills, i.e, communications, water line breaks, sampling with a professional trainer	Water system staff and professional trainer	May 2003

Section 15.
Plan Approval

Representatives of the water system who are ultimately responsible, such as water system manager, owner, board members, commissioners and council members, should review, approve, and sign the emergency response plan. This demonstrates support for the plan, acknowledges the effort put into its preparation, and puts it officially into effect.

Be sure to secure and protect the emergency response plan as it may contain sensitive information about facilities and response activities that you may not want others to know in order to safeguard the water system.

Example: Plan approval

This plan is officially in effect when reviewed, approved, and signed by the following people:

Name/Title	Signature	Date
Marsha Ready Water System Manager	*Marsha Ready*	March 1, 2003
Bob Jones Chairman Water Commissioners	*Bob Jones*	March 1, 2003

Part 2: Planning Template

Introduction

Preparing an emergency response plan is an essential part of managing a drinking water system. The Department of Health (DOH) has made this template available to all public water systems in the state to help them develop such plans.

How to use the template

The template follows the outline in Part 1 of this document. Part 1 discusses key components of emergency planning and provides examples of how you might present information in your plan. Use Part 1 as a tool to learn about emergency planning and then fill out the template provided here as you go through your planning process.

The template is just a guide; you may modify it in any way that works for you – add sections, take them out, or rearrange them if you wish. You may also use a completely different format for your plan if you find one that works better for your system.

An electronic copy of the template is available, and allows you to easily fill in the blanks using a computer if you wish. To obtain the template you can visit the DOH Division of Drinking Water web site at http://www.doh.wa.gov/ehp/dw/Security/Publications.htm

Section 1.
Emergency Response Mission and Goals

Use the mission statement and goals to help focus emergency planning and response.

Emergency response mission and goals

Mission statement for emergency response	
Goal 1	
Goal 2	
Goal 3	
Goal 4	

Section 2.
System Information

Keep this basic information readily available for when you need it for emergency responders, repair people, and the news media.

System information

System identification number		
System name and address		
Directions to the system		
Basic description and location of system facilities		
Location/Town		
Population served and service connections from Division of Drinking Water records.	_____ people	_____ connections
System owner (the owner should be listed as a person's name)		
Name, title, and phone number of person responsible for maintaining and implementing the emergency plan.		_____ Phone _____ Cell _____ Pager

Section 3.
Chain of Command – Lines of Authority

The first response step in any emergency is to inform the person at the top of this list, who is responsible for managing the emergency and making key decisions.

Chain of command – lines of authority

Name and title	Responsibilities during an emergency	Contact numbers

Section 4.
Events that Cause Emergencies

The events listed below may cause water system emergencies. They are arranged from highest to lowest probable risk.

Events that cause emergencies

Type of event	Probability or risk (High-Med-Low)	Comments

Section 5.
Severity of Emergencies

Decisions on severity should be collaborative among system personnel, but are ultimately made by the person in charge of the emergency. The information for making such a decision will accumulate over time, and may result in changes in the assessment of severity.

Communicate each assessment of severity immediately to all those dealing with the emergency. Make sure staff have cell phones, pagers, or radios when they are in the field.

Level I – _____ (Definition)

Description:

Level II – _____ (Definition)

Description:

Level III – _____ (Definition)

Description:

Level IV – _____ (Definition)

Description:

Section 6.
Emergency Notification

Notification call-up lists

Use these lists to notifying important parties during of an emergency.

Local notification list

Local Law Enforcement day	Local Law Enforcement night
Fire Dept day	Fire Dept night
Ambulance service day	Ambulance service night
Local Health Jurisdiction day	Local Health Jurisdiction after hours
Water Testing Laboratory day	Water Testing Laboratory after hours
Local emergency management day	Local emergency management after hours
Water System Operator day	Water System Operator night
Neighboring Water System day	Neighboring Water System night
Neighboring Water System day	Neighboring Water System night
News Media Contact	Local Radio Station
Other	Other

State notification list

State Police day	State Police night
Division of Drinking Water Regional Office day	Division of Drinking Water after hours
State testing laboratory day	▪ State testing laboratory after hours
Other	Other

Service/repair notification list

Electrician day	Electrician night
Electric Utility day	Electric Utility night
Plumber day	Plumber night
Pump Specialist day	Pump Specialist night
Soil Excavator day	Soil Excavator night
Equipment Rental day	Equipment Rental night
Other	Other
Other	Other

Notification procedures

Notifying water system customers

Who is Responsible:	
Procedures:	

Alerting local law enforcement, state drinking water officials, and local health

Who is Responsible:	
Procedures:	

Contacting service and repair contractors

Who is Responsible:	
Procedures:	

Contact neighboring water systems, if necessary

Who is Responsible:	
Procedures:	

Procedures for issuing a health advisory

Who is Responsible:	
Procedures:	

Other procedures, as necessary

Who is Responsible:	
Procedures:	

Section 7.
Water Quality Sampling

If contamination is suspected, notify and work with the local health jurisdiction and State DOH, Division of Drinking Water (DDW) regional office to help identify what testing should be done. This may help prevent illness or even death.

Water quality sampling

Sampling parameter	Do we have procedures? Yes/No	Basic steps to conduct sampling (sites, frequency, procedures, lab requirements, lab locations, contacts, etc.)
Coliform Bacteria		
Hetertrophic Plate Count (HPC)		
Chlorine Residual		
Chlorine Demand		
Nitrate/Nitrite		
Total Organic Carbon (TOC)		
Total Halogenated Organic Carbon (TOX)		
Cyanide		

Section 8.
Effective Communication

Communication with customers, the news media, and the general public is a critical part of emergency response.

Designated public spokesperson

Designate a spokesperson (and alternates) for delivering messages to the news media and the public (see Section 6 for news media contacts in local notification list).

Designate a spokesperson and alternates

Spokesperson	Alternate 1	Alternate 2

Key messages

Develop possible messages in advance, and update them as the emergency develops:

-
-
-
-
-
-

Health advisories

During events when water quality and human health are in question, it may be necessary to issue a health advisory that gives advice or recommendations to water system customers on how to protect their health when drinking water is considered unsafe. These advisories are issued when the health risks to the consumers are sufficient, in the estimation of the water system or state or local health officials, to warrant such advice.

Health advisories usually take the form of a drinking water warning or boil water advisory. Communication during these times is critical. Health advisories should always be well thought out and provide very clear messages.

The Division of Drinking Water has put together a number of tools, including fact sheets, brochures, forms, and templates to help prepare for a health advisory. These are on the Web at: http://www.doh.wa.gov/ehp/dw/Our_Main_Pages/purveyor_assist_2.htm

Section 9.
The Vulnerability Assessment

This is an evaluation of each water system component to identify weaknesses or deficiencies that may make them susceptible to damage or failure during an emergency. It also assesses facilities for security enhancements that may guard against unauthorized entry, vandalism, or terrorism.

Facility vulnerability assessment and improvements identification

System component	Description and condition	Vulnerability	Improvements or mitigating actions	Security improvements
Source				
Storage				
Treatment				
Pump-house and pumping facilities				
Computer and telemetry system				
Other consider-ations				

Section 10.
Response Actions for Specific Events

In any event there are a series of general steps to take:

1. Confirm and analyze the type and severity of the emergency.
2. Take immediate actions to save lives.
3. Take action to reduce injuries and system damage.
4. Make repairs based on priority demand.
5. Return the system to normal operation.

The following tables identify the assessment, set forth immediate response actions, define what notifications need to be made, and describe important follow-up actions.

A. Power outage

Assessment	
Immediate actions	
Notifications	
Follow-up actions	

B. Transmission or main break

Assessment	
Immediate actions	
Notifications	
Follow-up actions	

C. Distribution line break

Assessment	
Immediate actions	
Notifications	
Follow-up actions	

D. Chlorine treatment equipment failure

Assessment	
Immediate actions	
Notifications	
Follow-up actions	

E. Treatment equipment

Assessment	
Immediate actions	
Notifications	
Follow-up actions	

F. Source pump failure

Assessment	
Immediate actions	
Notifications	
Follow-up actions	

G. Microbial (coliform, E. coli) contamination

Assessment	
Immediate actions	
Notifications	
Follow-up actions	

H. Chemical contamination

Assessment	
Immediate actions	
Notifications	
Follow-up actions	

I. Vandalism or terrorist attack

Assessment	
Immediate actions	
Notifications	
Follow-up actions	

J. Reduction or loss of water in the well

Assessment	
Immediate actions	
Notifications	
Follow-up actions	

K. Drought

Assessment	
Immediate actions	
Notifications	
Follow-up actions	

L. Flood

Assessment	
Immediate actions	
Notifications	
Follow-up actions	

M. Earthquake

Assessment	
Immediate actions	
Notifications	
Follow-up actions	

N. Hazardous materials spill in vicinity of sources or system lines

Assessment	
Immediate actions	
Notifications	
Follow-up actions	

O. Electronic equipment failure

Assessment	
Immediate actions	
Notifications	
Follow-up actions	

P. Cyber attack

Assessment	
Immediate actions	
Notifications	
Follow-up actions	

Q. Other

Assessment	
Immediate actions	
Notifications	
Follow-up actions	

Section 11.
Alternative Water Sources

Intertie to adjacent water supply system

Water systems within one-quarter mile of our system	Feasibility of connecting

Alternate source(s) of water

Alternative sources	Names	Phone	Availability	Is the water safe for drinking?

Section 12.
Curtailing Water Usage

Curtailing water use

Water curtailment measures	Actions

Section 13.
Returning to Normal Operation

Returning to normal operations

Action	Description and actions

Section 14.
Training and Rehearsals

Training

Identify staff position training needs and expectations.

Position	Training needs and expectations
Water System Manager	
Water System Manager	
Field support	
Administrative Support	

Emergency rehearsals

Schedule for drills, tabletop exercises, and other ways to practice emergency response:

Event	Description	People and organizations involved	Date

Section 15.
Plan Approval

Plan approval

This plan is officially in effect when reviewed, approved, and signed by the following people:

Name/Title	Signature	Date

CHAPTER 6

OPERATION & MAINTENANCE PROGRAM

INTRODUCTION

The objective of this chapter is to provide an evaluation of North Beach Water District's (NBWD's) operation and maintenance (O&M) program and its ability to assure satisfactory management of the water system operations in accordance with WAC 246-290. NBWD's Operation and Maintenance Manual and specific component related documentation are maintained by NBWD for use by operations personnel.

The O&M Program includes the following elements:

- Water System Management and Personnel
- Operator Certification
- System Operation and Control
- Water Quality Monitoring
- Preventive Maintenance
- Emergency Response Program
- Cross-Connection Control Program
- Customer Complaint Response Program
- O&M Improvements

WATER SYSTEM MANAGEMENT AND PERSONNEL

NBWD's water system is managed and operated by NBWD staff under general direction of the NBWD Board of Commissioners. Mr. Bill Neal is NBWD General Manager, Mr. Jack McCarty is the NBWD Office Manager, Ms. Lisa Larcom is the NBWD Billing Clerk, Mr. Bob Hunt is the NBWD Field Supervisor, and Mr. Dennis Schweizer is the NBWD Treatment Plant Operator.

OPERATOR CERTIFICATION

Department of Health (DOH) requires all Group A water systems to have at least one certified Water Distribution Manager (WDM) under WAC 246-292-050. The WDM must further be certified at a level equal to or higher than the water system's classification rating as described in Table 6-1 and in accordance with WAC 246-292-040.

TABLE 6-1

Water System Group Classification

Classification	Population Served
Group 1	Less than 1,500
Group 2	1,501 to 15,000
Group 3	15,501 to 50,000
Group 4	Greater than 50,000

NBWD serves between 1,501 and 15,000 people on a full-time basis, and, therefore, is required to have a WDM Level 2. NBWD operates two water treatment facilities, rated by DOH as requiring a Water Treatment Plant Operator 2 (WTPO 2) in charge of the water treatment facility. Additionally, NBWD is required to have a Cross-Connection Control (CCC) Program and must ensure that a Cross-Connection Specialist (CCS) is responsible for overseeing the program and for periodic inspections of premises for cross-connections. Finally, NBWD must ensure that a Backflow Assembly Tester (BAT) is responsible for inspecting, testing, and monitoring backflow prevention assemblies in accordance with WAC 246-290-490. NBWD can have a CCS on staff or have an outside CCS specialist review their CCC program. NBWD can also have a BAT on staff to perform the backflow assembly tests or can allow the customers to have their device tested by an approved BAT. Table 6-2 provides a list of NBWD personnel, positions and certifications.

TABLE 6-2

NBWD Water System Personnel Certifications

Staff	Position	Operator No.	Certifications
Bill Neal	General Manager	012803	WDM 2, WTPO 1, CCS
Robert Hunt	Field Supervisor	011725	WDM 2 WTPO 2
Dennis Schweizer	Treatment Plant Operator	012695	WDM 2 WTPO 2
Jonathan Fleming	Water Service Worker I	013551	WDM 1
Joshua Maxey	Water Service Worker I		

PROFESSIONAL GROWTH REQUIREMENTS

In order to promote and maintain expertise for the various grades of operator certification, Washington State regulations require all certified operators meet professional growth requirements by completing no less than three continuing education units (CEUs) every three years. Programs sponsored by both Washington Environmental Training Resource

Center (WETRC) and the American Water Works Association (AWWA) Pacific Northwest Subsection are the most popular sources of CEUs for certified operators in Washington State. The professional growth requirement may also be met by advancement, by examination, or by certification in a different classification.

The NBWD General Manager monitors the status of staff CEUs and assures that resources to obtain training are provided by NBWD as necessary to maintain these credits.

SYSTEM OPERATION AND CONTROL

MAJOR SYSTEM COMPONENTS

The locations of the major system components are shown on Figure 1-11, the system facilities map. System facilities are described in Chapter 1 of this Plan under the heading Inventory of Existing Facilities. A description of the normal operation of each facility is given in the following sections.

Sources of Supply

Water from the North Wellfield (NWF) is pumped by the individual well pumps through the NWF treatment system and into the NWF Reservoirs. Similarly, water from the South Wellfield (SWF) is pumped by the individual well pumps through the SWF treatment system and into the SWF Reservoirs. Historically, systems were in place to turn the wells on and off based on water levels in the reservoirs. However, those systems are no longer functioning and for the past few years the wells have been operated manually. This has resulted in frequent overflows of the reservoirs and an unknown amount of water loss, which is thought to contribute significantly to Distribution System Leakage (DSL). NBWD is planning to replace the operational control system, which will remedy this problem.

Treatment

Water flows through the treatment systems when the well pumps are running. The aeration systems run when the well pumps run. As discussed in Chapter 1, the treatment system seems to provide adequate treatment with the ozonation system turned off, so NBWD is no longer running the ozonation systems at either wellfield site. Backwash of the filter units is triggered either by volume of water filtered or by elapsed time since the last backwash, whichever comes first. Backwash water is discharged to local infiltration areas where it is allowed to percolate into the ground.

Reservoirs

As described in Chapters 1 and 3, NBWD operates three reservoirs at the NWF site and one reservoir at the SWF site. These reservoirs are depicted in Figures 1-6 and 1-7. Capacity analysis of the reservoirs is provided in Table 3-9. Water from the wells is pumped to the reservoirs through the treatment systems. The water level in the reservoirs is monitored visually based on water level gages on the sides of the reservoirs. Wells are turned on and off manually based on water levels observed on the water level gages. As shown in Table 3-9, the NWF reservoirs are 45 feet tall, and the SWF reservoir is 40 feet tall. This is not enough elevation to provide the pressure required for water system operation, so water from the reservoirs is pumped into the water distribution system to maintain system pressure.

Pumping Facilities

In order to maintain adequate distribution system pressure, there are pumping stations located at both the NWF and the SWF sites. The pumping systems maintain output pressures of 60 psi. The NWF booster pump control system has not been operating properly, so NBWD staff have been turning booster pumps on and off manually. Pump station output pressure is controlled by a pressure reducing valve, so having unneeded pumps on does not create excessive system pressure. However, having an inadequate number of pumps on can result in low system pressure. Therefore, operations staff tend to leave unneeded pumps on rather than risk having an inadequate number of pumps on, which means that the NWF booster pump system uses more energy than is necessary to meet system demands. This also means that operations staff need to go by the pump station in early morning to turn on pumps prior to morning demand, and in late evening to turn off unneeded pumps, and it means that operation staff need to go by the pump stations regularly to check the pumps.

The SWF booster pump system output pressure is controlled by a Variable Frequency Drive (VFD) system, which adjusts the booster pump speed to control distribution system pressure. The system to turn pumps on and off at the SWF booster pump station is also not working properly, and, like the NWF booster pump system, booster pumps are turned on and off manually. When demand is low, the control system slows down the pumps, and when demand is high, the control system speeds up the pumps.

System Control

As discussed above, the control systems for the NWF and SWF facilities are not working properly, resulting in the need to turn wells and booster pumps on and off manually. This results in wasted water, wasted energy, additional staff time costs, and reduced system reliability. In addition, there is no centralized control system. Since both booster pump systems are controlled by output pressure, it is a problem getting both systems to run without one system overpowering the other. A centralized control system could be

designed to operate the booster pump systems as needed to meet varying system demand in different parts of the system at different times. In addition, a centralized control system could allow for centralized monitoring and alarm systems at a central location, so that system conditions and system alarms can be better monitored.

As described in Chapter 1, the NBWD water system is a merged composite of two separate systems. This is the major reason why there is currently no centralized control system. It is also a contributing factor as to why the existing control systems at the NWF and SWF facilities are not operating properly. Neither previous owners saw much need to invest in control systems that would soon be the responsibility of the future owner. However, now that the system is under unified and stable ownership, NBWD views improvements and consolidation of the control system as a high priority.

Distribution System

NBWD maintains more than 56 miles of pipeline, which interconnects the wells, storage, and pumping stations with consumer service connections. A list of total pipe by size is presented in Table 1-5. Figure 1-11 shows the location of all distribution pipelines and their size. The majority of the distribution piping system is made up of 2-inch pipe. Chapter 3 identifies water system hydraulic deficiencies. Most of the existing two-inch pipe is adequate for existing demands, but is not adequate for fire flow. There are no existing fire hydrants on two-inch water mains so this does not show as a deficiency in the hydraulic analysis. However, if fire hydrants are to be eventually installed at 900-foot intervals as required by WAC 246-293-640, then significant amounts of 2-inch water main will need to be replaced with larger mains.

Operation and maintenance of the water distribution system includes water quality sampling, water main flushing, valve exercising, and regular inspection and repair of water main leaks and breaks.

WATER QUALITY MONITORING

NBWD receives an annual report from DOH that indicates what water quality tests are required and when they are required. In addition, NBWD is required to prepare a Coliform Monitoring Plan (WAC 246-290-300 (3) (b)), and Inorganic Chemical Monitoring Plan (WAC 246-290-300 (4) (f)), and an Organic Chemical Monitoring Plan (WAC 246-290-300 (7) (e)). Copies of the monitoring requirements for 2014, and the coliform, inorganic chemical, and organic chemical monitoring plans are included in Appendix G. An analysis of NBWD's most current water quality test results can be found in Chapter 3. NBWD is also required to publish a Consumer Confidence Report (CCR) every year to provide customers with water quality data and system information. A copy of the most recent CCR can be found in Appendix H.

PREVENTIVE MAINTENANCE

The most cost-effective method for maintaining a water system is to provide a planned Preventive Maintenance (PM) program. A planned PM program can provide the optimum level of maintenance activities for the least maintenance cost. Typical tasks that are performed on a daily, monthly, or annual basis are listed below in Table 6-3.

TABLE 6-3

Preventive Maintenance Tasks

Preventive Maintenance Tasks and Frequency	
Daily • On-call 24 hours per day. • Respond to customer inquiries. • Respond to service requests. • Monitor distribution system chlorine residuals. • Monitor for leaks in the system. • Visit well sites to record meter readings and ensure proper operation of disinfection facility and wells. • Monitor water level in the reservoir. • Check chlorine level in feed tanks. Add chlorine if needed. • Check chlorine feed pump for proper operation. • Check chlorine residual in finished water. • Record production and backwash meter readings.	**Weekly** • Test and record finished water color. • Test and record finished water iron and manganese. • General cleaning and housekeeping. **Monthly** • Collect routine coliform samples. • Inspect reservoir hatches, vents, and screens. **Annual** • Inspect all backflow prevention devices. • Flush distribution system and repair leaks (more often as needed). • Inspect wellhead protection area for contaminant sources. • Inspect and exercise hydrants and valves. **Every 5 Years** • Clean reservoirs (as needed). • Check filter media.

Reservoirs

Improperly maintained reservoirs can cause contamination in public water systems. This can result from contaminants entering the reservoir through cracks or openings at the vent, overflow or drain screens. Deteriorating hatch covers and vandalism can also compromise reservoir water quality. Poorly designed and maintained reservoirs can hamper the emergency operation of a water system. If reservoir drains are not functioning properly, it may be difficult to purge a contaminant from the system. Written

documentation of reservoir maintenance must be completed with each inspection and repair, and a copy of the report retained on file.

All four of NBWD's reservoirs received interior inspections and cleaning in 2006 and it was determined no further action was necessary at that time.

One problem that can occur in reservoirs, particularly in tall narrow reservoirs such as the ones at NBWD, is stratification and stagnation of water. Stratification occurs when the water in the reservoir is warmer than the water entering the reservoir. Colder water is denser than warmer water, and sinks to and remains at the bottom of the reservoir until it exits the reservoir. Water above this cold layer can remain in the reservoir for months, losing chlorine residual and, potentially, growing bacteria. Then when a large water demand occurs that draws this water out of the reservoir, or when colder ambient temperature causes the water in the reservoir to cool to or below the temperature of the water entering the reservoir, bacteria can move into the distribution system, potentially resulting in coliform MCL violations. If this becomes a problem, the common remedy is reservoir mixing.

The NBWD reservoirs have separate inlets and outlets, with the inlets discharging to the reservoirs approximately half way up the sides of the reservoirs. This design may help to prevent water stratification. Also, if ambient temperatures never get high enough to raise water temperature in the reservoirs enough to cause stratification, or if the reservoir materials provide adequate insulation to prevent the temperature differential, then stratification may never occur and water stagnation in the reservoirs may not be a problem.

To determine if stratification and stagnation of water in the NBWD reservoirs is a problem, NBWD will consider conducting stratification studies on the reservoirs toward the middle to end of summer. A temperature profile can be obtained by lowering a temperature probe into each reservoir and recording the temperature at different depths. In addition, a chlorine residual profile can be obtained by lowering a tube into each reservoir and using a small pump to obtain chlorine samples at different reservoir levels. If these studies show reservoir stratification and/or water stagnation, options will be considered to create reservoir mixing.

Wells

Routine maintenance for the wells includes keeping records of water meter readings, discharge pressures, sounding of static and pumping water levels in each well, and keeping the well facilities clean. Water quality samples are taken at each well as required by DOH. Summaries of the total annual production of each wellfield, as well as peak daily production are maintained.

Distribution System Valves

Good preventive maintenance dictates that all valves be exercised regularly. An important aspect of distribution system valve maintenance and record keeping is to ensure that distribution valves are completely open. A partially closed valve can reduce peak day operation and fire flow. NBWD is currently developing and implementing a plan that exercises valves in the system on an annual basis. NBWD keeps records of valve maintenance.

Hydrants

Hydrants should be inspected regularly and repaired if necessary. It is important to maintain good records of hydrant maintenance. NBWD flushes and inspects fire hydrants annually. The following recommended procedure for testing fire hydrants has been adapted from the American Water Works Association (AWWA) (1989).

- Check appearance of hydrants for visible damage or leaks. Check for residue stains on the hydrant.
- Remove an outlet nozzle cap and sound for leakage.
- Check for presence of water or ice in the hydrant body with a plumb bob.
- Replace the outlet nozzle cap. Open the hydrant a few turns and allow air to vent. Tighten cap.
- Open the hydrant fully.
- Check for leakage at flanges and around outlet nozzles, packing, and seals.
- Partially close the hydrant so the drains open and water flows through under pressure for about 10 seconds, flushing the drain outlets.
- Close the hydrant completely.
- Remove an outlet nozzle cap and attach a fire hose or some other deflector.
- Open the hydrant and flush.
- Close the hydrant and check for operation of the drain valve.
- Check the main valve for leakage.
- Remove all outlet nozzle caps, clean and lubricate threads.
- Check chains and cables for free action.
- Replace caps and tighten.
- Check lubrication of operating nut threads.
- Locate and exercise auxiliary valve. Leave open.

Distribution System Flushing

Distribution system flushing is conducted on an annual basis. A plan is being developed and implemented to routinely flush designated areas to help reduce stagnant water, and

also to maintain proper system wide chlorination in the distribution system to prevent water quality problems.

Meters

Accurate water metering is an essential financial and conservation-oriented component of water system infrastructure. Without accurate source meter readings, NBWD cannot determine well pump performance or well output. Without service meters NBWD cannot bill equitably for water usage and cannot determine how much water production is leaking from the distribution system.

NBWD water distribution system is fully metered, per Water Use Efficiency Rule requirements. Tracking of total water sales and regular comparison to total water production is important to monitor the condition of the water distribution system. As water meters age, they tend to under-report usage. Low reading meters can result in lost revenue and artificial inflation of DSL rates. Typical water meter life is approximately ten years. Water meters can generally be replaced for less than the cost of testing and repairing water meters. Therefore, a water meter replacement program on approximately a ten year cycle will help to keep water sales data accurate.

Water Billing

Water billing software has two important functions: Creating water bills and tracking payments to support the operation of the water system, and regular tabulation of total volume of water sold, which by comparison with water produced, is an indicator of the condition of the water distribution system.

EMERGENCY RESPONSE PROGRAM

Water utilities have the responsibility to provide an adequate and reliable quantity and quality of water at all times. To meet this requirement, utilities must reduce or eliminate the effects of natural disasters, accidents, and intentional acts. Although it is not possible to anticipate all potential disasters affecting NBWD's water system, formulating procedures to manage and remedy common emergencies is appropriate.

NBWD will regularly review and practice its emergency response plan. An Emergency Response Planning Guide is available at the following web site:

https://fortress.wa.gov/doh/eh/dw/publications/publications.cfm?action=pubdetail&type=title&PubId=203&CFID=245767&CFTOKEN=36023621

Following is a summary of emergency response information and actions that may be required in typical emergency situations.

WATER SYSTEM PERSONNEL EMERGENCY CALL-UP LIST

Table 6-4 provides phone numbers for emergency contacts including response agencies, governments, and material suppliers.

TABLE 6-4

Water System Emergency Phone List

Agency/Group	Contact	Phone Number
Fire/Police		911
NBWD Business Office	Bill Neal, General Manager	Office: (360) 665-4144 Mobile: (360) 244-0068
	Jack McCarty, Office Manager	Office: (360) 665-4144
	Robert Hunt, Field Superintendent	Office: (360) 665-4144
Electrical	Public Utility District No. 2	(360) 642-3191
Telephone Service	Century Telephone	(800) 954-1211
Testing Lab	Columbia Analytical Services, Inc.	(360) 577-7222
Washington State Department of Health	SW Regional Office, Teresa Walker, P.E.	(360) 236-3030 (360) 236-3032
	24-Hour Emergencies	(877) 481-4901
Washington State Department of Ecology	Emergency Spill Response	(360) 407-6300
Pacific County	Emergency Management	(360) 875-9340
	Public Works	(360) 875-9368
	General Information	(360) 875-9300
	Planning Department	(360) 875-9356
	Road Maintenance	(800) 875-9380
State Wide One-Call	Utility Locates	(800) 424-5555
Gray & Osborne, Inc. Engineering Services	Olympia Number	(360) 292-7481
	Seattle Number	(206) 284-0860

EMERGENCY PROCEDURES

Bacterial Contamination of Water Supply

Bacterial contamination of the water supply can result from such items as main breaks, backflow events, or pollution from an isolated source. Any time coliform bacteria are detected in a water system sample, the DOH regional office should be notified as soon as possible. The contact number is listed in Table 6-4. WAC 246-290-320 (2) further specifies specific follow-up procedures in the event coliform bacteria are detected in the water system. Table 6-5 lists additional appropriate actions to be taken in the event of the contamination of the water supply.

TABLE 6-5

Water System Bacterial Contamination Response Actions

Distribution System Contamination
• Perform chemical and free chlorine residual analysis at various locations within the system, including the reservoirs and at system extremities.
• Disinfect distribution lines as dictated by the nature of the contamination.
Reservoir Contamination
• Isolate reservoir from system.
• Inspect vent screens, hatches, and piping to identify source of contamination.
• Resample to confirm contamination. Take multiple samples at different locations in Reservoir, if possible.
• Check distribution system for presence of contamination.
• If reservoir water is contaminated and, therefore, considered unsuitable for consumption, drain and clean reservoir.
• Disinfect reservoir if bacteriological standards are exceeded. Follow AWWA Standards. A 50-ppm chlorine solution in the reservoir can be obtained by adding 97 gallons of 5.25 percent chlorine bleach per 100,000 gallons of storage.

Inorganic Chemical/Physical Characteristics Exceedance

Inorganic Chemical/Physical Characteristics (IOC) samples are routinely collected from water supply sources, generally once every three years, unless monitoring waivers have been issued, or a higher frequency has been required. IOC tests include numerous different chemicals. If routine IOC samples detect one or more chemicals in excess of an MCL, additional samples may be collected specifically for that chemical if it reduces follow-up chemical testing costs. If practical, the source of supply that exceeds the IOC MCL should be taken out of service until the cause of the problem is identified and corrected. Follow-up procedures in the event of an Inorganic Chemical/Physical Characteristics MCL violation are specified in WAC 246-290-320 (3). Follow-up actions may vary depending on the specific chemical detected and the level at which it is detected. The DOH regional office should be contacted at the number listed in Table 6-4 to coordinate follow-up sampling and appropriate responses.

Organic Chemical VOC and SOC

Organic Chemical VOC and SOC samples are routinely taken from water supply sources, generally once every three years, unless monitoring waivers have been issued, or a higher frequency has been required. VOC and SOC tests include numerous different chemicals. VOCs and SOCs are generally not detected in water supply sources. Therefore, any detection of VOCs or SOCs may warrant follow-up investigation even if it does not

exceed an MCL. If routine VOC or SOC samples detect one or more chemicals, additional samples may be taken specifically for that chemical or possibly for a surrogate such as Total Organic Carbon if it reduces follow-up chemical testing costs. If practical, the source of supply from which the VOCs or SOCs have been detected should be taken out of service until the cause of the problem is identified and corrected. Follow-up procedures in the event of a VOC or SOC detection are specified in WAC 246-290-320 (6). Follow-up actions may vary depending on the specific chemical detected and the level at which it is detected. The DOH regional office should be contacted at the number listed in Table 6-4 to coordinate follow-up sampling and appropriate responses.

Power Failure

Various types of weather can cause a loss of power. These weather conditions include wind, lightning, freezing rain, or snowstorm. Commonly trees or tree branches fall on power lines due to wind, freezing rain or snow, causing power disruptions. Downed trees can also make it difficult to access the location of the power outage to implement repairs. Additionally, power can be lost through traffic accidents.

In the event of a power outage, NBWD staff will first check reservoir levels visually. The possible length of the power outage will be estimated and customers will be notified of the emergency and water conservation will be requested through radio, television, and newspaper and, if needed and available, through a police loudspeaker system.

NBWD has four diesel powered generators with a combined total capacity 480 kW. Automatic transfer switches automatically start the generators on power failure. These generators are adequate to power all facilities at both wellfields.

Severe Earthquake

A severe earthquake can result in distribution system breaks and structural damage to the wells and reservoirs. Table 6-6 provides procedures to follow in the event of a severe earthquake. A severe earthquake can also cause a power failure. See Power Failure, above.

Note: In the event of a large earthquake along the Pacific coast there is a possibility of a resultant tsunami. The possibility of a tsunami should be taken into consideration when determining appropriate follow-up action immediately following a large earthquake. See section on tsunami later in this chapter.

TABLE 6-6

Severe Earthquake Response Actions

System Component	Proposed Actions
Reservoir	• Observe reservoir for visual signs of structural damage. • If structural damage is apparent, drain reservoir and inspect the interior, exterior, and roof of the reservoir. • If leakage is suspected, isolate reservoir and monitor water level.
Distribution Lines	• Close valves to isolate breaks. • Check reservoir level. • Notify water customers of emergency and request water conservation.
Wells	• Inspect wells and treatment for operation. • Inspect well seals to prevent contamination from entering the wellhead. • Inspect for alignment of pump column and casing.
Note:	• In the event of a large earthquake along the Pacific coast, there is a possibility of a resultant tsunami. The possibility of a tsunami should be taken into consideration when determining appropriate follow-up action immediately following a large earthquake. See section on tsunami later in this chapter.

High Wind

High wind can cause downed trees and tree limbs. These, in turn, can block roads and cause power outages. Chain saw, cable, and winch may be necessary to clear downed trees to access facilities. See section on Power Failure, above.

Cold Weather Conditions/Severe Snow Storm

Extended cold weather conditions could cause freezing problems at shallow service connections, valve vaults without an insulating earth cover, reservoirs, and water supply and treatment facilities. Heavy snowfall may impede employees from reaching a problem area and can cause collapse of structures. Water supply should not be interrupted because flowing water is used to prevent pipes from freezing. Heavy snow and/or freezing rain can cause power outages. Commonly, trees or tree branches fall on power lines due to wind, freezing rain or snow, causing power disruptions. Downed trees can also make it difficult to access the location of the power outage to implement repairs. See Power Failure, above. Table 6-7 addresses the possible emergency events and response actions that will be taken in the event of a severe snowstorm.

TABLE 6-7

Severe Freezing/Snowstorm Response Actions

System Component	Proposed Actions
Facilities Access	• Have chains and snow gear ready for maintenance equipment and vehicles. • Contact Pacific County Public Works to expedite plowing to any problem area. • Heavy snow and/or freezing rain can cause downed trees and tree branches, blocking access to some areas. Chain saw, cable, and winch may be necessary to clear downed trees to access facilities.
Reservoir	• Clear snow from roads and walkways. • Clear ice from level gauges, overflows, and vents.
Distribution Lines	• Maintain mapping of valve locations to locate valves as needed. • Frozen lines can be wrapped with heat tape.
Wells	• Clear snow from well access roads. • Inspect wells and treatment for operation. • Install space heater at wells as necessary.

High Water and Flooding

Heavy rains and/or snowmelt can cause the water levels to rise and reach a flood level. Table 6-8 addresses the possible emergency events and response actions that will be taken in the event of high water or flooding. The NBWD area is in the Pacific County Flood Control District #1 which provides flood control facilities including ocean outfalls, surface drains, and pipes that control surface water during the heavy winter storms. Generally, flooding is confined locally as the groundwater level rises above ground level. Onsite septic systems may become flooded and non-operative. Flooded systems could become sources of contamination in the distribution system. If flooding overtops wells, wells should be considered contaminated until sampling indicates acceptable water quality.

TABLE 6-8

High Water/Flooding Emergency Response Actions

System Component	Proposed Actions
Reservoir	• No action should be required as reservoirs are above flood level.
Distribution Lines	• Test for coliform bacteria.
Wells	• Inspect wells and treatment for operation. • Test for coliform bacteria.

Tsunami

The North Beach area is vulnerable to tsunami (tidal wave). A tsunami could be caused by a large earthquake felt locally, or could be caused by a large earthquake at a distant location such as Japan. For tsunamis generated by distant events, a tsunami early warning system is in place. For locally generated tsunamis there may not be time for an early warning system to provide notification. The primary defense against a tsunami is to move to high ground. In the event of a major earthquake all people should move to high ground until the threat of a tsunami has passed.

Damage caused by a tsunami can include flooding of facilities and washing away of structures and water mains. Wells in areas that have been inundated should be considered contaminated until they can be cleaned, disinfected and tested. If storage reservoirs are not over-topped or damaged, water in the reservoirs can most likely be considered safe. If a tsunami were to flood the NBWD wellfields, then the water booster pump systems would most likely be inundated, and would require major repairs to be placed back in service. It is also possible that a tsunami could damage power supply to the entire North Beach Peninsula, so that only emergency power supplies, such as the North Beach backup power generators, may be available. Water from the NBWD reservoirs could be supplied to local residents in need of safe water supply from the piping at the wellfield control buildings. It would be important to maintain the safe supply of water in the NBWD reservoirs until water supply can be restored. Therefore, valves at the reservoir site should be closed as necessary to prevent loss of water from the reservoirs.

CROSS-CONNECTION CONTROL PROGRAM

WAC 246-290-490 (3) establishes the minimum requirements for a cross connection control program. The regulation identifies ten elements that must be addressed in a cross connection control program. These elements are further detailed in the DOH Publication *Guidance Document: Cross-Connection Control for Small Water Systems, March 2004.* These elements are summarized as follows:

1. Instrument of Legal Authority to Implement Program
2. Procedures and Schedules for Evaluating Service Connections
3. Procedures and Schedules for Eliminating and Controlling Cross-Connections
4. Qualified Personnel to Implement Program
5. Ensure that Approved Backflow Preventers Are Operating Correctly
6. Ensure that Backflow Preventers Are Tested Properly
7. Procedures for Responding to Backflow Incidents
8. Consumer Education
9. Cross-Connection Control Record Keeping
10. Additional Requirements if Reclaimed Water Is Used

NBWD Rules and Regulations Part 1.01.100, revised September 16, 2013, state that cross connections are prohibited, identifies authority of NBWD to enforce their cross connection control rules and requires backflow prevention where cross connections cannot be eliminated. A copy of NBWD Rules and Regulations are included in Appendix D. NBWD has also prepared a draft Cross Connection Control Program, which has not yet been adopted by the NBWD Board. Copies of the draft NBWD Cross Connection Control Program are included in Appendix I. The ten required elements of a cross connection control program summarized above are addressed in the draft NBWD Cross Connection Control Program.

PRIORITY SERVICE LIST

There are three categories of business establishments that may pose a hazard to the water system.

Category One Services

Category one services pose the highest degree of hazard and includes the following facilities:

- Printers
- Medical laboratories
- Chemical companies
- Radiator shops
- Battery, fertilizer, and paint manufacturers
- Pest control businesses
- Janitorial companies

Category Two Services

Category two services are considered less hazardous and include the following:

- Doctor, dentist, and veterinarians' offices
- Blood banks
- Drug rehabilitation centers
- Car washes
- Photo labs
- Commercial laundries
- Nursing homes and hospitals

Category Three Services

The least hazardous service category includes the following types of businesses:

- Food processing facilities
- Dairy establishments
- Beverage and candy manufacturers
- Massage and health spas
- Motels and schools with pool, spa, or sauna facilities

NEW AND EXISTING CROSS-CONNECTION DEVICES

NBWD currently has sixteen cross-connection control devices located within the water system. They are located at the following services:

- Ocean Park School
- Free By the Sea
- Port of Peninsula
- Golden Sands
- Queen Fisheries
- Wiegardt Brothers Inc.
- Coast Seafood Company
- Ocean Aire Trailer Park
- Loomis Lake State Park
- Pacific Pines
- Taylor Resources
- Department of Fisheries
- Peninsula Senior Center
- Sunset View Resort [Fire Flow]
- OB School District 101 [Fire Flow]
- Gary McGrew [Residential]

CUSTOMER COMPLAINT RESPONSE

NBWD rarely receives complaints about water service, but when complaints are received, they are taken seriously. Complaints are logged in at the NBWD office and a water system operator is sent to investigate the complaint. Depending on the findings of the

complaint investigator, appropriate actions are taken to resolve the complaint. If a customer feels that their complaint is not being addressed properly, all customers of the water system have access to NBWD Board at regularly scheduled meetings to be heard regarding their concerns/complaints.

O&M IMPROVEMENTS

This section reviews operations and maintenance activities, schedules and needs as identified in the first part of this chapter and identifies possible operations or system changes that could improve or streamline operations.

WATER SYSTEM MANAGEMENT AND PERSONNEL

The scope of this Plan does not include a comprehensive evaluation of the staffing needs and adequacy of staffing. Due to complications in merging two separate water systems, problems with control systems at both wellfields, and lack of a centralized control system for the whole system, staff are at times kept busy with manual operation of source, treatment and pumping facilities. Installation of a new, centralized monitoring and control system will reduce requirements for staff to manually operate facilities and focus more on other aspects of system operation, maintenance, and improvements. NBWD Board have been supportive of assuring that adequate staff is provided to accomplish the system operations requirements. NBWD management will continue to monitor staff requirements and adjust staffing levels as needed to assure adequate staffing.

NBWD would like to develop in-house capabilities to complete water main replacement and water main extension projects. Water main construction generally requires a three to four person crew, including a backhoe operator, and equipment including a backhoe for digging and filling trenches and for helping to lift sections of pipe, a dump truck for hauling unsuitable excavation material away and for hauling suitable fill material to the site, and a flat bed trailer for hauling sections of pipe and fittings from stock areas to the construction site. Additional construction crew may also be needed at times for traffic control.

SYSTEM OPERATION AND CONTROL

The existing operations and control systems for both wellfields are in disrepair and need to be rehabilitated and/or replaced. NBWD intends to rehabilitate existing control systems and/or install new control systems at both wellfields, and install a new centralized monitoring and control system at the NBWD business office within the next year.

WATER QUALITY MONITORING

No deficiencies in water quality monitoring have been identified.

PREVENTIVE MAINTENANCE

No deficiencies in Preventative Maintenance have been identified.

EMERGENCY RESPONSE PROGRAM

No deficiencies in Emergency Response Program have been identified.

CROSS-CONNECTION CONTROL PROGRAM

NBWD needs to complete and adopt a cross connection control program. It is also advisable that NBWD staff obtain a BAT certification to improve internal control over the program.

CUSTOMER COMPLAINT RESPONSE PROGRAM

No deficiencies in the Customer Complaint Response Program have been identified.

SUMMARY OF O&M IMPROVEMENTS

- NBWD may need to increase staff as operational demands increase; however, installation of improved automated control at both wellfields and centralized monitoring and control at the NBWD office may alleviate need for additional staff.

- It would be beneficial to have NBWD staff with BAT certifications.

- NBWD may need to increase staff to complete more water main projects in house.