Guidance Document

Water Shortage Response Plans

For Small Public Drinking Water Systems

October 2008
Revised

DOH PUB. #331-316

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Introduction: Protecting Public Health

Safe and reliable drinking water is vital to every community. Being prepared and knowing how to respond to a water shortage is an essential part of managing a drinking water system.

Most public water systems have experienced routine types of water shortages such as those caused by pipe breaks, pump malfunctions, and power outages. These types of shortages are typically manageable. More serious water shortages result from drought, earthquakes, or storm events that directly affect the water source. These can drastically affect the water system and the community that depends on it.

Water shortage response planning is a process water systems can use to identify events that could cause water shortages and specific actions to reduce customer demand. A good water shortage response plan can help systems minimize water shortages, or avoid them altogether. However, a water shortage plan is only for use during unusual events. It is not a substitute for good water supply development and sound conservation programs.

The Requirement for a Water Shortage Response Plan

If a public water system in Washington experiences a water shortage, or anticipates experiencing one in the next six years, state rule (WAC 246-290-100(4)(d)(v)) requires it to prepare a water shortage response plan as part of a water system plan. This guidance document can help water systems meet this requirement, although other methods or formats also are acceptable.

In addition, drought-related financial assistance programs sometimes require water systems to have a water shortage response plan to qualify for funding.

Any water system can use this guidance document. However, it is primarily for small water systems *not* required to complete a water shortage response plan to use when preparing to address potential water shortage events or seeking financial assistance for drought-related projects.

How to Use this Guidance Document

Developing a water shortage response plan takes time and effort. This guidance document can make the job easier and help create a detailed plan for responding to a water shortage. Each water system can modify it to meet specific needs. Smaller water systems should consider each section and use what is relevant for the type, size and complexity of their facility.

This guidance document can be used independently, but it is designed for use with the Department of Health Office of Drinking Water's (ODW) **Emergency Response Planning Guide for Public Drinking Water Systems (331-211)***.

This guidance document has two parts:

Part 1 discusses important water shortage response planning elements and provides instructions and examples to help complete Part 2. You can also use Part 1 as an educational tool to help water system staff understand the key components needed for a well thought-out plan.

Part 2 is a template for creating your own plan. You may use the template in its original form or modify it to meet your system's needs. An electronic copy of this guidance document, including templates allowing you to fill in the blanks with a computer, is on the ODW Web site. (See **Water Shortage Response Plans for Small Public Drinking Water Systems (331-316).**) *

Do *not* submit your plan to ODW unless it is requested. ODW may request the plan as part of a water system plan or a funding requirement.

Be sure to store your plan in a safe and secure location. ODW recommends you store one copy on-site and another off-site to ensure it is available if you are unable to access your offices or facilities.

* You can get a copy of this and other ODW publications by calling (800) 521-0323 or visiting the Web site at http://www4.doh.wa.gov/dw/publications/publications.cfm

Section 1.
Events that Cause Water Shortages

Water shortages occur for a variety of reasons, including:

- Natural disasters
- Extreme customer usage
- Equipment failures
- Leakage
- Shallow wells or inadequate source water

Each type of event causes different situations, including complete service disruption, low pressure, air or sediments in the supply or backflow contamination. You should evaluate a variety of events and the ways they could affect your water system and its infrastructure. Remember, a water shortage may affect the entire water system or only isolated sections. Include these evaluations in your water shortage response plan along with procedures for responding to specific events.

What can cause a water shortage?

Consider common natural disasters and other factors when developing a water shortage response plan, including:

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 can lead to water shortages. A combination of environmental factors affects drought severity. These factors change over time and include rainfall, temperature, snow pack and length of drought. Compared to other natural disasters, drought has a relatively slow onset and is easier to anticipate. However, drought-related problems can be the most difficult to resolve because they typically involve a shortage in the actual water supply.

Valley of the Horses Water System

Background: Small water system constructed in the early '70s serving 22 households with about 90 individuals. Community faces imminent health concerns resulting from system reliability issues related to drought conditions.

Difficult issues: Demand exceeds supply and the system experiences outages. Storage tank is only 12,000 gallons and has served its useful life. Wells under produce, or quit producing altogether, in spring, summer and fall. Backflow created during outages results in severe public health risks.

What is needed? Construct a new larger reservoir, deepen and rejuvenate existing wells, or develop new sources. Acquire funding for the improvements. Develop a water conservation and water shortage response plan.

Cost: $90,000 to construct new reservoir and rejuvenate wells.

Water Rates: Rates increased from $22 to $45 a month.

Earthquakes: The shaking and settling of the ground, as the earth shifts along geologic faults, 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 earthquakes can and do happen.

High Winds: Pacific Northwest storms often generate winds in excess of 50 miles an hour and have exceeded sustained hurricane-force winds of 74 miles an hour or more. These storms often disrupt power and damage water system facilities, creating a disruption in the supply.

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.

Equipment Failure: Drinking water systems must continuously evaluate facilities and replace them before a water shortages or failure occurs. For example, aging well pumps may cause an emergency water shortage if they need replacement, go without attention so long that they fail, or run low on water due to drought.

Construction Accidents: A utility must be aware of construction in and around the water system and be prepared to respond quickly if an accident occurs. For example, if a contractor damages a water line, the water system may need to be shut down for repair. If the response is not timely and effective, this kind of incident could turn into a serious water outage. The water system may lose pressure, resulting in serious backflow incidents that contaminate the water. The response may include asking customers to curtail water use until repairs are made.

Chattaroy Springs West Water System

Background: Small water system with a 10-gpm spring source serving a 37-lot rural subdivision in northeast Spokane County. For 5 years in a row, the system has experienced water supply problems because of drought conditions. Customers have used up to 1,000 gallons per day per connection.

Difficult issues: Current spring source deteriorating with supply dropping to 7 gpm in the summer. New wells difficult to find. Water shortages typical in the summer. System has had to truck in water to supply basic needs. System's operator did not want to continue operating the system. Water conservation program needed.

Actions taken: Drilled several dry wells to find additional water – no luck. Asked Stevens PUD to acquire the system. Stevens PUD agreed to take over the system and intertie it with a neighboring water system.

Cost: Total project estimated to cost $475,000.

Water Rates: $61.07 a month plus overage. High cost due to the necessity to intertie with a neighboring system over a mile away and drill a second well for the neighboring system.

Define the Types of Events that May Affect the Water System

A water system may be vulnerable to various types of events that could cause a water shortage. Understanding and evaluating these vulnerabilities is an important part of preparing a water shortage response plan. Start by defining the events most likely to affect your water system. Next, consider the probability of them happening and then assign a risk of high, medium or low. Consider that some events cause an immediate water shortage, without notice, such as an earthquake or equipment failure. Other events can be anticipated, and planning may reduce or avoid the impact altogether, as in drought.

Design the response actions you develop in Section 7 to respond to these different types of events (See page 15). Immediate water shortages require immediate actions to fix the problem or bring in an alternative source. However, anticipating a drought may require water conservation activities to avoid a future water shortage.

Sample of Events that Cause Water Shortages at XYZ Water System

Event	Probability or Risk (High – Med – Low)	Immediate or Anticipated Event	Comments
Earthquake	High	Immediate	Had minor earthquake damages in February 2001. Needed to conserve water for 5 days, as 1 line cracked from source.
Drought	High	Anticipate	Need to plan for decrease in well or source yield during dry summers. Implement water conservation measures to minimize well impacts.
High Winds	High	Anticipate	Water system is vulnerable to high wind events. Power is disrupted. Make adjustment prior to wind events.
Ice Storm	Med	Immediate	Minor damage caused in December 1996. Broken pipes and damaged pump house.
Flood	Low	N/A	Water system located in an area not vulnerable to flooding.

Section 2.
Evaluate Supply and Demand

To prepare a water shortage response plan, a water system must evaluate and compare supply and demand. To do this, a water system must have both supply and demand information.

Ideally, a water system should be able to determine whether a water shortage is likely and be able to predict the magnitude of the shortage. This determination is complicated because of the difficulty in estimating available supplies.

Source and service meters present the best way to obtain the necessary data to analyze supply and demand. However, many small water systems do not have service meters and some do not have source meters. Therefore, water systems must use the best available information to make an estimate.

The primary objective is determining whether the water system is vulnerable and faces the possibility of a shortage. Next, the water system must estimate the magnitude of a potential shortage using the best information available. Answer the basic question: "How likely is it the water system will use more water than it can produce?" If it seems likely, consider conservation measures to reduce usage within the limits of the supply. If the anticipated shortage is more severe, such as a well failure, consider alternative water supplies.

Evaluate the Source of Supply

Knowing the source of supply is critical to understanding if environmental conditions or demand could lead to a water shortage. What it is capable of producing? How it is constructed? What is its geological and environmental make-up?

To truly assess the supply, know the basics: How deep is the well? How big is the well pump? What does it produce? What kind of geologic characteristics does the well have? Most of this information is in the *Water Well Report* completed when the well was drilled. If you need a copy of the report, call the state Department of Ecology at (360) 407-6000.

Example: Source of Supply Information

Source ID	Well Depth	Pump Size	Water Level	Well Test	Water Right Info	Notes
SO3202	98 feet	Goulds 3 hp	Static Level 25 feet	20 gpm 6 hr, 10' drawdown	Qi 25 gpm Qa 10 acre feet	Geologic make-up results in significant draw down during summer.

Questions to Help You	Answer
How much water can the well pump produce in 1 hour?	
How much water can the well pump produce in a 24-hour period?	

Evaluate Consumption (Demand)

If you have source and service meters and you keep good records, understanding the supply and demand is relatively simple. However, if you do not have source or service meters, there are other ways to measure demand:

A. If there is an elapsed time meter on the well pump and the pumping capacity is known for a given pressure, it is possible to determine the amount of water consumed over a given period of time.

B. If there is a storage reservoir, it is possible to determine consumption by shutting down the pumps and measuring the drawdown over a period of time. Ideally, the reservoir is recorded, the pumps are shut down for 24 hours, and the drawdown is measured for the 24-hour period. Repeat once a week, for two or three weeks, and average the results. If storage is inadequate for the 24-hour period, you may have to reduce the time to 12 hours and test more frequently.

C. A third way to *estimate* water consumption is to estimate the Average Day Demand (ADD) per household. Data from a 1994-1995 ODW assessment indicates average annual water demand is related to average annual rainfall (AAR). To get your ADD on a per residential connection basis, determine the average annual rainfall for the area and use the equation below. You can get your average annual rainfall from the Western Regional Climate Center online at http://www.wrcc.dri.edu/summary/climsmwa.html To get the estimated peak day demand, apply a peaking factor of two. To get total system consumption, multiply the ADD by the number of connections.

ADD = 8,000/AAR + 200

ADD = Average day demand (gallons per residence per day)

AAR = Average annual rainfall (inches per year)

Peak Day = Multiply *ADD times 2 (ADD x 2)*

Example: Calculation for Centralia, Washington where AAR = 46.47 inches

ADD 8,000 divided by 46.47 = 172

Add 200 to 172 to get the ADD = 372 gallons per day per residence

Peak Day 372 x 2 to get the peak day = 744 gallons per day per residence

Example: Calculation for Richland, Washington where AAR = 7.11 inches

ADD 8,000 divided by 7.11 = 1,125

Add 200 to 1,125 to get the ADD = 1,325 gallons per day per residence

Peak Day 1,325 x 2 to get the Peak Day = 2,650 gallons per day per residence

Please note: These calculations are very conservative estimates. It is important to account for specific conditions at the water system such as lot size, types of landscaping, water use characteristics and so on. For example, a small water system in Richland with small lots may not use 1,325 gallons per residence per day or ever experience a peak day of 2,650 gallons per day. On the other hand, if the lots are more than an acre in size and there is a lot of landscaping with irrigation needs, 1,325 gallons per day with peak day use up to 2,650 may be realistic. So, when using these calculations, consider other relevant factors that may decrease or increase the number.

Once you calculate data or estimates, enter the information into a format you can easily use.

Example: Consumption Information

# Services	Estimated average gallons per day from source	Estimated peak day gallons per day from source*	Estimated average gallons per day used per residence	Estimated peak day use per residence*
22	8,200	16,400*	372	744*

**Number based on multiplying average day demand by 2.*

Compare Supply and Consumption

Compare the supply and consumption information by answering the following questions:

Questions to Help You	Yes or No
Can the source and pumping capability meet average day demand?	
Can the source and pumping capability meet peak day demands?	
Is the water in the well lower than normal?	
Is there more than normal or significant drawdown in the storage reservoir during times of average and/or peak day demand?	
Does consumption ever exceed the supply resulting in water shortage problems?	
Think about if the supply were reduced by 10%, 20% and 30%. Where is the point at which demand could not be met?	What percent?
Is it likely the water system will experience a water shortage? If yes, do you consider the magnitude of the shortage severe, moderate or minor?	

Section 3. Defining Stages and Criteria of a Water Shortage

The severity of water shortages varies widely depending on the type of event. Defining stages of severity can significantly aid in determining appropriate response actions. For example, anticipating events that may affect your system, and estimating how severe the effects would be, makes it easier to respond and communicate with others. It also helps water system personnel keep their response balanced and effective.

In classifying the severity of a water shortage, define as many stages and criteria for each stage as you find useful. Begin by defining the stages and then list criteria that describe them. The following is a four-stage example for a water system supplied by groundwater. This is just an example; you may choose to classify water shortages another way. Very small water systems may prefer using two or three stages.

Stage I – Advisory Actions: Water system manager or operator knows there is potential for a water shortage based on projected drought conditions, a drought declaration or other emergency prediction. In this situation, it is not likely a water shortage will happen in the near future but it is important to begin responding to avoid or minimize future impacts.

Example Description and Criteria: Stage 1 – Advisory

Description: The XYZ water system considers the following a Stage I water shortage:

- Projected drought conditions or a drought declaration, but prior to noticing impacts.
- Major storm predictions.
- Well water level noticeably lower than in recent years for the given time of the year.

Note: The water system has specific response activities identified for these types of shortages, including public awareness messages about water conservation. If the system determines problems are likely, the situation will progress to Level II.

Stage II – Voluntary Actions: The water system anticipates conditions likely result in a minor water shortage. Minor is less than 5 percent of normal supply. It is important the water system communicate with customers about the event and the voluntary actions they can take to help minimize the effects.

Example Descriptions and Criteria: Stage II – Voluntary

Description: The XYZ water system considers the following a Stage II water shortage:

- Drought declaration with worsening conditions projected.
- Drought, with a slight but noticeable and continuing decline of water level in the well.

Stage III – Mandatory Actions: The water system experiences significant supply reduction or mechanical problems where disruption in supply is inevitable. Water system personnel are directed to implement mandatory water conservation or curtailment measures to reduce demand.

Example Descriptions and Criteria: Stage III – Mandatory

Description: The XYZ water system considers the following a Stage III or actual emergency:

- Verified 10 percent or greater reduction in source of supply including well level decrease below normally observed conditions.
- Evidence of pressure problems.
- Short-term power outage where water system is running on a generator or using storage.
- Pump or other equipment failure, but water system is able to produce and supply a partial supply of water.
- It is evident severe drought conditions will affect well yield.

Stage IV – Emergency Actions: The water system experiences loss of water because of major damage or reduction of source supply from a natural disaster, accident, act of terrorism or severe drought conditions, *i.e.*, the well is out of water. These incidents require the water system to implement its emergency response plan immediately. It may be necessary to immediately notify affected parties. Immediately issuing health advisories and declaring a water supply emergency are critical to protect public health. These events often take several days or weeks to resolve before the water system returns to normal operation.

Example Description and Criteria: Stage IV – Emergency

Description: The XYZ water system considers the following events to be Stage IV emergencies, requiring implementation of its emergency response plan:

- Earthquake shuts down the water system or affects its sources, lines and so on.
- Well runs dry as a result of drought or supply is unable to keep up with pump.
- Flood infiltrates water system facilities and sources.
- Storm significantly damages power grid and water system facilities.
- Mudslide or other earth shift causes failure of transmission or loss of water in well.

Section 4.
Alternate or Emergency Water Sources

Water shortages may require the water system to get water from an alternate source or switch to an emergency back-up source to meet basic community needs. All public water systems should plan ahead to provide alternate safe water or switch to an approved back-up source, if one is available. It is important to evaluate potential alternate and emergency water supplies ahead of time to ensure the water is safe and the supply is available.

Sources a water system may use when primary and seasonal sources cannot meet demands are "emergency sources." They may include back-up or emergency wells, surface water or springs. Emergency sources are used only as required by extreme, mostly unpredictable circumstances. A water system that anticipates using an emergency source should plan and act well in advance of any need. As part of water shortage response planning, the water system should test these sources and obtain ODW approval to use them as emergency sources.

The water system also may consider establishing an intertie with an approved water supply that could benefit both water systems in an emergency. Discuss this possibility with adjacent water systems. Other emergency sources to consider are bottled water suppliers or a local tanker truck that could bring water in.

Example: Intertie to an Adjacent Water Supply System

Water Systems within ¼-mile of our Water System	Feasibility of Connecting
There is one water system located within 1/4-mile of the XYZ water system. The XYZ distribution water system is within 1,000 feet of the other water system.	The water system has discussed installing an intertie with the adjacent water supply. The water system is willing but, at this time, cannot assist financially unless there is an actual emergency. The cost of the project is about $10,000 to install pipe and an intertie connection. In the event of a potential water shortage, the XYZ water system will look for funding to construct the intertie.

Example: Switching to a Back-up Well

Source Description	Well ID	Required testing before bringing on-line	Special considerations and procedures
The XYZ water system has an emergency back-up well that may be used in the event of a water shortage. The well will not supply the entire water system but will augment current demand.	SO#	Must sample for coliform and nitrates Sample for IOC is recommended	Notify Department of Health Office of Drinking Water's regional engineer Flush and disinfect well

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 1,000 gallons in one-gallon jugs within 24 hours	Yes
Tanker trucks in the area available to deliver bulk water	Fred Jones local dairy truck	(509) 333-3333	5,000 gallons in less than 6 hours	No

Section 5.
Effective Communication

Effective communications with customers is integral to successful water system operations and should be part of a water system's overall emergency planning. During a water shortage, customers may be concerned or upset. It's important to earn their trust early. Communicate with customers as early and directly as possible about potential shortages, especially anticipated ones, such as a drought-related shortage. This may pave the way to better cooperation when it's time to implement water conservation or curtailment measures, especially if they become mandatory.

During a drought, it is especially important to understand and plan messages carefully. Coordinate with local and state health officials or a third-party technical assistance provider to develop key messages and ways to deliver them. Strive for clarity, and avoid jargon and technical terms.

Once a shortage is over, promptly deliver the good news to customers and thank those who assisted in resolving the event. By asking customers to evaluate how you did and to recommend what would work better for them, you can prepare better for the next situation.

As part of the water shortage response plan, develop key messages and 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 field and office staff to defer questions respectfully to a spokesperson.

Example: Key Water Shortage Messages

Develop possible messages in advance, and update them as an event develops:

- There is potential for a water shortage this year due to drought conditions. We are taking this seriously and will be communicating with you regularly.
- Our primary concern is protecting our customers' health and the quality of the water being supplied by keeping the water system operational.
- What we know right now is _____.
- "We respectfully request customers to conserve water" by implementing water conservation measures.
- The potential exists for a less-than-normal water supply. Customers are advised that water-use restrictions may become necessary to minimize or avoid water supply problems.
- "The current drought situation is beginning to affect our water supplies. Well levels are declining at a higher rate than normal. Please use water wisely during this time."
- Please be advised that everyone is required to conserve water in the following ways:

Section 6.
Demand Reduction

Demand reduction measures, including water conservation and water use curtailment, are a key component of a water shortage response plan. It is important the water system develop a list of possible actions it can take in response to a potential or real water shortage.

All water systems should have a water conservation program encouraging wise water use. Conservation measures can be implemented well in advance of a potential shortage and may be the key to avoiding a shortage altogether. Develop a water conservation program with clear measures that can be implemented over a long period of time.

An actual water shortage may require reducing water usage, so identify curtailment measures in advance. Possible measures include restrictions on landscape watering, car washing, filling swimming pools and hot tubs, and other nonessential activities such as cleaning driveways and sidewalks. 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 conserving water or curtailing water use. Examples include door-to-door postings, phone contact, posting signs in visible community areas and contacting the news media. Use the key messages you developed in advance to ensure communications are clear and you say want you really want to say.

Example: Water Conservation Measures

Water Conservation Measures	Actions necessary for implementation
Limit watering to even-number days for west end residences and odd-number days for east end residences. Implement conservation-based rates on June 15.	• Deliver conservation brochures and door hanger regarding irrigation times. • Send a rate notice with the May bill.

Example: Curtailing Water Use Measures

Water Curtailment Measures	Actions necessary for implementation
Restrict outside water usage such as watering lawns, washing cars and so on. Request curtailment of inside usage.	• Develop door hanger with curtailment messages and post on customer doors. • Contact the local radio news station to announce curtailment message. • Monitor water system usage and spot check meter usage, if time is available.

Section 7.
Water Shortage Response Actions

Numerous events could cause a water shortage, depending on a water system's size, complexity, type of source and geographic location. As discussed before, likely causes of a water shortage are power outages, transmission or distribution line breaks, earthquakes, source pump failures, loss of water in wells, droughts, floods and ice storms. In any of these situations, the priority is protecting the people who use the water. Therefore, the core of the response plan is specific actions the system can take to respond to different events.

The following pages provide a format and examples for your water shortage response plan. However, this is only the starting point. Every water system is unique. It is important to prepare for any situation that could affect your system, even those not covered here.

Example: Water Shortage Response Action Plan Worksheet

Stage	Criteria	Actions	Messages
Stage 1 Advisory	Potential for drought Drought declaration Well level slightly lower (less than 10 percent) than in recent years on the current date.	Advise water system customers of situation. Advise staff of situation and request they implement water conservation objectives during job activities. Begin monitoring well level every two weeks. Keep up to date weekly on drought monitor at: http://www.drought.unl.edu/dm/monitor.html	"We may soon experience less-than-normal water supplies. Customers are advised that water use restrictions may become necessary to make sure we don't run out of water." "Please use water wisely. Refer to water conservation education materials".
Stage 2 Voluntary	Drought declaration – area is in a moderate to severe drought condition and conditions are expected to worsen. Noticeable and continuous decline of water level in the well each week.	• Post advisory and provide ODW **Water Conservation Guidelines*** to customers. • Request water system customers to conserve water by: - Limiting outside watering to 2 days a week between 7:30 p.m. and 7 a.m. - Washing vehicles on grassy areas. - Following ODW **Water Conservation Guidelines*** 1, 2 and 3: **1. Indoor water conservation** **2. Outdoor water conservation** **3. Lawn watering guide** • Continue monitoring well level once a week. • If well declines more than 10 percent, elevate to stage 3. *** Water Conservation Guidelines** are online at http://www4.doh.wa.gov/dw/publications/publications.cfm	"Our water supplies are being affected by the current drought situation." "Well levels are declining at a rate higher than normal." "We respectfully request customers to conserve water" by implementing water conservation measures. "Please use water wisely. Refer to water conservation education materials".

Stage	Criteria	Actions	Messages
Stage 3 Mandatory	System estimates 10 percent or larger reduction in source supply, including decreased well level or below-normal surface water flow. Short term power outage where water system is running on generator or storage. Pump or other equipment failure, but water system is able to produce and supply. A reduced supply of water. Severe drought conditions likely will affect well yield.	Initiate mandatory water use restrictions, such as: • Limiting lawn watering to 1 day per week, less than 2 hours, between 8 p.m. and 6 a.m. • Prohibiting all daytime irrigation. • Limiting outside watering to odd-number days, after 8 p.m. and no more than 1 hour. Implement a water-conservation rate structure. Inform customers about the situation. Monitor well level twice a week at varying intervals. Post notices around neighborhoods. Implement water use rates if well declines below 20 percent of normal.	"Due to a continuing decline in our source water supply, we need to impose mandatory water use restrictions. Until further notice, everyone is required to conserve water in the following ways: (Develop list)
Stage 4 Emergency	Well level is unsafe for pumping, pumps are cavitating, or there is air in the distribution system. Earthquake shuts down the water system or affects sources, lines and so on. Flood inundates water system facilities and sources. Storm significantly damages power grid and water system facilities.	Mandatory rationing. Initiate intertie with neighboring water system. Bring in bottled and trucked water.	"You may obtain water for emergency use from the storage reservoir. We will be available to assist you from ___ to ___, or call…" If you use water from this source, bring it to a rolling boil for one minute and let it cool before using.

Part 2: Planning Template

Introduction

Preparing an emergency response plan is an essential part of managing a drinking water system. The Department of Health Office of Drinking Water (ODW) is making this template available to all public water systems in Washington to help them develop such plans.

How to Use this Template

The template follows the outline in Part 1 of this guidance document. Part 1 discusses key components of emergency planning and provides ways to present information in the plan. Use Part 1 as a tool to learn about emergency planning. And then, as you go through the planning process, complete the template on the following pages.

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 the plan if you find one that works better for the water system. The sections in the template are:

Section 1.
Events that Cause Water Shortages

List below the events that may cause water system emergencies for your system. Arrange them from highest to lowest probable risk. See pages 3-5 of this guidance document for more information.

Events that Cause Emergencies

Type of Event	Probability or Risk (High – Med – Low)	Immediate or Anticipated Event	Comments

Section 2.
Evaluate Supply and Demand

Use the following tables to define information that will help estimate supply and demand. See pages 6-8 of this guidance document for more information.

Evaluate the Source of Supply

To truly assess the supply, begin by putting basic information about each water source in the box below.

Source of Supply Information

Source ID	Well Depth	Pump Size	Water Level	Well Test	Water Right Info	Notes

Answer the questions below to completely understand the make-up and capacity of the supply. Most of this information is in the *Water Well Report* completed when the well was drilled. If you need a copy of the report, call the state Department of Ecology at (360) 407-6000.

Questions to Help You	Answer
How much water can the well pump produce in 1 hour?	
How much water can the well pump produce in a 24-hour period?	
Does the water right allow for a larger pump to be placed in the well?	

Evaluate Consumption (Demand)

If you have a source meter and service meters and you keep good records, understanding the supply and demand is relatively simple. However, if you do not have source or service meters, there are other ways to measure demand:

A. If there is an elapsed time meter on the well pump and the pumping capacity is known for a given pressure, it is possible to determine the amount of water consumed over a given time period.

B. If there is a storage reservoir, it is possible to determine consumption by shutting down the pumps and measuring the drawdown over a period of time. Ideally, the reservoir is recorded, the pumps are shut down for 24 hours, and the drawdown is measured for the 24-hour period. Repeat once a week, for two or three weeks, and average the results. If

storage is inadequate for the 24-hour period, you may have to reduce the time to 12 hours and test more frequently.

C. A third way to *estimate* water consumption is to estimate the Average Day Demand (ADD) per household. Data from a 1994-1995 ODW assessment indicates average annual water demand is related to average annual rainfall (AAR). To get your ADD on a per residential connection basis, determine the average annual rainfall for the area and use the equation below. You can get your average annual rainfall from the Western Regional Climate Center online at http://www.wrcc.dri.edu/summary/climsmwa.html To get your estimated peak day demand, apply a peaking factor of two. To get your total system consumption, multiply the ADD by the number of connections.

ADD = 8,000÷AAR + 200

ADD = Average day demand (gallons per residence per day)

AAR = Average annual rainfall (inches per year)

Peak Day = Multiply ADD x 2

Calculating Your System's Average Day Demand (ADD)

Follow the examples on page 7 of this document.

Your water system has _____ connections

Average annual rainfall (ARR) in your area is _____ inches

Your ADD:

8,000 ÷ _____ + 200 = _____ gallons per day per residence

Your total system ADD:

Number of connections _____ + _____ = _____ gallons per day

Calculating Your System's Peak Day Demand

Your Peak Day demand:

Your ADD _____ x 2 =_____ gallons per day per residence

Your total System Peak Day Demand:

Number of connections _____ x _____ = _____ gallons per day

Consumption Information

Number of connections	Estimated average gallons per day from source	Estimated peak day gallons per day from source	Estimated average gallons per day used per residence	Estimated peak day use per residence

Compare Supply and Consumption

Compare the supply and consumption information by answering the following questions.

Questions to Help You	Yes or No
Can the source and pumping capability meet average day demands?	
Can the source and pumping capability meet peak day demands?	
Is the water in the well lower than normal?	
Is there more than normal or significant drawdown in the storage reservoir during times of average and/or peak day demand?	
Does consumption ever exceed supply resulting in water shortage problems?	
Think about if the supply were reduced by 10%, 20% and 30%. Where is the point at which demand could not be met?	What percent?
Is it likely the water system will experience a water shortage? If yes, do you consider the magnitude of the shortage severe, moderate or minor?	

Section 3.
Defining Stages and Criteria of a Water Shortage

Defining the stages of a water shortage should be discussed among water system personnel, but the person in charge ultimately must decide what they will be. The information for making this decision accumulates over time, and may cause changes in the assessment of severity. To assist in the decision-making process, identify and define the stages and the specific events that trigger them. See pages 9-10 for more information.

Stage I – _____ (Definition)

Description:
Criteria:

Stage II – _____ (Definition)

Description:
Criteria:

Stage III – _____ (Definition)

Description:
Criteria:

Stage IV – _____ (Definition)

Description:
Criteria:

Section 4.
Alternate Water Sources

Identifying and planning for alternate water sources is an important part of responding to a water shortage. The water system may already have completed this exercise as part of its overall emergency response plan. If so, use the same information below, or refer to the emergency response plan. See pages 11-12 for more information.

Intertie to Adjacent Water Supply System

Water Systems within ¼-mile of our Water System	Feasibility of Connecting

Switching to Back-up Well

Source Description	Well ID	Required testing before bringing on-line	Special considerations and procedures

Alternate Source(s) of Water

Alternate Sources	Names	Phone	Availability	Is the water safe for drinking?

Section 5.
Effective Communication

Communication with customers, the news media, and the general public is a critical part of water shortage response planning and actions. Develop key messages that are clear and understandable to the customer. See page 13 for more information.

Key Messages

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

-
-
-
-
-
-

Section 6.
Demand Reduction Alternatives

It is important to develop a list of possible actions the water system can take to respond to a potential or actual water shortage.

Water Conservation Measures

Water Conservation Measures	Actions necessary for implementation

Curtailing Water Use

Water Curtailment Measures	Actions necessary to implementation

Section 7.
Water Shortage Response Actions

Define specific water shortage response actions on the worksheet provided, or use your own. This is the core of your plan. Use the examples in Part 1 as a starting point.

Example: Water Shortage Response Action Plan Worksheet

Stage	Criteria	Actions	Messages

Stage	Criteria	Actions	Messages

Stage	Criteria	Actions	Messages