



Missouri Department of Natural Resources

Water Protection And Soil Conservation Division
Public Drinking Water Program

MODEL

Emergency Operating Plan
For Public Water Supplies

Water Distribution System Emergencies
Before the Emergency (Vulnerability Assessment)

General

Security

Pipelines

Storage

Pump Stations

Disinfection

During The Emergency

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PUBLIC WATER SYSTEM
MODEL EMERGENCY OPERATING PLAN

WATER DISTRIBUTION SYSTEM EMERGENCIES

The most common problems with a water distribution system under an emergency situation are:

- X loss of power to pump stations
- X loss of telemetry
- X structural damage to storage facilities and other equipment
- X structural damage to pump stations
- X line breakage
- X loss of pressure due to excess leaks/breaks

BEFORE THE EMERGENCY (VULNERABILITY ASSESSMENT)

Before an emergency, think about how your distribution system may not work in an emergency. The questions below should help you find weak areas. Think about what you can do to improve these areas. Some areas can be helped by asking others to borrow equipment. Other areas will need physical improvement. Plan to do these system improvements over the next few years. You need to have a plan for what to do until the improvements are built.

General

Is your distribution system susceptible to natural and human-caused hazards such as drought, earthquake, flood, tornado, winter storms, security threats, contamination, or nuclear release?

Where are drawings and information about the distribution system kept? List building location and the location in the building or use the *Maps* section to list location. _____

Where is an overall sketch of the system? The *Maps* section is a convenient place to keep these kinds of sketches. _____

Are drawings and information stored above flood levels and in a fire-protected area? _____

What parts of the distribution system are below the 100 or 500-year flood level? _____

Where are storage tanks? List size, location, and material of construction. _____

Where are pump stations? List size and location. _____

Where are the customers on the priority list? _____

Where are boats and 4-wheel drive vehicles kept? _____

Do you have alternative finished water sources for use in an emergency? _____

Are emergency water supply interconnections with other water utilities in place? _____

Security

Are restricted areas posted with "Employees Only" or Restricted Area" signs?

Is access to pump station and storage facilities restricted by fence, locked gates, window, doors or other physical barriers? _____

Is access to manholes covers and hatches restricted by locks or alarms? _____

Are locks tamper-proof? _____

Are only authorized personnel given access keys or codes for locked facilities? _____

Who has keys to locked facilities? _____

Where are duplicate keys or codes located? _____

Is adequate exterior or interior lighting in place? _____

Are facilities monitored? _____

By utility staff / intrusion alarms / television monitors? _____

Does staff vary security checks to the well facilities to avoid predictable patterns?

If alarm is activated, what is the response plan? _____

Do local law enforcement personnel perform regular security checks? _____

Are local homeowners/landowners aware of need for security with telephone number(s) to call to report suspicious behavior? _____

Are procedures in-place when specific security threats are issued by local/national law enforcement authorities? _____

Is a contamination monitoring system in place, operational and tested?

Pipelines

Are isolation valves operated every 6 months or every year? _____

Which valves are not used often or operated regularly? _____

Are there isolation valves to shut off the parts of the system in an emergency? _____

Which valves will you close to shut off each part of the system? _____

Can valves be easily and quickly located during emergency situations?

Are most areas served by looped piping or by dead-end piping? _____

How many people will be without water if a pipe breaks and is not looped? _____

What repair parts do you keep in stock? List type and sizes.

Tapping sleeves _____

Repair sleeves _____

Pipe _____

How will you get repair parts if you do not have them in storage? _____

Who knows how to repair each type of pipe in your system? _____

What pipes are critical to getting water to your customers? _____

What happens if one of these pipes breaks? _____

Is there another way to get water to your customers if one of these pipes breaks? _____

How will you know if pipes break? _____

Are hydrants, manholes, meter boxes and valve boxes fitted with tamper proof caps and lids?

Are valve and meter vaults fenced and locked to deter access? _____

Do you have valves installed at critical points in the system to prevent backflow? _____

Storage

Are reservoir and tank access panels and vents tamperproof?

Are all finished water reservoirs covered and locked? _____

What is the normal water level in each storage facility? _____

How long does it take to fill each storage facility? _____

How many days can you serve customers from storage only? _____

How many days, if your customers reduce water use? _____

How will you get your customers to reduce water use? _____

What storage facilities are in the floodplain? _____

How will you protect these facilities in a flood? _____

What are the elevations of the overflow, access hatch, and vent of any storage facilities in the flood plain? _____

How will you close off the overflow? _____

Pump Stations

Is there redundancy in the system where the spare pumps are located in a different location from the working equipment? _____

What are the power sources to each pump station? _____

Have you coordinated with electric utility for priority feed to pump station? _____

What happens if a pump station cannot run because of a power outage? _____

Do you have emergency generators to use with pump stations? _____

Where are the generators stored? _____

Who knows how to operate the generators? _____

Where are the directions (operating manual) for the generators? _____

What is the fuel source and where is the fuel kept? _____

Where do you buy the fuel? _____

Where can you get a generator if you do not have one? _____

How are the pump stations controlled? _____

What happens if telemetry or automatic control is lost? _____

Who knows how to operate the pumps manually? _____

What pump stations are below the 100 or 500-year flood level? _____

How will you protect these pump stations in a flood? _____

Disinfection

Do you monitor customer complaints on color, taste and odor? _____

Is there a program in place that increases the frequency and the geographic distribution of chlorine residual monitoring? _____

Do you have an early warning monitoring system to notify an operator of changes in chlorine residual, pH, flow, pressure and temperature? _____

What will you do if there is a security threat/violation? _____

Where do you disinfect in the distribution system? _____

Are any of these points in the 100 or 500-year floodplain? _____

How will you protect these points from floods or other emergency? _____

What disinfection chemical is used? _____

Who knows the safety procedures for this chemical? _____

What quantity of chemical is stored at each disinfection point? _____

What happens if there is a spill of disinfectant? _____

What happens if there is an overfeed of disinfectant? (see Appendix J for chlorine and Appendix K for other chemicals) _____

How is the disinfection controlled? _____

What happens if the automatic controls or telemetry is lost? _____

Who knows how to manually operate the disinfection feed? _____

DURING THE EMERGENCY

The damage assessment forms at the end of this section can be used to evaluate the condition of the distribution system during an emergency like a flood.

Always check for safety before doing anything!

What needs to be done in an emergency:

- X If unauthorized intrusion is evident, notify law enforcement, determine type of security threat and respond accordingly.
- X Coordinate alternative water supply if necessary.
- X Increase sampling efforts if contamination is threatened.
- X See the treatment responses for various contamination in *General Procedures for Specific Emergencies* under Contamination.
- X Know current flood level and predicted flood crest.
- X Compare elevations in the distribution system to the predicted flood levels.
- X Sandbag and make other preparations before flood levels rise.
- X Once an area has been evacuated, mark all valve boxes by tying empty, capped, plastic milk jugs with strong wire to the valve boxes.
- X Make sure power will be available to pump stations.
- X Get generators if they will be needed. The emergency form lists where to get generators. There is also information in Appendix D.
- X Get extra disinfection chemicals if you do disinfection at points in the distribution system.
- X Seal storage tanks at overflow and vent if the tanks might be flooded. Tanks should be filled before sealing and isolating. No water can be put into or taken out of sealed tanks to prevent structural damage.
- X Turn power off to all pump stations and other facilities if they will be flooded.
- X Get boats or 4-wheel drive vehicles if they might be needed. The emergency form lists where to get these. There is also information in Appendix G.
- X Isolate areas that will be flooded using valves.
- X If valves are underwater, use book maps and divers with metal detectors to find the valves. If milk jugs were tied to valve covers, those can help divers find the valves.
- X Let customers know what is happening.
- X Call MDNR for advice and to tell them what is happening (Phone number is on emergency form).
- X If an emergency threatens your ability to supply water to some or all of your customers, get another water supply. The Emergency Plan Information form should list where you can get another supply. If the sources you prepared for in advance are not available, use Appendix I to find another source.
- X Call MDNR and tell your customers about the need or possible need for using another supply.
- X Keep track of all emergency related labor hours and work repairs performed. Take pictures of all damaged to distribution system components.

AFTER THE EMERGENCY

The first thing to do after an emergency is to check the condition of the distribution system. Forms for damage assessment are at the end of this section.

When doing a damage assessment, always check for safety before going in a building, driving around the distribution system, or getting out of a truck or car.

The damage assessment should cover:

- X security
- X pipelines
- X pump stations
- X storage tanks
- X disinfection points.

Once damage assessment for the entire system has been done, repair work can be prioritized and repair work can begin.

If the distribution system has lost pressure, flushing of lines and disinfection of the area affected will be needed. Repair of breaks and leaks should be by area such that areas can be brought back on line as quickly as possible. For example, the area closest to the treatment plant should be repaired first, then the next closest, etc. Keeping an area pressurized while that area still has many leaks (even if small) is difficult and time is better spent working out to the farthest area of the distribution system rather than trying to serve everyone at once. Remember that household leaks can cause severe water loss as well. In past emergency situations, some utilities have had to shut all customers off, pressurize the system, and then turn customers back on.

Mains may be disinfected in accordance with AWWA Standard C651-99. Major provisions of the standard are as follows:

- X Continuous Feed Method - When repairs are complete, the mains should be filled, taking care to eliminate air and then the lines should be flushed at a velocity of 2.5 feet per second or greater. After flushing, the main should be filled with water with 25 ppm free available chlorine. The heavily chlorinated water should be in contact with the main for 24 hours and at the end of 24 hours should have a residual of 10 ppm free chlorine.

Any storage facilities and pump facilities will also need cleaning and disinfecting. All electrical gear should be inspected before using. Storage facilities should be inspected for structural damage, particularly at the foundation. Storage facilities may be disinfected in accordance with AWWA Standard C652-02. Major provisions of the standard are as follows:

- X Chlorination of the full volume, to the overflow, such that a residual of 10 ppm is available at the end of 24 hours.
- X Spraying or painting all water contact surfaces with a solution of 200 ppm available chlorine.
- X Appropriate disposal of all heavily chlorinated waters, to avoid environmental damage.