Missouri Department of Natural Resources

Water Protection And Soil Conservation Division
Public Drinking Water Program

MODEL

Emergency Operating Plan
For Public Water Supplies

Water Source Emergencies - Surface Water

Before The Emergency (Vulnerability Assessment)
General
Security
Power
Telemetry/Controls
Structures
Contamination
Screens and Bar Racks
Pumps
Transmission Piping
Watershed

During The Emergency

After The Emergency
WATER SOURCE EMERGENCIES - SURFACE WATER

The most common problems with a surface water source under emergency situations are:

- loss of power
- loss of telemetry
- structural damage to the intake
- contamination
- loss of raw water transmission
- damage to raw water pumps
- inability to pump due to excessively high or low water levels

BEFORE THE EMERGENCY (VULNERABILITY ASSESSMENT)

Before an emergency, think about how your intake 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 intake and source water susceptible to natural and human-caused hazards such as
drought, earthquake, flood, tornado, winter storms, security threats, contamination, or nuclear
release?

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

Where is a sketch of how to get to the intake? 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 is the lowest elevation you can pump from?

What is the highest elevation you can pump from?

What is the elevation of the road to the intake?

How will you get to the intake in a flood or other emergency? Access by boat?

Do you have alternative routes?

Where are boats and 4-wheel drive vehicles kept?

Do you have alternative raw water sources or multiple intakes?
Are emergency water supply interconnections with other water utilities in place? 

If intake is damaged can water be pumped via bypass? 

Are dams visually inspected to identify potential problems of ground movement? 
Are the grass surface moved and brush removed to aid visual observations of the dam? 
Are drain systems in and under embankment and dams maintained to prevent liquefaction and assure stability particularly during an earthquake? 
Are embankment dams installed with dense clay with gentle slopes and adequate freeboard? 

Security
Are restricted areas posted with “Employees Only” or Restricted Area” signs? 
Is access to intake/river/dam/reservoir restricted by fence, locked gates, structure, alarms or other physical barrier? 
Are only authorized personnel given access keys or codes for locked facilities? 
Who has keys to locked facilities? 
Are locks tamper-proof? 
Where are duplicate keys or codes located? 
Is adequate exterior or interior lighting in place? 
Is intake/river/dam/reservoir monitored? 
By utility staff / intrusion alarms / television monitors? 
Does staff vary security checks to the intake/river/dam/reservoir 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? 

Power
What are the power sources? 
Have you coordinated with electric utility for priority feed to the intake? 
Do you have an emergency generator that can be used for the intake pumps? 
Where is this generator stored? 
Are generators exercised regularly? 
Who knows how to operate the generator? 
Where are the directions (operating manual) for the generator? 
Where is the fuel kept? 
Where do you buy fuel? 
Where can you get a generator if you do not have one?
Where are the electric lines?  ____________________________
Where is the meter for the intake?  ________________________
Are the meters below the 100 or 500-year flood level?  __________
Is the substation feeding the intake in the 100 or 500-year floodplain?  __________
Have you talked to the power company about how they will supply power during a flood?  ____
How will they supply power?  ________________________________
What electrical equipment is below the 100 or 500-year flood level?  __________
How will you protect this equipment from flooding?  _______________________

**Telemetry/Controls**
Are controls automatic and/or by telemetry?  _______________________
How will the intake be controlled if telemetry is lost?  _______________________
If you will need to control the pumps locally, how will you get to the intake?  _______________________
Are SCADA system sensors operational and tested?  _______________________

**Structures**
Is the intake structure constructed of fire-safe building material?  _______________________
Is reinforced masonry and other hazard-resistant construction used?  _______________________
Does the intake structure have flood protection?  _______________________
How will you protect the structure from floods?  _______________________
Will you need sump pumps to keep all or parts of the intake dry?  _______________________
Where can you get a sump pump?  _______________________
What elevation are drains?  __________  windows?  __________ and doors?  __________
Are these elevations above the 100 or 500-year flood level?  _______________________

**Contamination**
Contamination of a surface water supply is generally known before the contamination gets to an intake. How fast can you shut down the intake if you are warned of contamination?  __________
How will you accomplish this shut down?  _______________________
Do you have automated or real-time monitoring equipment?  _______________________
Do you monitor pH, turbidity, total and fecal coliform, total organic carbon, ultraviolet absorption, color and odor of source water?  _______________________
Is a contamination monitoring system in place, operational and tested?  _______________________
What will you do if there is a security threat/violation?  _______________________
Is there chemical feed at the intake?  _______________________
How will the chemical feeder be controlled if there is a loss of telemetry?  _______________________
What happens if the chemical feed quits?  _______________________
How will you deliver chemicals to the intake if the roads are inaccessible?  _______________________
What will you do if there is a chemical overfeed or a chemical spill?  (see Appendix J for chlorine or Appendix K for other chemicals)  _______________________

Filename: SURFACEWATER.DOC  SW-4  Revised: 12-18-02
**Screens and Bar Racks**

How are the intake screens or bar racks cleaned? 

If hydraulic means are used, will they work at high water associated with flooding? 

How will you clean the screens or bar racks if high water prevents backwashing?
Pumps
Are the pump motors above the 100 or 500-year flood level? ______________________________
If they could be flooded, how do you plan to protect the motors from flood waters? __________

Are the pumps protected from flood water and debris? _________________________________
How will you protect the pumps from debris? _________________________________

Transmission Piping
How many pipelines come from the intake? _________________________________
Is there redundancy in the system? _________________________________
Are there isolation valves on each line? _________________________________
Where are the isolation valves? _________________________________
Are the isolation valves marked on any drawings? _________________________________

How will valves be located and operated during high water or when covered with debris? ______

Are there air or vacuum valves? _________________________________
What are the elevations of the valves? _________________________________
Can they be flooded, letting sand and silt clog the valve and get into the raw water line? ______

How will you protect the air and vacuum valves? _________________________________
What are the elevations of the control valves? _________________________________
Are the valves and valve pits protected from flooding and tampering? _________________________________

How? _________________________________
Are valves regularly operated and maintained? _________________________________
Is piping flexible to allow for ground movements? _________________________________
Are piping buried below the frost depth (typically 3 feet for Missouri)? _________________________________
Are valves, sleeves, clamps and piping spares available for an emergency? _________________________________
Are piping adequately setback from sewer lines or other sources of contamination? _________________________________

Watershed
Describe the watershed: _________________________________

What businesses or other operations in the watershed could cause contamination? For example a hog operation could cause high coliform or a farmer storing pesticides could cause chemical contamination. _________________________________

What happens if these operations flood? _________________________________

How will you know if any of these operations cause contamination? _________________________________
DURING THE EMERGENCY

The damage assessment form at the end of this section can be used to evaluate the condition of the intake during an emergency.

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 the predicted flood crest.
X Compare elevations of intake and equipment in the intake to the predicted flood levels.
X Sandbag or take other protective measures before flood levels threaten the intake.
X Make sure power will be available during any emergency.
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 chemicals if roads or bridges will be inaccessible.
X Move pump motors and other equipment if possible to prevent damage.
X If you quit pumping because of high water, seal air and vacuum valves and valve pits.
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 If flood waters are going to overtake the intake, shut off all power and remove or elevate as much electrical equipment as possible.
X Call MDNR for advice and to tell them what is happening. (Phone number is on emergency form and in Appendix A.)
X If an emergency is threatening the intake, get another water supply. The emergency form should list where you can get tank trucks and potable water or where you can get bottled water. If the sources you prepared for in advance are not available, use Appendix H 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 facilities and building contents.
AFTER THE EMERGENCY

The first thing to do after an emergency is check the condition of the intake structure, pumps, raw water pipelines, dam and reservoir. A form for damage assessment is at the end of this section.

When doing a damage assessment, always check for safety before going into a building, driving to the intake/dam, or getting out of a truck or car.

The damage assessment should cover:
X security
X power supply
X controls
X intake building
X intake screens
X raw water pumps
X pump motors
X chemical feed
X raw water pipeline.

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

Repair work may include:
X security enhancements
X cleaning and refurbishing electrical gear that was submerged
X cleaning and fixing intake screens
X cleaning pumps of debris
X fixing breaks in the raw water line
X cleaning valves of debris, silt and sand.

If you suspect contamination at the intake (the water has a chemical smell, for example), shut off the intake and call MDNR (phone number on emergency form). If contamination has progressed to the treatment plant or beyond, notify customers immediately. If the contamination can be isolated from parts of the system using valves, close the necessary valves to prevent spreading the contamination and notify customers of the shutoff.

After the emergency is over, damage are assessed and repairs are complete, apply for financial assistance (see Appendix N).