

State of Kansas

Tool for Planning Temporary Water Supply Response in Drought Emergencies



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Kansas

Tool for Planning Temporary Water Supply Response in Drought Emergencies

This Tool is offered to support water resource and utility professionals with the challenge of providing water to communities under the influence of severe drought.

The objective of the Tool is to assist in planning for water shortages by familiarizing users with alternative sources, treatment processes, distribution options, short term equipment solutions for treatment, and the regulatory process as it relates to emergency situations.

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Bureau of Reclamation and the State of Kansas





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Important
information that all
users should know



Example For Using This Guide





This Tool contains links to **web sites** - If you are connected to the internet, these links will bring up web sites with useful information.



This Tool contains links to **documents or worksheets** included with this file.



Water Source specific information. The [Alternative Sources Menu](#) describes different types of water sources with different icons for each source.

- Use keyboard arrows  to navigate to previous or next slide.
- When clicked, links may open in a window behind the presentation. Minimize the presentation to view the link .
- When copying the CD of file folder to your hard drive be sure to maintain the file structure to preserve linked documents.



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What will I have at the end?

- ✓ Knowledge of the State's drought planning resources,
- ✓ An estimate of emergency water supply requirements,
- ✓ Potential sources of emergency water,
- ✓ Knowledge of how those sources need to be treated, waste that will be generated and how to manage waste,
- ✓ Ideas for distribution of emergency water,
- ✓ A clear plan for navigating the regulatory process,
- ✓ Sources of equipment, and
- ✓ Strategies for involving the public.





Disclaimers

- The Bureau of Reclamation and the State of Kansas have provided the information contained in this Tool as a service to the public. We offer a wide range of information, including links to other organizational sites, to meet as many needs as possible. We have made every effort to provide accurate data according to the resources available to us. However, neither the authors, nor any other party involved in the preparation of the material and data available on or through this tool, represent that the information provided here is in every respect complete and accurate and are not responsible for errors or omissions.
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- **Do** check local sources for any equipment and service needs.



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Preparation

- Now is the best time to think about what to do in an emergency. The State of Kansas, Environmental Protection Agency (EPA), Federal Emergency Management Agency (FEMA), Centers for Disease Control (CDC), Department of Homeland Security (DHS), water industry professional organizations, and the United Nations, have produced documents to assist in preparing emergency plans for a wide range of events, including drought.
- The objective of this section is to introduce State, Federal, and Professional Organization resources for drought planning and to alert you to potential health issues in drought conditions other than lack of water.

- 1 State Resources
- 2 Federal Resources
- 3 Professional Organizations
- 4 Drought Health Issues

Number Buttons take you to the Subsection.



Water
Capacity



State Resources

[Kansas Water Office \(KWO\)– Kansas Drought web site](#)

- Provides up-to-date information on drought conditions, public water supplier's water conservation stages, press releases, and drought preparedness & response information.

[Responding To Drought: A Guide For City, County And Water System Officials](#)

- Identifies areas such as: Drought Monitoring, Local Planning and Coordination, Disaster Declarations, State and Federal Assistance, Sources of Additional Information.



Water
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State Resources

- Kansas Water Office (continued)

 Drought Response Plan Template for [Cities](#) and [Rural Water Districts](#).

- Provides guidance in developing a Drought Response Plan.

 A Water Drought/Emergency Ordinance ([for cities](#)) or Resolution ([for rural water districts](#)) must also be adopted to allow implementation of the drought response portion of the water conservation plan.

 [Kansas Drought Response Guidelines for Public Water Suppliers](#)



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State Resources



[Kansas Department of Health and Environment \(KDHE\)](#)



[KDHE's Emergency Response Planning Guidance for Kansas Public Water Supply System](#)

- State guidelines and templates for preparing Emergency Response Plans.



[Simplified Vulnerability Assessment Tool for Drinking Water](#)

- Evaluation of vulnerability of drinking water supplies risk assessment methodology




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State Resources

 [Kansas Drought Operations Plan](#) was developed by the [Governor's Drought Team](#) to:

- Identify membership and leadership of the Governor's Drought Response Team,
- Provide guidance for drought monitoring and communication,
- Establish drought stages,
- Define duties and responsibilities of state agencies in regard to drought,
- Identify responsibilities for actions and response in regard to drought, and
- Provide mitigation and assistance information.

 [Click here for Governor Brownback's Kansas Drought Resources website.](#)



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State Resources



[Kansas Division of Emergency Management \(KDEM\)](#)



- Provides guidance to Kansans and communities regarding how to plan for disasters, conducts training and exercises with county governments, provides response assistance to counties, and administers recovery programs for individuals and communities on behalf of Kansas and FEMA.



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Federal Resources

-  [EPA: Natural Disasters and Weather Emergencies](#) provides information for what to do before and during a severe drought.
-  [EPA: Tabletop exercise tool for Water Systems: Emergency Preparedness, Response & Climate Resiliency.](#)
 - The PC-based Tabletop Exercise Tool for Water Systems: Emergency Preparedness, Response, and Climate Resiliency (TTX Tool) contains materials that assist those interested in planning and facilitating tabletop exercises that focus on Water Sector-related issues. Register at this web site to download the TTX Tool and guidance documents.



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Federal Resources

 [EPA Response Protocol Toolbox: Planning for and Responding to Drinking Water Contamination Threats and Incidents](#) provides the following:

- Water Utility Planning Guide,
 - Contamination Threat Management Guide,
 - Site Characterization and Sampling Guide,
 - Analytical Guide,
 - Public Health Response Guide,
 - Remediation and Recovery Guide, and
 - Response Guidelines.
- There are many other useful Water Security Documents at the above site too.



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Professional Organization



Kansas Mutual Aid Program (KS MAP)

- Program provides the structure for inter-utility assistance in times of disaster or other emergencies helping to bring all the pieces together to restore utility services.
- Website will provide information on: becoming a participating utility in KSMAP, planning before disaster strikes, calling for help or assistance from other utilities, and responding when your utility is asked to help.



List of organizations that agreed to work collectively to develop an emergency response effort for Kansas utilities.



Kansas Municipal Utilities

- Statewide association of municipally-owned and -operated electric, gas, water, wastewater, stormwater, and telecommunications utilities across the State of Kansas.



Water
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Professional Organizations

Kansas Rural Water Association

- Provides education, and technical assistance to public water and wastewater utilities

American Water Works Association – Drought Preparedness and Response (Table of Contents)



- Discusses forming a water shortage response team; forecasting supply in relation to demand; balancing supply, demand, and assessing mitigation options; establishing triggering levels; developing a staged demand reduction program; and involving the community in plan adoption and implementation.



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Professional Organizations

-  [Water Environment Research Federation](#) provides information and planning resources on many aspects of water resource management, treatment, delivery, security & emergency response.
-  [Water Environment Federation](#) provides water education materials for public relations, online education, and free webcasts.



Water
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Drought Health Issues



CDC & EPA: Health Issues - When Every Drop Counts

- When surface or groundwater supplies are diminished other health concerns arise. The CDC and EPA collaborated on a document describing health concerns that can develop with prolonged drought and how to prepare for public health protection at each stage of drought.



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Drought Health Issues

Harmful Algal Blooms

- Cyanobacteria (blue-green algae) can become a problem in warm surface water. They produce cyanotoxins that can be harmful to animals and humans. The Kansas Department of Health and Environment Harmful Algal Bloom website contains current advisories, information on how to determine blue green algae are an issue in your water source, and precautions that should be taken to prevent exposure to cyanotoxins.



Water
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Drought Health Issues

- These resources describe treatment considerations for water with blue green algae.



[EPA Cyanobacteria Factsheet](#) provides:

- Causes of harmful algal blooms,
- Health effects,
- Screening methods, and
- Cyanotoxin treatment and bloom management.



[Cyanotoxin Removal in Drinking Water Treatment Process and Recreational Waters](#) provides information for treatment to remove bacteria and their extra-cellular dissolved toxins.



Water
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Minimum Water Supply Requirements

- How much water do you need? Here are some considerations for narrowing in on the critical supply for an emergency.
 - The minimum necessary for health and sanitation.
 - The minimum necessary to keep the distribution system functioning.
 - The maximum that you can get and treat reliably.
- The next pages provide references to help define your emergency water requirement.



Preparation



Alternative
Sources





Recommendations



[KDHE Emergency Response Guideline](#)

- Emergency Water Requirements section defines water requirements during the recovery phase published by the U.S Department of Defense.



[World Health Organization - Emergency Water Supply, Chapter 7. Water Supply](#) provides information for:

- Establishing and protecting centralized and decentralized water supplies.
- Recommending a minimum water supply capacity of 4 gallons per person per day.



Preparation



Alternative
Sources





Recommendations

Centers for Disease Control

@ The [Emergency Preparedness Water Supplies](#) page recommends storing at least 1 gallon per person per day and keep a 3-day supply.

@ The [Emergency Water Supply Planning Guide for Hospitals and Health Care Facilities](#) also recommends methods for estimating critical water supply needs.

@ [The Sphere Project Handbook](#) – Humanitarian Charter and Minimum Standards in Humanitarian Response

@ Section on minimum standards in water supply, sanitation and hygiene promotion. [Free Download Available](#).

@ Use the “Capacity” tab of the [Planning Spreadsheet](#) to calculate minimum water requirements based on recommendations from WHO, CDC, and the Sphere Handbook.





Water Capacity Requirements



Public water systems are regulated by the Kansas Department of Health and Environment. [The Engineering and Permits Unit](#) reviews and approves plans and specifications for drinking water projects based on KDHE's minimum design standards "[Policies, General Considerations, and Design Requirements for Public Water Supply Systems in Kansas, 2008 ed.](#)"

- Chapter VIII on Distribution Systems recommends no less than 20 lb./in² at ground level at all points in the distribution system.



Preparation





Alternative
Sources





Water Capacity Requirements

- When the water supply available for treatment decreases, conservation measures can assist in keeping the distribution system filled. However water also must be kept fresh to prevent build up of disinfection by-products in the distribution system.
-  KDHE provides information and monitoring plan examples for [Disinfection By-products](#).
- If levels are above the MCL at the farthest customer then further treatment to remove organic material may be necessary.
- See Water Treatment section  for more recommendations.



Preparation



Alternative
Sources





Alternative Sources



Conservation



Local Municipal Water Utilities/Agricultural Water Rights Holder



Surface Water



Brackish Surface Water



Groundwater



Wastewater reuse



Water Hauling



Use the “Alternative Sources” Tab of the [Planning Spreadsheet](#) to inventory potential sources.

* Entities must comply with KDHE’s Drinking Water Standards. See Section  for drinking water standards.



Water Capacity



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Equipment





Conservation

 [Kansas Municipal Water Conservation Plan Guidelines](#)

 [Kansas Irrigation Water Conservation Plan Guidelines](#)


 [Kansas Water Conservation Education/Water Sense](#)

- Kansas' partnership with EPA to make product choices that use less water and perform well/better than existing products.

 [Drop by Drop](#)

- Sierra Club & National Wildlife Foundation Study on Texas Water issues.
- Suggestions for improving conservation are applicable to all.

 [Water conservation tips for the home](#)

- Many suggestions for reducing water use indoors.
- See also Public Communications and Involvement section .



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Neighboring Water Utilities/ Agricultural Water Rights

-  Register with [Kansas Mutual Aid Program for Utilities \(KS MAP\)](#). The mission of the KS MAP is to support and promote statewide emergency preparedness, disaster response and mutual assistance for utility systems in Kansas.
-  The state of Kansas State Department of Agriculture, Division of Water Resources has four field offices to assist with local water supply issues. [Click here](#) to find the field office closest to you.
 - Contact the entity if you have identified an agricultural water source that could be used water as a municipal water supply.
-  EPA document [Gaining Operational and Managerial Efficiencies Through Water System Partnerships: Case Studies](#) describes a variety of water utility partnerships from organizational to structural.



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Surface Water

-  Emergency Access to State Fishing Lakes and Corps of Engineers Reservoirs is granted when there has been a declaration of drought emergency. [Click here](#) for more information and a list of State lakes and Federal reservoirs available for withdrawals in an emergency.
 - Users must get permission through Kansas Water Office for Emergency Access
-  Kansas Department of Wildlife, Parks & Tourism [Map](#) of State Fishing Lakes



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Surface Water

- The following precautions should be considered when using surface water for an emergency drinking water supply.
 - Increased nutrient levels can result in algal blooms.
 - Some algae produce toxic compounds that are difficult to remove in conventional treatment systems.
 - Ultrafiltration is an excellent method for removing suspended solids, turbidity and micro-organisms.
 - Disinfection should not be done before ultrafiltration of surface water to prevent breaking algal cell membrane and releasing toxins.
- See section **D** on Ancillary Equipment for intake, pump, and power systems.
- See section **E** on Treatment Solutions for emergency treatment systems.



Water Capacity



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Surface Water

- Invasive species, such as zebra mussels, can be spread through hauling water from one location to another.

@ Kansas Department of Wildlife, Parks & Tourism Information on [Zebra Mussels](#)

@ [Guidance](#) on preventing spread by cleaning anything that comes in contact with the water and a listing of colonized waters in Kansas.

@ Reclamation produced [an Inspection and Cleaning Manual for Equipment and Vehicles to Prevent the Spread of Invasive Species](#).



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Brackish Surface Water

- Brackish surface water could occur during times of drought in isolated areas of central Kansas. KDHE can help you determine if this is occurring in your area.
- Surface water may become brackish during a drought due to a combination of evaporative losses, decreased precipitation, and discharge of waste water.
- The concerns regarding surface water apply to brackish surface water as well.
 - Increased nutrient levels can result in algal blooms.
 - Some algae produce toxic compounds that are difficult to remove in conventional treatment systems.
 - Ultrafiltration is an excellent method for removing suspended solids, turbidity and micro-organisms.
 - Disinfection should not be done before ultrafiltration of surface water to prevent breaking algal cell membrane and releasing toxins.



For more information and studies on brackish water desalination see <http://www.usbr.gov/research/AWT/brackish.html>.



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Groundwater Resources

-  The Kansas Geological Survey web site describes the location, productivity, and quality of [groundwater resources](#) of Kansas.
-  The Kansas State Department of Agriculture Basin Management Team tracks [groundwater basins](#) throughout Kansas. Information on each of the aquifer basins and well water levels is available from their main website.
-  The [Water Well Completion Records](#) (WWC5) Database has information on well locations, owner, depth, depth to water level, and yield. Data can be selected by county, or Township and Range. A listing of Water Well Contractors in the State is also available at this site.



Water Capacity



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Equipment





Groundwater Resources

- Well Services:



The Kansas Ground Water Association provides listings by county of [contractors](#) licensed by the State of Kansas to provide well services.

- Well jetting opens up clogged screens, packing material that can aid in restoring well productivity. Most licensed well drillers can provide this service.



Water Capacity



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Equipment





Reusing Wastewater

@ The Western States Water Council report *Water Reuse in the West: State Programs and Institutional Issues* documents the state of water reuse in the western US, including a [section for Kansas](#).

- Contact KDHE if considering use of wastewater effluent.
- [Kansas Water Appropriation Act](#) states that “all water” is dedicated to the use of the people and that the Chief Engineer shall not approve any application submitted for the proposed use of fresh water “in any case where *other waters* are available for such proposed use.”
 - Contact [Kansas Department of Water Resources \(DWR\)](#) if considering use of wastewater effluent.



Water Capacity



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Equipment





Reusing Wastewater



Findings of the National Academies Press's [Water Reuse: Expanding the Nation's Water Supply Through Reuse of Municipal Wastewater](#) include:

- The National Research Council's (NRC's) Committee on Assessment of Water Reuse as an Approach for Meeting Future Water Supply Needs was formed to conduct a comprehensive study of the potential for water reclamation and reuse of municipal wastewater to expand and enhance the nation's available water supply alternatives



See: <http://www.usbr.gov/research/AWT/reuse.html> for more information on water reuse.



The WRRF Report 06-008: [Low Cost Treatment Technologies for Small-Scale Water Reclamation Plants](#)

- Identifies and evaluates established and innovative technologies that provide treatment of flows of less than one million gallons per day. The report includes an extensive cost database, where the cost and operation data from existing small-scale wastewater treatment and water reuse facilities have been gathered and synthesized.



Water Capacity





Ancillary
Equipment





Hauling water

- Often the quickest way to provide an emergency water supply is to transport water in tankers from a nearby source and store the water in tanks and reservoirs.
- It is important to note that hauling water is often the most expensive alternative, but may be more expeditious for a moderate supply volume.
-  The State of Kansas does not license water haulers. The state of Oregon provides [Drinking Water Hauling Guidelines](#) that describe types of tanker trucks that can be used, how they should be filled, and cleaned.
-  [Click Here](#) for a listing of potable or non-potable water hauling companies in Kansas (Bulkwaterdelivery.com). Consult KDHE or KDEM for suggestions of appropriate potable water hauling companies.



Water Capacity



Ancillary
Equipment





Hauling water



Contact your Division of Water Resources [Field Office](#) to help locate sources of water for hauling.

- See section [F](#) for information on storing hauled drinking water for distribution.



The section on [Surface Water](#) for precautions concerning potential contamination with [blue-green algae](#) and [zebra mussels](#).



Water Capacity



Ancillary
Equipment





Ancillary Equipment for New Sources

- Potential equipment that may be needed for new sources of water:



1

Intakes



2

Pumps



3

Power

Number Buttons take
you to the Subsection!



Kansas State University Agricultural Experiment Station and Cooperative Extension Service [Handbook for Livestock Producers and Landowners](#) has extensive information on water sources, intake, pumping, storage, alternative power and distribution systems for livestock, but the information is equally valuable for temporary, or alternative water supplies for small towns.

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Alternative
Sources



Treatment
Needs





Intakes

- Regulations require that new surface water sources will need a screened intake. Examples of local suppliers are listed below.
 - @ Cook Legacy Water & Energy specializes in screen systems of all kinds. They provide [The Cook Book: Water Intake System Design & Technology](#) that is helpful in learning more about screen systems.
 - @ [Fluid Equipment](#) in Kansas City and Wichita can help with choosing a screen solution for surface water intakes.

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Alternative
Sources



Treatment
Needs





Pumps



Local suppliers can be identified on Thomasnet.com. An example query for [Pump Supplier list located in Kansas.](#)

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Alternative
Sources



Treatment
Needs






Power

- It is a good idea to plan ahead for power outages during a drought. Some of the well pump suppliers provide solar or wind powered pumps, but generators are also a good idea for when there is a power failure. An example of local supplies are below.

 [Central Power Systems & Services](#) – Wichita, Great Bend, Liberal, Salina, and Colby, KS; and Liberty and Springfield, MO

 [Clifford Power Systems, Inc](#) – Kansas City, KS

 [TechPower Systems, Inc.](#) – Kansas City, MO

 [Foley Equipment](#) – Colby, Liberal, Dodge City, Great Bend, Saline, Concordia, Park City, Wichita, Manhattan, Topeka, Chanute, and Olathe, KS

 [SmartPower Services](#) – Greenwood, MO

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Alternative
Sources



Treatment
Needs





Power

- Alternative energy might also be a good idea for distributed pumping systems and temporary treatment systems. These companies have solar, wind, geothermal, and/or biogas power systems:
 - @ [Alternative Energy Solutions International](#) – Wichita, KS
 - @ [Kansas Energy Information Network](#) has information on [wind](#), [solar](#), [biofuels](#), and [geothermal](#) energy options. Each website has link to a listing of businesses and organizations involved in developing that form of alternative energy.

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Alternative
Sources





Treatment
Needs





Treatment

- The minimum treatment required for potable water is determined by the State of Kansas Department of Health and Environment regulations:
 -  [KDHE's Primary Drinking Water Regulations](#)
 - To find Article 28-15a, click on the Blue Box that indicates Proceed Directly to 40 CFR PART 141.
 - Designed to protect human health. The regulations address microorganisms, disinfectants, disinfection byproducts, inorganic and organic chemicals and radionuclides.
 -  [Secondary water quality standards](#) are set for cosmetic or esthetic effects.



Ancillary
Equipment






Distribution
and Storage





Treatment

-  A water analysis should be performed before using a new water source. The EPA [Response Protocol Toolbox, Chapter 3](#) describes the EPA water source characterization protocol.
-  Record water analysis data on the [Planning Spreadsheet](#) H2OAnalysis tab. The primary and secondary Safe Drinking Water Standards are included on the H2OAnalysis to aid in identifying treatment goals.
-  The [Water Treatment Primer for Communities in Need](#) summarizes drinking water regulations, conventional and advanced treatment processes and treatment for specific contaminants.



Ancillary
Equipment



Distribution
and Storage





Distribution and Storage

1

Distribution Options

2

Blending and Re-mineralization

3

Temporary Water Storage

4

Disinfection of Tanks

5

Disinfection of Containers

Number
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Treatment
Needs



Waste
Management



Distribution Options

With a reduced water supply, it can be difficult to keep the distribution system full and maintain acceptable quality of water. The following slides provide options for handling decreased supply and demand.



Treatment
Needs



Waste
Management





Distribution Options

- Distribution water quality issues:



Water Research Foundation's [State of The Science Report](#) on Distribution System Water Quality reviews issues of: disinfectant residuals and decay; lead, copper, and corrosion; distribution system modeling; distribution system monitoring and sampling; pressure transients and intrusion; and water quality maintenance and operations.



[Distribution System Water Quality Control](#) discusses water quality issues and control measures undertaken by the City of Raleigh, NC during drought in 2007.



Treatment
Needs



Waste
Management





Distribution Options

- The primary protection of drinking water after it leaves the treatment facility is disinfection and pressurization to keep untreated water from infiltrating into the water distribution system. If the potable water supply is too low to keep the distribution system filled, there is risk of contamination. If this happens, the system needs to be disinfected and flushed before it can be used again safely.
- If the distribution system is designed in segments, then one segment can be filled at a time with extra disinfection residual. As a short term emergency strategy, point of use treatment systems such as carbon filter pitchers can be distributed to treat tap water for drinking and cooking.



[EPA Environmental Technology Verification Reports](#) for Point of Use treatment.



Treatment
Needs



Waste
Management





Distribution Options

- Public water dispensary:



World Health Organization's "Environmental Health in Emergencies and Disasters: a Practical Guide" provides information on using water tankers, temporary water distribution stands, water containers, and facilities for personal hygiene.



Treatment
Needs



Waste
Management





Blending and Re-mineralization

- When introducing demineralized water to a distribution system it is important to stabilize the water to prevent piping corrosion.



The World Health Organization's [*Safe Drinking-Water from Desalination*](#), chapter 6, provides information on blending desalted water with other sources (in order to protect storage and distribution plumbing) and re-mineralization (to increase the concentration of important nutritional minerals).



Treatment
Needs




Waste
Management





Temporary Water Storage

- Temporary storage bladder tanks provide easily transportable water storage in a wide variety of sizes. Examples of suppliers are listed below.
- 
- [Interstate Products, Inc.](#) – Sarasota, FL
 - [Aero Tec Laboratories](#) – Ramsey, NJ
 - [Basic Concepts, Inc.](#) – Anderson, SC
 - [Tank Depot](#) – online wholesale supplier
 - [Husky Portable Containment](#) – Dewey, OK
 - [Kansas Rural Water Association](#) maintains a portable storage bladder for public water suppliers.

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Treatment
Needs



Waste
Management





Disinfection of Tanks



KDHE Minimum Design Standards – Water Storage Tanks – Disinfection

- Section B.12 discusses disinfection of Water Storage Tanks
- The World Health Organization has developed information on [cleaning and disinfecting water storage tanks and tankers](#), which includes:
 - Considerations for converting tanks from another purpose to hauling or storing water.
 - Instructions for disinfecting the tank.
 - Chlorine testing to ensure disinfectant is sufficiently rinsed out.
 - Considerations for disposal of waste liquids.



Treatment
Needs



Waste
Management





Disinfection of Containers

 Centers for Disease Control and Prevention provides information on the [cleaning and storage of water containers](#), such as:

- Instructions for cleaning and sanitizing water containers.
- Properties of acceptable water containers.
- Proper labeling and storage of water containers.
- Instructions for disinfecting water at home by filtering, boiling, and using household disinfectants.



Treatment
Needs



Waste
Management





Waste Management for Municipal Water Treatment



1

Waste Management for Desalination Concentrate

a

Brackish Water Concentrate

b

Land Application

c

Discharge to Wastewater Treatment Plant

d

Discharge to Surface Water

e

Deep Well Injection

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2

Solid Waste Management



Distribution
and Storage



Regulations






Waste Management for Municipal Water Treatment

- The link below provides information regarding water treatment permitting procedures and requirements for the regulatory activities associated with the Kansas Department of Health and Environment's Bureau of Water:

 [Wastewater Permitting Requirements for Proposed Projects](#)

-  Work closely with your [KDHE - Public Water Supply Section Staff - Engineering and Permits Unit Chief](#) to ensure the acceptability of the selected approach to waste stream management for water supply treatment systems.

- Following slides are options for management of liquid water treatment waste products. KDHE can help you to select the appropriate solution for your situation.



Distribution
and Storage



Regulations





Desalination Concentrate

- All water treatment desalination processes generate a concentrated waste stream.
 - Brackish water nanofiltration and reverse osmosis recovery rates range from 50% to 85% depending on the water composition and system design.
 - Small point-of-use reverse osmosis systems have a low recovery rate of 5 - 7%.
 - The volume of concentrate is inversely proportional to recovery rate.
 - The salt loading of the concentrate is directly proportional to recovery rate and depends on the salt load of the source water.



Distribution
and Storage



Regulations





Desalination Concentrate

- Local engineering firm can determine the best concentrate management solution for your situation.
- In some cases it will be best to maximize recovery (smallest concentrate volume with maximum TDS).
- In other cases it will be best to minimize recovery (increase concentrate volume with minimal TDS) so that it can be used locally for beneficial purposes.



Distribution
and Storage



Regulations





Brackish Water Concentrate

- Concentrate management summaries for brackish desalination.

[Central Arizona Salinity Study: Phase II Concentrate Management](#)

- Comparison of Concentrate Management solutions and Evaluation and cost analysis of alternatives.

[Existing & Emerging Concentrate Minimization & Disposal Practices for Membrane Systems](#) (Sethi et al. 2006 Florida Water Resources Journal)

- Description of methods.

[Bureau of Reclamation Concentrate Management Research](#)

- Download Federally funded reports on concentrate issues and management processes.



Distribution
and Storage



Regulations





Land Application

- Liquid and solid waste can be generated from water treatments processes.
 - Check with KDHE for appropriate permitting.

@ Solid waste land application – Kansas State University, Department of Agronomy prepared a factsheet for [Considerations for Direct Land Application of Organic Waste Products](#).

@ Liquid waste land application – The WaterReuse Foundation funded a [Salinity Management Guide](#). While it is geared toward plants for California, the other information in the guide can be combined with knowledge of local plant varieties.

@ Soil scientist can estimate the [Sodium Absorption Ratio](#) (SAR) and determine suitability for plants.

@ Total Dissolved Solids (TDS) concentration in the desalination wastewater is a main concern for irrigation. TDS is usually represented in this context as “EC” or electro-conductivity. Click [here](#) for a graph of the combined effects of SAR and EC on irrigation water.

@ Reclamation’s [Water Reuse Study for Big Bear, California](#) compares RO and NF concentrate quality to secondary municipal wastewater for irrigation water potential. Report includes analysis of SAR, conductivity, and fitness for irrigation.



Distribution
and Storage



Regulations





Discharge to Wastewater Treatment Plant

- Discharge of water treatment waste streams to a wastewater treatment facility may be an option depending on the composition of the concentrate and other flows into the system. This issue should be discussed with your engineer, wastewater treatment system management, and [KDHE-BOW](#) representative.



Distribution
and Storage




Regulations





Discharge to Surface Water

 Discharge of water treatment waste streams to surface water system is regulated by the [KDHE- BOW](#). Their website has contact information and information on procedures and permit forms.



Distribution
and Storage



Regulations





Deep Well Injection

- @ Waste disposal by deep well injection is covered by the KDHE Bureau of Water [Underground Injection Control](#) Program. Their web site has contact information, UIC regulations, procedures, guidance, forms, and educational material.
- @ [Class I](#) wells are used for injecting hazardous and non-hazardous wastes into deep, isolated rock formations that are thousands of feet below the lowermost [underground sources of drinking water](#).
- @ An example of a Class I deep well injection study is the [Deep-Well Injection of Desalination Concentrate in El Paso, Texas](#)
 - Southwest Hydrology, March/April 2008



Distribution
and Storage



Regulations





Solid Waste Management

- Solid waste might be generated during a drought from the existing water treatment plant if hazardous materials contaminate media or coagulated solids.



The [KDHE – Public Water Supply Section –Engineering and Permits Unit Chief](#) determines the best disposal method for waste generated from municipal water treatment operations.



Distribution
and Storage





Regulations





Regulations

-  The KDHE Bureau of Water [Public Water Supply Section](#) regulates public water supplies. It is important to involve them in planning for temporary emergency water supplies.
-  If there is a change in water source for any reason, it is important to involve [Kansas Department Agriculture – Division of Water Resources](#).



Waste
Management



Federal
Treatment
Resources






Treatment Systems Available from Federal Sources



The Governor must request the President to declare a state of emergency before Federal resources can be called into service:

- Department of Defense Reserves and National Guard
-  Access to military expeditionary [water treatment equipment](#) with capacities ranging from 5 gal/min to 100 kgal/day.



Regulations




Operator
Requirements





Water Treatment Operator Requirements

-  Kansas Department of Health and Environment Bureau of Water has a [Water and Wastewater Operator Certification](#) Program with a certified Operator Database, Training materials and schedules for training opportunities and examination dates.



Federal
Treatment
Resources



Commercial
Treatment
Resources





Commercially Available Packaged Treatment Systems¹

1 Mobile/Containerized Treatment

2 Commercial System Sources

Number
Buttons take
you to the
Subsection!

- ¹ This is a list of systems developed through a review of companies that sell or rent mobile treatment equipment.

Presentation of these commercial products does not constitute an endorsement from the State of Kansas or the Bureau of Reclamation



Operator
Requirements



Funding





Mobile/Containerized Systems



Example: Commercial and Industrial RO Systems
[Applied Membranes, Inc.](#)

Water treatment systems designed and built by the private industry have the capacity to treat a broad range of source water quality.

- Brackish Surface Water
- Produced Water
- Secondary Wastewater
- Groundwater



- A number of companies specialize in the design and construction of mobile or containerized water treatment a number of which are included in the Equipment



Sources list tab in the [Planning Spreadsheet](#).



Operator
Requirements



Funding





Mobile/Containerized Treatment

System Types	Advantages and Disadvantages
Smaller Mobile Units (< 100,000 gpd)	<ul style="list-style-type: none">• Highly mobile light weight truck or double axle trailer mounted units easy to transport• Smaller capacity systems
Larger Mobile Units (up to 500,000 gpd)	<ul style="list-style-type: none">• Process configuration is inclusive of multiple process options allowing for the treatment of a variety of source waters• Set design configurations and processes equipped on all systems regardless of source water application
Custom Containerized Systems	<ul style="list-style-type: none">• Highly customizable to water source, eliminates extraneous processes• Specific design for a set water chemistry• Mounted in 20 to 40 ft containers, requires crane and commercial transport to move containers to new locations



Operator
Requirements



Funding





Commercial System Sources

Several examples of mobile systems:

-  [Applied Membranes](#)
-  [Aqua Sun](#)
-  [Environmental Improvements Inc.](#)
-  [First Water](#)
-  [Forever Pure](#)
-  [GE Water](#)
-  [Life Stream Water Purification Equipment](#)
-  [Noah Water](#)
-  [Pall](#)
-  [Pure Aqua](#)
-  [RODI Systems FX Water Purification System](#)
-  [Veolia](#)
-  [Water Control Corp](#)

Presentation of these commercial products does not constitute an endorsement from the State of Kansas or the US Bureau of Reclamation



Operator
Requirements



Funding





Funding for emergency water supplies

- 1 State of Kansas
- 2 Bureau of Reclamation Drought Program

Number
Buttons
take you to
the
Subsection.



Commercial
Treatment
Resources



Public
Communication/
Involvement



State of Kansas



KDHE provides a [Public Water Supply Technical and Financial Assistance Quick Reference Guide](#).

- Financial Assistance programs from KS Dept. of Health and Environment, KS Dept. of Commerce, USDA Rural Development, Midwest Assistance Program, and Department of Agriculture - Division of Conservation.
- Also information on planning and technical assistance, and training opportunities.
- Emergency financial assistance might be available from individual agencies.
 - National Rural Water Association
 - USDA Midwest Assistance Program
 - Department of Commerce



Commercial
Treatment
Resources




Public
Communication/
Involvement



Bureau of Reclamation

 The [WaterSMART Program](#) provides cost-shared funding for the following types of projects:

- Water and Energy Efficiency,
- System Optimization Reviews,
- Advanced Water Treatment Pilot and Demonstration Projects, and
- Research on Development of Climate Analysis Tools.

 The [Title XVI Program – Water Reclamation & Reuse Program](#) provides financial and technical assistance for appraisal studies, feasibility studies, research and demonstration projects, and construction projects that reclaim, reuse, or recycle water.

 Program brochures: [WaterSMART](#) and [Title XVI](#)

 For additional information on Reclamation programs contact the [Oklahoma Texas Area Office](#).



Commercial
Treatment
Resources




Public
Communication/
Involvement





Public Communications & Involvement

 AWWA – [Drought Preparedness and Response](#) has examples of successful conservation publicity plans, rate structuring to promote conservation, and considerations for limiting water deliveries.

 [Table of Contents and Introduction](#)

- Use your emergency communication system to alert residents of the water situation, where they can get drinkable water, and how to handle tap water and grey water.



Funding



Contacts



Public Communication

- Some examples of Public Outreach resources:
 - [Kansas Water Office - Water Conservation Education](#)
 - [California Water Awareness Campaign](#)
 - [Texas Water Development Board Conservation Education](#)
 - [Spokane – Elementary Water Conservation Trailhead](#)
 - [The Nature Conservancy Global Freshwater Program](#)
 - [Water Use it Wisely](#)



Funding



Contacts



For questions about this tool, please contact:

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Public
Involvement

