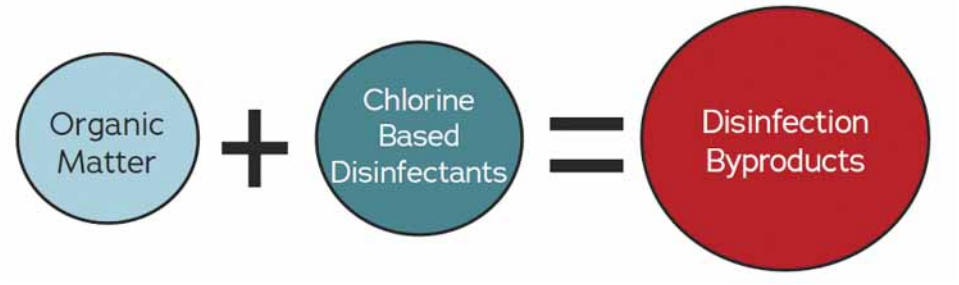
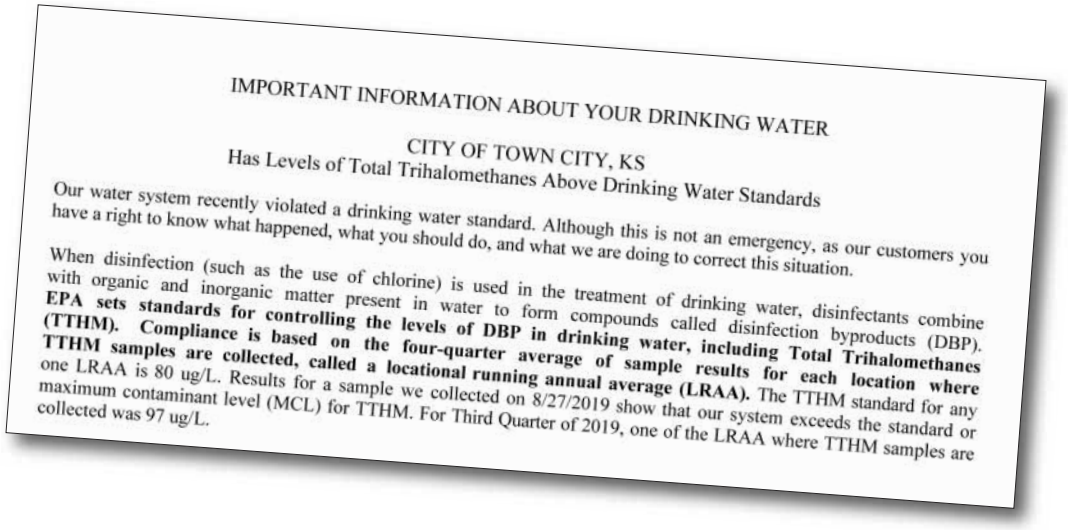
By Daryn Martin, KRWA Technical Assistant



Avoid Disinfection Byproducts Testing if the Water is HOT!



IMPORTANT INFORMATION ABOUT YOUR DRINKING WATER

CITY OF TOWN CITY, KS
Has Levels of Total Trihalomethanes Above Drinking Water Standards

Our water system recently violated a drinking water standard. Although this is not an emergency, as our customers you have a right to know what happened, what you should do, and what we are doing to correct this situation.

When disinfection (such as the use of chlorine) is used in the treatment of drinking water, disinfectants combine with organic and inorganic matter present in water to form compounds called disinfection byproducts (DBP). **EPA sets standards for controlling the levels of DBP in drinking water, including Total Trihalomethanes (TTHM). Compliance is based on the four-quarter average of sample results for each location where TTHM samples are collected, called a locational running annual average (LRAA).** The TTHM standard for any one LRAA is 80 ug/L. Results for a sample we collected on 8/27/2019 show that our system exceeds the standard or maximum contaminant level (MCL) for TTHM. For Third Quarter of 2019, one of the LRAA where TTHM samples are collected was 97 ug/L.

The days are getting warmer as we head further into summer. The water is also warming and public water supplies that treat or purchase surface water are starting to fight chlorine residual loss in the far ends of their distribution systems. These same water suppliers will be required to sample for Disinfection Byproducts (DBP) this summer when the water is warmest. A DBP sample at the wrong time will cause multiple violations and headaches for the next year. It is important to avoid testing for DBPs during a burn out when the water is too hot, with free chlorine that is!

To combat biofilms and chlorine residual loss, many surface water treatment plants will switch from combined chlorine, called chloramines, to free chlorine for a short period to "burn-out" their distribution system. It's important to avoid DBP sampling during this time. Chloramines are formed when free chlorine is combined with ammonia. This disinfectant is not as potent as free chlorine. KDHE requires five times as much be maintained in the system with minimum residual of 0.2 mg/L free chlorine vs. 1.0 mg/L combined or total, but it does have its advantages. Chloramines are used in most surface water treatment plants to avoid the formation of DBPs, which are created when free chlorine reacts with organic matter in the water. That is why it is not smart to take a DBP sample during a free chlorine burnout. After a short period of free chlorine disinfection, surface water plants add ammonia to the water to combine with the free chlorine and form chloramines. Water systems with large distribution systems and long pipe runs often utilize chloramines because of the increased residual stability.

To combat biofilms and chlorine residual loss, many surface water treatment plants will switch from combined chlorine, called chloramines, to free chlorine for a short period to "burn-out" their distribution system. It's important to avoid DBP sampling during this time.

As time passes and the water travels down the pipeline, the chloramine continues to disinfect. Chlorine reacts with any oxidizable materials in the water or on the pipe wall itself. As chlorine is used up, the remaining residual decreases and free ammonia remains. The free ammonia is an ideal food source for biofilm, which reacts with chlorine to further diminish the residual. It is a vicious cycle played out each summer in water systems across the state.

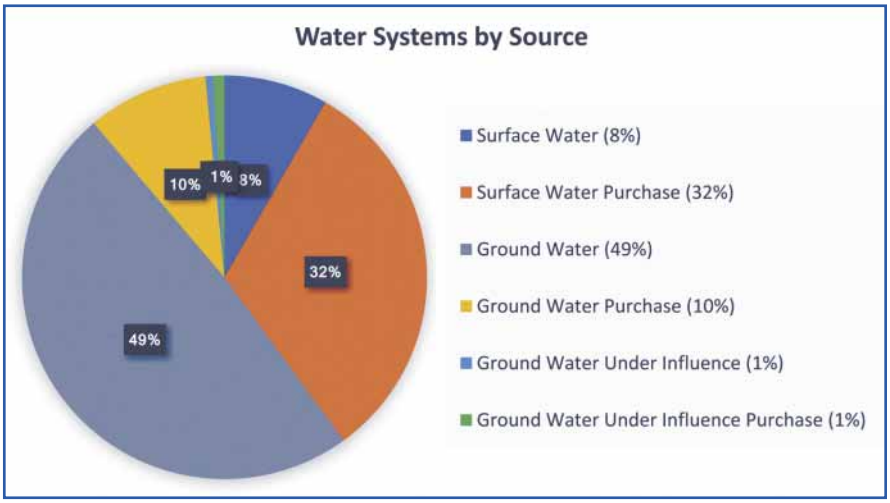
One good maintenance practice is to perform a burn-out of the distribution system. A water plant will stop feeding ammonia and maintain a free chlorine residual in the system. As earlier stated, free chlorine is a much more effective oxidizer, and along with line flushing, can remove biofilms in the distribution lines. The burn-out procedure requires the operator to move water via flushing to ensure that all areas of the distribution system are disinfected. The ideal time is when the water is warm and usage is high.

A call to the Kansas Department of Health & Environment (KDHE) is required before switching to free chlorine. To avoid angry phone calls, a water system should also notify its wholesale and residential customers before the switch. Wholesale customers should also pass along the word. Letting people know what to expect will save a lot of time on the phone.

Because of the switch to free chlorine, DBP levels will be greatly elevated during this procedure.

Most water treatment plants plan burn-outs around DBP samples. The Stage 2 DBP rule requires systems to sample during the month of warmest water, for most that is in August or September, the best time to perform a burn-out. The DBP sample must be taken in the month stated on the lab paperwork, but not on a certain day of the month. For example, an operator may sample DBPs on August 1 or August 31 and both be compliant. It is best practice to sample DBPs prior to starting a burn-out to ensure the sample is representative of the normal water conditions.

As the free chlorine in the water makes its way through the system, DBPs continue to form. A wholesale customer will receive water with exponentially higher DBPs than normal operation. If that system samples for DBPs they will likely be in violation. Drinking water regulations measure DBP compliance on an annual average, so one very high sample can cause a violation each quarter for an entire year, even if the quarterly samples



In Kansas 275 water systems purchase surface water from a wholesaler. Most of these systems have no control over chlorine type or levels. It is important for these operators to pay attention to the chlorine levels before sampling for DBPs.

Chloramines are used in most surface water treatment plants to avoid the formation of DBPs, which are created when free chlorine reacts with organic matter in the water. That is why it is not smart to take a DBP sample during a free chlorine burnout.

Drinking water regulations measure DBP compliance on an annual average, so one very high sample can cause a violation each quarter for an entire year, even if the quarterly samples themselves are low. That means one sample can cause four violations and require four separate public notices.

themselves are low. That means one sample can cause four violations and require four separate public notices.

What can be done?

Many water systems buy water from another system and have no control over whether the water contains free or combined chlorine. For starters, do not take a DBP sample during a free chlorine burnout. Operators need to pay attention to the daily chlorine levels. As a system switches from combined to free chlorine, residuals will drop consistently until they suddenly start to increase. This is called breakpoint chlorination, there are no more chloramines in the water, only free chlorine. Operators should also have a supply of free chlorine DPD packets so they can analyze samples for free chlorine. The operator should measure for free chlorine during the daily sample until the burn-out ends. See my article in the March 2021 issue of *The Kansas Lifeline* for tips on properly analyzing chlorine samples. It's at this link: https://www.krwa.net/portals/krwa/lifeline/2103/Adequate-Chlorine-Residuals.pdf

Operators also need to pay attention to what samples are required and when they need to be taken. A DBP violation could be avoided if the operator is aware enough to take the sample early in the month before the burn-out starts. Calling KDHE to request taking samples early or late to avoid sampling during a burn-out can also be done. KDHE staff are generally very reasonable and are willing to work with water systems if given the chance.

Free chlorine burn-outs are a common practice in surface water plants in Kansas. The procedure is safe and effective. It is very important to remember to not take a DBP sample during a free chlorine burnout.

Any system with questions about DBPs or chlorine residual maintenance is welcome to call on KRWA for guidance.

Daryn Martin began work with KRWA in August 2019. He previously was a Water Program Inspector and Environmental Program Administrator at KDHE's Wichita office. Prior to joining KDHE, he worked as an operator in the El Dorado Water Treatment Plant. He holds a Class IV water operator certification.

EPA
United States
Environmental Protection
Agency

Stage 2 Disinfectants and Disinfection Byproducts Rule: A Quick Reference Guide For Schedule 4 Systems

Overview of the Rule

Title	Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR) 71 FR 388, January 4, 2006, Vol. 71, No. 2
Purpose	To increase public health protection by reducing the potential risk of adverse health effects associated with disinfection byproducts (DBPs) throughout the distribution system. Builds on the Stage 1 Disinfectants and Disinfection Byproducts Rule (Stage 1 DBPR) by focusing on monitoring for and reducing concentrations of two classes of DBPs - TTHM and HAA5 - in drinking water.
General Description	Stage 2 DBPR requires some systems to complete an Initial Distribution System Evaluation (IDSE) to characterize DBP levels in their distribution systems and identify locations to monitor DBPs for Stage 2 DBPR compliance. The Stage 2 DBPR bases TTHM and HAA5 compliance on a locational running annual average (LRAA) calculated at each monitoring location.
Utilities Covered *	▸ All community water systems (CWSs) and nontransient noncommunity water systems (NTNCWSs) that either add a primary or residual disinfectant other than ultraviolet light, or deliver water that has been treated with a primary or residual disinfectant other than ultraviolet light. ▸ Schedule 4 includes CWSs and NTNCWSs serving fewer than 10,000 people and not belonging to a combined distribution system in which any system serves less than 10,000 people.

* NTNCWSs serving < 10,000 people do not need to complete any of the IDSE options, but must conduct Stage 2 DBPR compliance monitoring.

Stage 2 DBPR Regulated Contaminants

Regulated Contaminants	MCLG (mg/L)	MCL (mg/L)
Total Trihalomethanes (TTHM)		**0.080 LRAA**
Chloroform	0.07	
Bromodichloromethane	zero	
Dibromochloromethane	0.06	
Bromoform	zero	
Five Haloacetic Acids (HAA5)		**0.060 LRAA**
Monochloroacetic acid	0.07	
Dichloroacetic acid	zero	
Trichloroacetic acid	0.02	
Bromoacetic acid	-	
Dibromoacetic acid	-	

IDSE Requirements**

IDSE Option	Description
Standard Monitoring	Standard monitoring is one year of increased monitoring for TTHM and HAA5 in addition to the data being collected under Stage 1 DBPR. These data will be used with Stage 1 DBPR data to select Stage 2 DBPR TTHM and HAA5 compliance monitoring locations. Any system may conduct standard monitoring to meet the IDSE requirements of the Stage 2 DBPR.
System Specific Study (SSS)	Systems that have extensive TTHM and HAA5 data (including Stage 1 DBPR compliance data) or technical expertise to prepare a hydraulic model may choose to conduct a system specific study to select Stage 2 DBPR compliance monitoring locations.
40/30 Certification†	The term "40/30" refers to a system that during a specific time period has all individual Stage 1 DBPR compliance samples less than or equal to 0.040 mg/L for TTHM and 0.030 mg/L for HAA5 and has no monitoring violations during the same time period. These systems have no IDSE monitoring requirements, but will still need to conduct Stage 2 DBPR compliance monitoring.
Very Small System (VSS) Waiver†	Systems that serve fewer than 500 people and have eligible TTHM and HAA5 data can qualify for a VSS Waiver and would not be required to conduct IDSE monitoring. These systems have no IDSE monitoring requirements, but will still need to conduct Stage 2 DBPR compliance monitoring.
EPA has developed several tools to assist systems with complying with the Stage 2 DBPR IDSE requirements. These materials can be downloaded at www.epa.gov/safewater/disinfection/stage2.	

** NTNCWSs serving < 10,000 people do not need to complete any of the IDSE options.
† Systems that are notified by EPA or the state their VSS waiver or 40/30 certification has not been approved will need to complete Standard Monitoring or System Specific Study.

For additional information on the Stage 2 DBPR

Call the Safe Drinking Water Hotline at 1-800-426-4791; visit the EPA web site at www.epa.gov/safewater/disinfection/stage2; or contact your state drinking water representative.

Compliance with Stage 2 DBPR MCLs (Routine Monitoring)

Source Water Type	Population Size Category	Monitoring Frequency [1]	Total Distribution System Monitoring Locations Per Monitoring Period [2]
Subpart H	<500	per year	2
	500-3,300	per quarter	2
	3,301-9,999		2
	10,000-49,999		4
	50,000-249,999		8
	250,000-999,999		12
	1,000,000-4,999,999		16
	≥5,000,000		20
Ground Water	<500	per year	2
	500-9,999		2
	10,000-99,999	per quarter	4
	100,000-499,999		6
	≥500,000		8

Operational Evaluation

Systems must begin complying with the operational evaluation provision of the Stage 2 DBPR.

[1] All systems must monitor during month of highest DBP concentrations.

[2] Systems on quarterly monitoring must take dual sample sets every 90 days at each monitoring location, except for subpart H systems serving 500-3,300. Systems on annual monitoring and subpart H systems serving 500-3,300 are required to take individual TTHM and HAA5 samples (instead of a dual sample set) at the locations with the highest TTHM and HAA5 concentrations, respectively. If monitoring annually, only one location with a dual sample set per monitoring period is needed if highest TTHM and HAA5 concentrations occur at the same location, and month.

Critical Deadlines and Requirements

For Drinking Water Systems (Schedule 4)

January 4, 2006	Systems serving fewer than 500 people that have TTHM and HAA5 compliance data qualify for a VSS Waiver from conducting an IDSE, unless informed otherwise by U.S. EPA or state primacy agency.
April 1, 2008	Systems that do not receive a VSS Waiver must submit to the U.S EPA or state primacy agency either a: ▸ Standard monitoring plan, ▸ System specific study plan, or ▸ 40/30 certification.
April 1, 2009	Systems conducting standard monitoring or SSS begin collecting samples in accordance with their approved plan.
April 1, 2009	Consecutive systems must begin monitoring for chlorine or chloramines as specified under the Stage 1 DBPR.
March 31, 2010	No later than this date, systems conducting standard monitoring or a SSS complete their monitoring or study.
July 1, 2010	No later than this date, systems conducting standard monitoring or a SSS must submit their IDSE report.
October 1, 2013	No later than this date, systems must: ▸ Complete their Stage 2 DBPR Compliance Monitoring Plan (Systems serving more than 3,300 people must submit their Monitoring Plan to the state.)* ▸ Begin complying with monitoring requirements of the Stage 2 DBPR.†
July 2014††	Systems must begin complying with rule requirements to determine compliance with the operational evaluation levels for TTHMs and HAA5s.

For States

July - December 2006	States are encouraged to inform systems serving fewer than 500 people and do not qualify for a VSS Waiver from the IDSE requirements should begin complying with standard monitoring requirements.
March 31, 2009	States must approve the system's standard monitoring plan, 40/30 certification, or system specific study plan or notify the system that the state has not completed its review.
October 4, 2007	States are encouraged to submit final primacy applications or extension requests to EPA.
January 4, 2008	Final primacy applications must be submitted to EPA, unless granted an extension.
September 30, 2010	States must approve the system's IDSE report or notify the system that the state has not completed its review of the IDSE report.
January 4, 2010	Final primacy revision applications from states with approved 2-year extensions agreements must be submitted to EPA.

* A compliance monitoring plan is not required if the IDSE report includes all information required in a Stage 2 DBPR compliance monitoring plan.
† States may allow up to an additional 24 months for compliance with MCLs for systems requiring capital improvements. System not conducting *Cryptosporidium* monitoring under 141.701(a)(4) must begin Stage 2 DBPR Monitoring by this date. Systems conducting *Cryptosporidium* monitoring under 141.701(a)(4) or 141.701(a)(6) must begin Stage 2 DBPR Monitoring by October 1, 2014.
†† System not conducting *Cryptosporidium* monitoring under 141.701(a)(4) must comply by this date. Systems conducting *Cryptosporidium* monitoring under 141.701(a)(4) or 141.701(a)(6) must begin complying by July 2015.

Office of Water (4606) EPA 816-F-06-004 www.epa.gov/safewater June 2006