



**WESTCAS**

**2011 Fall Conference**

**"Fire and Water: Impacts on Western Water Quality"**

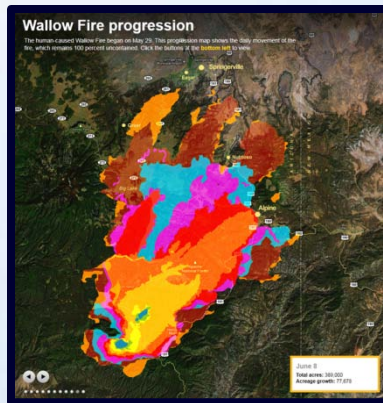
**General Session IV: Associates Focus**

**"Treatment Technologies to  
Remove Organic Contaminants in  
Source Water from Forest Fires"**

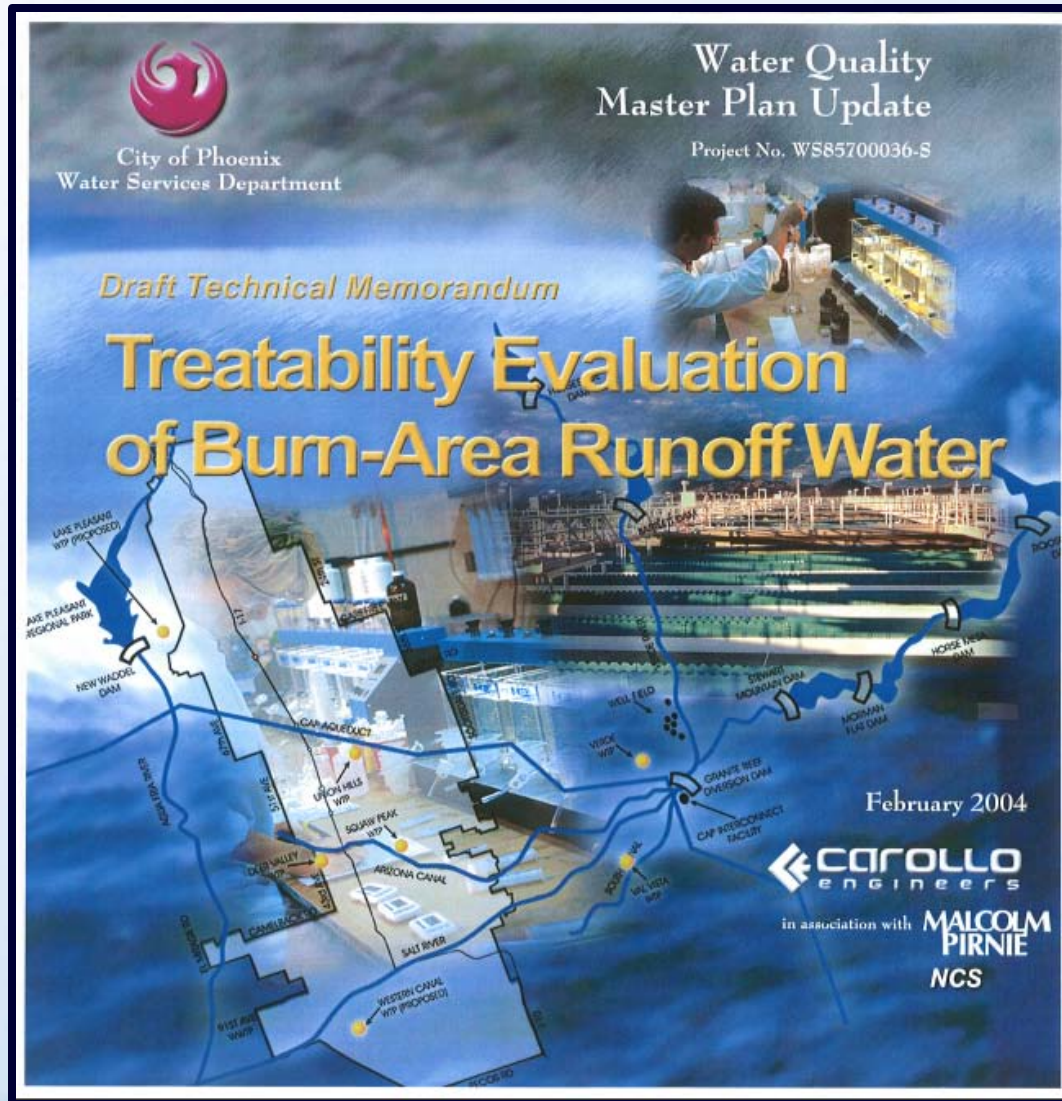
**David Siebert, P.E.**



# Forest fires in watersheds that supply our drinking water can be a significant issue.



# Not to worry...it's been studied!





# However, it is more about.....

United States Environmental Protection Agency  
Office of Water (4606)  
EPA 816-F-01-010  
May 2001  
www.epa.gov/safewater

## Stage 1 Disinfectants and Disinfection Byproducts Rule: A Quick Reference Guide

### Overview of the Rule

<b>Title</b>	Stage 1 Disinfectants and Disinfection Byproducts Rule (Stage 1 DBPR) 65 FR 80385 - 80478, December 18, 1998, Vol. 65, No. 241
<b>Purpose</b>	Revisions to the Interim Enhanced Surface Water Treatment Rule (IESWTR), the Stage 1 Disinfectants and Disinfection Byproducts Rule (Stage 1 DBPR), and Revisions to State Primary Enforcement Regulations to Implement the Safe Drinking Water Act (SDWA) Amendments 66 FR 3770, January 18, 2001, Vol. 66, No. 29
<b>General Description</b>	Improve public health protection by reducing exposure to disinfection byproducts. Some disinfectants and disinfection byproducts (DBPs) have been shown to cause cancer and reproductive effects in lab animals and suggested bladder cancer and reproductive effects in humans.
<b>Utilities Covered</b>	The Stage 1 DBPR is the first of a staged set of rules that will reduce the allowable level of DBPs in drinking water. The new rule establishes seven new standards and a treatment technique of enhanced coagulation or enhanced surface water treatment. The rule is designed to limit capital investments and avoid major shifts in disinfection level until additional information is available on the occurrence and health effects of DBP humans.

### Public Health Benefits

<b>Implementation of the Stage 1 DBPR will result in...</b>	<ul style="list-style-type: none"> <li>As many as 140 million people receiving increased protection</li> <li>24 percent average reduction nationally in trihalomethanes</li> <li>Reduction in exposure to the major DBPs from use of chlorine dioxide (DBP = disinfectant)</li> </ul>
<b>Estimated impacts of the Stage 1 DBPR include...</b>	<ul style="list-style-type: none"> <li>National capital costs: \$2.3 billion</li> <li>National total annualized costs to utilities: \$60 million</li> <li>86 percent of households will incur an increase in costs</li> <li>4 percent of households will incur an increase in costs</li> <li>&lt;1 percent of households will incur an increase in costs</li> </ul>

### Critical Deadlines and Requirements

<b>For Drinking Water Systems</b>	Surface water systems with a population of 15,000 or more people must comply with the rule by January 1, 2002
<b>For States</b>	States with a population of 15,000 or more people must comply with the rule by January 1, 2004
<b>For Small Systems (VSS)</b>	States with a population of 15,000 or more people must comply with the rule by December 16, 2000
<b>For Very Small Systems (VSS)</b>	States with a population of 15,000 or more people must comply with the rule by December 16, 2002

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](http://www.epa.gov/safewater/disinfection/stage2); or contact your state drinking water representative.

## Stage 2 Disinfectants and Disinfection Byproducts Rule: A Quick Reference Guide For Schedule 1 Systems

### Overview of the Rule

<b>Title</b>	Stage 2 Disinfectants and Disinfection Byproducts Rule (Stage 2 DBPR) 71 FR 388, January 4, 2006, Vol. 71, No. 2
<b>Purpose</b>	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 HAAs - in drinking water.
<b>General Description</b>	Stage 2 DBPR requires some systems to complete an initial Distribution System Evaluation (DSE) 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 HAAs compliance on a seasonal running annual average (LRAA) calculated at each monitoring location.
<b>Utilities Covered</b>	<ul style="list-style-type: none"> <li>All community water systems (CWSs) and nontransient noncommunity water systems (NTNWSs) 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.</li> <li>Schedule 1 includes CWSs and NTNWSs serving 100,000 or more people OR CWSs and NTNWSs that are part of a combined distribution system in which the largest system serves 100,000 or more people.</li> <li>NTNWSs serving &lt; 10,000 people do not need to complete any of the DSE options, but must conduct Stage 2 DBPR compliance monitoring.</li> </ul>

### Regulated Contaminants

Regulated Contaminants	MCLG (mg/L)	MCL (mg/L)
<b>Total Trihalomethanes (TTHM)</b>		
Chloroform	0.07	0.07
Bromochloromethane	zero	0.06
Dibromochloromethane	zero	0.06
<b>Five Haloacetic Acids (HAAs)</b>		
Monochloroacetic acid	0.07	0.07
Dichloroacetic acid	zero	0.02
Trichloroacetic acid	zero	0.02
Bromochloroacetic acid	0.07	0.07
Dibromochloroacetic acid	zero	0.02

### IDSE Requirements\*\*

IDSE Option	Description
<b>Standard Monitoring</b>	Standard monitoring is one year of increased monitoring for TTHM and HAAs 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 HAAs compliance monitoring locations. Any system may conduct standard monitoring to meet the IDSE requirements of the Stage 2 DBPR.
<b>System Specific Study (SSS)</b>	Systems that have extensive TTHM and HAAs 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.
<b>4030 Certification</b>	The term "4030" 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 0.020 mg/L for HAAs 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.
<b>Very Small System (VSS) Waiver</b>	Systems that serve fewer than 600 people and have eligible TTHM and HAAs 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](http://www.epa.gov/safewater/disinfection/stage2).

\*\* NTNWSs serving < 10,000 people do not need to complete any of the IDSE options.

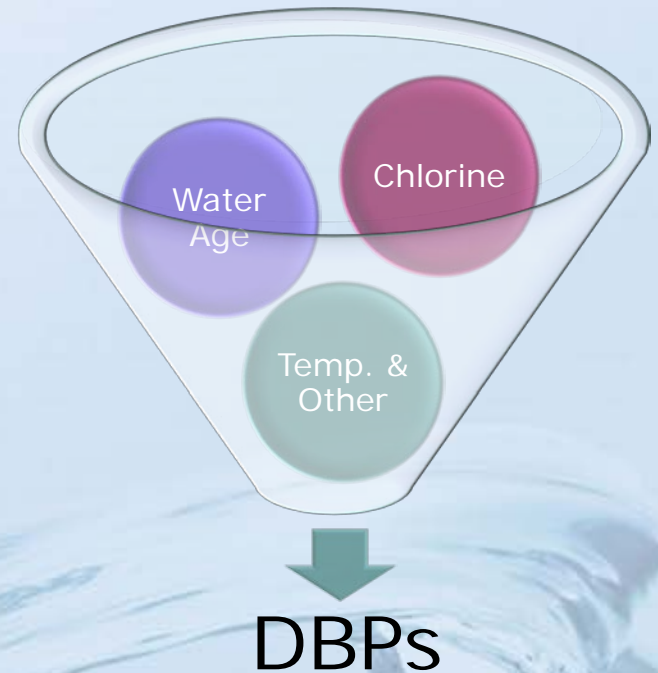
† Systems that are notified by EPA or the state that they VSS waiver or 4030 certification has not been approved will need to complete Standard Monitoring or System Specific Study.

# Stage 2 D/DBPs Rule is a “Game Changer”

- Stage 1 compliance based on system running annual average
- Stage 2 compliance based on a locational running annual average (LRAA)
  - ❖ The > system size, the > # of monitoring points
- Must be proactive to meet compliance
- For Valley of the Sun: TTHMs are the challenge

# Today's Focus – TTHM Compliance

1. TTHMs result from a reaction between TOC and chlorine (the Valley's primary disinfectant)
2. TTHMs are impacted by TOC levels, chlorine dosage, time, and temperature
3. Fires have increased Raw Water TOC levels



# What does this mean in terms of water treatment?





# The 1<sup>st</sup> Tool out of the box is...



## "Planning"



# The next Tools are...



## Pre-chlorination

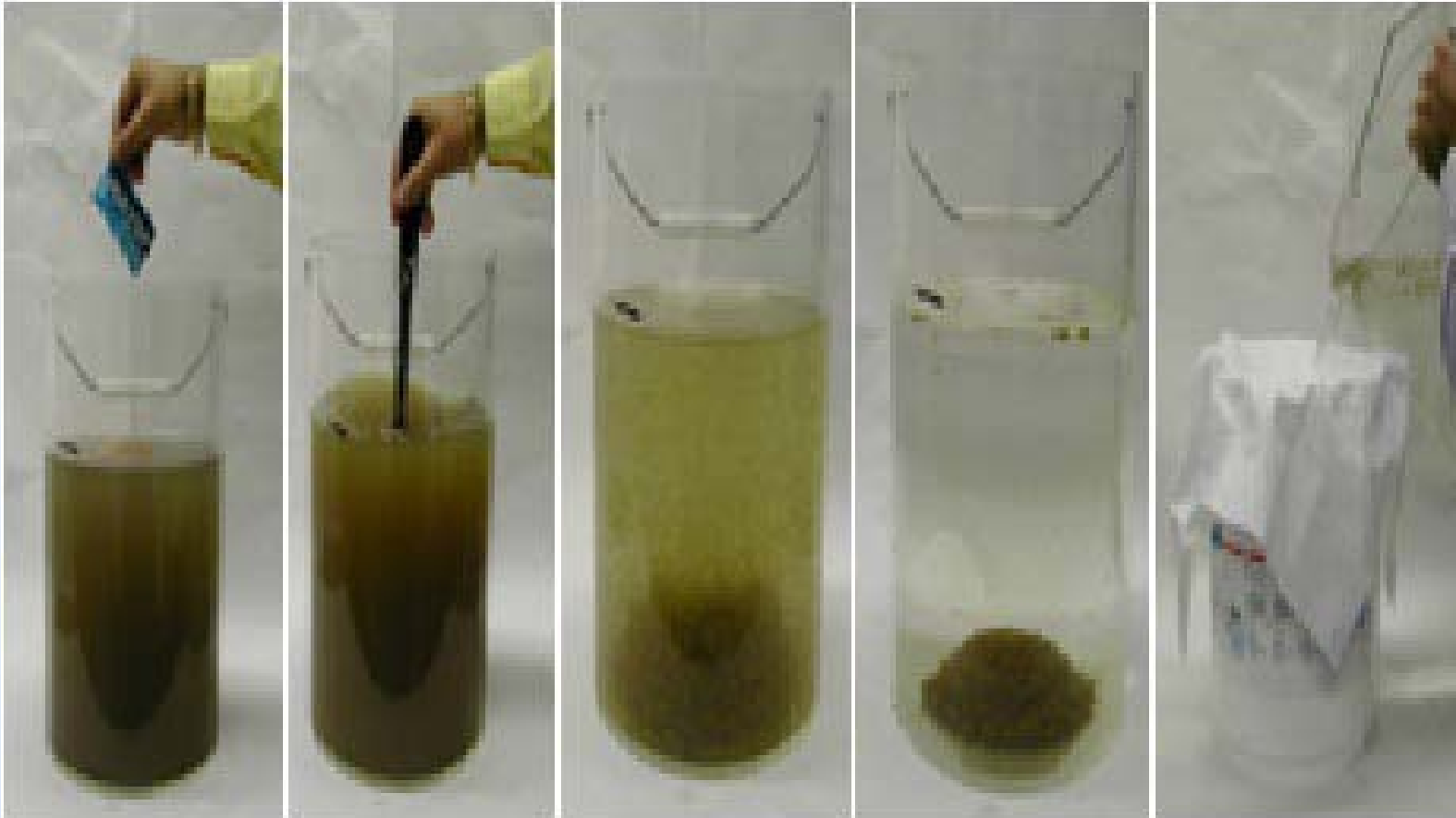
- Chlorine Dioxide
- Ozone
- PAC

# The next Tool out of the box is..



## Enhanced Coagulation

# Enhanced Coagulation



- Alum vs. Ferric
- Biggest bang for \$
- w/ pH Control



# The next Tool is...



## Granular Activated Carbon (GAC)

# GAC works by “adsorbing” Organics

- GAC Filter Adsorbers
- Post Filtration GAC Contactors
- Dependent on contact time
- Virgin or Reactivated
- \$\$\$



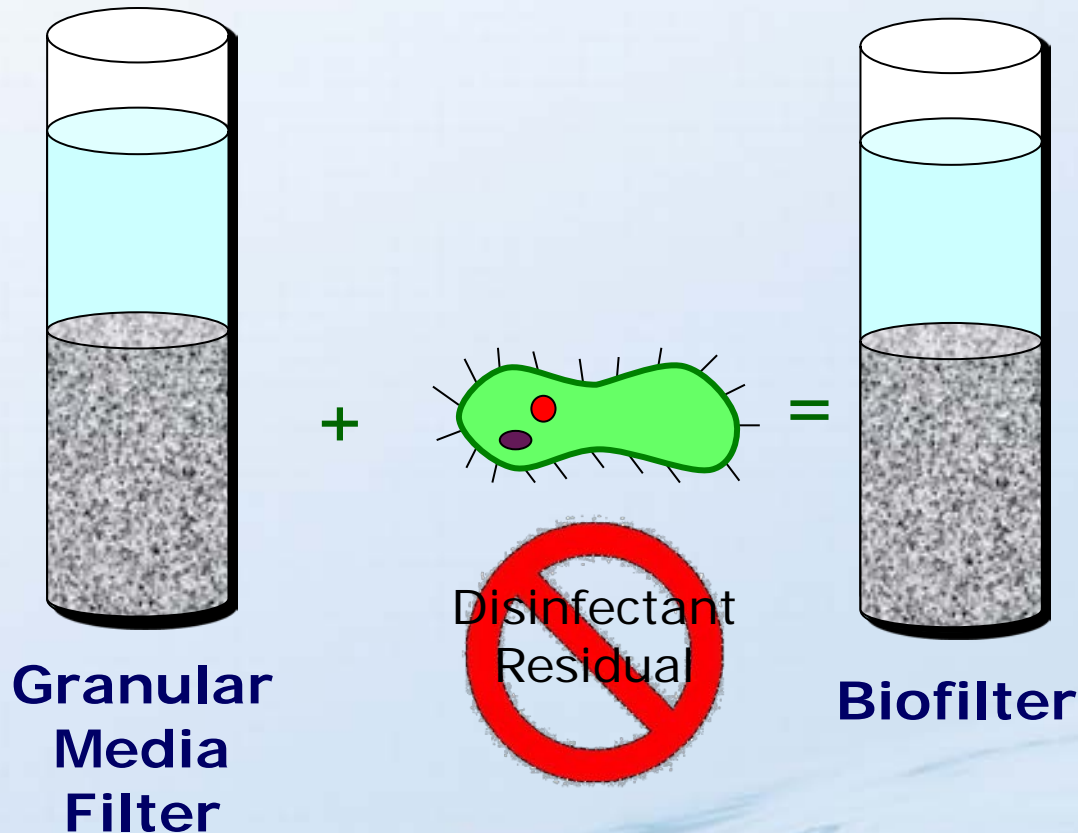
# The next Tool out of the box is...



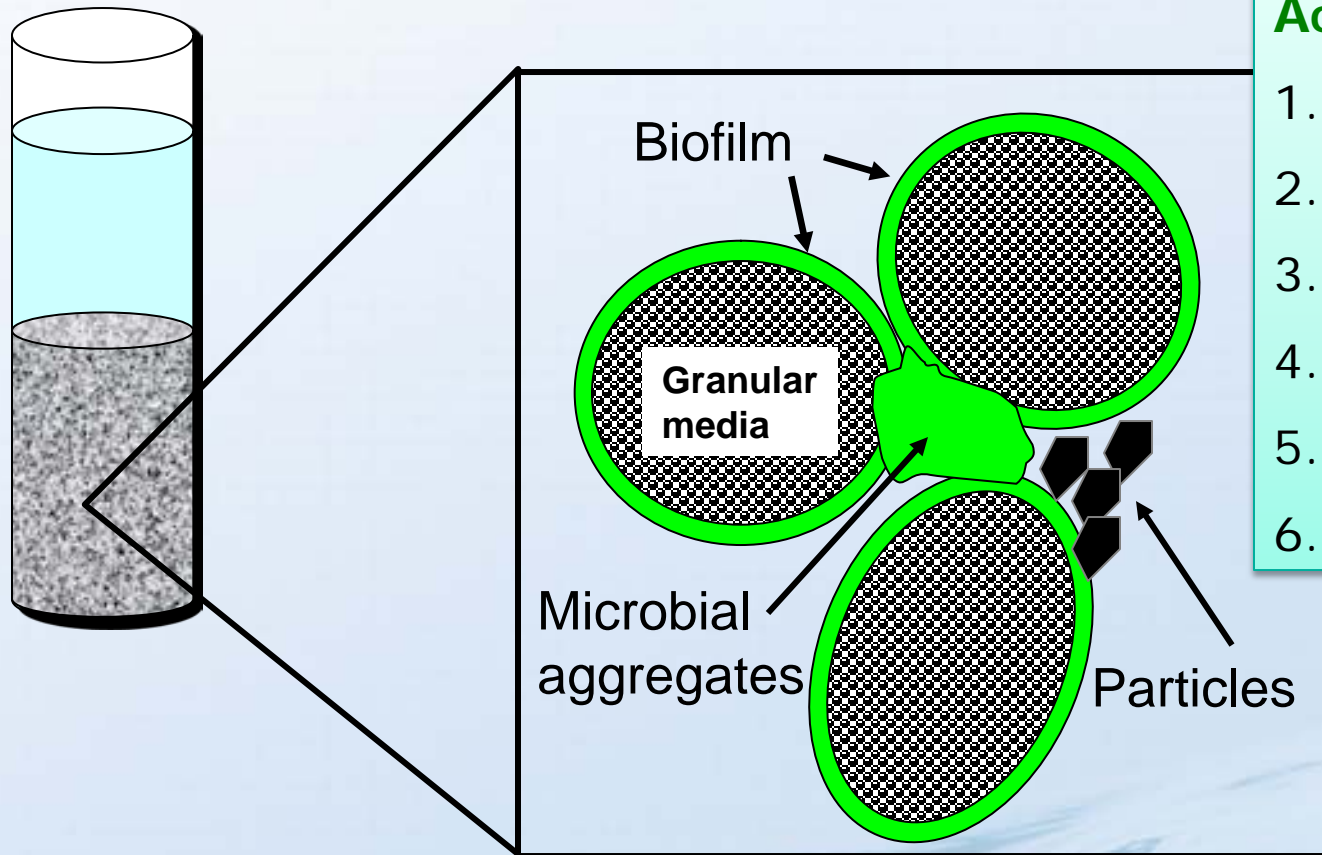
## Biologically Active Filtration



# Biofiltration is modified conventional granular media filtration



# Biofiltration is modified conventional granular media filtration



## Active Processes

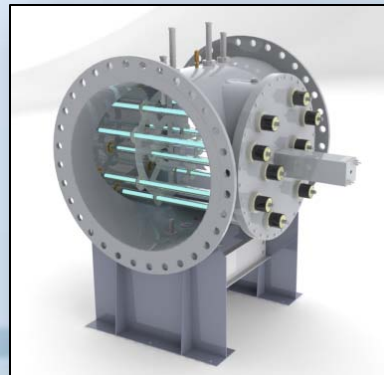
1. Growth
2. Decay
3. Attachment
4. Detachment
5. Biodegradation
6. Filtration

**Engineered BAF**

# The next Tool out of the box is...



## UV Disinfection

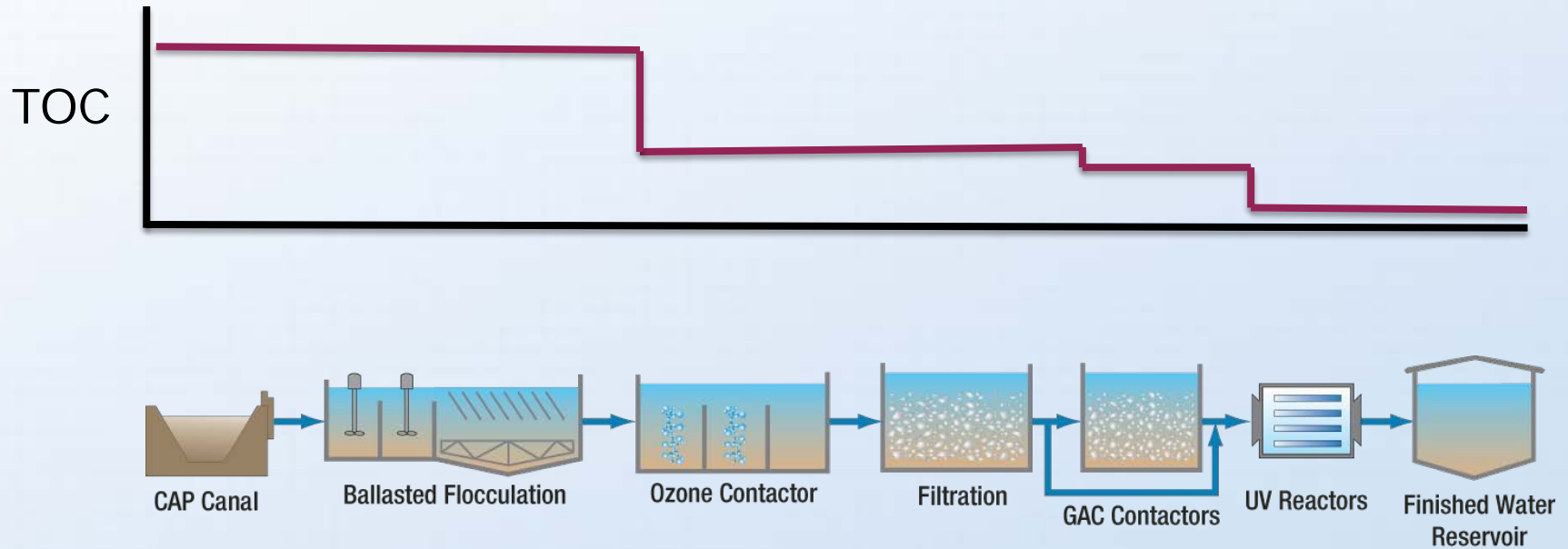




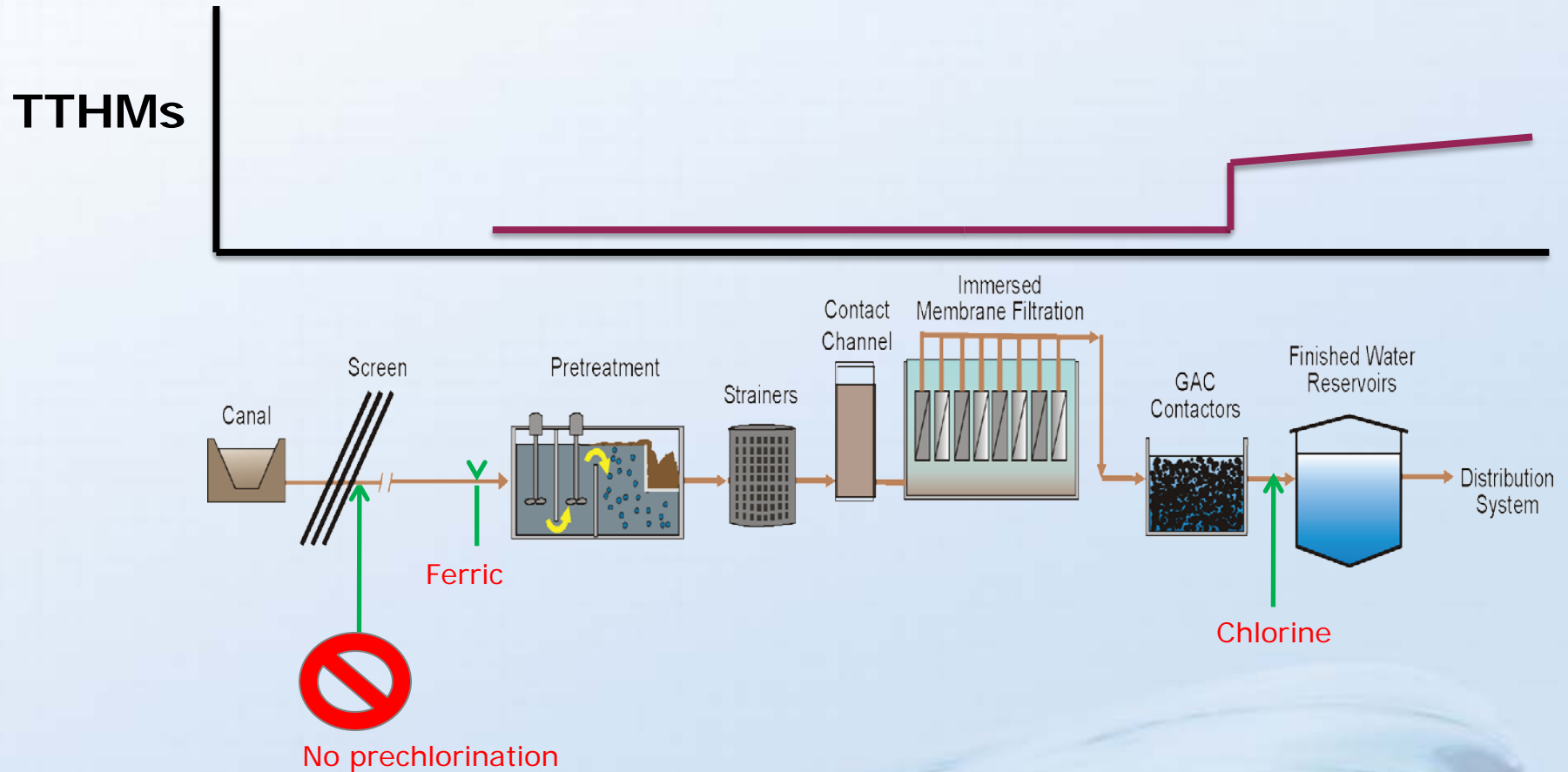
# Post-Treatment Techniques

- Distribution System Flushing
- Reservoir Aeration
- Hotspot Treatment

# Individual Treatment Processes Remove Different Amounts of TOC



# TTHM Formation in WTP Impacted by Chlorine and TOC





**One technique that shouldn't  
be overlooked.....**



# Acknowledgements

City of Phoenix  
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Chemistry Land  
Desdemonia Despair  
Salient News  
Christopher Leign Studios  
ABC15.com  
Aquaray  
Unknown  
Troy Hayes  
Chance Lauderdale  
Mark Gross  
Teresa Linke

# Questions?

