# ARKANSAS
# DRINKING WATER UPDATE

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## Senate Hearing Held on Rx's in Water Supplies

Following publication by the Associated Press in March of a series of articles detailing the existence of pharmaceuticals in the drinking water of a number of U.S. cities, the Senate held a hearing on the issue on April 15 in Washington, D.C.

Benjamin Grumbles, EPA Assistant Administrator for Water, testified before the Senate Subcommittee on Transportation Safety, Infrastructure Security, and Water Quality that the U.S. has one of the safest drinking water supplies in the world and that his agency was committed to keeping the waters clean and healthy. He said the agency had considered 287 pharmaceuticals and personal care chemicals in the draft Contaminant Candidate List 3 (CCL3) published for public comment in February. However, Grumbles said that only one chemical made the draft CCL3 list because the agency determined that most such chemicals in drinking water were at levels far below those currently associated with adverse health effects.

The CCL is a list of chemicals that the EPA will evaluate for possible regulation under the Safe Drinking Water Act.

An opposite view was expressed at the hearing by Jennifer Sass of the Natural Resources Defense Council. She told members of the Committee that antibiotic, endocrine disrupting, hormonal, and other compounds in the nation's waterways drinking water presented a health threat to the public. She criticized EPA for not beginning a screening program on the health effects of endocrine disrupting compounds in drinking water that was required by the 1996 Amendments to the Safe Drinking Water Act. She also criticized EPA for not including more pharmaceutical and endocrine compounds on the CCL3.

Others testifying at the hearing included representatives of the U.S. Geological Survey, the American Water Works Association, the New Jersey Environmental Federation, and the Pharmaceutical Research and Manufacturers of America. The testimony of Shane Synder, representing the AWWA, is reprinted beginning on page two of this newsletter.

All of those testifying at the hearing called for greater monitoring efforts and for greater health effects research.

The Associated Press articles were published in March and described the results of monitoring programs by both researchers and by utilities on the presence of pharmaceuticals and personal care products in untreated and treated drinking water. The authors stated that chemicals were found in 24 water utilities which served a total of 41 million Americans.

The Department of Health's current monitoring program for Arkansas public water systems includes all regulated and unregulated chemicals specified by the EPA's National Primary Drinking Water Regulations, but does not include the type of chemicals discussed in the hearing.

An April letter from Grumbles was sent to all state Health Officers requesting information on any state activities or initiatives regarding pharmaceuticals in water. He also requested input on the proposed CCL3.

In a May response, Paul K. Halverson, DrPH, director of the Arkansas Department of Health, advised Grumbles that a coordinated national effort was needed to address the issue. Halverson said that effort needed to include greater data on the prevalence of chemicals, greater health effects research, expanded programs to reduce pharmaceutical waste streams, and a greater emphasis on source water protection.

## SRF Provides $93 Million For State Water Systems Over 10 Years

The Drinking Water State Revolving Loan Fund (DWSRF) in Arkansas has provided $93 million in funding for public water system construction since its inception in 1997 based on EPA's 2007 Annual Report on the program. The SRF funds and the state's general obligation bond program provide a key source of money for public water system in the state. The two programs combined have provided hundreds of millions of dollars in funding for water projects. Both loan programs are overseen by the Arkansas Natural Resources Commission.

The 1996 Amendments to the Safe Drinking Water established the DWSRF with the goal of ensuring the viability of water systems and to protect public health. Each state primacy agency establishes its own criteria to prioritize DWSRF drinking water projects.

According to the EPA annual report, the federal government has realized a return on investment of 180% on the $8.2 billion invested nationally in the program. In Arkansas, the return on the federal investment has been 289%.

States are required to match 20% of the EPA capitalization grant and twenty states, including Arkansas, utilize bond

See SRF page 2

Inside the *Update* Page

Testimony on Rx's in Water…….2
ADEQ Reg Moves Forward…….4
Considering Chloramines…….5
News of Note……7
Water Exam Locations….....8
LT2 Training Completed….....9
Alma's CTA Experience.....9
Licensing Committee Report.....13
Training.....8,16

Statement of Dr. Shane Snyder, Southern Nevada Water Authority
before the
Senate Subcommittee on Transportation Safety, Infrastructure Security, and Water Quality
on
Pharmaceuticals in the Nation's Water: Assessing Potential Risks and Actions to Address the Issue
April 15, 2008

Good afternoon. My name is Dr. Shane Snyder and I am the Research and Development Project Manager for the Southern Nevada Water Authority. I have conducted research related to trace contaminants in water, including pharmaceuticals, for nearly 15 years. I have served as principal investigator for numerous research projects related to the trace-level detection, removal, and toxicology of pharmaceuticals in water supplies, and have published approximately 50 peer-reviewed articles and book chapters on this topic. I would like to make it perfectly clear that I am a scientist, not a policy maker. While I am honored to share some of my findings with you today, please keep in mind that I do not establish, suggest, or enforce policy decisions. I am appearing today on behalf of the American Water Works Association (AWWA). AWWA is the world's oldest and largest association dedicated to safe water. Our utility members serve safe and affordable drinking water to over 80 percent of the American people.

Contrary to recent reports that characterize pharmaceuticals in water as an entirely new issue, pharmaceuticals were first reported in US waters by the EPA in 1975. The fact that more pharmaceuticals are detected today is not due to greater contamination of our nation's water, but a reflection of the increasingly sensitive analytical technology that allows us to identify and quantify diminishingly minute concentrations of these chemicals in water.

My research related to trace pharmaceuticals in drinking water has been conducted entirely without federal mandate through the volunteer efforts of our nation's water utilities. The fact is, the cities that participated in my current study by submitting water samples for analysis, did so in the absence of any regulatory requirement, going well above and beyond the regulations in the interest of furthering understanding of this issue.

My previous studies have been transparent, and have been published in open literature and frequently presented in public forums. I will do that again when my current research is complete. However, as a scientist, I would strongly caution against presenting preliminary findings of partially completed studies. In order to provide meaningful information on pharmaceutical compounds and other substances in water, scientists need both occurrence data and human health effects information. It is scientifically inadequate to communicate solely on what we can measure at any level without a frame of reference for what that means.

I have frequently been asked about the sources of these products in our waters. I will not go into it here in detail, but will note that both nonpoint source runoff and sewage effluent from properly operated waste treatment plants may contain minute traces of these compounds. Some minute quantities of these products will pass through animals and humans who use them, and enter the waste stream. They are typically not completely destroyed or removed by waste water treatment processes.

A more central point about our studies is that the few pharmaceuticals we did detect in US drinking waters occurred at unfathomably low concentrations. To illustrate that point, consider this: If our study had been constrained by the ability to find these compounds at parts-per-billion levels instead of delving into the parts-per-trillion range, none of them - not a single one-would have been found.

This raises a critical question. Are

Continued next page

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**Little Rock, AR 72205**

Some water systems continue to send correspondence to the old Department of Health & Human Services address (P.O. Box 1437, Little Rock, AR 72201). This address is not valid for the Department of Health. Water systems which continue to use the invalid address may have their submittals discarded.

Please use the correct address for all submittals to the Engineering Section. Your cooperation is appreciated.

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**SRF** *continued from page 1*

leveraging to increase the available funds even more. Over $14 billion has been made available nationally to fund over 5500 projects.

Small systems, those serving less than 10,000 population, and disadvantaged communities are provided priority consideration under the program. In Arkansas, that consideration can include longer repayment terms on a loan. Forty million of the $93 million awarded in Arkansas has been to small systems and $77 million to disadvantaged systems.

The national average interest rate for the DWSRF program in 2007 was 2.2% compared to a market rate of 4.2%. The majority of the loans are evenly split between distribution projects and water treatment (43 vs 44 percent). In addition to construction, SRF loans can be used to consolidate or restructure a water system, and to acquire property for source water protection as long as the acquisition is not by eminent domain.

A copy of the report can be obtained at the EPA website - www.epa.gov/safewater/dwsrf/ .

we going to make decisions based upon our ability to find contaminants, or based upon protection of public health? I am not a policy-maker; I am a scientist. However, I can tell you with absolute certainty that, if we regulate contaminants based upon detection rather than health effects, we are embarking on a futile journey without end. The reason is simple: Decades ago, we could only detect contaminants at parts per million levels. Years ago, we advanced to parts per billion. We are now able to detect compounds at the parts-per-trillion level, and are breaching the parts-per-quadrillion boundary in some cases. The truth is that the concentrations of pharmaceuticals found in water supplies are millions of times lower than a medical dose. Consider that the highest concentration of any pharmaceutical we detected in US drinking waters is approximately 5,000,000 times lower than the therapeutic dose. This concentration is difficult to perceive, so consider these analogies. This concentration is roughly equivalent to 1/2 of an inch in the distance between the earth and the moon, or in terms of time, this concentration would be equivalent to approximately one second in approximately 750 years. Based upon our four-year study of the health relevance of trace pharmaceuticals, using the highest concentrations found and the most conservative safety factors to protect susceptible populations such as infants and pregnant women, our report will demonstrate that one could safely consume more than 50,000 eight-ounce glasses of this water per day without any health effects. While the report will not be published until later this year, I can tell you that the bottom-line conclusion is that the concentrations of pharmaceuticals we studied are orders of magnitude lower than would pose a public health threat. I am not suggesting that this is the final, definitive study on this issue; in fact, I urge you to support further health effects research.

That said, the Safe Drinking Water Act already has established processes for identifying and regulating drinking water contaminants to protect human health. The Contaminant Candidate List and the Unregulated Contaminant Monitoring Rule are appropriate processes that entail great scientific rigor. As a scientist, I would caution against regulating pharmaceuticals any differently than the scores of contaminants currently covered by the Safe Drinking Water Act, because in reality they are no different. Our decision as humans to improve and extend our lives by using pharmaceuticals dictates that some infinitely small amount of these products can and will make their way into the environment. The fact that we can detect trace contaminants does not alone imply risk.

> "…if we regulate contaminants based upon detection rather than health effects, we are embarking on a futile journey without end."

With regard to removing these compounds through treatment, my team has tested the effectiveness of a diverse array of water treatment technologies on removal of pharmaceutical compounds, and to be certain, some technologies are more effective than others. However, the pinnacle question is whether the use of these treatment technologies is warranted to protect public health, because there are environmental and societal costs associated with using them. In an age where we are concerned about greenhouse gas emissions and minimizing our nation's energy demands, is it wise to dictate energy-intensive water treatment systems when there is no evidence of public health benefits? Additionally, there is a looming crisis related to aging water infrastructure that will require a vast financial investment by utilities. Should that be set aside so they can chase down the last nanogram of a compound?

So what should we do? A couple of things make sense. This issue does highlight the need to better protect America's sources of drinking water from various sources of contamination. And clearly there is a pressing need for additional research on this issue. As a scientist, I recommend we focus on research related to health effects from trace pharmaceuticals with a lesser emphasis on occurrence, in order to determine whether there is in fact a problem to solve. The critical question we must address is not "Do they exist?" but rather, "At what concentration are these compounds harmful to human health?" Only then can we make intelligent, rational decisions that protect the health of this country's municipal water customers.

Our recommendations are spelled out in more detail below:

1. EPA should work with states, water and wastewater utilities, and the agricultural community to minimize contamination of source waters by pharmaceutical products as well as other contaminants.

It is imperative that the nation do a better job of protecting its waters, and especially sources of drinking water, from contamination. We have said previously that there is an imbalance between the enforceable controls on point sources, such as Publicly Owned Treatment Works, and the less rigorous programs used to limit nonpoint sources of pollution, such as agricultural runoff. Congress may wish to evaluate this issue to assure that all sources of pollution are equitably contributing to the protection of the nation's waters.

2. We urge support for proper pharmaceutical disposal programs to reduce the flushing of pharmaceutical products into sewage systems to the greatest degree possible, while recognizing that this addresses only a small part of the problem.

Although more research would be needed to accurately characterize this issue, we believe it is likely that more pharmaceuticals end up in the environment after passing through humans than after flushing unused products. However, some unused pharmaceutical products are undeniably flushed into waste streams, contributing to the problem but also offering an opportunity to make reductions in the pollutant loading

See Testimony page 4

**Testimony** *continued from page 3*

through a "pollution prevention" approach. We urge support for pharmacy "take back" programs that make doing the right thing obvious and convenient for consumers.

3. Elevate EPA's drinking water health effects research budget at least equivalent to the air pollution health effects research budget. Even though this Subcommittee does not appropriate funds, we ask you to support this increase.

To date, no peer reviewed published research has found ill effects on humans from pharmaceuticals in the environment at the trace levels we have seen in drinking water. However, drinking water providers would like to see more research on this matter, so that we can either take appropriate action to address an actual health risk if there is one, or reassure the public that there is not one. Treatment to completely remove all traces of pharmaceuticals from drinking water will be very expensive, and our customers have a right to expect that we will only undertake the investment necessary to do this - and increase their utility bills to pay this expense - if doing so addresses an actual health risk.

We also specifically support: 1) a dedicated authorization in the Research Title of the Agriculture Reauthorization bill for collaborative research between the drinking water community and the agriculture industry on ways to limit contaminants from entering water supplies; and 2) a dedicated research authorization to support decisions on contaminant listing and rulemaking by EPA's Office of Ground Water and Drinking Water. These funds should be used to focus research on priority drinking water areas of concern.

4. We should continue to rely upon EPA's science-driven Contaminant Candidate List (CCL) process to identify candidates for new drinking water standards.

Though at times this process appears to move slowly, a methodical, science-based process is necessary for determining which contaminants need to be regulated, so that we focus on actual risk and on the higher risks first. The standard setting process detailed in the Safe Drinking Water Act is sound, and setting standards through a science-driven process gives the public confidence that the regulations they pay for are necessary, reasonable, and protect public health. An increase in human health effects research, as mentioned in Item 3 above, would improve this process.

5. We should continue to rely upon the Unregulated Contaminant Monitoring Rule (UCMR) for decisions concerning testing and reporting to customers about contaminants that are not currently regulated.

EPA employs a comprehensive and science-based approach to determining which unregulated contaminants utilities should monitor for, and what utilities should say about these contaminants (if detected) to their customers. It is appropriate to use this kind of science-based process to determine which, if any, additional currently unregulated contaminants utilities should investigate. ♦

## PC&E Commission Approves Utility's Request to Seek Input on Wastewater Discharge Ban

The Arkansas Pollution Control and Ecology Commission approved at its March meeting a petition allowing Central Arkansas Water to move forward in the administrative procedures process on its petition to ban wastewater discharges in the watershed of Lake Maumelle. The petition proposes a revision to an Arkansas Department of Environmental Quality regulation on wastewater permits. The Commission's decision allows the utility to move forward with public hearings and legislative review of the proposal but is no guarantee of its final approval.

During their consideration of CAW's petition, Commissioners inquired about the status of the utility's efforts to revise the subdivision regulations of the Pulaski County Planning Commission, and expressed the opinion that CAW's petition needed to be addressed on the local level before being considered by the state PC&E Commission. The lake's watershed includes property within Pulaski, Perry, and Saline Counties. CAW officials responded that they were working with county officials and stakeholders, and hoped to have revisions approved soon.

The PC&E Commission included a caveat in its approval that it would not take a final vote on the petition before January 1, 2009, presumably in order to allow time for Pulaski County to address the issue.

## WATER SYSTEM IMPROVEMENTS

CENTRAL ARKANSAS WATER: 1800 L.F. of 3 – 12 inch mains and a 500 gpm booster pump station to serve the Ridgefield Estates area in Pulaski County.
ENGLAND: additional 600 gpm well and a new 0.86 mgd water treatment plant.
FORT SMITH: 13,000 L.F. of 12 – 16 inch mains to improve water pressures and flows in the Howard Hill area.
GRAND PRAIRIE WATER USERS: upgrade and expansion of the Hwy 31 treatment plant to 2 mgd.
JONESBORO: construction of a 2000 gpm pump station on Neely Road.
MAGNOLIA: distribution system improvement consisting of 25,000 L.F. of 6 & 8 inch mains.
SEVIER COUNTY WATER: water treatment plant expansion to 2.3 mgd through the addition of a second treatment module and distribution system improvements consisting of 83,000 L.F. of 8 & 10 inch mains.
YELLVILLE: 8,000 L.F. of 12 inch main and a 0.5 MG ground storage tank.

# Considering the Switch to Chloramines

Craig Corder, P.E., Engineer Supervisor

A number of public water systems are wrestling with how to achieve compliance with the current EPA Stage 1 Disinfectants and Disinfection By Product Rule or are facing the prospect of noncompliance with the upcoming Stage 2 Rule.

Chloramination is one of the options that a water system can consider in addressing issues with disinfection by-products (DBPs). It is not the only option that should be evaluated and it has disadvantages that may make it unfeasible or undesirable. Just as with any treatment modification, before a utility makes the leap to chloramines, a deliberate study needs to be undertaken, including possible pilot or bench testing, in order to weigh the pluses and minuses of the process.

Definition & Chemistry

Chloramination has been used as a treatment process since the early part of the twentieth century and became more common in the United States in the 1950's and later. It is the reaction of chlorine and ammonia to form combined chloramines; specifically, monochloramine ($NH_2Cl$), dichloramine ($NHCL_2$), and trichloramine ($NCL_3$). Ammonia is added to the water, along with chlorine, to form the reaction, or ammonia may be naturally present in the raw water. The particular species of combined chloramines formed, after meeting any inorganic chlorine demands such as from iron or manganese, depends on a number of factors. These include the chlorine dose; the temperature, pH, and alkalinity of the water; and the chlorine to ammonia-nitrogen ratio.

Up to a chlorine to ammonia weight ratio of 5:1, the predominant product formed is monochloramine. Monochloramine is the preferred form of combined chlorine because it is less likely to be associated with adverse tastes and odors. Monochloramine is generally formed at a pH above 7 with the optimum pH being 8.4. At high chlorine to ammonia ratios, the ammonia is oxidized to ammonia gas, nitrates, or nitrogen containing inorganic compounds. The presence of nitrates and nitrites in drinking water, both of which are regulated under the Safe Drinking Water Act, as the result of chloramination is known as nitrification and is a side effect that must be monitored, particularly in warmer weather months and in areas of the distribution system with long detention times.

Chloramination is utilized primarily as a secondary disinfectant to guard against contamination after the entry of the water into the distribution system. The chloramines levels and contact times necessary to inactivate pathogenic cysts such as Giardia (CT value) are too high to be practical for most systems.

Advantages

Chloramines have two major advantages over free chlorine. The first is that chloramines are more persistent than free chlorine. Use of chloramines in large distribution systems may help with the maintaining of a disinfectant residual throughout the entire distribution system.

The second advantage is the lower formation potential for trihalomethanes and haloacetic acids after the water enters the distribution system. Once ammonia is added, there is little or no additional formation of regulated trihalomethanes. While there may be some additional formation of haloacetic acids, it is at a much lower formation rate than with free chlorine.

If you are considering changing to chloramination to control trihalomethanes or haloacetic acids it is critical to know where the DBPs are forming. Chloramination does not remove or reduce DBP's that have already been formed such as in the treatment plant itself or in a clearwell.

Chloramines may be more effective at controlling bio-films in PVC piping than free chlorine due to the higher and more persistent chloramine residuals typically used. Reports from the American Water Works Research Foundation indicate that neither chloramine residuals nor free chlorine residuals typically found in water systems are effective at elimination of bio-films in piping with significant tuberculation. The research does indicate that periodically changing from chloramination to free chlorine reduces the bio-film more effectively than maintaining either free chlorine residual or a chloramination residual.

Disadvantages

Chloramines are a much weaker disinfectant than free chlorine. The use of chloramines to meet inactivation requirements for pathogens (CT) is usually impractical. The contact time necessary for a given chloramines

See Chloramines page 6

## Disinfection by Product MCLs

The Stage 1 Disinfectants and Disinfection By Product Rule sets a maximum contaminant level of 80 parts per billion for total trihalomethanes and 60 parts per billion for haloacetic acids. The compliance calculation is based on a running annual average from each of the previous four calendar quarters.

Under the Stage 2 Rule, which phases in beginning in 2012 for large systems, the MCLs will remain unchanged. However, sampling sites are being reevaluted as part of the Individual Distribution System Evaluation (IDSE) to determine if those sites represent the locations for highest disinfection by product levels. Additionally, compliance will be calculated based on a running annual average for each individual sample site (Locational Running Annual Average – LRAA) rather the entire distribution system. This means that for Stage 2 each sample site must meet the MCLs based on the average of the four quarterly results from that particular site. Sample results from sites located close to the distribution entry point cannot be average with results from farther in the distribution system.

Working with each water system, the Engineering Section will complete the selection of Stage 2 monitoring sites in 2008 and 2009. Engineering staff hope to begin noncompliance investigative sampling of those sites in 2009 and 2010. This should provide water systems an advance notice on their compliance status before the effective date of the Stage 2 rule.

## Chloramines *continued from pg 5*

residual to achieve an inactivation rate is an order of magnitude greater than the equivalent contact time using free chlorine. For example, a contact time ($T_{10}$ time) of 180 minutes for chloramines requires only 20 minutes using free chlorine. Most surface water treatment plants in Arkansas have contact times of less than 100 minutes.

Since chloramines are a much weaker disinfectant than free chlorine, they are more easily overwhelmed by gross distribution contamination events that occur due to a loss of system pressure or from cross connections. This may be somewhat offset due to chloramine residuals generally being higher than free chlorine residuals in a distribution system.

When changing from free chlorine to chloramination, there are additional costs related to purchasing and feeding the ammonia, for process control, and for monitoring. The correct chlorine to ammonia ratio must be maintained, and should be in a range of 3:1 up to 5:1. Nitrification is a concern due to the potential for free ammonia being present in the distribution system at ratios below 3:1.

At a chlorine to ammonia ratio between 5:1 and about 8:1, problems with taste, odor and loss of chloramination residual can result. When the ratio goes above 5:1, monochloramine is both formed and destroyed, and dichloramines and trichloramines are formed. Also, the blending of water with free chlorine with water containing chloramines can cause the ratio to change and result in a loss of disinfectant residual, and in taste and odor complaints.

Switching to chloramines has been linked to increased corrosion in some water systems. This can be a concern due to both dirty water complaints from customers and to compliance problems with the EPA Lead & Copper rule, as was demonstrated by the water utility serving the Washington, D.C. area.

Chloramines can form disinfection by products other than trihalomethanes and haloacetic acids. Chloramines can form N-nitrosodimethyl amine (NDMA), cyanogen chloride, and some iodinated DBPs. These DBP's are not currently regulated by EPA, but could be at some point in the future.

Finally, the gasket material for water pipe is chlorine resistant but may not be chloramine resistant in some pipes. The use of chloramination could result in leaks due to premature gasket failure.

Processes & Practices

There are several controlling factors to consider for the routine use of chloramines. The Maximum Contaminant Level (MCL) for chlorine (total or free) is 4 PPM. As mentioned previously, systems using chloramines usually carry a higher residual (total chlorine) in their distribution system. In Arkansas, by regulation, an adequate disinfectant residual must be carried to all points throughout the distribution system. For systems using chloramination, it is recommended that sufficient chlorine be used to maintain a total chlorine residual of at least 0.5 PPM throughout the distribution system.

The ratio of chlorine to ammonia must be carefully controlled. Water systems will typically try to maintain a ratio in the range of 4:1 up to 5:1.

As part of the use of chloramines, a water system must identify and routinely monitor key points in the distribution system for process control. At a minimum, the total chlorine residual should be monitored. Additional recommended parameters to monitor include free chlorine, free ammonia, and monochloramine residuals. Systems should also consider occasional monitoring for nitrite, nitrate, and heterotrophic plate count bacteria at key points during warmer months.

Water systems using chloramines should practice periodic breakpoint chlorination in order to help prevent nitrification and as a response to nitrification. This is also referred to as a "free chlorine burn" or a "chlorine shock". Essentially this means that on a periodic basis, water systems using chloramines need to establish a free chlorine residual throughout the distribution system in order to reduce bio-films and to oxidize nitrite or nitrate if present. The length of time for the chlorine burn varies in the literature, but generally is cited as two to four weeks once a year. Unidirectional flushing during chlorine burns is commonly used to help establish a free chlorine residual throughout the distribution system. Also, some systems drain and re-fill storage tanks.

Notification

The Department of Health requires water systems to notify all customers prior to changing from chlorine to chloramines. A sample notice can be obtained by contacting this writer.

Customers who are kidney dialysis patients are at risk in a switch to chloramines since the disinfectant interferes with treatment and must be removed prior to the water's use in the dialysis equipment. Dialysis equipment set up to remove free chlorine may not adequately remove chloramines and can endanger the patient's life. Also, since they are toxic to fish, chloramines must be removed from the water prior to its addition to fish tanks.

If you would like more information on the use of chloramines, a list of resources from the AWWA on the subject are listed below, or you may contact Craig Corder at 501-661-2623.

**AWWA Materials**

*- Water Chlorination and Chloramination Practices and Principles (M20), Second Edition*
*- Fundamentals and Control of Nitrification in Chloraminated Drinking Water Distribution Systems (M56)*
*- The Chlorination/Chloramination Handbook*
*- Converting Distribution Systems From Chlorine to Chloramines (DVD)*

**AWWARF Reports**

*- Optimizing Chloramine Treatment*
*- Exploring HAA Formation Pathways During Chloramination*
*- Effect of Changing Disinfectants on Distribution System Lead and Copper Release, Part 1 -- - Literature Review*
*- Monitoring Ammonia-Oxidizing Bacteria in Chloraminated Distribution Systems*
*- Assessment of Chloramine and Chlorine Residual Decay in the Distribution System*
*- Seasonal Chlorination Practices and Impacts to Chloraminating Utilities*
*- Ammonia from Chloramine Decay: Effects on Distribution System Nitrification*
*- Long-Term Effects of Disinfection Changes on Water Quality*
*- Assessment of Chloramine and Chlorine Residual Decay in the Distribution System*

♦

NATIONAL

* A settlement has been reached between most US gasoline makers and a number of water systems which sued them in an attempt to recover costs associated with removing MTBE from the water systems' groundwater supplies. A May newspaper article listed the settlement amount as $423 million. The case involved over 150 water providers in 15 states. The only oil company holdout in the settlement was ExxonMobil which is facing separate multiple trials over MTBE contamination.

* Under the Regulatory Flexibility Act, the EPA has initiated a review of the Stage 1 Disinfectant & Disinfection By Product Rule. The Act requires that within 10 years of promulgation an agency review the impact a rule has on small entities. Among the items EPA must review are the continued need for the rule, its complexity, and the comments and complaints received on the rule. EPA's review is to be completed by year's end.

* Residents of Alamosa, CO were unable to consume their tap water for a 24 day period beginning in March after a ban on the use of the water was imposed by state public health officials. Officials placed the ban on the town's 8000 residents after salmonella bacteria were discovered in the drinking water. Almost 400 persons reported being ill from the contamination and 16 had to be hospitalized. The consumption ban enabled city water personnel to install chlorination equipment and to shock treat the distribution system with a high chlorine residual. The source of the salmonella bacteria was not definitively determined. A 1920's era water storage tank in the water system was reported to have been removed from service in order to replace missing rivets in the tank.

ARKANSAS

* Alan Fortenberry, CEO of Beaver Water District, was recognized with the George Warren Fuller Award at the AWWA's 2008 annual conference in Atlanta, GA. The award recognizes AWWA members for their distinguished served in the water supply field. Beaver Water District was formed in 1957 and supplies 250,000 people and industries in northwest Arkansas. Fortenberry has been with the District since 1991 and was named CEO in 2001.

# News of Note

* Water managers and public water systems recognized at the 77th Annual Conference of the Arkansas Water Works & Water Environment Association in April in Hot Springs include the following:

Outstanding Achievement Awards
David Rawls – Center Grove
Wayne Robbins – Fayetteville

Small Systems Water Awards
Center Grove Water Users Assoc.
Bodcaw Water
Piggot Water

Drinking Water Taste Contest Winner
Center Grove Water Users Assoc.

ENGINEERING SECTION

* Steve Waldron, 57, Environmental Specialist for twelve counties in the southwest part of the state died unexpectedly in March.

Steve worked for the Department of Health for 35 years including the last 17 years in the drinking water program. Steve was a competent, knowledgeable, and conscientious ADH employee. As an individual he was friendly, personable, easy to get along with, and was well liked and respected both by his ADH colleagues and by the regulated community he served. He had a passion for public health, for fairness, and for serving the citizens of the state. His death was a great loss both to the Department and to the public.

* Stephen Youngblood, P.E., has joined the Engineering Section as District Engineer for the southwest area of the state. His primary duties will include plan review, sanitary surveys, and technical assistance.

Stephen holds a Bachelor's Degree in Mechanical Engineering from Oklahoma State University and has ten years of prior engineering experience in industry as a project engineer and a contract engineer.

* Comments are still being accepted on the Engineering Section's revised policy on the use of PVC pipe for water. The policy and an accompanying article were published in the Spring 2008 edition of the *Arkansas Drinking Water Update.* If you have comments on the policy or would like to obtain a copy, contact Jeff Stone at 501-661-2623 or Jeffery.Stone@Arkansas.gov.

*This March photo is of War Eagle Creek at the War Eagle Mill in northwest Arkansas. The state experienced severe flooding and tornados in the spring of this year. The resulting disaster declarations made local governments and private nonprofit organizations in 55 counties eligible for assistance from FEMA. A number of public water systems were affected by the weather, primarily from power outages, but very few systems had major damage.*

# Mandatory Training Course Schedule

Most Current Listing is at: www.healthyarkansas.com/eng/autoupdates/oper/mandtrngall.htm (Courses begin at 8:00 a.m.)

| MANDATORY COURSE NAME | START DATE | END DATE | OPCERT GRANT ELIGIBLE COURSE | CITY | LOCATION All courses begin at 8 a.m. | SPONSOR |
|---|---|---|---|---|---|---|
| Advanced Treatment | 07/01/08 | 07/15/08 | Yes | Internet | Contact AEA for Registration | AEA |
| Basic Water Math | 07/07/08 | 07/07/08 | Yes | Paragould | Ops Center, 2435 S Industrial Dr. | AEA |
| Applied Water Math | 07/08/08 | 07/08/08 | Yes | Paragould | Ops Center, 2435 S Industrial Dr. | AEA |
| Intermediate Distribution | 07/08/08 | 07/10/08 | Yes | Russellville | Tri-County Water , 5306 N AR 7 | ARWA |
| Basic Water Math (PM Class) | 07/08/08 | 07/17/08 | Yes | Van Buren | Crawford Co Adult Ed Center, 605 Alma | AEA |
| PWS Compliance | 07/09/08 | 07/09/08 | Yes | Paragould | Ops Center, 2435 S Industrial Dr. | ADH |
| Basic Water Distribution | 07/14/08 | 07/16/08 | Yes | Camden | Arkansas Env Acad, 100 Carr Road | AEA |
| Advanced Distribution | 07/15/08 | 07/31/08 | Yes | Internet | Contact AEA for Registration | AEA |
| Basic Distribution | 07/21/08 | 07/23/08 | Yes | Fayetteville | Ops Center, 2435 S Industrial Dr. | AEA |
| Intermediate Treatment | 07/22/08 | 07/24/08 | Yes | Lonoke | ARWA Training Facility, 240 Dee Dee | ARWA |
| Intermediate Treatment | 07/29/08 | 07/31/08 | Yes | Heber Springs | ASU, 71 Cleburne Park Rd, Rm 110 | ARWA |
| Basic Water Math | 08/01/08 | 08/15/08 | Yes | Internet | Contact AEA for Registration | AEA |
| Advanced Distribution | 08/04/08 | 08/06/08 | Yes | Monticello | Health Unit, 447 West Gaines St | AEA |
| Basic Distribution | 08/05/08 | 08/07/08 | Yes | W Memphis | Utilities Office, 604 East Cooper | ARWA |
| Basic Water Math | 08/11/08 | 08/11/08 | Yes | Camden | Arkansas Env Acad, 100 Carr Road | AEA |
| Applied Water Math | 08/12/08 | 08/12/08 | Yes | Camden | Arkansas Env Acad, 100 Carr Road | AEA |
| PWS Compliance | 08/13/08 | 08/13/08 | Yes | Camden | Arkansas Env Acad, 100 Carr Road | ADH |
| Applied Water Math | 08/15/08 | 08/29/08 | Yes | Internet | Contact AEA for Registration | AEA |
| Intermediate Treatment | 08/18/08 | 08/20/08 | Yes | Russellville | Tri-County Water , 5306 N AR 7 | AEA |
| Intermediate Distribution | 08/19/08 | 08/21/08 | Yes | Lonoke | ARWA Training Facility, 240 Dee Dee | ARWA |
| Intermediate Distribution | 08/26/08 | 08/28/08 | Yes | McGehee | Municipal Building, 901 Holly Street | ARWA |
| Basic Treatment | 09/01/08 | 09/15/08 | Yes | Internet | Contact AEA for Registration | AEA |
| Basic Treatment | 09/08/08 | 09/10/08 | Yes | Van Buren | Crawford Co Adult Ed Center, 605 Alma | AEA |
| Basic Water Math | 09/09/08 | 09/09/08 | Yes | Jonesboro | CWL Serv Center, Johnson & Main | ARWA |
| Applied Water Math | 09/10/08 | 09/10/08 | Yes | Jonesboro | CWL Serv Center, Johnson & Main | ARWA |
| PWS Compliance | 09/11/08 | 09/11/08 | Yes | Jonesboro | CWL Serv Center, Johnson & Main | ADH |
| Basic Distribution | 09/15/08 | 09/30/08 | Yes | Internet | Contact AEA for Registration | AEA |
| Intermediate Treatment | 09/16/08 | 09/18/08 | Yes | Lonoke | ARWA Training Facility, 240 Dee Dee | ARWA |
| Basic Distribution | 09/16/08 | 09/18/08 | Yes | Jonesboro | CWL Serv Center, Johnson & Main | ARWA |
| Intermediate Treatment | 09/16/08 | 09/18/08 | Yes | Camden | Arkansas Env Acad, 100 Carr Road | AEA |
| Basic Water Math | 09/22/08 | 09/23/08 | No | Hot Springs | ARWA Conf, HS Convention Center | ARWA |
| Applied Water Math | 09/22/08 | 09/23/08 | No | Hot Springs | ARWA Conf, HS Convention Center | ARWA |
| Basic Distribution | 09/22/08 | 09/24/08 | Yes | Batesville | Ramada Inn, 1325 North St. Louis St | AEA |
| PWS Compliance | 09/22/08 | 09/23/08 | No | Hot Springs | ARWA Conf, HS Convention Center | ADH |

*Opcert Grant Eligible Course – Meal and lodging expenses may be reimbursed for operators from Community or Non-Transient Non Community Public Water System serving a population of 3300 or less. The course may be space limited, with eligible system operators given preference.

All courses require pre-registration. The course sponsor must be contacted to register for each course and to confirm course information that is subject to change or cancellation. Contact information for the sponsors is shown below.

ADH – Arkansas Department of Health and Human Services – Contact Jeremy Rowe or Martin Nutt – (501) 661-2623 – Jeremy.Rowe@arkansas.gov

AEA – Arkansas Environmental Academy – Contact Letitia Rusch – (870) 574-4550 – lrusch@sautech.edu

ARWA – Arkansas Rural Water Association – Contact Carol Shaw – (501) 676-2255 – info@arkansasruralwater.org

Additional courses are shown on the internet at: http://www.healthyarkansas.com/eng/autoupdates/oper/opcert/opertrng.htm

# Long Term 2 ESWTR Training Completed for Small Systems

Chris Joyner, SWTR Engineer

Training by Engineering Section staff for small Arkansas water systems that will be monitoring their source waters for the presence of *Cryptosporidium* was completed in May and June. The monitoring is a requirement of the Long Term 2 Enhanced Surface Water Treatment Rule as the result of source water *E.coli* levels. The Rule requires *Cryptosporidium* monitoring by a small system if its source water *E.coli* average exceeds 10 colonies/100mL if a lake or reservoir, or exceeds 50 colonies/100mL if a flowing stream. Small systems are defined by the Rule as those serving less than 10,000 population.

Training sessions were held in Charleston, Mena, Clarksville, DeQueen, Danville, and Clinton. Monitoring by the small systems for *Cryptosporidium* began in July. To date, 24 small water systems in Arkansas with a total of 29 sources have exceeded the trigger limits for *E.coli* based on source monitoring that began in October, 2007. These 24 small systems are in addition to the 24 large Arkansas water systems which have been conducting *Cryptosporidium* monitoring since January 2007.

Attendance at a training session by a representative of each affected water system was requested by the Engineering Section because of the complexity of the sample collection, the cost per sample (~$400), the temperature and time restraints during sample transport, and the potential impacts to a system's treatment requirements. The *Cryptosporidium* analyses are being conducted by a private lab and paid for by the Department of Health's Public Water System Supervision Fees.

The training sessions included an overview of the LT2ESWTR, each affected system's *E.coli* results, the EPA Sample Method 1622/23 for *Cryptosporidium*, sampling equipment, bulk water sampling versus filter sampling, packing and shipping instructions, scheduling, resample procedures, possible violations, and potential treatment impacts.

The small systems will monitor for *Cryptosporidium* once per month for 24 months on a schedule established by the Department of Health. Once monitoring is complete, those systems will be classified in 1 of 4 treatment Bins, with higher levels of treatment required for Bins 2, 3 & 4. Small systems that did not have to monitor for *Cryptosporidium* will fall into Bin 1 which requires no additional treatment beyond the current requirements.

For additional information on the training or the source monitoring efforts in Arkansas, feel free to contact the ADH Source Protection Staff (Chris Joyner, Don Fiegel, or Lyle Godfrey) at 501-661-2623.♦

## WATER OPERATOR LICENSE EXAMINATIONS

*NOTE: The licensing program is significantly behind in processing exam results and licenses due to an extended staff vacancy in the program. Exam results can be obtained by contacting Jeremy Rowe or Martin Nutt several weeks after an exam is taken.*

Up to date listing: http://www.healthyarkansas.com/eng/autoupdates/oper/operexam.htm
Listed below are the dates and locations of examination sessions. All Treatment and Distribution exam grades will be available at the sessions. Acceptable photo identification (Drivers License or equivalent) will be required to sit for an Exam. Cell phones and other electronic communication devices are not allowed in exam sessions. Non-programmable calculators are allowed.

| DATE | CITY | LOCATION | TIME |
|---|---|---|---|
| 7/17/08 | Camden | Arkansas Environmental Academy, SAU Tech | 9:00 AM |
| 7/24/08 | Fayetteville | Operations Center, 2435 S Industrial Dr. | 9:00 AM |
| 7/25/08 | Lonoke | ARWA Training Facility, 240 Dee Dee Lane | 9:00 AM |
| 8/1/08 | Heber Springs | ASU, 71 Cleburne Park Rd (Hwy 110 East), Rm 110 | 9:00 AM |
| 8/7/08 | Monticello | Health Unit, 447 West Gaines St | 9:00 AM |
| 8/8/08 | West Memphis | Utilities Office, 604 East Cooper | 9:00 AM |
| 8/21/08 | Russellville | Tri-County Water, 5306 North Arkansas | 9:00 AM |
| 8/22/08 | Lonoke | ARWA Training Facility, 240 Dee Dee Lane | 9:00 AM |
| 8/29/08 | McGehee | Municipal Building, 901 Holly Street | 9:00 AM |
| 9/11/08 | Van Buren | Crawford Co Adult Education Ctr, 605 Alma Blvd | 9:00 AM |
| 9/19/08 | Camden | Arkansas Environmental Academy, SAU Tech | 9:00 AM |
| 9/19/08 | Jonesboro | CWL Service Center, Johnson & Main | 9:00 AM |
| 9/19/08 | Lonoke | ARWA Training Facility, 240 Dee Dee Lane | 9:00 AM |
| 9/24/08 | Hot Springs | ARWA Conference, Hot Springs Convention Center | 9:00 AM |
| 9/25/08 | Batesville | Ramada Inn, 1325 North St. Louis St | 9:00 AM |
| 10/9/08 | Camden | Arkansas Environmental Academy, SAU Tech | 9:00 AM |
| 10/10/08 | Jonesboro | CWL Service Center, Johnson & Main | 9:00 AM |
| 10/16/08 | Maumelle | Wastewater Plant, Hyman Drive | 9:00 AM |
| 10/23/08 | Arkadelphia | Recreation Center, 2555 Twin Rivers Drive | 9:00 AM |
| 10/24/08 | Lonoke | ARWA Training Facility, 240 Dee Dee Lane | 9:00 AM |

The above exam session information is subject to change. You should confirm this information just prior to the scheduled examination period. You may confirm the exam session and its location by contacting your District Specialist or Engineer at (501) 661-2623.

Please verify that your license application has been filed with the Engineering Section and that the required exam fee for each exam has been paid. The license exams require significant preparation prior to sitting for the exam. The preparation must include extensive study utilizing the study guide and recommended reference materials. Credit for the mandatory Certification Training Courses must be obtained prior to sitting for an exam.

**PREPARATION = SUCCESS**

# Application of the CTA tool: The Alma Experience

Larry DeMers, Process Applications, Inc. & Alison Dugan, EPA Technical Services Ctr.

*Reprinted from the May 2008 edition of AWOP News published by the Association of State Drinking Water Administrators*

**Overview**

The Comprehensive Technical Assistance (CTA) tool was originally developed as a follow-up technical assistance activity under the Composite Correction Program. While it is one of the least frequently used tools in the Area Wide Optimization Program (AWOP) toolbox, when applied in the correct situation, it can be very effective in achieving multiple optimization objectives. During a CTA project a qualified facilitator, or team of facilitators, work one-on-one with the water system staff to address their performance limiting factors (PLFs).

These PLFs are typically identified either during a comprehensive performance evaluation (CPE) or are common factors which have been identified at several similar water systems and apply to the CTA system. The ultimate goals of a CTA are to achieve water quality goals at the system and to transfer priority setting and problem solving skills to the staff to sustain long-term performance. CTA projects involve a long-term commitment, which often ranges from one to three years. One of the main drawbacks to using the CTA tool is the amount of resources required to support a project (i.e., one or more facilitators working with a single water system over an extended time period), opposed to the Performance Based Training (PBT) approach which impacts multiple systems (and generally over a shorter time period).

However, a significant advantage of conducting a CTA project, especially a project that focuses on a relatively new area of optimization, is the opportunity the project can provide to work in a collaborative environment with water system staff to address issues and challenges associated with improving water quality at the system. This approach ultimately facilitates the development of information and optimization approaches, which benefit both the system as well as the national program.

The development of an optimization approach for disinfection and disinfectant byproducts (DDBP) control presented many challenges. Development work was initiated in this area in the late 1990's and was primarily focused on gaining experience with DDBP optimization concepts through the implementation of CPEs. CPEs focused on DDBP objectives were conducted in several AWOP states and provided valuable experience for the development team to better determine the needs for water quality monitoring, data assessment, and potential DBP control strategies that water systems could implement to improve water quality. After about ten DBP CPEs, the development team was ready for the next step – finding a water system or systems that would be interested in partnering in a follow-up project focused on DBP control, primarily through optimizing plant, opposed to distribution system, operations. The CTA tool was selected as the next developmental step because it could potentially provide a flexible framework to implement many of the lessons learned during the DDBP CPEs through a longer-term partnership with a water system. This is especially important when working on DDBP optimization because of the seasonal nature of DBP formation and the challenges associated with monitoring water quality in distribution systems.

| | CTA Project Goals and Objectives |
|---|---|
| 1 | Control DBPs and meet related performance goals. |
| 2 | Identify and assess process control tests for DBP optimization (THM Plus, TOC, others). |
| 3 | Evaluate the effectiveness of DBP control strategies and secondary impacts. |
| 4 | Maintain low finished water manganese (achieve < 10 ppb leaving plant). |
| 5 | Achieve turbidity performance goals. |
| 6 | Set up operational guidelines to support meeting the performance goals. |
| 7 | Understand the relationship between turbidity and DBPs (i.e., the impact/trade-off of controlling one parameter over the other). |
| 8 | Understand chlorine demand and DBP formation through the process train and distribution system. |
| 9 | Identify potential modifications to achieve performance goals (minor & major). |
| 10 | Document results on the project with data, trends, special studies, and reports. |

Work began to identify potential CTA candidates in late 2003. At this time Arkansas was one of the AWOP states that was proactively conducting field work with their water systems to gain experience with DDBP optimization tools and a better understanding of potential challenges they may be facing with implementation of D/DBP-related requirements. The National Leadership Optimization Team (NOLT) worked closely with Arkansas Department of Health (ADH) staff to identify potential CTA candidates. The site selection process included the review of data provided by ADH from several water systems and subsequent site visits at two of the systems. Ultimately, the City of Alma was selected for the CTA project based on several water quality challenges they had to address to lower DBP concentrations and the overall enthusiasm and commitment of their plant staff and public works administration.

Alma is located in Northwest Arkansas, and the municipal water system serves approximately 9,000 people and one significant industry (spinach canning). Three consecutive systems also purchase water from Alma. Lake Alma is the water source for the 3.5 million gallons per day (MGD) treatment plant. The plant includes two treatment trains – one consisting of a conventional sedimentation basin followed by dual media filters and another consisting of a solids contact clarifier followed by a mixed media filter. Filter effluent is combined and directed through a clearwell prior to pumping to the distribution system. At the time that the CTA was starting in early 2004 the plant staff had made a decision to move their point of chlorination from prior to coagulant

Continued next page

feed to the top of the filters. However, they experienced treatment challenges during the winter with controlling raw water manganese and had to resume prechlorination to maintain their desired level of finished water manganese.

**CTA Project Kick-Off**

The Alma CTA project was initiated with a site visit to the system in February 2004. NOLT members and ADH AWOP staff met with the water system operators, supervisor, and public works director over two busy days to initiate project activities. Informal presentation and workshop formats were used to provide an overview of the CTA tool, establish project goals and objectives (Figure 1), and develop a monitoring plan to initiate the collection of water quality data. To provide analytical support for the project ADH offered the services of their state laboratory to conduct DBP and TOC testing on samples collected from investigative sites during the CTA. DBP sampling frequency was increased from the standard quarterly schedule to a monthly schedule, and this routine has been maintained during most of the CTA. In addition, plant staff was trained on conducting DBP and TOC surrogate process control tests, which were needed to provide more real-time information to support decision making by the CTA team.

To complement the technical training during this first site visit, tools were also introduced to begin the development of communication approaches that would ultimately sustain the CTA effort over multiple years and support the transfer of leadership and management skills to the system staff. The primary tools included the use of operational guidelines to describe key plant based activities, the establishment of monthly CTA team meetings (either conference calls or site visits), documentation of project status and action items, and periodic meeting with the city public works director to sustain management support. Although all of these tools have been critical to the success of the CTA, the routine CTA team meetings have been the "glue" that has sustained the project and provided an ongoing mechanism to review the system operational status, review performance data and studies, and set priorities and future direction of activities.

**Performance Monitoring**

Much of the focus of the CTA team during the first year was on performance trending and monitoring. Operational guidelines and a monitoring plan were developed to support this. Several computer spreadsheets were introduced to the staff and populating these spreadsheets with process control data became part of their weekly routine. Plant staff entered turbidity, disinfection, and water quality data into project spreadsheets, which provided the basis for reviewing system trends during the CTA team meetings.

Alma's baseline (historical) total trihalomethanes (TTHM) and the sum of 5 haloacetic acids (HAA5) data were compiled based on their historical regulatory monitoring data. HAA5 data shown in Figure 1 demonstrates the water quality challenges the system was facing at the beginning of the CTA. Neither the individual site LRAA (locational running annual average) goal of 60 ppb (part per billion) nor the long-term goal of 40 ppb (based on the average of the eight most recent maximum LRAA values) were being achieved (system concentrations were 99 ppb and 98 ppb, respectively). With respect to TTHM performance, Alma was achieving the individual site LRAA goal of 80 ppb but not the long-term goal of 60 ppb (system concentrations were 70 ppb and 79 ppb, respectively).

Both the number of DBP monitoring sites and the frequency of monitoring were increased to support the CTA effort. For example, prior to the CTA plant staff had not monitored DBPs in the finished water. Since this sampling location was identified as important based on CPE experience, finished water DBP monitoring was added to the monitoring plan. Also, a new remote distribution system sampling location, which likely represented higher water age and potentially higher TTHM concentrations in the system, was added to the monitoring plan.

**Introduction of Special Studies**

Once the project baseline monitoring requirements were established, the team focused on the process for implementing operations-based control strategies in the Alma water system, which were needed for the system to achieve the DBP performance goals. For DBP control,

See Alma page 12

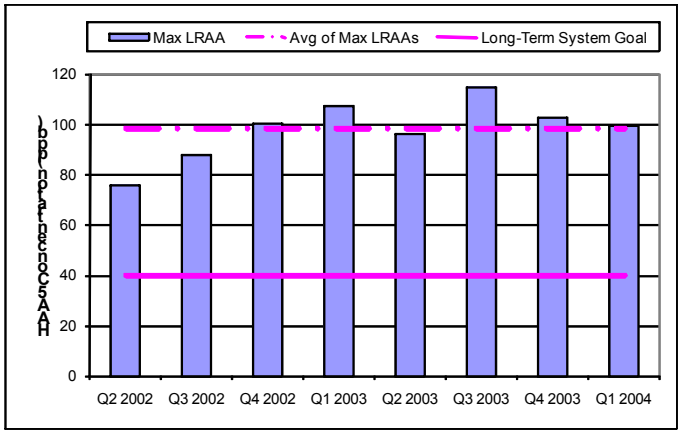


***Figure 1. Alma HAA5 Performance Trends Prior to CTA***

**Alma** *continued from page 11*

these strategies typically involve optimization of plant and distribution system chlorine feed, reduction of total organic carbon (TOC), and minimizing water age in the distribution system. Prior to the start of the CTA, the staff attempted to make a process control change which involved moving the first point of chlorination in the plant, from prior to rapid mix to the top of their filters. However, they were not able to sustain this change during the winter due to high raw water manganese concentrations. Similarly, their previous attempts with feeding potassium permanganate for preoxidation, in lieu of chlorine, were not successful.

| | Alma CTA Special Studies ( 2004 – Present) |
|---|---|
| 1 | Moving point of chlorination from before coagulation to after sedimentation. |
| 2 | Use of permanganate for preoxidation of manganese. |
| 3 | Use of hydrogen peroxide application for oxidation of T&O compounds. |
| 4 | Powdered activated carbon application for removal of T&O compounds. |
| 5 | Alternative coagulant for turbidity and TOC removal (alum versus PACl and ACH). |
| 6 | Optimization of chlorine dose before and after filters. |
| 7 | Control of plant start-up filter turbidity spikes. |
| 8 | Optimization of storage tank turnover and mixing (Eagle Crest Tank). |
| 9 | Investigation of alternative sample site and sample station flushing practices (Site #7). |
| 10 | Optimization of storage tank turnover and mixing (Tank 1). |
| 11 | Investigation of in-tank mechanical mixing on water quality (Tank 1) – under development. |
| 12 | Investigative sampling to identify critical sites in DS – planned 2008. |

To support the staff in overcoming these challenges and to enhance their problem solving skills, the use of the special study approach was introduced early in the CTA. One of the first special studies involved a simple monitoring investigation on the removal of manganese through the treatment processes. A simple study was selected to introduce the special study concept and components (i.e., hypothesis, approach, duration, expected results, results, and implementation) to the staff. This study was also complementary to the CTA objectives since addressing the secondary impact issue of manganese removal was key to the successful implementation of changing the chlorine feed location in the plant.

Plant operators were made responsible for drafting the special study write-up and sharing it with the CTA team for review and comments. Through the use of the special study approach the staff was successful in their next attempt to feed potassium permanganate as a preoxidant in place of chlorine and since the spring of 2004 the plant has continually fed this alternative oxidant.

The CTA team meetings provided the necessary structure to review the results of special studies, assess the considerations for full scale implementation, and plan the next studies. Performance monitoring and trend analysis were always a part of the meeting agendas. The CTA team prioritized special studies by first focusing on DBP formation factors that could be controlled in the treatment plant (i.e., chlorine optimization, TOC removal) and later on factors that could be controlled in the distribution system (i.e., chlorine optimization, water age). A summary of the progressive nature of the special studies is shown in the table above. Several of the early studies involved secondary impacts on performance that were related to changing chlorine feed practices in the plant (e.g., T&O control, turbidity spike control).

**Current CTA Status**

The CTA team has been working together now for over four years and many of the original goals and objectives of this project have been achieved or are continuing to be pursued. Additionally, the level of trust among the participants and the commitment to the project goals have allowed optimization efforts to expand into areas that were not anticipated at the beginning of the project (i.e., distribution system optimization special studies).

Current optimization efforts are focused on water quality in the distribution system and specifically storage tanks. Recent studies have focused on a 1 MG ground storage tank that has experienced very low chlorine residual concentrations during the drain cycle. A continuous chlorine monitor on-loan from ADH was installed at the common tank inlet and outlet pipe. The resulting continuous chlorine residual and temperature data have provided valuable information to assess the impact of different operational scenarios on water quality. Efforts are currently underway to assess the water quality impacts of installing a mechanical mixer in this same tank.

One of the main goals of the CTA was to lower DBP concentrations in the system. DBP water quality improved through 2006 to the extent that, with the exception of the long-term system goal for HAA5, the DBP performance goals were being achieved by Alma. Alma was on track to meet all of the DBP performance goals; however, in late 2006 the performance trends changed and continued to degrade through 2007. Contrary to performance trends at the beginning of the CTA, TTHM performance degraded more significantly than HAA5 performance.

See Alma next page

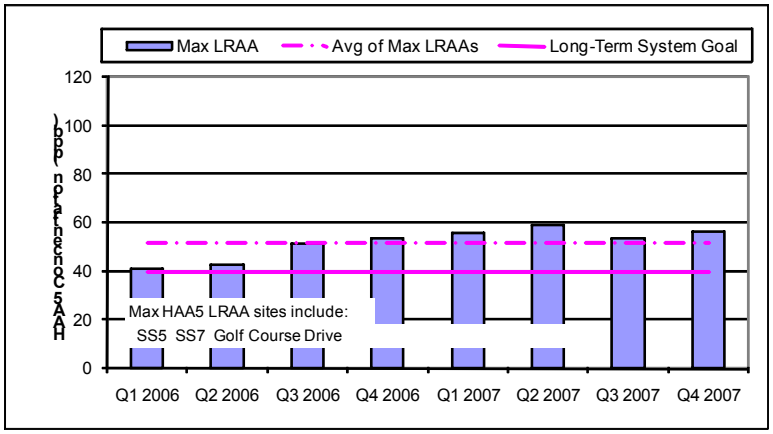


***Figure 2. Current Alma HAA5 Performance Trends***

# Major Monitoring, MCL, Treatment Technique, & Licensing Violations

Community & Nontransient Noncommunity Public Water Systems January – March, 2008

| | |
|---|---|
| ALICIA WATER | Bmon 1 |
| ALL SEASONS MHP | Tmon 1,2,3 |
| ALMATIS | TMCL 1 |
| BEN LOMAND WATER | Bmon 3 |
| BERGMAN WATER | Bmon 1 |
| BIG FLAT WATER | Bmon 2 |
| BOONEVILLE WATER | DMCL 1,2,3 |
| BRANCH WATER | DMCL 1,2,3 |
| BRYANT WATER | DMCL 1,2,3 |
| BUENA VISTA-OGEMAW WATER | DMCL 1,2,3 |
| CADDO VALLEY WATER | Bmon 3 |
| CAMDEN WATER | Bmon 1 |
| CAMPBELL STATION WATER | OperLic 1,2,3 |
| CASA WATER | DMCL 1,2,3 |
| CHERRY HILL PFB WATER | DMCL 1,2,3 |
| CHICOT JUNCTION WATER | Bmon 2,3 |
| CLINTON WATER | Bmon 2 |
| DANVILLE WATER | DMCL 1,2,3 |
| DANVILLE WATER | Tmon 2 |
| EAST LOGAN CO RURAL WATER | Bmon 2 |
| EL DORADO CHEMICAL CO WATER | DMCL 1 |
| GILLHAM REGIONAL WATER DIST | DMCL 1,2,3 |
| GLENHAVEN YOUTH RANCH WATER | Bmon 2 |
| GRADY WATER | BMCL 1 |
| GREAT LAKES CHEMICAL SOUTH WATER | BMCL 1 |
| GREAT LAKES CHEMICAL WEST | Bmon 1 |
| GREENBRIER WATER | DMCL 1,2,3 |
| GREENWAY WATER | Bmon 1 |
| GREENWOOD WATER | DMCL 1,2,3 |
| HATFIELD WATER | DMCL 1,2,3 |
| HIGHFILL WATER | DMCL 1,2,3 |
| HOSANNA HEIGHTS WATER | BMCL 2 |
| HOSANNA HEIGHTS WATER | Bmon 3 |
| HWY 4-24 WATER | DMCL 1,2,3 |
| LAKE TABLE ROCK ESTATES WATER | BMCL 1 |
| MAGNESS WATER | OperLic 1 |
| MARION WATER | DMCL 1 |
| MAYFLOWER WATER | DMCL 1,2,3 |
| MONTGOMERY CO REGIONAL WATER | DMCL 1,2,3 |
| MONTROSE WATER | BMCL 1 |
| MONTROSE WATER | Bmon 2 |
| MOUNT IDA WATER | DMCL 1,2,3 |
| MOUNT MORIAH WATER | Bmon 1 |
| MOUNT MORIAH WATER | OperLic 1,2 |
| MOUNT SHERMAN WATER | RMCL 1,2,3 |
| MOUNT ZION WATER | OperLic 1,2,3 |
| MULBERRY WATER | DMCL 1,2,3 |
| MURFREESBORO WATER | DMCL 1,2,3 |
| NASHVILLE RURAL WATER | DMCL 1,2,3 |
| NORTHEAST YELL CO WATER | DMCL 1,2,3 |
| NEW LONDON WATER | DMCL 1,2,3 |
| NORTH PIKE CO RURAL WATER | DMCL 1,2,3 |
| ODEN-PENCIL BLUFF WATER | DMCL 1,2,3 |
| ODEN-PENCIL BLUFF WATER | OperLic 1,2,3 |
| OLA WATER | DMCL 1,2,3 |
| OUTSIDE KINGSLAND WATER | OperLic 1 |
| PANGBURN WATER | DMCL 1,2,3 |
| PANGBURN WATER | Tmon 1,2,3 |
| PARON-OWENSVILLE WATER | DMCL 1,2,3 |
| PERLA WATER | Bmon 3 |
| PIKE CITY WATER | DMCL 1,2,3 |
| PLAINVIEW WATER | DMCL 1,2,3 |
| PORTLAND WATER | DMCL 1,2,3 |
| PRESCOTT WATER | DMCL 1,2,3 |
| RATCLIFF WATER | DMCL 1,2,3 |
| SDM WATER | RMCL 1,2,3 |
| SDM WATER | FMCL 1,2,3 |
| SEVIER CO WATER | DMCL 1,2,3 |
| SOUTH LOGAN CO WATER | DMCL 1,2,3 |
| SOUTH MOUNTAIN WATER | RMCL 1,2,3 |
| SPARKMAN WATER | DMCL 1,2,3 |
| SAINT FRANCES RIVER REGIONAL WATER | Bmon |
| SUBIACO ACADEMY WATER | DMCL 1,2,3 |
| TANKSLEY APTS WATER | BMCL 1 |
| TOLLETTE WATER | OperLic 1 |
| TUCKERMAN WATER | Bmon 2 |
| WABBASEKA WATER | Bmon 1 |
| WALDRON WATER | DMCL 1,2,3 |
| WALKER WATER | OperLic 1,2 |
| WATSON CHAPEL WATER | DMCL 1,2,3 |
| WIRE ROAD WATER | DMCL 1,2,3 |
| WOOSTER WATER | DMCL 1,2 3 |

**KEY:** Bmon = Bacti Monitoring; BMCL = Bacti MCL; Dmon = Disinfection By Product Rule Monitoring; DMCL=Disinfection By Product Rule MCL or Treatment Technique; Tmon = SWTR Major Monitoring; TMCL = SWTR Treatment Technique; SWTR= Failure to Filter; RMCL = Radiochemical MCL; FMCL = Fluoride MCL; SMCL = Synthetic Chemical MCL; OperLic = Operator Licensing; 1=January, 2=February, 3=March

**Alma** *continued from page12*

Although source water quality and treatment may have played a role in these performance changes, analytical testing issues may have also contributed to the unusually high TTHM levels reported during this period. Recent HAA5 performance trends are shown in Figure 2, where the individual site LRAA is 56 ppb and the long-term LRAA average was 52 ppb. The corresponding TTHM performance for the same period was that the individual site LRAA was 91 ppb and a long-term LRAA average was 73 ppb. The CTA team is assessing these recent trends and considering the addition of analytical support to confirm DBP results.

**CTA Benefits**

Benefits continue to be realized for the City, the NOLT, and ADH as the result of the CTA efforts. Some of the main benefits are summarized below.

The CTA has provided the NOLT the opportunity to partner with ADHHS to work with Alma in addressing challenging simultaneous treatment objectives through optimizing their existing facilities.

Surrogate field testing methods for TOC and DBPs have been successfully utilized during the project, and the CTA team has gained skills in interpreting test results and using them as predictors of water quality changes.

The continuous chlorine monitor has provided valuable water quality data, which has supported the implementation of distribution system special studies and furthered all parties' understanding of distribution system optimization to improve water quality.

Participation in the CTA has been a proactive way for Alma to prepare for the Stage 2 DDBP rule requirements. The NOLT has benefited from the real-world experience gained through implementing various DBP control strategies in a water system over a long time period.

The CTA experience provided the basis for the development of a DDBP PBT series developed by NOLT and piloted with four South Carolina water systems.

**Summary**

Overall, the application of the CTA tool for DDBP optimization and control in Alma, AR, has been very successful and yielded many benefits. Many of the original project goals and objectives have been met, and the strong partnership between the NOLT, ADH and Alma has allowed the project to continue, with the current focus being on optimization of the Alma's distribution system operations to control DBPs. This project has provided the foundation for the development of a PBT series focused on DDBP optimization, which will be discussed in a future issue of AWOP News. *Note: Alma is currently expanding its water treatment plant and is including facilities for the addition of ozone as part of that construction.* ♦

REPORT OF THE

# Arkansas Drinking Water Advisory and Operator Licensing Committee

A. Martin Nutt, Training and Certification Officer

A quarterly meeting of the Arkansas Drinking Water Advisory and Operator Licensing Committee was held on April 9, 2009. Members present were Les Patterson, P.E., Chair; Charles Nickle, P.E., Vice-Chair; Robert Hart, P.E., Executive Secretary; Rodney Williams, P.E.; Scott Borman; and Terry House. Not present was Steve DiCicco. Arkansas Department of Health staff members present were Martin Nutt and Jeremy Rowe. Guests present were Dennis Sternberg, Arkansas Rural Water Association; Melanie Sharp, Arkansas Environmental Academy; Vicky Prewett, Arkansas Department of Environmental Quality; Stanley Moore, Mayor, and Ronnie Miller, City of Mountainburg; and Jim Shempert and Danny Bolden, City of Marion.

**Standing Business**

The Committee reviewed and approved the High School Waiver Requests of Mr. Ronnie Miller of Mountainburg and Mr. Danny Bolden of Marion.

Borman reported that both ADEQ and ADH had issued cards to be used in electronically tracking attendance. Both ADEQ's and ADH's cards were scanning well. Some districts were slow to order scanners, but the NW and SW districts planned to scan in May. Borman noted that if districts would get together, a 15% discount was available when ordering multiple scanners. Nutt added that ADH hoped to include barcodes on 2009 renewal cards.

Nutt discussed with the Committee the need to proceed with updating exams to match the Association of Boards of Certification's exam concepts due to aging Arkansas exams. Discussion followed on what changes might benefit reciprocity with other states.

House reported on a productive meeting of the Proactive Service Fee Education Subcommittee. The subcommittee recommended the development of educational materials to be used within the industry and community outlining the role of the Engineering Section and the use of service fees within Arkansas' water industry. Hart, also present for the subcommittee meeting, indicated the meeting provided a venue not only to provide information to stakeholders but also an opportunity to gain insight as to community and industry concerns.

Nutt reported progress in tracking operator training attendance on the Section's website, though some problems continued to turn up. He hoped to have current difficulties addressed prior to the 2009 renewal.

The Committee discussed the utilization of the OpCert Grant which pays for small systems to attend eligible training. Even after expanding grant approved courses to include AEA's and ARWA's backflow prevention courses and ARWA's Operator Expo, some small systems were not taking advantage of the reimbursement of meals, lodging, and registration fees under the grant. Having spent less than half the grant, the Committee discussed ways to promote it's utilization within the industry. The grant ends in September, 2010.

**Old Business**

Nutt informed the Committee that the Section's databases had been updated and that any operator not listed on the Section's website under *Certified Operators* did not hold a valid license. He suggested to the members that they encourage operators to check their license status on the website.

Hart reported on enforcement actions taken against another operator who had falsified bacteriological samples. Luckily, investigation showed that water safety had not been compromised by the operator's actions. The operator was reprimanded and conditions set upon the operator's renewal.

**New Business**

Members reviewed nominations for the Committee seat that will be vacated by Les Patterson in July. ARWA and AWWMA nominated Wayne Stallings of James Fork Regional Water District. AWW&WEA nominated Susan Merideth of Jonesboro City Water & Light. Nominations would be presented to the Board of Health during the April 24th meeting for the appointment of one nominee to the Committee.

Charles Nickle, Chair Elect, indicated that he would like the Committee to investigate alternate funding for training to be utilized after the OpCert grant expires. Nutt indicated that, as part of the licensing program goals, he would like to reevaluate the licensing enforcement plan.

**Reports to the Committee**

Hart, in his Engineering Section Chief's report, stated that the Section's budget was being developed and was due in July. The State would be cutting agency budgets, but he thought the Section would be sound financially due to the recent fee increase. He reported that service fee monies had already been utilized in updating lab methods and funding LT2 monitoring and analysis. Hart's concern was obtaining sufficient appropriations to utilize available funds.

Hart noted that more emphasis within the industry was being put upon source water protection. Pharmaceuticals in drinking water were also receiving additional attention due to recent news articles. Hart indicated that the Section would be following those issues closely.

Hart informed the Committee of the untimely death of Steve Waldron, District 6 Environmental Specialist. Steve was a long-time employee with the agency, a benefit to the water industry, and a friend to many who knew him. Other vacancies within the Section included the District 6 Engineer, vacated by Lonea Shirey, and the Licensing Program's Administrative Assistant position, vacated by Debbie Bertrand. Hart reported that Teresa Lee had been hired as the Cross Connection Control Engineer and that Sandra Chandler had been hired as the Senior Geologist for the Section.

Hart indicated that the recent floods had adversely affected only a few water systems. Regulation

compliance to protect structures against flooding had aided in the protection of systems, especially in regard to wells.

Nutt, in his license update, referred to the exam passage rate spreadsheet which included rates for the past year and reviewed the passing percentages. Concern over the pass rate for Distribution Grade 2 exams was mentioned, but the Committee was pleased with the overall passage rates for Arkansas exams. Some members thought low scores on Distribution Grade 3 exams may be due to operators taking the exam before they were prepared.

Nutt reviewed the enforcement data with the Committee. Several systems continued to operate without a licensed operator.

Nutt reported that exam results and application turnaround times were suffering due to staff shortages. In order to produce and mail training cards, exam results being mailed out had suffered an even bigger hit. He and his staff were looking up exam results for operators calling in.

Sharp reported that AEA, from January through March, had held 14 water classes with a total of 71 students. Sternberg reported that ARWA continued to have good attendance at its classes. Sternberg also discussed ARWA's restoration assistance offered to systems during recent severe weather events. He indicated that ARWA's generators as well as generators volunteered by other systems proved beneficial to systems in need. In light of recent weather events, he thought emergency generators were a must for rural systems and pushed membership with W.A.R.N.. Sternberg closed by asking that members and the industry support the upcoming Arkansas 300 million dollar infrastructure bond affecting monies available to the water industry.

**Other Business**

No other business was brought before the Committee. Patterson thanked the members for the opportunity to serve having been a member himself for six years with perfect attendance. The next Committee Meeting was tentatively set for July 9, 2008.

## New Water License Committee Member

On April 24, 2008 the State Board of Health appointed Ms. Susan Merideth, P.E., Water and Wastewater Treatment Superintendent, City Water and Light, Jonesboro, Arkansas to the Arkansas Drinking Water Advisory and Operator Licensing Committee. She brings to the Committee a strong background in the water industry and will be a valued member of the Committee.

Nominations were received from four organizations: the *Arkansas Water and Wastewater Managers Association*, the *Arkansas Rural Water Association*, the *Arkansas Water Works and Water Environment Association,* and the *Arkansas Environmental Academy Advisory Board*. The other nominees were Wayne Stallings, General Manager, James Fork Regional Water District, in Greenwood, Arkansas and David Richardson, Assistant Manager, Camden Water Utilities, in Camden, Arkansas.

The Committee at its April 2008 meeting thanked Les Patterson for his six years of loyal service to the Committee. He served as the Committee Chair during his last year of service.

The Committee advises the Department of Health and its Engineering Section on matters affecting Public Water Systems and the administration of the Water Operator Licensing Program.

## Bar-coded Training Cards Issued

If you have an active water operator license, operator in training card or a current water license application on file with the Engineering Section's Water Operator Licensing Program, you should have recently received a slate blue wallet training card. If you feel you should have received an ADH training card and didn't, please contact Jeremy Rowe or Martin Nutt.

The card has a barcode, with the information on the bar-code shown immediately below it. The barcode provides training organizations an easy, more reliable method to record your training attendance. Also, the barcode is converted to electronic attendance data which is conveniently transferred to training databases. This will allow you to track your actual training attendance by visiting an internet based training database. Attendance records for both renewal and mandatory training are available on the internet at: http://www.healthyarkansas.com/eng/opcert/oper.htm .

You can expect to be asked to provide your training card at future training sessions. The training providers are planning to track attendance utilizing scanning devices to read the barcode. If you hold a wastewater license, ADEQ is also furnishing renewal cards with a barcode. Either barcode can be used to record your attendance since they hold identical data.

Please remember, your ADH Training Card is not your license card. The training card was issued to everyone that had a current water license or application on file. If you have any questions, contact Jeremy Rowe or Martin Nutt with the Engineering Section.

AWW&WEA District Meetings

See also the Division's web site www.healthyarkansas.com/eng/ for updates.

| DATE | TIME | CITY | LOCATION | SPONSOR |
|---|---|---|---|---|
| August 2008 | | | | |
| 7 | 5:00PM | Benton | Brown's Restaurant | Central District, AWW&WEA |
| 7 | 6:30PM | Fort Smith | Golden Corral | Western District, AWW&WEA |
| 14 | 5:30PM | Russellville | Western Sizzlin | AR Valley District, AWW&WEA |
| 14 | 5:30PM | Batesville | Western Sizzlin | North Central District, AWW&WEA |
| 14 | 5:30PM | Des Arc | White River Princess | Eastern District, AWW&WEA |
| 19 | 6:30PM | Crossett | Western Sizzlin | Southeast District, AWW&WEA |
| 20 | 9:00AM | Harrison | Comfort Inn | Northwest District, AWW&WEA |
| 21 | 1:00PM | Jonesboro | Ron's Catfish | Northeast District, AWW&WEA |
| 28 | 6:00PM | Prescott | to be announced | Southwest District, AWW&WEA |
| September 2008 | | | | |
| 4 | 5:00PM | to be announced | to be announced | Central District, AWW&WEA |
| 4 | 6:30PM | Fort Smith | Golden Corral | Western District, AWW&WEA |
| 11 | 5:30PM | Clarksville | Western Sizzlin | AR Valley District, AWW&WEA |
| 11 | 5:30PM | Batesville | Western Sizzlin | North Central District, AWW&WEA |
| 11 | 5:30PM | Helena | River Road Restaurant | Eastern District, AWW&WEA |
| 16 | 6:30PM | Hamburg | Catfish Inn | Southeast District, AWW&WEA |
| 17 | 9:00AM | Springdale | Jones Center | Northwest District, AWW&WEA |
| 18 | 1:00PM | Jonesboro | Western Sizzlin | Northeast District, AWW&WEA |
| 25 | 6:00PM | East Camden | to be announced | Southwest District, AWW&WEA |
| October 2008 | | | | |
| 2 | 5:00PM | Benton | Brown's Restaurant | Central District, AWW&WEA |
| 2 | 6:30PM | Fort Smith | Golden Corral | Western District, AWW&WEA |
| 9 | 5:30PM | West Memphis | Southland Greyhound Park | Eastern District, AWW&WEA |
| 9 | 5:30PM | Russellville | Western Sizzlin | AR Valley District, AWW&WEA |
| 9 | 5:30PM | Batesville | Western Sizzlin | North Central District, AWW&WEA |
| 15 | 9:00AM | Eureka Springs | Best Western Inn of the Ozarks | Northwest District, AWW&WEA |
| 16 | 1:00PM | Paragould | Service Center Bldg. | Northeast District, AWW&WEA |
| 21 | 6:30PM | Barkada | Young's BBQ | Southeast District, AWW&WEA |
| 23 | 6:00PM | Waldo | to be announced | Southwest District, AWW&WEA |

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