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Inside:

Harmful Algal Blooms and You
100th Annual Conference Recap
Industry News
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Annual Conference a success

Our 100th year anniversary Conference in Duluth was a huge success. We set attendance, exhibitor, and banquet attendance numbers. Congratulations to our entire section for the volunteer hours put in by so many to make this our grandest of all conferences. Many volunteers made this a special event with extremely dedicated year-long planning. From the historical artifacts brought in by so many various utilities throughout the state of Minnesota to the special MAC Social at Clyde’s Iron Works and the special 100-year commemorative video, it surely proved to be a conference for the record books.

David LaFrance, the Associations CEO, was kind to spend the entire week with our section in Duluth, engaging fully in the ceremonies. Congratulations are in order to Carol Blommel Johnson from Apple Valley, the first-ever woman Minnesota Section recipient of the Fuller award. We look forward to traveling to Philadelphia in June, when Carol will be presented her award at the National AWWA ACE. My sincere congratulations are extended to all award winners at this year’s memorable conference. They are Myron Volker, Scott Froniek, Dave Ninow, Uma Vempati and Joe Zauner. Please refer to the website or this edition of the Breeze to see the awards that were presented and also to see all of the competition contest winners. I am proud and thankful for all of our award winners this year; they truly bring strength to our organization.

For those of you who do not know me, I have been in the water industry since graduating from the University of Notre Dame in 1982. I have worked for two Companies in 34 years: Water Products Co. (now HD Supply) and Engineering America, Inc. I consider my involvement with AWWA as one of the best choices of my career. Make this your year to get active and involved in your section or district. The connections and friends that you meet in this organization are remarkable. You will be amazed by the people whom you will be associating with and their willingness to share knowledge with you. This year, our section will adopt our association’s vision of making a better world through better water. Our mission will also be to follow our association’s mission of providing solutions to effectively manage water, the world’s most important resource. Our core principals will be to protect public health, safeguard the environment, share best practices, inspire innovation, and foster diversity and inclusion. I have offered an operational plan to our section leadership to carry these principals into actions in the upcoming year. I am excited to continue the positive vibe of our celebration conference in Duluth and do so by thanking Jim Sadler for his leadership role as chair of the section this year and also acknowledge Jeff Larson as he leaves our executive team. My truly humble thanks are extended to Lucas Martin for his role as secretary-treasurer over the past three years. As most of you know, the secretary-treasurer post is a very demanding job, and Lucas performed very admirably during his term.

Our new section director will be Pete Moulton and our new chair-elect is David Brown. I look forward to serving with these two and all of our district trustees, council chairs and committee leaders in aligning our section with the Association’s vision, mission, and core principals.

Go Purple reign! Yes, at the time of this article the Vikings are the only undefeated team in the NFL. I hope they do not take anyone too lightly the rest of the season, especially those visiting teams who have reported injuries to key players. A well-known coach of mine used to say, “Be very leery of the team that limps into town because, they usually take the Champaign flight home!”

-may our NFL opponents never taste Champaign this season.

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Message from the Director

Congrats on 100 years of service

Congratulations to all...the Minnesota Section has reached a major milestone; ONE HUNDRED YEARS OF SERVICE to our members and the public!

Another exceptional Fall Conference has passed...

- The conference attendance exceeded the previous peak by over 10 percent; registrations were 615...Nice!
- The opening general session, exhibition, museum, MAC social, technical sessions, member appreciation night, and Friday updates were outstanding.
- Congratulations to all the award winners! The George Warren Fuller award winner was Carol Blommel-Johnson from Apple Valley; Leonard N. Thompson award winner was Myron Volker from Owatonna; Andrew Sullivan Award for Outstanding Leadership winner was Uma Vempati from the I&S Group; Operator Meritorious Service award went to Dave Ninow from Elk River Public Utilities; Benjamin G. Mason Award of Excellence to Joe Zauner from ACIPCO; and newly renamed Jon B. Eaton Excellence in Volunteer Service Award (formerly the Volunteer of the Year) to Scott Fronke from Black & Veatch.
- Congratulations to all the competition winners! City of St Cloud in Top of the Glass award, Kyle Hinrichs in Meter Madness, City of Duluth in Pipe Tapping, and the City of Bloomington in Hydrant Hysteria. Look forward to seeing everyone compete in Philadelphia in 2017!
- Welcome to our newly elected board members – Section Chair-elect David Brown, Section Director Pete Moulton, and Assistant Secretary Anna Schliep.
- The Section Bylaw update was approved by the membership.
- Thanks to all who contributed...The Minnesota Section raised over $18,000 for Water for People!
- And a special thank you to our Association CEO, David LaFrance, for attending to our Section conference, speaking, and celebrating our historical Section milestone.

At the Association level...

- a new policy on Lead Service Line Management is pending approval
- a Community Engineering Corps Excellence Award is being proposed
- the travel policy is being updated
- the Partnership for Clean Water continues to make steady progress, and
- the updated membership model will be rolled out in January 2017.

I want to Thank the Section for approving me as Director and Association Board for voting me as Vice-President. I am honored to represent our Section and Association.

Jon Eaton

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Celebrate championships in a good way

As I write this, I am preparing to watch a World Series between two teams who have never won the World Series in my lifetime (and with one of the teams, in just about anyone’s lifetime).

As one who doesn’t have a particular interest in either team (Cleveland, which last won the World Series in 1948, or the Chicago Cubs, who are making their first appearance in the World Series since 1945 and who haven’t won it since 1908, a monumental season with “Merkle’s Boner” being a key to the Cubs reaching the World Series), I still am taken by the significance of all this.

I’ve grown up consumed by baseball history, and I’ve now lived long enough where what was once current events has become history, so of course I’m captivated by this. It’s interesting to see others, people who don’t follow baseball closely, also being drawn in.

My wife and I joined a few others at a local watering hole to watch the game on the Saturday night when the Cubs beat the Dodgers to win the National League pennant. The others in the group are from Chicago and more emotionally invested in the Cubs, but I marveled just as much as they did at what we were seeing.

I hung around after the game ended to watch the celebrations. I was happy to hear that with all the people cramming bars as well as the streets of Wrigleyville that there was little trouble and few arrests.

“I had a lot of pride as a Minnesota sports fan in seeing us celebrate a championship in a good way.”

It reminded me of when the Twins won the World Series in 1987. People celebrated, they partied, they let it all out. The Minneapolis police had it figured out – let the folks assemble in downtown and don’t worry about public consumption of alcohol. Just let them have a good time and step in only if there is trouble.

And there wasn’t trouble. I had a lot of pride as a Minnesota sports fan in seeing us celebrate a championship in a good way. That doesn’t always happen. I’m aware that there can be ugliness in sports in many ways, including how people celebrate a championship (just look at what happens to Dinkytown when the Minnesota Gophers hockey team reaches the national title game).

I love sports, especially baseball, and have reached the point where I follow it more for the appreciation of the sport rather than in having a rooting interest in a particular team (even though I have a few). I sometimes shake my head at how some people let their emotions be affected to an inordinate degree depending on whether their favorite team wins or loses.

But sometimes I’m reminded of how much fun it can be to have a rooting interest in a team and to be able let some joyous emotions loose.

That’s why it was so much fun to see the Cubs win the National League pennant and see so many people enjoy it in a good way.

I’m signing off with this report (which has nothing to do with water or Minnesota AWWA) before the World Series starts. By the time you read this, you’ll know who won and how people celebrated the win or lamented the loss. I hope it all continues to be good, no matter what the outcome.
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Governing Board Highlights

A recap of the board meetings and events at the Minnesota AWWA annual conference in Duluth.

Approximately 615 people attended the annual conference.

Financial report from secretary-treasurer Ben Feldman
As of June 2016, section income for the year was $167,570, and expenses were $155,458 for a net income of $12,112. Investments were up since the beginning of the year by $4,634 for a total net income of $16,747.

The balance of the reserve fund at the end of June 2016 was $210,946, which is below the goal of 50 percent of the budgeted expenses ($454,615). This was expected as the board had approved increased expenses for the 100-year anniversary of the annual conference.

The endowment fund balance at the end of June 2016 was $235,223, which exceeds the goal of $180,000.

In related news, Anna Schliep of the Minnesota Department of Health was appointed as assistant secretary-treasurer.

Election results
• Dave Brown of the Metropolitan Council was elected chair-elect.
• Pete Moulton of Saint Peter was elected director.

Awards
• Leonard N. Thompson Award – Myron Volker
• George Warren Fuller Award – Carol Blommel Johnson
• Operator Meritorious Service Award – Dave Ninow
• Benjamin G. Mason Award of Excellence – Joe Zauner
• Jon Eaton Excellence in Volunteering Award – Scott Fronek
• Life Members – Steven Gatlin, Marvin Wurzer, Terry Schiro

Competitions
• Best in Glass – St. Cloud came out victorious among 11 samples submitted
• Meter Madness – Kyle Hinrichs of Mankato won with a time of 55 seconds. Brent Massmann of Bloomington was second and Jim Duffy of St. Paul Regional Water Services third.

Scholarships
• Community College – Matthew Withrow, St. Cloud Technical College
• Advanced Degree – Rena Weis, University of Minnesota; Ryan David, North Dakota State University; Ryan Hanson, University of North Dakota
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100th Annual Conference
Duluth, Minnesota
September 20-23, 2016
Recap
100 YEARS OF SERVICE TO SECTION MEMBERS AND THE PUBLIC!

Let’s make a toast…

To the friends, colleagues, and connections we have made

To all of our dedicated volunteers; past, present, and future

For developing and fostering, member and industry, diversity and inclusion

For all the innovation, accomplishments, and best practices we have inspired, developed, shared, and will make

For working tirelessly to safeguard the environment

For 100 years of service

All in the name of public health, public safety, and the way of life that we have become accustomed to

May all of us succeed in the noble pursuit to make a better world through better water

Here is to the next century!

Duluth was the setting for the 100th annual conference of the Minnesota Section of American Water Works Association.

AWWA executive director David LaFrance
Competitions – pipe tapping, hydrant hysteria, and meter madness – were among the attractions at the conference.

Some venerated veterans of Minnesota AWWA: Jon Eaton, Verne Jacobsen, Gerry Mahon, and Jim Sadler.

Outgoing chair Jim Sadler with incoming chair Tony Belden.

Section director Uma Vempati (right) poses with Wanky the Water Drop.

Competitions – pipe tapping, hydrant hysteria, and meter madness – were among the attractions at the conference.
AWWA executive director David LaFrance presents the George Warren Fuller award to Carol Blommel Johnson.

Section chair Jim Sadler presents the Leonard N. Thompson award to Myron Volker of Owatonna.

Andrew Sullivan presented the Andrew Sullivan Award for Outstanding Leadership to Uma Vempati.

The conference included a memorabilia museum.

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Is Your Utility PREPARED?

Improve your utility’s resilience to all-hazards  By Jonathan Nagata

Flood. Drought. Ice storm. Water main break. Chemical spill. Cyber-attack. Every day, drinking water and wastewater utilities face natural and man-made threats to their operations. It is a question of when – not if – an emergency will occur, potentially affecting water and wastewater services. Is your utility prepared? Learn how your utility can take action to prepare for, respond to, and recover from water emergencies in this article.

HAZARD MITIGATION FOR NATURAL DISASTERS

While we cannot prevent natural disasters from happening, we can complete projects to help reduce the negative impacts they may cause. Hazard mitigation projects can improve your utility’s ability to withstand and recover quickly from disasters like flood, drought, tornado, and power outage. It is often more cost-effective to protect your utility before a disaster than to repair damage after a disaster.

Hazard mitigation projects vary greatly depending on the utility’s assets, relevant hazards, and available funding. For example, if your utility is in a flood-prone area, you might look into elevating wellheads and electrical panels, protecting facilities with flood-proof doors and barriers, or upsizing culverts to better handle flood surges.

A first step to hazard mitigation is to connect with your local mitigation planner. Your local community is likely involved in efforts to mitigate the effects of natural disasters; most state and local governments have existing hazard mitigation plans. In most cases, proposed projects must be included in the local mitigation plan to be eligible for federal funding.

The U.S. Environmental Protection Agency (EPA) has developed a quick-and-easy guide that serves as a starting point for water and wastewater utilities that want to pursue hazard mitigation projects. To find out more, access Hazard Mitigation for Natural Disasters: A Starter Guide for Water and Wastewater Utilities, visit www.epa.gov/waterutilityresponse.

PREPARE FOR POWER OUTAGES

Loss of power during severe weather events or grid infrastructure failure could lead to water service disruptions, boil water advisories, and sewage back-ups. To prepare for power outages, your utility may want to establish a relationship with your power provider, conduct an assessment to determine your power needs, procure generators, and consider fuel source and storage options.

EPA conducted a series of nationwide water and power resilience workshops to identify ways to help water utilities become more resilient to power outages. You can discover findings, tips, and case studies from these workshops.
in the Power Resilience Guide for Drinking Water and Wastewater Utilities. To access the guide, visit www.epa.gov/communitywaterresilience.

ACCESS KEY INFORMATION DURING AN EMERGENCY
Will the storm affect my utility? How do I reach the state emergency management agency? What actions should I take to minimize damage to our assets? You may be asking these questions before and during an emergency. Situational awareness and timely coordination can reduce the impacts of natural disasters at your utility.

The Water Utility Response On-The-Go mobile website puts valuable emergency response resources in the palm of your hand. Use Response On-The-Go to access weather forecasts, emergency contact lists, incident action checklists, damage assessment forms, and Incident Command System information. Visit www.epa.gov/responseotg and bookmark it on your mobile device.

CONNECT WITH YOUR CUSTOMERS
Many Americans may not know how water arrives at their taps or where it goes when they flush. Additionally, the public may be unaware of the vulnerability of drinking water and wastewater services to natural or man-made disasters. Although stronger communication with the public is often needed, many utilities may not have the resources or staff available to conduct public outreach activities.

Regular communication with customers can improve community preparedness for water-related emergencies. When citizens are informed about their water and wastewater utilities, they tend to respond better during service interruptions and offer stronger support for water infrastructure upgrades.

EPA developed the Water Utility Public Awareness Kit to assist utilities in their public outreach efforts. The kit includes materials – brochures, mail inserts, posters, web graphics, and a video – that water utilities can use to inform customers about the value of water and wastewater services. Using several communications methods, utilities can encourage the public to “be aware, be prepared, and show you care.” To download the Public Awareness Kit materials, visit www.epa.gov/communitywaterresilience.

For more water resilience resources on risk assessment, training, surveillance, emergency response, and recovery, visit www.epa.gov/waterresilience. Please contact us with comments or questions at WSD-Outreach@epa.gov.

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The rise in number of cyanobacteria blooms in our region is becoming more and more of a concern for water utilities that utilize surface water supplies across the country. Cyanotoxins are less commonly found in drinking water than T&O compounds, however their toxicity and public perception is a concern for water utilities. Global climate change (increased temperatures) seems to be one of the primary drivers pushing toxin-producing cyanobacteria into more temperate regions and becoming more widespread.

In order to better understand cyanobacteria, some background on algal blooms should first be discussed.

What are Algal Blooms?
Algal blooms occur when algae reach extremely high cell densities (20,000 – 100,000 cells per milliliter); there is a proliferation of algae dominated by a single or a few species; and there is a visible accumulation of algae (floating mats, green water).

When do algal Blooms Occur?
Algal Blooms can occur any time of the year. Green algae blooms are common in the spring. Cyanobacterial blooms are common during the summer and fall. All types of algae can cause blooms under the right conditions.

What Causes Algal Blooms?
Many environmental factors influence the occurrence of algal blooms. In general, an algal bloom indicates that an ecosystem is in some form of imbalance. Factors include: nutrients (phosphorus and nitrogen); water clarity (sediment); circulation patterns; hydrology; biological community interactions; and weather. Algal blooms are caused primarily by eutrophication (the decaying of plant material) and man-made pollution, which increase nutrient loading of waterbodies and leads to increases in taste and odor (T&O) compounds and toxin production.

Characteristics of Algal Blooms
Each algal-driven T&O and harmful algal bloom event is unique. They are also highly unpredictable in that "change" happens, and their patterns will vary. This is mainly due to the myriad of factors that go into the generation of an algal event. Each water body is unique and this drives the dynamics of what is required for conditions to be "right" for a bloom. Often, multiple producers are common with each having different environmental factors that favor one over the other. The time scales of an event can vary from days to weeks. And there is often a short response time for management of the problem. The bottom line is a water source manager that has algal issues needs to know and understand their system in order to truly be able to manage the situations that may arise.
Characteristics of Problem Algae

Relatively few cyanobacteria produce 2-methylisoborneol (MIB) and Geosmin, and even fewer produce algal toxins. These problem algae (T&O and toxin) producers are frequently minor components of a bloom, meaning they are hard to find. Complicating the matter, they can be either benthic (associated with the bottom and often attached) or planktonic (floating or drifting in the water column) with each having critical management implications. They are opportunistic (waiting to exploit the perfect conditions), many are photosynthetic (light controls their distribution) and nutrient levels (phosphorus and nitrogen) control their mass. Also some are nitrogen fixers, and accumulate their own levels of nitrogen meaning they can wait out periods when nitrogen input levels are low, but can pull this ace out of their sleeve when they are ready. If it sounds like a problem, that’s because it is!

The most frequently cited cyanobacterial metabolites are the T&O compounds of Geosmin and MIB. However, attempts to use T&O compounds as indicator of toxins have been inconclusive. Complicating the management of toxins, most cyanobacterial species don’t cause T&O problems, or produce toxins; however, some species that produce T&O compounds can produce toxins.

As previously mentioned, and to be discussed further in this document, a water manager really needs to know his water source. Obviously for algal toxins, there is no easy replacement for monitoring algal populations. This may seem like a daunting task because there are greater than 10,000 species of all algae. Of this number approximately 2,000 species are cyanobacteria. Of these cyanobacteria, only about 3% are known to produce taste and odor components, and even less are known to produce cyanotoxins. So it would seem like this is looking for the needle in the haystack. However, with a willing staff member, a good microscope, some basic training, and patience, water managers can achieve the intimate knowledge of the algal population in their waterbody.

What are some common types of algae that produce T&O and toxin compounds?
The following table provides a listing (not all inclusive) of some of the more common taste- and odor- and toxin-producing algae genera in the mid-South where I have most of my experience. Many of these genera also occur in other parts of the United States, and could be used as a quick guide for water managers to be aware of. These genera have been divided into four general classes: diatoms, green & yellow-greens, bluegreens (cyanobacteria) and flagellates. All of the genera listed are known to produce T&O compounds, and those bolded and asterisked are also known to produce toxins.

<table>
<thead>
<tr>
<th>Diatoms</th>
<th>Bluegreens</th>
<th>Green and Yellow-Greens</th>
<th>Flagellates</th>
</tr>
</thead>
<tbody>
<tr>
<td>Synedra</td>
<td>Anabaena*</td>
<td>Actinastrum</td>
<td>Ceratium</td>
</tr>
<tr>
<td>Tabellaria</td>
<td>Aphanizomenon*</td>
<td>Ankistrodesmus</td>
<td>Euglena</td>
</tr>
<tr>
<td>Asterionella</td>
<td>Cylindrospermopsis*</td>
<td>Chlorellia</td>
<td>Peridinium</td>
</tr>
<tr>
<td>Nitzshia</td>
<td>Merismopedia</td>
<td>Closterium</td>
<td>Phacus</td>
</tr>
<tr>
<td></td>
<td>Microcystis*</td>
<td>Raphidiopsis</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Oscillatoria*</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Denotes genera that can produce both T&O and toxins.

Why are Algal Blooms Bad?
The problems associated with algal blooms can generally be summed up into three general concerns: public health, ecologic and economic. Let’s briefly look at each.

Public Health Concerns – Exposure to algal toxins may occur through consumption of tainted water, fish, or shellfish; recreational activities; or inhalation of aerosolized toxins. Algal toxins are known to cause illness immediately (hours to days) after exposure. In addition, several algal toxins are believed to be carcinogenic or to promote tumor growth, although more research on the effects of long-term exposure is needed.

Because of potential human-health risks, freshwater algal toxins are on the U.S. Environmental Protection Agency...
drinking-water contaminant candidate list, and fish and shellfish advisories are frequently posted in coastal areas.

**Ecologic Concerns** – HABs may cause mortality of aquatic organisms because of low dissolved oxygen or algal toxins resulting in fish kills and potential disruption to the ecosystem. Algal toxins also may cause mortality of terrestrial organisms using the water source. It is not uncommon for pets and livestock to succumb to exposure to algal toxins as well. Additionally, the long-term effects of persistent HABs on ecosystem structure and function are not well understood.

**Economic Concerns** – Economic concerns associated with HABs include increased drinking-water treatment costs, loss of recreational revenue, loss of aquaculture and fisheries revenue, and livestock sickness or fatalities. Taste-and-odor compounds are of particular concern to drinking-water suppliers because of customer dissatisfaction with malodorous drinking water and increased treatment costs. This can lead to distrust in the drinking water provider and questioning of the safety of consumption. Economic losses (mainly coastal fishery and shellfish production) in the United States because of HABs during the last decade are estimated to be in excess of $1 billion (U.S. Congress, 1998).

**How Are People and Animals Exposed to These Toxins?**

The pathways for exposure include ingestion and inhalation during recreational activities, inhalation of aerosolized toxins (spraying water), direct contact with blooms (dermatitis) and consumption in drinking water. However, research has shown that drinking water treatment process effectively removes most toxins, but caution should still be exercised if your water source is experiencing an algal bloom. More effort needs to be undertaken into understanding exactly what the best method is for toxin removal.

**What Are Cyanobacterial Toxins and How Are They Produced?**

Algae and cyanobacteria are natural components of fresh water; however, under favorable conditions, they can rapidly multiply causing “blooms.” Some cyanobacterial species can produce toxins (cyanotoxins) at levels that may be of concern for human health. These cyanobacterial toxins are of particular concern because of their potential impacts on drinking water and the possible affect to human health. Toxins are produced as a natural process during the metabolism of algae. It isn’t clear why the toxins are produced because they aren’t always manufactured. There is a suggestion that it may be a stress response by the organism. Sometimes algae produce toxins, sometimes they don’t.

**How Common Are Toxic Cyanobacterial Blooms?**

At least 36 U.S. states have anecdotal reports of human or animal poisonings associated with cyanotoxins. However, accurate records are rarely kept of how frequently cyanotoxin exposures occur. Five states have routine monitoring programs for cyanotoxins. Seventeen states have action plans for cyanotoxins. The USGS has measured cyanotoxins in most states, including five (AK, AR, LA, GA, and DE) which have not had listed poisonings or advisories.

**No Current Environmental Protection Agency (EPA) Regulations**

Algal toxins are not currently regulated under the Safe Drinking Water Act, and therefore are not subject to any national primary drinking water regulation. However, cyanotoxins were included on EPA’s Contaminant Candidate List (CCL3) list and are proposed to be monitored in the Unregulated Contaminant Monitoring Rule (UCMR) 4 by EPA. Ten cyanotoxins are proposed to be monitored from March 2018 through November 2020 and include: Anatoxin-a; Microcystins- total, LA,LF,LR,LY,RR,YR; Cylindrospermopsin and Nodularin.

Microystins is the only cyanobacterial toxin class internationally assessed for health risk. The World Health Organization (WHO) has established a provisional guideline of one microgram per liter (ug/L) for Microsystin-LR in
drinking water. They have also provided some guidelines and risk levels associated with microcystin (see Table 1).

Most cyanobacteria poisoning involves three types of toxins: hepatotoxins (liver toxins), neurotoxins (causing nerve damage) and derma-toxins (skin irritant). Table 2 briefly summarizes each along with their associated toxins and potential symptoms of exposure.

Table 3 provides the toxin group, the primary target organ in mammals, and more importantly, the algae genera most often associated with their production.

Cyanotoxin Detection Methods
Table 4 describes the commonly used analytical methodology used to detect algal toxins, their use as a tool (whether screening or confirmatory), the analysis selectivity, and their associated detection limits. The ELISA method is a relatively low-cost and simple screening tool that could be used by drinking water utility and recreational water managers. However, its use is intended to be just that, a simple screening tool. Liquid Chromatography/Mass Spectroscopy/Mass Spectroscopy (LC/MS/MS) is considered the premier tool for obtaining confirmation and quantification of toxins. Those using the ELISA method for screening should always consider additional analyses to confirm preliminary results if toxins are detected at levels of concern.

Management Strategy
So what is a drinking water utility to do? Wait for a bloom to occur that creates a public health concern? Wait until EPA completes the next round of UCMR4 monitoring and eventual regulation, potentially a nine to 12-year process? Many state environmental and health agencies, along with more progressive water utilities, are creating their own monitoring protocols in order to more proactively manage their concerns.

Most are focusing on developing an early warning baseline monitoring program that is based on either analytical hits from routine sampling or customer concerns.

The attempt at management should include Focused Monitoring. Where is it?

### Table 1

<table>
<thead>
<tr>
<th></th>
<th>Microcystin concentration</th>
<th>Cyanobacteria cell/ml</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tolerable Daily Intake (provisional)</td>
<td>0.04 ug/kg-day</td>
<td></td>
</tr>
<tr>
<td>Recreational Bathing Waters</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low Risk</td>
<td>4 ug/L</td>
<td>20,000</td>
</tr>
<tr>
<td>Moderate Risk</td>
<td>20 ug/L</td>
<td>100,000</td>
</tr>
<tr>
<td>High Risk</td>
<td></td>
<td>Scums</td>
</tr>
<tr>
<td>Drinking Water (provisional)</td>
<td>1 ug/L</td>
<td></td>
</tr>
</tbody>
</table>

### Table 2

<table>
<thead>
<tr>
<th>Toxin Type</th>
<th>Common Toxin</th>
<th>Symptoms of Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hepatotoxins</td>
<td>Microcystin-LR, Microcystin-LA, Cylindrospermopsis, and Nodularin</td>
<td>vomiting, diarrhea, fever, cramps</td>
</tr>
<tr>
<td>Neurotoxins</td>
<td>Anatoxins and Saxitoxins</td>
<td>paralysis and seizure</td>
</tr>
<tr>
<td>Dermatoxins</td>
<td>Aplysiatoxin, Lipopolysaccharides and Lyngbyatoxin</td>
<td>irritation to eyes, ears and throat; rashes; and skin lesions</td>
</tr>
</tbody>
</table>

### Table 3

<table>
<thead>
<tr>
<th>Toxins</th>
<th>Primary organ in mammals</th>
<th>Cyanobacteria Genera</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cyclic peptides</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Microcystins</td>
<td>Liver</td>
<td>Microsystis, Anabaena, Plankothrix (Oscillatoria), Nostoc, Hapalosiphon</td>
</tr>
<tr>
<td>Nodularin</td>
<td>Liver</td>
<td>Nodularia</td>
</tr>
<tr>
<td>Alkaloids</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Anatoxin-a</td>
<td>Nerve synapse</td>
<td>Anabaena, Plankothrix (Oscillatoria), Aphanizomenon</td>
</tr>
<tr>
<td>Anatoxin-a(S)</td>
<td>Nerve Synapse</td>
<td>Anabaena</td>
</tr>
<tr>
<td>Aplysiatoxins</td>
<td>Skin</td>
<td>Lyngbya, Schizothrix, Plankothrix (Oscillatoria)</td>
</tr>
<tr>
<td>Cylindrospermopsis</td>
<td>Liver</td>
<td>Cylindrospermopsis, Aphanizomenon, Umezakia</td>
</tr>
<tr>
<td>Lyngbyatoxin-a</td>
<td>Skin, gastro-intestinal tract</td>
<td>Lyngbya</td>
</tr>
<tr>
<td>Saxitoxins</td>
<td>Nerve axons</td>
<td>Anabaena, Aphanizomenon, Lyngbya, Cylindrospermopsis</td>
</tr>
<tr>
<td>Lipopolysaccharides (LPS)</td>
<td>Potential irritant, affects any exposed tissue</td>
<td>All</td>
</tr>
</tbody>
</table>
What is it? What is the rate of growth? What is the Limnological Status of the water body? And use the historical experience of the resource managers and users of the water body. Table 5 represents a monitoring framework and discusses the demands on equipment and personnel and who is suited to perform each task.

The next step is to understand the **Operational Status** of the water source and what **Options** may be available.

### TABLE 4

<table>
<thead>
<tr>
<th>Test</th>
<th>Use</th>
<th>Selectivity (Does it measure only the targeted compound?)</th>
<th>Minimum Detection Level</th>
</tr>
</thead>
<tbody>
<tr>
<td>ELISA</td>
<td>Screening test (generally requires confirmation with another test type)</td>
<td>Based on antibody/antigen interactions. Less selective because of cross reactivity with other similar molecules, including other microcystins, and nonspecific binding.</td>
<td>0.16 ppb</td>
</tr>
<tr>
<td>LC/PDA</td>
<td>Confirmatory</td>
<td>Chromatography separates the microcystins, microcystins identified by UV spectrum. More selectivity than ELISA, less selective than LC/MS/MS</td>
<td>0.1 ppm</td>
</tr>
<tr>
<td>LC/MS/MS</td>
<td>Confirmatory</td>
<td>Chromatography separates the microcystins, identifies microcystins by precursor ion. Most selective.</td>
<td>0.1 - 10 ppb</td>
</tr>
</tbody>
</table>

### TABLE 5

<table>
<thead>
<tr>
<th>Monitoring Type</th>
<th>Parameters/Variables</th>
<th>Demands on Equipment and Personnel</th>
<th>Who</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic</td>
<td>Site inspection for indicators of cyanobacteria in water body</td>
<td>Transparency, discoloration, scum formation, detached mat acculation</td>
<td>Operators, practitioners</td>
</tr>
<tr>
<td>Surrogates</td>
<td>Potential for cyanotoxin problems in water body</td>
<td>Total phosphorus, nitrate and ammonia, flow regime, thermal stratification, transparency, phycocyanin</td>
<td>Linnologist</td>
</tr>
<tr>
<td>Cyanobacteria</td>
<td>In water body and drinking water</td>
<td>Dominant taxa (quantity); determination to genus level is often sufficient; quantify only as precisely as needed for management</td>
<td>Phycologist or a technician trained by a phycologist</td>
</tr>
<tr>
<td>Cyanotoxins</td>
<td>In water body and drinking water</td>
<td>Microcystin, anatoxin-a, cylindrospermopsin</td>
<td>Chemist</td>
</tr>
</tbody>
</table>

For instance, the manager should understand their system well enough to know: flows/demands; scheduled shut downs; scheduled maintenance; alternate sources; bypass options; blending options; selective withdrawal options; treatment plant issues and options; and the availability of logistical support (local, state and federal).

### Why the Focus on Harmful Algal Blooms?

In September 2013, the Ohio Environmental Protection Agency placed Toledo under a “Do No Drink” advisory. The incident was driven by a bloom that centered on their water utilities’ intake structure. While the “perfect storm” of events drove the Toledo problem, Lake Erie had for years been the site of significant algal blooms, and when the bloom occurred around the Toledo water intake, their system was quickly overcome by the extent of the bloom. This event brought to the public eye the algal issue.
models would allow resource managers time to respond more effectively to potentially harmful conditions.

**Collaboration in Arkansas**

On August 31, 2015, a group of interested parties held the inaugural Arkansas Harmful Algal Bloom (HABs) Workgroup meeting at the Arkansas Department of Environmental Quality headquarters in North Little Rock, AR. This group was comprised of members from: Arkansas Department of Environmental Quality, Arkansas Department of Health, US Army Corps of Engineers, Central Arkansas Water, Beaver Water District, US Geological Survey, UofA Little Rock, UofA Fayetteville and Arkansas Game and Fish Commission. The goal of the workgroup is to continue collaborative efforts among the various stakeholders in the state, and develop a standardized method of early detection utilizing predictive models and management strategies.

Inspired by the creation of this working group on HABs in Arkansas, the Arkansas Water Resource Center is developing this year’s agenda around HABs and water quality. Their annual Water Conference will be held July 26 – 27, 2016 at the Fayetteville Town Center.

The keynote speakers will be Hans Paerl of the University of North Carolina at Chapel Hill, and Alan Wilson of Auburn University. They will deliver presentations about the growing occurrence and increasing threats of HABs in freshwater systems. (Hans and Alan are pictured below, from left).

Other Agenda items for the conference include:
- Nutrient loading
- Water quality trends
- Nutrient criteria development
- HABs in source waters and recreational waters

To learn more about the conference and/or to register, visit: [http://arkansas-water-center.uark.edu/annualconferences.php](http://arkansas-water-center.uark.edu/annualconferences.php).

**Some Available Resources**

To learn more about T&O and cyanobacterial toxins, the following is a series of free manuals, documents, and web pages you can review.

Drinking Water Health Advisory for the Cyanobacterial Microcystin Toxins
The EPA announced the release of the aforementioned cyanotoxin management document. The document is intended to assist PWSs that choose to develop system-specific plans for evaluating their source waters for vulnerability to contamination by microcystins and cylindrospermopsin. It provides information and a framework that PWSs and others (as appropriate) can consider to inform their decisions on managing the risks from cyanotoxins to drinking water.


The American Water Works Association (AWWA) believes that the document titled “Recommendations for Public Water Systems to Manage Cyanotoxins in Drinking Water” (hereafter “Recommendations”) constitutes a “Significant Guidance Document” as defined by the Office of Management and Budget January 18, 2007 memo Final Bulletin for Agency Good Guidance Practices. To date, EPA has not classified the Recommendations as a Significant Guidance Document. Furthermore, we also believe that the Recommendations also satisfy the classification criteria for an “Economically Significant Guidance Document”. We believe that EPA should reissue this guidance after completing the necessary procedures associated with an economically significant guidance document.
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Metro School to Feature Stand-Alone Exam Prep for Class A & B Licenses

The 2017 Metro District School, conducted by the Minnesota Department of Health (MDH) and the Minnesota Section of American Water Works Association (AWWA), will be held from Monday to Wednesday, April 3-5, 2017 at the Earle Brown Heritage Center in Brooklyn Center.

The school will include an exam prep for those taking the Class C & D exams. However, the exam prep for Class A & B licenses will be held separately, on Friday, March 24, at the Bloomington Public Works Training Facility.

“I hope that this will encourage all of us to better prepare for testing and the implications it has associated with a certification. In turn we can concentrate on the school content,” said MDH certification officer Mark Sloan.

The three-day school will feature technical and leadership classes with specialized sessions on system business solutions, treatment, distribution, and succession planning.

The planning committee is also promoting Gimmicks and Gadgets. “If you have created a gadget or gizmo that helps you at work, bring it to the school,” says committee member Brent Massmann. “There will be an opportunity for the creator of the item to demonstrate how it is used.”

A separate Granular Media Filtration workshop will be held on Thursday, April 6 at the Bloomington Public Works Training Facility, which is at W. 98th Street and James Avenue.

More information on the exam prep, three-day school, and the follow-up workshop will be in the Spring 2017 issue of the Waterline.

Mobile Art Lab

For the third summer in a row, Public Art St. Paul conducted its mobile art lab with a focus on water in Western Sculpture Park in St. Paul. “Making a difference in your own backyard: Rain gardens for water conservation and pollinators” was the theme for the summer, which featured 12 weekly workshops. Director of education Mary Johnson said the art lab and workshops “have demonstrated water quality concepts to participants and have had an added focus on eco-friendly art-making practices and environmentally friendly behaviors as a whole.”

Drinking Water Institute

Dave Goergen of Edina, Jon Eaton of Eagan, George Kraynick of Minneapolis, and Jodi Wallin of St. Paul address teachers at the annual Drinking Water Institute for Educators, conducted in Eden Prairie in 2016. Held since 2001, the Institute brings in science teachers from around the state to develop action plans to create inquiry-based activities that they can integrate into their existing science curriculum. The 2017 Institute will be in Lakeville. More information on the Drinking Water Institute is at http://www.health.state.mn.us/divs/eh/water/institute.
Industry News

From the Waterline, newsletter of the Minnesota Department of Health

New Coliform Sample Drop-off Site in International Falls

Certain community public water systems are required to collect a monthly or quarterly total coliform sample and send the sample to a designated laboratory for analysis. There has been an increase in total coliform samples shipped from International Falls and the surrounding area that are not arriving at Pace Analytical in Virginia, Minnesota, within the required 30-hour hold time. As a result, the sample cannot be analyzed and must be recollected. This delay is likely due to changes with the United States Postal Service distribution centers located throughout the state.

In addition to using an overnight courier service, a new option is now available for submitting samples to the laboratory. Pace Analytical will now pick up samples from the Koochiching County Public Health Office in International Falls at noon every Wednesday. Those interested may collect the sample on Wednesday morning and deliver it by noon with the completed lab form to:

Koochiching County
Public Health and Human Services
Forestland Annex
1000 5th Street
International Falls, Minnesota 56649

This new option will guarantee that the sample arrives at the lab the same day it is collected.

The pickup charge is $15.00, payable either with the exact amount in cash or by a check payable to Pace Analytical (noting “sample pickup charge” in the memo section). Samples cannot be dropped off at the county health office without payment.

Contact information for the drop-off location: Debra Polkinghorne, 218-283-7070.

St. Cloud Sweeps Doubleheader in Taste Test

A member of the Minnesota Section of American Water Works Association (AWWA) is flanked by WCCO Radio personalities Jordana Green and John Williams following the Great Minnesota Tap Water Taste Test, which was held on the Sustainability Stage in the Eco Experience building at the State Fair. This year, St. Cloud water edged out Saint Peter for the championship, with Lino Lakes and North St. Paul making the final four. The St. Cloud water was brought to WCCO’s State Fair studio and put through another competition. WCCO employees and audience members sampled water from a number of different cities and once again picked St. Cloud as the best tasting.

Minnesota AWWA has been holding this contest for a number of years and hopes to continue going on WCCO Radio after each competition in the future. (Update: St. Cloud stayed on a roll and also won the Best in Glass taste-test competition at the Minnesota AWWA conference in Duluth in September.)
Bacteriological Sampling Plan Requirements and Guidance

Sample Site Locations
Public water systems (PWSs) must collect total coliform samples at sites which are representative of water quality throughout the distribution system, and the samples must be analyzed by an MDH accredited laboratory.

- Use easily accessible sites (24/7 access, if possible).
- Spread sites throughout the distribution system.
  - Divide system into segments/quadrants and choose sites from each area.
  - Use sites in different pressure zones.
  - Use sites in areas that serve sensitive populations.
  - Use sites fed by different storage facilities.
- Use sites that have an available upstream and downstream site within 5 service connections.
- Sample from taps that are in good condition (avoid bathrooms, outside taps, taps close to the ground, etc.).
- Use sites that get a fair amount of use on a regular basis (avoid seasonal sites or large diameter service connections that aren’t used regularly).
- Avoid dead-end sites.

Sample Scheduling
PWSs must collect samples at regular time intervals throughout the month, except that a system that uses only groundwater and serves 4,900 persons or fewer may collect all required samples on a single day if they are taken from different sites.

Systems may choose to use the same site location more than once a month, but the samples should be collected at least one week apart.

Use the guidance below if rotating sample sites throughout the month (or quarter):
- 1 sample/quarter: use 2-4 sites.
- 2-5 samples/month: use 5+ sites.
- 5-10 samples per month: use 5-10 sites.
- 10-20 samples per month: use 10+ sites.
- 20-50 samples per month: use 10-25 sites.
- 50+ samples per month: use 25+ sites

Responsibilities and Actions
- For systems taking less than 40 samples in a month, two or more routine/repeat total coliform positive samples triggers a Level 1 assessment.
- For systems taking 40 or more samples in a month, a Level 1 assessment is triggered when the number of routine/repeat total coliform positive samples is greater than 5% of the required number or monthly samples.
- A level 2 assessment is triggered if any repeat sample is E. coli positive, or if a routine E. coli positive sample is followed by a total coliform positive repeat sample.
- The State is responsible for conducting Level 1 assessments for water systems equal to or less than 1,000 in population.
- Water systems greater than 1,000 in population are responsible for conducting Level 1 assessments.
- The State is responsible for conducting Level 2 assessments for all water systems.
- Labs should be notifying the water system and the State within 24 hours when any CPWS samples come back positive.
- Repeat samples must be taken within 24 hours, or as soon as possible, after being notified.
- Water systems are responsible for making sure all required routine samples are taken for the compliance period.
Industry News

From the Waterline, newsletter of the Minnesota Department of Health

Lewis & Clark Project Reaches Magnolia

The last piece of 16-inch pipe is installed for the Magnolia service line as overall completion nears on the Lewis & Clark Regional Water System. Conceived in 1988 as a way of serving water-challenged areas in South Dakota, Iowa, and Minnesota, the Lewis & Clark project takes water from beneath the Missouri River at Vermillion, South Dakota, to communities as far as 125 miles away. The project will serve approximately 300,000 people when it is completed. The pipes crossed into Minnesota last year and in September 2016 reached Magnolia, which is a connection point to Rock County Rural Water System. Magnolia is also a connection point to Lincoln-Pipestone Rural Water, which serves a wide area that includes 38 cities in 10 counties. Next up is to extend the pipes to east of Adrian, another connection point to Lincoln-Pipestone, and then to Worthington. It’s anticipated that Lincoln-Pipestone will begin receiving water from the project in 2017. Carstensen Contracting Inc. of Pipestone, Minnesota, has installed all of the pipe in Minnesota. Construction of the entire system is now 67 percent complete; the entire service area will cover 5,000 square miles (approximately the size of Connecticut).

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<td>Erection Dismantles</td>
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</tr>
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</table>

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New Brighton Still Facing, Overcoming Water Challenges

The water professionals at the city of New Brighton have long dealt with challenges that were not of their own making. Operations at the Twin Cities Army Ammunition Plant (TCAAP), just north of New Brighton, created a robust plume contaminated with trichloroethylene and other volatile organic compounds that contaminated the city’s water supply. In the 1980s New Brighton and the U.S. Army reached a landmark litigation settlement agreement. The Army paid for a water treatment facility using granular-activated carbon to remove the contaminants. In addition, the innovative pump-and-treat approach provided residents with a safe supply of drinking water while also cleaning up the aquifer.

Under the settlement agreement, New Brighton pumps and treats a specified volume of water from the contaminated aquifer sufficient to contain migration of contaminants to other parts of the aquifer and to hasten the remediation process. The treated water is consumed by New Brighton residents, and excess water is delivered to Fridley. The agreement represents Minnesota’s largest groundwater cleanup process.

The pump-and-treat process has now been put on hold as the city addresses another issue; low levels of 1, 4 dioxane originating from TCAAP have been detected in some of New Brighton’s wells. The city conducted a pilot study and plans to add a new treatment process to its existing plant to remove dioxane to levels well below the Minnesota Department of Health (MDH) health risk limit.

In the meantime, New Brighton has switched to water from Minneapolis Water Works. The transfer of the water was easy in one sense. Minneapolis has reservoirs with a combined capacity of 74 million gallons in New Brighton (on the highest point in the Twin Cities), approximately five blocks east of the utility’s Columbia Heights ultrafiltration treatment plant and only 700 feet from the New Brighton plant. Minneapolis tapped into a 48-inch line next to its reservoir and installed a 24-inch line to send water to New Brighton.

Another aspect of the operation required close scrutiny. As seen from the disaster in Flint, Michigan, a water system switching sources must pay attention to the effect of the change, especially with corrosion control.

In the 1990s Minneapolis added an ortho/polyphosphate blend to its water, a means of providing a protective coating to insulate the water from absorbing materials such as lead and copper from the pipes. New Brighton planned for the switch in water and made sure there were no negative ramifications from it.

“New Brighton and Minneapolis worked together to ensure that the water from the two systems would be compatible before the transition,” said MDH engineer Anna Schliep. “New Brighton not only added the same corrosion inhibitor that Minneapolis uses but ensured that it was working to coat the pipes, did additional lead and copper monitoring in addition to other water quality parameters during the transition period, and planned communications to residents, including how they would respond to any customer complaints. MDH assisted in reviewing plans and data to provide feedback and technical assistance to New Brighton.”

The result was that, by the time the switch in water source occurred in July 2016, New Brighton’s water was insulated from materials in the pipes. The plan is for New Brighton to use Minneapolis water for two years until the new dioxane treatment system is added to its plant and normal pump-and-treat operations can be resumed. It means New Brighton residents can continue to be assured of safe drinking water; however, it also means that the pumping to reduce the contaminated plume has been put on hold.

Crews connect the Minneapolis 48-inch supply line to the 24-inch pipe to New Brighton.

Construction on the distribution control station building, which will house the permanent booster pumps.
Industry News

From the Waterline, newsletter of the Minnesota Department of Health

Clean Water Fund Water Reuse Project Seeking Stakeholder Input

A workgroup of state agencies and other interested parties is working to advance safe and sustainable water reuse in Minnesota. Efforts include making recommendations for clarifying the regulatory pathway for water reuse and evaluating resources needed for successful implementation of water reuse. The workgroup is in the process of gathering stakeholder input. Changes in water reuse policy may affect Minnesota's public health, environment, infrastructure, and water management system, so it's important that the group hear from key stakeholders to make sure sound recommendations are delivered to agency leaders and the legislature.

A Stakeholder Advisory Group representing interested parties has been meeting and will continue to meet until April 2017. Members were invited to participate on the advisory group because they represent organizations and entities that have a role in water reuse. Jon Eaton from the city of Eagan is representing water utilities. Even those not on the advisory group may still come to both stakeholder and workgroup meetings or provide input through the workgroup's email.

More information on the Clean Water Fund project, the group's meeting schedule, and opportunities to provide input are available at the project website: http://www.health.state.mn.us/divs/eh/water/dwp_cwl/reuse/index.html

Water utilities are also encouraged to subscribe on GovDelivery for information on water reuse. Go to http://www.health.state.mn.us/divs/eh/water/dwp_cwl/reuse/index.html and click on “Subscribe to water reuse updates.”

Deaths in the Water Industry

Jerry Neagbour, a senior utility operator for the city of Bloomington and a city employee since 1989, died September 7 at the age of 52. According to a utility representative, "Jerry was someone his co-workers considered the 'go-to guy' whenever there was a problem with the pumps or controls at any of the 28 sanitary lift stations throughout the city. It was not uncommon for his co-workers to call Jerry after hours or on weekends to pick his brain regarding problems they were encountering and couldn’t quite figure out how to fix. Jerry was said to be always helpful and accommodating, providing his co-workers the information and knowledge they needed to solve the issues they were dealing with."

Neagbour is survived by his wife, Laurie, and two daughters.

Robert Hintgen, the utility supervisor for the city of Richfield, died August 13. He was 46. Described as a “human dynamo” by one of his colleagues, Robert worked for the city for 20 years. He was 46. Described as a “human dynamo” by one of his colleagues, Robert worked for the city for 20 years. He is survived by his wife, Sara, and two children.
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Is your company a member of AWWA? ☐ Yes ☐ No

Company Member Number (if known)

Were you referred by an AWWA member? ☐ Yes ☐ No

Referring Member Name Email

Annual Dues (A1)

☐ Individual Active $182
An individual, such as a water utility employee, municipal official, public health professional, engineer, scientist, educator, consultant, or other person interested in or serving in the field of water supply. (02)

☐ Young Professional $99
An individual age 35 or younger who is interested in or serving in the field of water supply. (YP2016)

Section Dues (A2)

AWWA has 43 local Sections in North America. You are automatically enrolled in a Section based on your address.* Some Sections require additional fees to better serve you. Section dues are required if your address is located in one of the following areas:

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* In addition to your primary Section, you may join other AWWA Sections. There is a $33 multi-section fee, plus the assessment fee for the other Sections as appropriate. Please call 1.800.926.7337 for more information.

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By joining AWWA, you grant the association, through implied consent, authorization to send you commercial electronic messages. Your communication preferences can be updated at any time at www.awwa.org under "My Account."
Tell Us About Yourself  All applicants must complete this section.

What one business activity best describes your company? (Please check only one)

- A Public Water Supply Utility—Municipally Owned
- B Public Water Supply Utility—Investor Owned
- C Government—Federal, State, Local
- D Consulting Firm
- E Contractor
- F Private Industrial System or Water Wholesaler
- G Manufacturer of Equipment & Supplies (including representatives)
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- I Educational Institutions (faculty & students), Libraries and other related organizations
- J Fully Retired
- K Research Lab
- L Other allied to the field (please specify) ________________________

What one category best describes your job title? (Please check only one)

- A Executive (General Manager, Commissioner, Board Member, City Manager, Municipal Supt., Mayor, President, Vice President, Owner, Partner, Director, etc.)
- B Management/Non-Engineering (Division Head, Section Head, Manager, Dept. Head, Comptroller, etc.)
- C Design and Engineering/Both Managerial and Non-Managerial (Chief Engineer, Civil Engineer, Mechanical Engineer, Elect. Engineer, Environmental Engineer, Planning Manager, Field Engineer, System Designer, etc.)
- D Scientific/Non-Managerial (Chemist, Biologist, Biophysicist, Researcher, Analyst, etc.)
- E Purchasing (Purchasing Agent, Procurement Specialist, Buyer, etc.)
- F Operations (Foreman, Operator, Maintenance Crewman, Service Representative, etc.)
- G Marketing & Sales/Non-Managerial (Market Analyst, Marketing Representative, Salesperson, Sales Representative, etc.)
- H Professorial (Educator, Teacher, etc.)
- J Other (please specify) ________________________

What one category best describes your field served/principal activity? (Please check only one)

- 9 Both Water Supply & Wastewater
- 5 Water Supply Only
- 7 Wastewater Only
- 3 Other

What areas of the water and wastewater industry are of current interest to you? (Please check all that apply)

- Asset Management
- Backflow/Cross Connection
- Climate Change
- Conservation/Efficiency
- Customer Service
- Desalination
- Design/Construction
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- Drought
- Emergency Preparedness/Security
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- Training/Career Development
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- Water Research
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- Workforce Strategies
- Young Professionals

Gender  □ Male  □ Female  (Optional)

Birth Year  (Optional)

Dues and Section assessment rates valid through December 31, 2016. Dues are not deductible as charitable contributions for income tax purposes. The following is for USPS periodical mailing requirements only.

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