



# NewsWaves



A joint publication of MSAWWA & MWEA  
WINTER/SPRING 2016



***“Working Together To Protect Montana’s Water Resources”***  
***91st Meeting of the Montana Section of the American Water Works Association***  
***72nd Meeting of the Montana Water Environment Association***  
**April 26-28, 2016 in Bozeman, Montana**

## **MSAWWA PRECONFERENCE THEME: “Water Conservation”**

### **An Invitation to the Conference from your MSAWWA Chair and MWEA President**

Spring is approaching and that means it's time for our joint annual MSAWWA-MWEA Conference! The conference will be held in Bozeman April 26<sup>th</sup> through April 28<sup>th</sup> at the Holiday Inn and Best Western Gran Tree hotels. This year's preconference is sponsored by MSAWWA and will provide a full day of varied and interesting talks on the subject of **“Water Conservation.”** The conference itself, with the recurring theme of **“Working Together to Protect Montana's Water Resources,”** hosts a wide range of water-related topics and the speakers' backgrounds clearly reflect this theme. There will be presentations on drinking water, wastewater, and other closely-related topics. Our speakers cover the gamut of the industry - with vendors, consultants, utilities, and governmental agencies all volunteering their time to present subjects of their interest and expertise to you. This event is a premier networking opportunity for Montana water and wastewater operators, engineers, scientists, regulators and government staff. We believe our conference provides the best value in the region, and our committees are working to keep it that way. Besides providing new information in the water field, this conference affords attendees the opportunity to network with other professionals sharing the same interests and facing the same issues. It is a chance to make new friends and acquaintances, and catch up with old friends and co-workers. It is an excellent opportunity to acquire Continuing Education Credits (CECs) and Professional Development Hours (PDHs). The Annual Conference is the highlight activity for our organizations – both professionally and socially. It provides our organizations with the income to offer scholarships, sustain our operations, and promote water quality issues. You truly won't want to miss this year's conference! On behalf of the MSAWWA and MWEA boards and the organizing committees, we hope to see you in Bozeman!!

• **Amy Deitchler, MWEA Chair & Slim Miller, MSAWWA Chair**

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### **Welcome to Bozeman!**

Welcome to the 2016 MSAWWA and MWEA Joint Conference! This year's preconference and conference promises to be one of the best ever. As one of the fastest growing municipal water and sewer infrastructures in Montana, planning and construction is a top priority in Bozeman. We have worked extensively to stay ahead of the growth in our city and encourage you to tour one of our state-of-the-art treatment plants. Bozeman also has much to offer in the form of entertainment and recreational activities. Our downtown area is one of the most vibrant in the state with numerous eating and entertainment establishments with a parking garage nearby. The Museum of the Rockies has the best Dinosaur Exhibits in the country and just across the street is the largest and fastest growing University in the state. Go Bobcats! If you are up to some sightseeing there is the beautiful Hyalite Canyon south of town, just follow the road up to the dam where you can picnic by the lake or hike the nearby trails. Just ninety miles south is West Yellowstone and the west entrance to Yellowstone National Park, to get there you get to drive along the river through Gallatin Canyon which is a sight to see. There will be over 20 City of Bozeman Water/Sewer Operators in uniform at the conference; feel free to ask them any questions you may have about Bozeman and the surrounding area. We hope you have a great conference experience and enjoy the hospitality that Bozeman and the area has to offer.

• **Your MSAWWA/MWEA 2016 Host City Committee—John Alston, Chair**

### ***Inside:***

- **2016 Joint Conference Tentative Schedule**
- **Joint Conference Registration links**
- **2015-2016 MSAWWA-MWEA Boards**
- **2015-2016 MSAWWA-MWEA Committee Chairs**
- **Direct links to advertisers—just click ‘n go!**

NewsWaves is a joint publication of the Montana Section of the American Water Works Association and the Montana Water Environment Association. It is published twice yearly. It is available for viewing or printing on our website at: [www.montanawater.org](http://www.montanawater.org).

We welcome contributions to NewsWaves. For more information, contact:

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### **Mission of Montana Section AWWA**

The Montana Section of American Water Works Association is dedicated to the promotion of public health and welfare in the provision of drinking water of unquestionable quality and sufficient quantity. Montana Section of AWWA will provide the forum and opportunity through which its membership can exchange information, learn of new issues and technologies, educate the public, and enhance the professionalism of workers in all areas of the water industry.



### **Mission of the Montana Water Environment Association**

The Montana Water Environment Association (MWEA) is a non-profit organization dedicated to the preservation and enhancement of Montana's water environment. The Association is committed to advancing science and education, disseminating technical information, increasing public understanding and promoting sound public policy in the water quality and water resources field.



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### ***~Joint Scholarship Fund Raffle~***

***Thank you to DOWL, Great West Engineering, Interstate Engineering, and Morrison-Maierle, Inc. for their generous donations for this years' raffle to help fund the Donald G. Willems Joint Scholarship. 1st prize is a \$500 gift certificate to Chico Hot Springs. 2nd prize is a \$125 gift certificate to Cabelas and 3rd prize is a \$125 gift certificate to Scheels. Tickets are available for purchase at the Joint Conference or by contacting Coralynn Revis by email at: [coralynn.revis@hdrinc.com](mailto:coralynn.revis@hdrinc.com). The drawings will take place at the banquet on Wednesday evening of the Joint Conference. You need not be present to win. Ticket prices are \$5/each or 5 tickets for \$20. Buy your tickets to help fund a scholarship for a deserving student!***



## Water For People Silent Auction & Raffle

**Thank You! Great West Engineering, R.L. Winston Rod Co., and Montana Fly Goods for again donating the fly rod and reel for the Water For People raffle that will take place at the conference. The combo is a Winston 9' 6" 6 wt Boron III-X 4 piece fly rod with Lamson Guru 2 series reel. Retail value is \$1,100.00. Tickets are \$10.00 each and can be purchased at the Joint Conference or by contacting Carrie Gardner at [cgardner@greatwesteng.com](mailto:cgardner@greatwesteng.com) The drawing for the rod/reel will take place at the banquet on Wednesday evening of the Joint Conference. You need not be present to win.**

**ALSO—Please consider donating an item to the WFP silent raffle—any item, big or small, is appreciated! Contact Robin Matthews-Barnes for more information: [info@montanawater.org](mailto:info@montanawater.org)**



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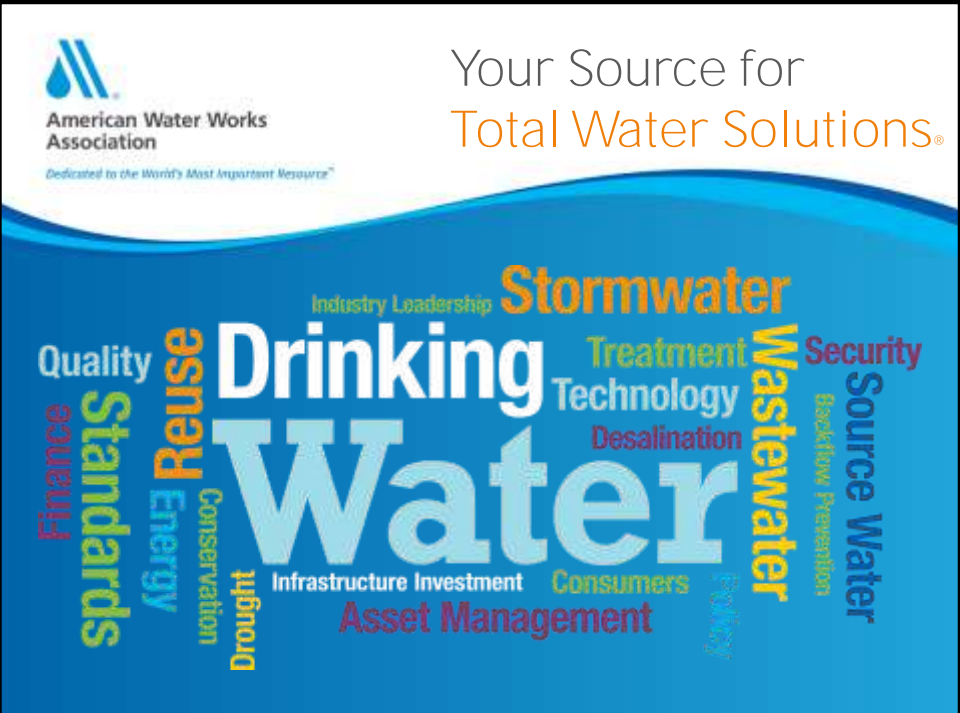
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### Are You Ordering Books from AWWA?

If so, please place your order through Robin Matthews-Barnes, MSAWWA Executive Secretary. MSAWWA receives credit for your order. The cost is the same to you, but MSAWWA gets a bonus.

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SMALL SYSTEM OPERATOR TRAINING:  
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## **Small System Operator Training to Achieve/Maintain Compliance with the Safe Drinking Water Act**

### **FREE/Complimentary Workshop Training**

### **Two dates/locations being offered in 2016**

*Designed for operators of systems serving a population up to 10,000*

**April 14, 2016 (Missoula) & October 18, 2016 (Billings)**

Your utility faces day-to-day challenges providing reliable, safe drinking water for your customers while avoiding costly violations. The Montana Section AWWA (MSAWWA) in partnership with METC is offering a **FREE** one-day workshop (lunch is not provided) to help your utility learn about compliance with drinking water regulations and steps to avoid costly violations. 0.8 CECs will be offered for full attendance at this workshop. You do not need to be a member of AWWA to participate.

### **Who should attend?**

The target audiences for this course are operators, decision makers, engineers, and managers of small water and distribution systems in Montana including tribal and non-tribal small community water systems, non-transient non-community water systems, and transient non-community water systems. If you operate multiple systems this may apply to more than one of your systems.

### **What topics will be covered at the workshop?**

Attendees will gain an understanding of existing and upcoming drinking water regulations such as the TCR, RTCR, Groundwater Rule, SWTR, Stage 2 DBPR, and LCR. Come away with knowledge on managing distribution system operations to prevent microbial or chemical contamination, compliance monitoring schedules, methods, and other requirements, and an understanding of the importance of optimizing treatment plant operations in enhancing distribution system water quality.



*This workshop is made possible by funding through the USEPA and AWWA's partner, the Rural Community Assistance Partnership.*





**SMALL SYSTEM OPERATOR TRAINING:  
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**PRINT THIS PAGE AND USE THIS FORM TO REGISTER!**

**Workshop Registration Form** (This is a complimentary offering but we ask that you please submit a completed registration form for planning purposes. You do not need to be a member of AWWA to participate.)

**Workshop Title: Small System Operator Training to Achieve/Maintain Compliance with the Safe Drinking Water Act**

Date/location (please circle one): April 14, 2016 in Missoula OR October 18, 2016 in Billings

Start and end times: 7:30 a.m (registration opens) to 5 p.m

Registration fee: **FREE (lunch on your own)**

<b>REQUIRED</b>	
First name	
Last name	
Job title	
Company/Organization/System name	
Mailing address	
City	
State	
Zip code	
Phone number	
Population served by system	<input type="checkbox"/> 0-500
	<input type="checkbox"/> 501-3,300
	<input type="checkbox"/> 3,301-10,000
Email address	

<b>OPTIONAL</b>	
Public Water System Identification Number <a href="#">Search for system ID</a> (PWSID) <small>U.S. EPA SDWIS website</small>	
AWWA Customer ID #	
How did you hear about the training?	

Please print this page, fill it out, and submit your registration form to: Robin Barnes, MSAWWA Exec. Secretary

By email: [info@montanawater.org](mailto:info@montanawater.org)

By fax: 1-866-754-1558

By mail: PO Box 582

### **NEW “ONE AWWA” WATER OPERATOR SCHOLARSHIPS**

MSAWWA has teamed with AWWA’s “The Water Equation” Campaign to offer (2) \$500 Water Operator Scholarships. The creation of the “One AWWA” Operator Scholarship addresses the present and future workforce need for operators by providing training and educational funding. It also creates an opportunity for collaboration between the Association and Sections within The Water Equation Campaign. The scholarship award can be used for certification/licensure, two-year water related associate degree, technical school program, professional training program, books and manuals and operator related conferences. Each scholarship recipient will also receive a one-year AWWA Operator membership. An application can be downloaded from the website at: <http://www.montanawater.org/awards-scholarships/scholarships-available/>.

### **MONTANA WATER ENVIRONMENT ASSOCIATION OPERATOR SCHOLARSHIPS**

The Montana Water Environment Association (MWEA) has allocated funds to certified operators looking for assistance in paying for continuing education and/or training event costs. Applicants must complete a scholarship application one month ahead of the training session they plan to attend, and awards of up to \$500 can be realized by each applicant. When approved in advance, the award money can be used to pay for the actual training as well as other miscellaneous costs associated with attending. Applicants must be a Montana certified operator or operator in training. Applications are available through the Montana Environmental Training Center (METC) or can be obtained by emailing MWEA Secretary/Treasurer, Dana Audet at [dana.audet@veolia.com](mailto:dana.audet@veolia.com).

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### 2016 Water Matters! Fly-In

~Nate Weisenburger, AE2S Inc.—MSAWWA Legislative Committee Chair

John Alston and Nate Weisenburger are registered to represent the Montana Section of the American Water Works Association at the 2016 Water Matters Fly-In on April 12-13 in Washington, D.C. The idea for the Fly-In originated from the enthusiasm generated by a rally on the steps of the U.S. Capitol building in 2001 when the Annual Conference and Exhibition was held in Washington, DC. Due to the overwhelming success of the event, AWWA has since sponsored the Fly-In annually via financial support from the Water Utility Council to provide a coordinated and consistent message to members of Congress regarding AWWA's legislative issues.

Water system funding has been a consistent topic during past Fly-In events, with points of discussion usually involving specific appropriations requests for the State Revolving Fund (SRF) programs. Fly-In participants were also instrumental in the Congressional approval of the Water Infrastructure Finance and Innovation Act (WIFIA), and the focus will likely transition to support for appropriations this year. New regulations or revisions to existing regulations continue to be an area of focus for the Water Utility Council. Due to current events, lead in drinking water will probably be a topic of discussion.

If you have any questions regarding the 2016 Water Matters Fly-In, please do not hesitate to contact Nate Weisenburger by email at [nate.weisenburger@ae2s.com](mailto:nate.weisenburger@ae2s.com) or by phone at (406) 268-0626.

## **EXCITING ACTIVITIES AT THE CONFERENCE THIS YEAR!**

**Pub-style Trivia Challenge**—Bring your team of 4-5 to the main Exhibitor Area during the Thursday morning break to challenge friends, competitors, and coworkers in a pub style trivia wager of wits. There will be a great prize for members of the winning team!

Rules:

- Teams will be made of 4-5 members.
- Answer sheet will be provided to each team.
- No electronic devices or any type of outside sources are allowed. Teams that are reported using any outside devices will be disqualified.

**Taste Test Challenge**—The challenge is on! Big Sky was the big winner in last year's taste test and went on to win the national title! Here is your chance to steal the show and take home the honors! Once again we will be leaving it to the judges to crown an official winner of the 3rd Annual **Best Tap Water Taste Test Competition**. Bring your community pride and come support your city in the competition!!! The Taste Test Challenge will take place in the Exhibitor Area during the Thursday morning break. The winning system will compete at the national level at ACE15 in June.

Rules:

- Participant must not have incurred any state or federal drinking water violations (MCL, monitoring, recordkeeping, etc.) during the previous 12 months.
- Samples should be brought in glass containers with the name of the water system clearly identified and delivered to Robin Matthews-Barnes at the front desk by 5 pm on Wednesday of the conference. Please deliver at least 1 gallon of water total (can be in multiple containers).
- Samples will be served at room temperature to help the judges better assess each sample.
- Judging for the People's Choice award will be open to all attendees.
- The official judging panel will be a mix of local public figures and flavor-profile analyzers.
- Samples will be judged on a 10-point scale from Good (1) to Best (10).
- Scores will be tabulated and the winner will be announced immediately following the contest.

**NEW!! SYP Poster Competition**—The joint Student & Young Professionals Committee is sponsoring the first poster competition at this years' conference. Posters will be displayed in the Exhibitor Area during the conference and the winner will be announced at the banquet on Wednesday evening. The winner will receive free registration and travel to ACE2016!

## **2016 JOINT CONFERENCE REGISTRATION INFORMATION**

Please go to [www.montanawater.org/jointconference](http://www.montanawater.org/jointconference) for more information and to fill out the registration form, or simply click on the link below. You will have a choice to register and pay by check or register and pay by credit or debit card. See the website for more detail. Please contact Robin Matthews-Barnes at [Info@montanawater.org](mailto:Info@montanawater.org) with any questions, or if you would like a hard copy of the registration form mailed to you, or emailed directly to you.

**[Click here for attendee registration to pay with check](#)**

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**For lodging reservations—please call the Holiday Inn at 406-587-4561 or the Best Western Gran Tree Inn at 406-567-5261 and mention the conference to obtain the conference rate of \$89/night (not including applicable taxes).**





## MSAWWA PRECONFERENCE

### "Water Conservation"

**Tuesday—April 26, 2016**

**7:00 am—5:00 pm**      **Registration desk open**  
**8:00 am—5:00 pm**      **All day session including lunch**  
**5:00 pm—6:30 pm**      **Ice-Breaker Sponsored by Exhibitors**

<b>Preconference Session—Room location: Montana-State-University/Holiday Inn</b> <b>Moderators:</b> Collette Anderson, Great West Engineering	
8:00—9:00	<b>Water Efficiency-An Overview—</b> Mary Ann Dickinson, President/CEO Alliance For Water Efficiency
9:00—10:00	<b>Increased Use Of Groundwater In The Gallatin Valley—Is It Sustainable?—</b> Tom Michalek, Montana Bureau of Mines & Geology
10:00—10:15	<b>BREAK</b>
10:15—11:15	<b>Multi-Century Perspectives On Current And Future Streamflow In The Missouri River Basin—</b> Greg Pederson, USGS Northern Rocky Mountain Science Center
11:15—12:15	<b>Untapped Potential: Water Conservation As A Source Of Additional Water Supply—</b> Lain Leoniak, City of Bozeman Water Conservation Division
12:15—1:15	<b>LUNCH—Room location: Jefferson-Gallatin Room/Holiday Inn</b>
1:15—2:15	<b>Rates And Revenue Stability—</b> Mary Ann Dickinson, President/CEO Alliance For Water Efficiency
2:15—2:30	<b>BREAK</b>
2:30—4:00	<b>AWWA Water Utility Audit Roundtable Discussion—</b> Brian Heaston, City of Bozeman
4:00—4:15	<b>BREAK</b>
4:15—5:00	<b>What's In Your Pint-The Importance Of Water Quality In Your Favorite Beverage—</b> Scott Schaefer, AE2S, Inc.

# MSAWWA-MWEA 2016 JOINT CONFERENCE

## ***“Working Together To Protect Montana’s Water Resources”***

**Wednesday—April 27, 2016**

7:00 am—8:00 am	Early Morning Break (Exhibitor Area—Atrium & Ballroom/Gran Tree Inn)
7:00 am—5:00 pm	Registration desk open (Lobby/Holiday Inn)
8:00 am—12:00pm	Morning General Session (Montana-State-University/Holiday Inn)
12:00pm—1:00 pm	Lunch & Awards (Jefferson & Gallatin/Holiday Inn)
1:00 pm—5:15 pm	Afternoon Concurrent Sessions (see breakout schedule for locations)
5:30 pm—6:30 pm	Beer and Wine Reception (Exhibitor Area—Atrium & Ballroom/Gran Tree)
6:30 pm—8:30 pm	Banquet and Awards (Jefferson & Gallatin/Holiday Inn)
	Water For People Raffle Drawing—donated by Great West Engineering, R.L. Winston Rod Company & Montana Fly Goods—Fly Rod & Reel
	Water For People Silent Auction items dispersed
	Scholarship Fund Raffle Drawing—donated by Interstate Engineering, DOWL HKM, Great West Engineering, & Morrison-Maierle, Inc.
	1st prize: \$500 gift certificate to Chico Hot Springs
	2nd prize: \$125 gift certificate to Cabelas
	3rd prize: \$125 gift certificate to Scheels
8:30 pm—10 pm	<b>Come and join in the fun—Casino Night!</b> Texas Hole ‘Em is back and there are great prizes to bid on with your earnings as a card shark!

### **Morning General Session**

<b>General Session—Room location: Montana-State-University/Holiday Inn</b> <b>Moderators:</b> Slim Miller, CDM Smith & Amy Deitchler, Great West Engineering	
8:00—8:15	<b>Welcome and Opening Session</b> Slim Miller, MSAWWA Chair/Amy Deitchler, MWEA President Carson Taylor—Mayor of Bozeman
8:15—9:45	<b>AWWA &amp; WEF Guest Speakers—General remarks followed by Q&amp;A</b> Gene Koontz, AWWA President Tom Kunetz, WEF Board of Trustees
9:45—10:30	<b>BREAK—Exhibitor Area</b> (Atrium & Ballroom/Gran Tree Inn)
10:30—11:15	<b>Applied Process Control for Optimized Advanced Wastewater Treatment—</b> Bill Bahr, MT DEQ
11:15—12:00	<b>The Most Important Things Happening In Water Right Now—</b> David LaFrance, AWWA CEO

**CEC Information**—Approximately 7.75 hours of training will be available for attendance at the preconference & 10.75 hours of training will be available for attendance at the conference, with a possible additional two hours for attendance at the Thursday afternoon facility tours. Actual number of credit hours are awaiting MT DEQ approval. Additional information & CEC forms will be included in your registration packet at the conference.



## Wednesday Afternoon Concurrent Sessions

### **Drinking Water Sessions—Room location: Madison /Gran Tree Inn**

Moderator: Doug Whitney, KLJ Engineering

1:00 – 1:45	<b>Not Your Father's Water Treatment Plant—</b> Jill Miller, City of Bozeman
1:45 – 2:30	<b>Coagulation And Direct Filtrations With Low Pressure Membrane for TOC Removal, A 1 Year Performance Review—</b> Stephan Bradley, DOWL
2:30 – 3:00	<b>BREAK – Exhibitor Area</b> (Atrium & Ballroom/Gran Tree Inn)
3:00 – 3:45	<b>Composite Elevated Water Storage Tank—Manhattan, MT—</b> Joel Pilcher, Great West Engineering, Inc.
3:45 – 4:30	<b>Winter Water Storage—Advantages Of Storing Water In Underground Reservoirs For Peak-Demand Periods—</b> Mike Waldron & John Mayhut, KLJ Solutions
4:30 – 5:15	<b>Understanding The ISO Fire Suppression Rating Schedule-Water Supply Evaluation—</b> Anthony Zampella, Insurance Services Office, Inc.

### **Wastewater Treatment Sessions—Room Location: Aspen /Gran Tree Inn**

Moderator: Matt Mudd, Great West Engineering

1:00 – 1:45	<b>Balancing Nutrient Removal With Operational Simplicity At Boulder's New Wastewater Plant—</b> YuJung Chang, AECOM
1:45 – 2:30	<b>City Of Glendive New ICEAS Wastewater Plant—</b> Amy Deitchler, Great West Engineering, Inc.
2:30 – 3:00	<b>BREAK – Exhibitor Area</b> (Atrium & Ballroom/Gran Tree Inn)
3:00 – 3:45	<b>Using Automation To Manage Dewatering Related Recycled Phosphorus Loading—</b> Gene Connell, City of Missoula/Coralynn Revis, HDR Engineering, Inc.
3:45 – 4:30	<b>Existing Storage And Irrigation Wastewater System Rehabilitation—</b> Carrie Gardner & Bob Church, Great West Engineering, Inc./Jean Riley, Eastgate Water & Sewer Association
4:30 – 5:15	<b>The Rocky Mountain Region's First Annamox Sidestream Centrate Treatment System—</b> Matt Gough, HDR Engineering, Inc.

### **Other Wastewater Sessions—Room Location: University/Holiday Inn**

Moderator: Jill Cook, Morrison-Maierle, Inc.

1:00 – 1:45	<b>Sewer Collection Systems Maintenance—</b> John Alston & Nick Pericich, City of Bozeman
1:45 – 2:30	<b>Butte-Silverbow Phase 2 MBR Upgrades: Construction Challenges With Retrofitting An Existing Treatment Plant Influenced by Two Superfund Sites—</b> Neal Levang & Jeremy Perlinski, Morrison-Maierle, Inc.
2:30 – 3:00	<b>BREAK – Exhibitor Area</b> (Atrium & Ballroom/Gran Tree Inn)
3:00 – 3:45	<b>Cold Climate Nitrification: Removing Ammonia From Ice-Covered Lagoons—</b> Todd Latchaw, Nelson Environmental, Inc.
3:45 – 4:30	<b>Industrial Pretreatment-Water Conservation In The West Bank, Occupied Territories, Israel—</b> Slim Miller, CDM Smith
4:30 – 5:15	<b>Impact Of Industrial Discharge On UV Retrofit Design—</b> Scott Schaefer, AE2S, Inc.

## Wednesday Afternoon Concurrent Sessions Continued

<b>Miscellaneous Sessions—Room Location: Tamarack Room/Gran Tree Inn</b> Moderator: Brent Pilon, Great West Engineering	
1:00 – 1:45	<b>Water Quality Trading Business Case For Montana—</b> Mark Kieser, Kieser & Associates/Travis Meter, Morrison-Maierle, Inc.
1:45 – 2:30	<b>Web Based SCADA And Data Management Systems—</b> Jason Sanden, AE2S, Inc.
2:30 – 3:00	<b>BREAK – Exhibitor Area</b> (Atrium & Ballroom/Gran Tree Inn)
3:00 – 3:45	<b>Asset Management-Building A System To Communicate Long-Range Needs—</b> Jon Henderson, Carrie Shockley, Tara Preston & Jamie Merrill, City of Bozeman
3:45 – 4:30	<b>Yellowstone Club Treated Wastewater Spill—</b> Eric Blanksma, Morrison-Maierle, Inc./Ron Edwards, Big Sky County Water & Sewer District
4:30 – 5:15	<b>Keeping In Step With The MS4 Program—</b> Boris Krizek, City of Billings

## MSAWWA-MWEA 2016 JOINT CONFERENCE

### *“Working Together To Protect Montana’s Water Resources”*

**Thursday—April 28, 2016**

7:00 am—8:00 am	Early Morning Break (Exhibitor Area—Atrium & Ballroom/Gran Tree Inn)
7:30 am—8:30 am	Joint MSAWWA-MWEA Membership Meeting and Election of Officers
8:00 am—10:00 am	Registration desk open (Lobby/Holiday Inn)
8:30 am—12:00pm	Morning Concurrent Sessions (see breakout schedule for locations)
10:00 am—10:30am	Operator Trivia Challenge & Best Tap Water Taste Test (Exhibitor Area)
12:15pm—1:30 pm	Lunch & Prize Drawings—Must be present to win from a great selection of Exhibitor sponsored prizes! (Jefferson & Gallatin/Holiday Inn)
1:30 pm—3:30 pm	Bozeman Water & Wastewater Facility Tours

### Thursday Morning Concurrent Sessions

<b>Drinking Water Sessions—Room location: Madison/Gran Tree Inn</b> Moderator: Greg Lukasik, Great West Engineering	
8:30 – 9:15	<b>Minimizing Membrane Water Treatment With Secondary Treatment Trains—</b> Stephan Bradley, DOWL
9:15 – 10:00	<b>Clean Water For The City Of Gillette—High Pressure-Direct Airy Rotary Drilling Below 2,400 ft. And High-Pressure Acid Frac Stimulation Used To Produce 1,400 gpm From 2,800 ft. Depth—</b> Michael Kaczmarek, Morrison-Maierle, Inc.
10:00 – 10:45	<b>BREAK – Taste Test and Pub-style Operator Trivia in Exhibitor Area</b> (Atrium & Ballroom/Gran Tree Inn)
10:45 – 11:30	<b>Ridgewood View And Reservoir Park Envision Certification, Beaverton, OR—</b> Bob Ward, AECOM
11:30 – 12:15	<b>Meter Information/Collection Technology Advancements—</b> Jeff Schroeder & John Alston, City of Bozeman

## Thursday Morning Concurrent Sessions Continued

<b>Wastewater Sessions—Room location: Aspen/Gran Tree Inn</b> Moderator: Chris Clark, Interstate Engineering	
8:30 – 9:15	<b>Getting New Life Out Of An Aging Lagoon System—</b> Tom Daugherty, Triplepoint Environmental
9:15 – 10:00	<b>Great Falls WWTP Upgrade—</b> Coralynn Revis & Craig Caprara, HDR Engineering, Inc./Travis Meyer, Morrison-Maierle, Inc.
10:00 – 10:45	<b>BREAK – Taste Test and Pub-style Operator Trivia in Exhibitor Area</b> (Atrium & Ballroom/Gran Tree Inn)
10:45 – 11:30	<b>Demonstrated Nutrient Recovery Through Use Of An Advanced Biological Nutrient Recovery—</b> Garrett Pallo, Clearas Water Recovery
11:30 – 12:15	<b>Balancing Nutrient Removal With Operational Simplicity At Boulder's New Wastewater Plant—</b> Travis Meyer & LeAnn Books, Morrison-Maierle, Inc./Dennis Wortman, City of Boulder

<b>Other Wastewater Sessions—Room location: University/Holiday Inn</b> Moderator: Carrie Gardner, Great West Engineering	
8:30 - 9:15	<b>Water Reuse A The Start Of The Alaska Highway—</b> Todd Latchaw, Nelson Environmental, Inc.
9:15 – 10:00	<b>Innovative IFAS-Oxidation Ditch Retrofit For Total Nitrogen Control—</b> Claire Welling, Entex Technologies
10:00 – 10:45	<b>BREAK – Taste Test and Pub-style Operator Trivia in Exhibitor Area</b> (Atrium & Ballroom/Gran Tree Inn)
10:45 – 11:30	<b>Wastewater Reuse Standards And Application—</b> Fred Phillips, Great West Engineering, Inc.
11:30 – 12:15	<b>Justifying The Implementation Of Aquifer Recharge And Recovery In The Absence Of Traditional Drivers—</b> Matthew Gregg, Brown & Caldwell

<b>Miscellaneous Sessions—Room location: Tamarack/Gran Tree Inn</b> Moderator: Nancy Cormier, Morrison-Maierle, Inc.	
8:30 - 9:15	<b>Understanding Control Valve Options—</b> Dale Fletcher, GC Systems, Inc.
9:15 – 10:00	<b>Lessons Learned In Commissioning Montana's Largest MBR—</b> Jeremy Perlinski, Morrison-Maierle, Inc.
10:00 – 10:45	<b>BREAK – Taste Test and Pub-style Operator Trivia in Exhibitor Area</b> (Atrium & Ballroom/Gran Tree Inn)
10:45 – 11:30	<b>Mobile Treatment Solutions For Drinking Water Compliance—</b> Joseph Swiezbin, Pall Corporation
11:30 – 12:15	<b>Western Utilities That Have Implemented Pipebursting On A Recurring Basis To Replace An Aging Water Piping Infrastructure—</b> Patrick Laidlaw, Underground Solutions



***Thank You To All Of The Exhibitors  
that have committed to participate at the 2016 Joint Conference  
~Your support of the Annual Joint Conference is vital  
to its success and is sincerely appreciated~***

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- MT Waterworks
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- Northwest Pipe Fittings, Inc.
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MSAWWA & MWEA produce **Newswaves** twice yearly for the memberships. Our subscribers include professionals in the water and wastewater industries including Montana cities and towns, engineering firms, and suppliers.

We certainly would like to hear from the education community. For each newsletter we encourage submission of student papers of 1000 words or less. If more than one article is submitted, they will be judged and the top pick will be printed in the newsletter. In addition, the student will receive a \$200 scholarship along with a 1 year membership to AWWA or WEF. The next **Newswaves** will be published this coming summer/fall. Articles must be received by August 15, 2016 to be considered. For more information, please contact Robin Matthews-Barnes at 406-546-5496 or by email at:

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Thank you to the following companies that have so far committed to sponsor events at the conference:

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Check out the *YP Connections* newsletter on the YP portion of [WEF.org](http://WEF.org), for the latest information on committee updates, member profiles, professional development and much more! *YP Connections* is published 3 times a year.

Contact Information: [YPConnections@wef.org](mailto:YPConnections@wef.org)

## Visiting Dignitaries from AWWA & WEF

Attendees of the 2016 Joint Conference will be introduced to **AWWA President Gene Koontz** and current **WEF Board Member Tom Kunetz**. In addition, **AWWA CEO David LaFrance** will be joining the conference. Mr. Koontz, Mr. Kunetz and Mr. LaFrance will offer their insight at the opening session of the conference on Wednesday morning, April 26th. The MSAWWA and MWEA Boards of Directors are honored to have these gentlemen contribute to this years' conference. Please help them welcome these visitors to Bozeman and the great State of Montana!

## Drinking Water Week 2016

~Rika Lashley, Morrison-Maierle, Inc.—Joint Public Education & Information Committee Chair

Drinking Water Week is May 1 – 7 this year and the theme is “Your Water: To Know it is to Love it.” The AWWA Connections newsletter reports that utilities, private companies, and government agencies across the country are planning activities aimed at educating the public about drinking water and instilling confidence in its quality. Activities include poster contests, sending bill stuffers out with the monthly bill, advertisements in local newspapers, setting up library displays, plant tours, and many others.

Here in Montana the need for investing in water infrastructure is a hot topic and water week may serve as an opportunity to spread the word. Water Week may be used as a “hook” to contact local representatives to remind them of the need for water infrastructure funding.

Water Week is also an opportunity to work with educators to find ways to spread the word about available careers in water treatment and distribution. High schoolers could be interviewing operators and managers while taking a plant tour. High school seniors or college students could be given information on the various education requirements for different positions in the water sector, from engineering to operation, as well as scholarship opportunities.

And lastly, Water Week may simply be used as a good excuse to have some fun. The AWWA Connections article describes utilities and agencies that are organizing cookouts, casual dress days, carnivals, golf-putting contests, cakewalks – in short, anything that is fun, though some of these don't seem to be exactly linked to water awareness, unless you count the fact that water is needed in some form for all of those.

If you would like to organize an event but are lacking for ideas, check out the April 1, 2016 AWWA Connections article titled “Drinking Water Week on tap for first week of May” (<http://www.awwa.org/publications/connections.aspx>). Aside from the descriptions in the article, AWWA has a list of suggested activities posted on the Connections website at <http://www.awwa.org/resources-tools/public-affairs/public-affairs-events/drinking-water-week.aspx>.



## STUDENT & YOUNG PROFESSIONALS (S&YP) COMMITTEE

for the Montana Section of AWWA & Montana WEA



# GET INVOLVED!

### WHY JOIN AWWA/WEF?

AWWA and WEF give you the opportunity to connect with a valuable network of operators, professionals, regulatory agencies, and technical staff that can help you forge your career in the water industry.

### ATTEND THE JOINT CONFERENCE

2016 MSAWWA-MWEA Joint Conference

**When:** April 27-28

**Where:** Holiday Inn & Grand Tree Hotels

### COMPETE! S&YP POSTER COMPETITION

Participate in the S&YP Poster Competition at the 2016 MSAWWA-MWEA Joint Conference. The competition is a great opportunity to:

- Present Graduate Research and Project Experience
- Meet Industry Professionals
- Gain Presentation Experience
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Thanks for protecting the aquifer, Missoula.



### ***Please Support Your Association's Committees***

Please remember that the committees cannot survive without member participation. You can sign up to be on a committee at any time during the year, however, the Joint Conference is the ideal time to do so and there will be sign-up sheets in your registration packet. Please consider participation in at least one committee. If you have questions about the committees, please contact the chair of that committee (see next page) to find out more about how you can help.

If you are currently serving on a committee and wish to continue serving, please be sure to sign up at each conference. The slate is wiped clean after each conference, and unless we have the new sign-up form, we do not know if you wish to continue serving.

**Thank you to everyone who volunteers for making MSAWWA and MWEA so great!**  
**Below are descriptions of the Committees you can join.....**

#### **MSAWWA/MWEA Joint Committees**

Cross Connection Control - Work with DEQ to implement the administrative rules for cross-connection control. Assist other groups in providing pertinent education and training.

Exhibitors - Increase exhibitors' involvement in section activities & technical education. Encourage exhibitors' strong presence at the Joint Conference.

Host City - Organize & plan for annual conference, working closely with Executive Secretary. The 2016 conference will be in Great Falls.

Information Management - Provide ongoing guidance for functionality of the joint website including incorporation of social media and preservation of historical documents of MSAWWA and MWEA.

Lifetime Achievement - Select the awardee(s) & present award at annual conference.

Program - Prepare & distribute "Call for Program Abstracts" to solicit interest in program presentations for annual conference. Review abstracts & select/schedule speakers & topics.

Public Education/Information - Promote Water Week, Stockholm Junior Water Prize, as well as other educational activities for school age children. Assist in publicizing MSAWWA/MWEA activities.

Scholarship - Select one/two students annually whose course work will lead to employment in the water and/or wastewater fields. The Scholarship is to be used toward the cost of tuition & books & includes a one year student membership for MSAWWA or MWEA.

Student & Young Professionals - The committee is intended to include members less than 35 years in age and who have worked less than 10 years in the industry. The purpose is to encourage involvement of college students and young professionals in either organization and at the Joint Conference.

#### **MSAWWA Committees**

Awards - Assist in identifying and awarding water system safety awards. Assist in selecting AWWA Operator Meritorious award recipient.

Education - Promote educational opportunities and provide training and assistance for small systems.

Legislative - Promote continual involvement with AWWA. Be aware of, respond to, and distribute information on changing legislation on both national & state levels. Recommend legislative tracking consultant.

Membership - Increase membership by identifying & contacting potential members. Provide membership benefit materials to recruiting members. Mentor first-time conference attendees.

Water for People - Continue to actively support WFP. Continue fund raising activities at the annual conference.

#### **MWEA Committees**

Beneficial Reuse - Obtain nominations & select a system best demonstrating the management of biosolids.

Education - Enhance the professional competency & qualifications of members. Work with program committee to pick topic and solicit/select speakers for 2017 Preconference.

Government Affairs - Obtain & disseminate relevant legislative information. Participate in the legislative & regulatory development processes.

Honors & Awards - Help select awardees & give recognition to individuals & facilities for exemplary performance.

Long Range Planning - Develop & implement the long-range plan that identifies the direction of the association.

Membership - Maintain current members, attract new members, & diversify professionally.

Pretreatment - The pretreatment committee is a forum for discussion of both existing and new pretreatment programs and will provide direction to new programs being implemented. This committee will also serve as a round-table for existing communities with pretreatment programs to discuss problems or regulations.

Stockholm Junior Water Prize - Encourage student participation in water-related projects within regional & state science fairs in Montana. MWEA members participate as judges in regional & state fairs as judges to select a state winner to attend the WEF-SJWP competition.

Stormwater - MWEA has added a stormwater committee recently. The purpose of the committee is to provide support and information to communities, engineers, and operators as they deal with stormwater issues.



## 2015—2016 Committee Chairs

Below is a list of the members of MSAWWA and MWEA that volunteered to chair each organization's committees following last years' Joint Conference. Volunteers are always welcome, so if you wish to help your association and serve on a committee you may still sign up by contacting the chair of that committee or Robin Matthews-Barnes at [Info@montanawater.org](mailto:Info@montanawater.org) or (406) 546-5496.

### Joint Committee Chairs

#### Cross Connection Control

- Barb Coffman

[barbara.coffman@msun.edu](mailto:barbara.coffman@msun.edu)

#### Exhibitors

- Bill DeMeyer

[bill@tellerus.com](mailto:bill@tellerus.com)

#### Host City

- John Alston

[jalston@bozeman.net](mailto:jalston@bozeman.net)

#### Information Management

- Nate Weisenburger

[nate.weisenburger@ae2s.com](mailto:nate.weisenburger@ae2s.com)

#### Lifetime Achievement

- Paul LaVigne

[plavigne@mt.gov](mailto:plavigne@mt.gov)

#### Program

- Amy Deitchler

[adeitchler@greatwesteng.com](mailto:adeitchler@greatwesteng.com)

#### Public Education/Information

- Rika Lashley

[rlashley@m-m.net](mailto:rlashley@m-m.net)

#### Scholarship

- Coralynn Revis

[coralynn.revis@hdrinc.com](mailto:coralynn.revis@hdrinc.com)

#### SYP Committee

- David Carlson

[david.carlson@ae2s.com](mailto:david.carlson@ae2s.com)

### MSAWWA Committee Chairs

#### Awards

- Collette Anderson [ctanderson@greatwesteng.com](mailto:ctanderson@greatwesteng.com)

#### Education

- Collette Anderson [ctanderson@greatwesteng.com](mailto:ctanderson@greatwesteng.com)

#### Legislative

- Nate Weisenburger [nate.weisenburger@ae2s.com](mailto:nate.weisenburger@ae2s.com)

#### Membership

- Logan McInnis [logan@mtwater.com](mailto:logan@mtwater.com)

#### Water For People

- Carrie Gardner [cgardner@greatwesteng.com](mailto:cgardner@greatwesteng.com)

- John Camden [jcamden50@bresnan.net](mailto:jcamden50@bresnan.net)

### MWEA Committee Chairs

#### Beneficial Reuse

- Terry Campbell [tcampbell@mt.gov](mailto:tcampbell@mt.gov)

#### Education

- Jeremy Perlinski [jperlinski@m-m.net](mailto:jperlinski@m-m.net)

#### Government Affairs

- Scott Buecker [scott.buecker@ae2s.com](mailto:scott.buecker@ae2s.com)

#### Honors & Awards

- Bill Bahr [bbahr@mt.gov](mailto:bbahr@mt.gov)

#### Long Range Planning

- No Chair

#### Membership

- Coralynn Revis [coralynn.revis@hdrinc.com](mailto:coralynn.revis@hdrinc.com)

#### Pretreatment

- LeAnn Books [lbooks@m-m.net](mailto:lbooks@m-m.net)

#### Stockholm Jr. Water Prize

- Kristi Kline [kjfarm@mtintouch.net](mailto:kjfarm@mtintouch.net)

#### Stormwater

- Coralynn Revis [coralynn.revis@hdrinc.com](mailto:coralynn.revis@hdrinc.com)

## 2015—2016 MSAWWA Board of Directors

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## 2015—2016 MWEA Board of Directors

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### Past President

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### Junior Trustee

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MT DEQ  
[mabrahamson@mt.gov](mailto:mabrahamson@mt.gov)

### Executive Secretary

Dana Audet  
Veolia Water  
[dana.audet@veolia.com](mailto:dana.audet@veolia.com)

### ~2016 Joint Directory~

The 2016 Joint Directory was emailed to all MSAWWA and MWEA members recently. If you did not receive the digital copy, or would like a hard copy mailed to you, please email Robin Matthews-Barnes at [info@montanawater.org](mailto:info@montanawater.org) and let her know. The digital version allows changes to be made on a more regular basis rather than just annually, saves \$\$\$, and saves paper!

### Do You Have Something To Say?

If you have ideas, announcements, articles, or stories you would like to submit for consideration for publication in the next issue of NewsWaves, please email Robin Matthews-Barnes at [info@montanawater.org](mailto:info@montanawater.org). The next issue will be published late summer/early fall, so keep it in mind!



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## 2016 AWWA/WEF S & YP Summit—San Diego, CA

~Keeley Barry AE2S Inc.—MSAWWA/MWEA Student & Young Professional Committee Member

With support from the MSAWWA/MWEA boards, I had the opportunity to travel to the beautiful city of San Diego, California in February to attend the 2016 Young Professionals (YP) Chair Training and Summit representing the Montana MSAWWA/MWEA Student & Young Professionals (S&YP) Committee.

Both events were packed full of topics related to YPs and provided the perfect environment for networking.

The YP Chair Training is hosted by the American Water Works Association (AWWA) and provides a day of training on several topics related to being involved in a YP Committee. Attendees representing YP committees all over the US shared about the elements of their committees that they enjoy such as fundraising events, poster competitions and school outreach activities.






The YP Summit is organized jointly by the AWWA and the Water Environment Federation (WEF). During the summit, a variety of presentations geared towards YPs were given. Speakers included Paul Bowen, President of WEF and Gene Koontz, President of AWWA.

I want to thank the MSAWWA/MWEA for sponsoring me so that I could experience these YP events. For me, learning leadership skills, presentation skills and how other S&YP Committees operate were the most notable portions of my experience. It is the mission of the MSAWWA/WEA Joint S&YP Committee to pass on the knowledge and experienced gained at this event, and look forward to promoting water for the next generation.

For more information or to join the Joint SYP Committee, please contact Dave Carlson, SYP Committee Chair, at [david.carlson@ae2s.com](mailto:david.carlson@ae2s.com)


The graphic features the text "WATER'S WORTH IT." in large, bold, white capital letters on a blue background. Below the text are five circular icons: a globe, a recycling symbol, three people running, a heart, and two hands shaking. Under each icon is a label: "YOUR RESPECT", "YOUR EFFORT", "YOUR FUTURE", "YOUR HEALTH", and "YOUR LOYALTY". At the bottom, a white banner contains the text "Be as good to water as water's been to you. To learn more, visit [www.WatersWorthIt.org](http://www.WatersWorthIt.org)." In the bottom left corner is the Water Environment Federation logo, which includes a stylized 'W' and the text "Water Environment Federation the water quality people® www.wef.org".

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**HEADLINE:** Selenium removal using a moving bed biofilm reactor

By Caroline Dale and Barry Liner



Selenium is a naturally occurring and essential nutrient for humans, animals, and some plants; however, selenium also can cause adverse health and reproductive effects when consumed in excess. In nature, selenium is found primarily in organic-rich sedimentary rocks (e.g., petroleum source rock, coal, phosphorites, and carbonaceous shales) and sulfidic ores. Because of its natural occurrence in geologic materials used as industrial feedstocks, selenium often is present in wastewater due to oil and gas extraction, petroleum refining, coal-fired electric power generation, metals mining and processing, and production of phosphate fertilizers. It also is found in wastewater and sludge at wastewater treatment plants. Selenium also may be present in irrigation water and stormwater runoff from agricultural operations located in areas with seleniferous soils.

In mining and coal-fired power plant effluents, selenium is mainly found in the form of selenate (Se [VI]) and selenite, (Se [IV]). Both compounds are toxic to aquatic life; hence, discharge limitations for selenium are becoming increasingly stringent. The U.S. Environmental Protection Agency (EPA) requires selenium concentrations in discharges from coal-fired power stations to be below 12 ppb on a monthly average and 23 ppb as daily maximum. The discharge consent for release into freshwater systems at certain sites is 5 ppb.

**Treating selenium**

Selenium treatment technologies can be applied either at the source (upstream) or at the end of the pipe (downstream), or both. The species of selenium can change as wastewater moves through different chemical, physical, and biological processes within the facility's treatment plant or process units. The applicable treatment technology required will depend on the species of selenium in the wastewater and discharge requirements.

Selenate and selenite can be reduced biologically to the elemental form of selenium, which makes it virtually insoluble. Particulate elemental selenium can then be separated from the wastewater by traditional liquid–solid separation methods. Biological treatment methods include constructed wetlands and fixed-film bioreactors — using granulated activated carbon as support material for biofilm growth, either as a packed bed or as a fluidized bed — and moving bed biofilm reactors (MBBRs) utilizing a plastic support for biological growth. Other methods include precipitation with iron salts, ion exchange, zero valent iron, and reverse osmosis.

Although technologies are capable of removing selenium from industrial wastewater, the ability to consistently and reliably remove selenium remains a challenge. Treatment of selenium using these core technologies will require primary, tertiary, and residuals treatment. The effectiveness of selenium treatment is highly dependent on species, concentration, and mass of selenium in wastewater and other water matrix parameters. Therefore, a detailed wastewater characterization including selenium speciation and mass balance would be important to properly evaluate treatment options. An example of this evaluation based on utilizing an MBBR process on both power plant and mining effluent is provided below.

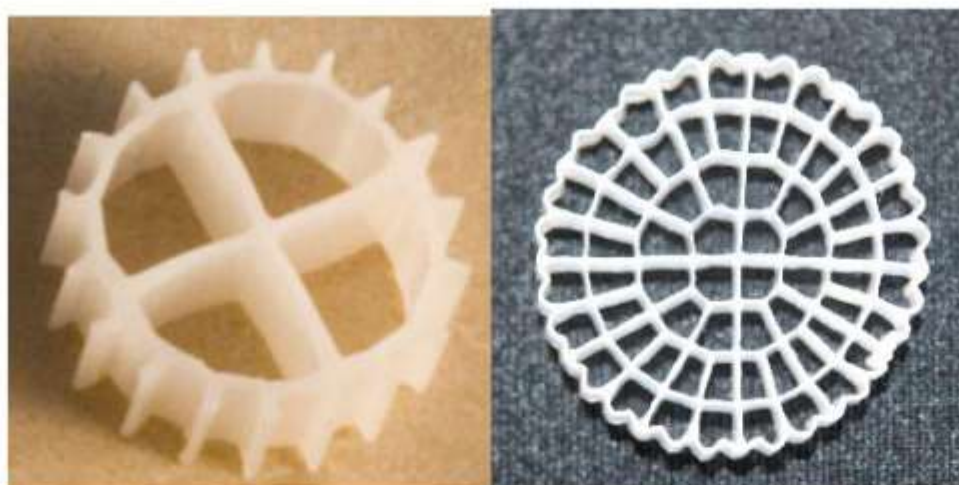
**MBBR technology**

An MBBR is a biological method to remove selenium that can operate with the same support material for over 20 years, while granulated activated carbon in other biological methods may need to be replaced regularly. The MBBR does not require back-washing; it can tolerate high suspended solids concentrations in the feed and is not subject to clogging. MBBRs also are generally energy-efficient, and individual reactors can be made significantly larger than other bioreactors.

The MBBR process has been used extensively for carbon and nitrogen removal. The process utilizes media made of polyethylene, which has a shape that provides a large protected surface area for biofilm development. Two examples of MBBR media are shown in Figure 1. K1 is the original media with a protected surface area for biofilm growth of 500



$\text{m}^2/\text{m}^3$  at 100% filling (bulk volume/volume). K5 is a later development that provides  $800 \text{ m}^2/\text{m}^3$  at 100% filling. Fillings up to 60% to 65 % can be used. Under anoxic conditions, the media are kept in suspension using mechanical mixers.



**Figure 1. Examples of MBBR media: K1 (left) and K5 (right).**

Credit: Veolia Solutions and Technologies

### Performance evaluation

Studies were performed on laboratory MBBR models that were continuously fed with industrial wastewater from two sources: flue gas desulfurization (FGD) from a power plant and a coal mine. Carbon sources and nutrients were added in small separate feed streams. Effluent samples were collected and treated in batches with either filtration through  $0.2\text{-}\mu\text{m}$  membrane filters or with coagulation and flocculation using ferric chloride and polymer.

The characteristics of the wastewaters treated are summarized in the table.

**Table. Influent characteristics of the tested wastewaters**

Parameter	FGD effluent	Coal mine effluent	Copper mine effluent
Selenate (ppb)	237	-	469
Selenite (ppb)	<5	-	9.5
Total Selenium (ppb)	249	38	560
$\text{NO}_3\text{-N}$ (ppm)	90	23	1.5
$\text{NO}_2\text{-N}$ (ppm)	0.7	0.02	0.015
Sulphate (ppm)	2000	420	240
COD (ppm)	105	<10	<10
$\text{PO}_4\text{-P}$ (ppm)	0.11	0.03	0.03
$\text{NH}_4\text{-N}$ (ppm)	3.3	<0.015	<0.015

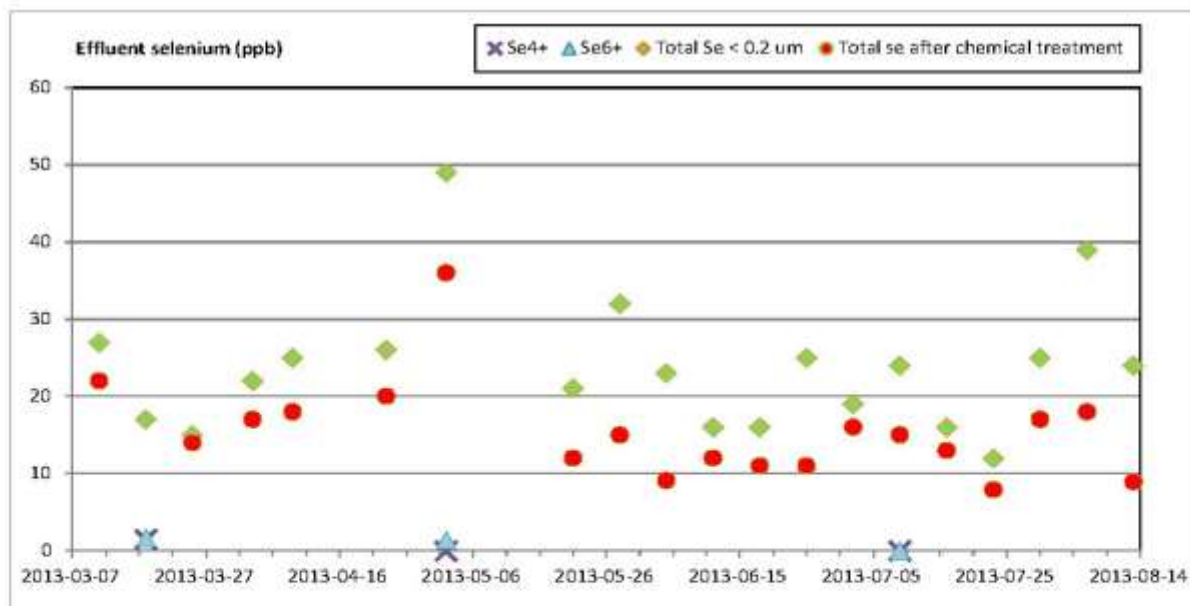
### FGD effluent

Treatment of the FGD effluent containing approximately 250 ppb selenate and 90 ppm  $\text{NO}_3\text{-N}$  was studied in a two-stage MBBR with K1 media. Glucose was added as carbon source and the process was operated at  $30^\circ\text{C}$ .

The results (Figure 2) show that it was possible to achieve 10–20 ppb of total selenium after chemical treatment. The total selenium concentrations after chemical treatment were consistently lower than that of the filtered samples, which demonstrates that chemical treatment was more efficient than filtration through a  $0.2\text{-}\mu\text{m}$  filter for separation of selenium from the effluent.

$\text{NO}_3\text{-N}$  and  $\text{NO}_2\text{-N}$  were depleted in the first MBBR, while most of the selenium removal took place in the second reactor.



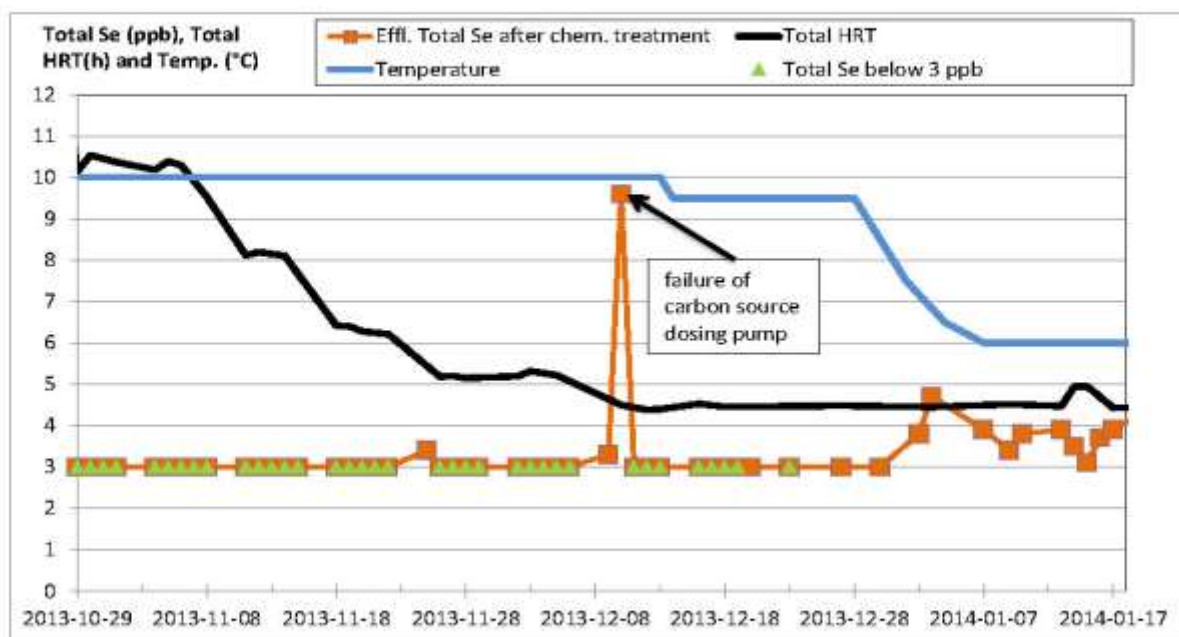


**Figure 2. Effluent concentrations of selenium when treating FGD wastewater**

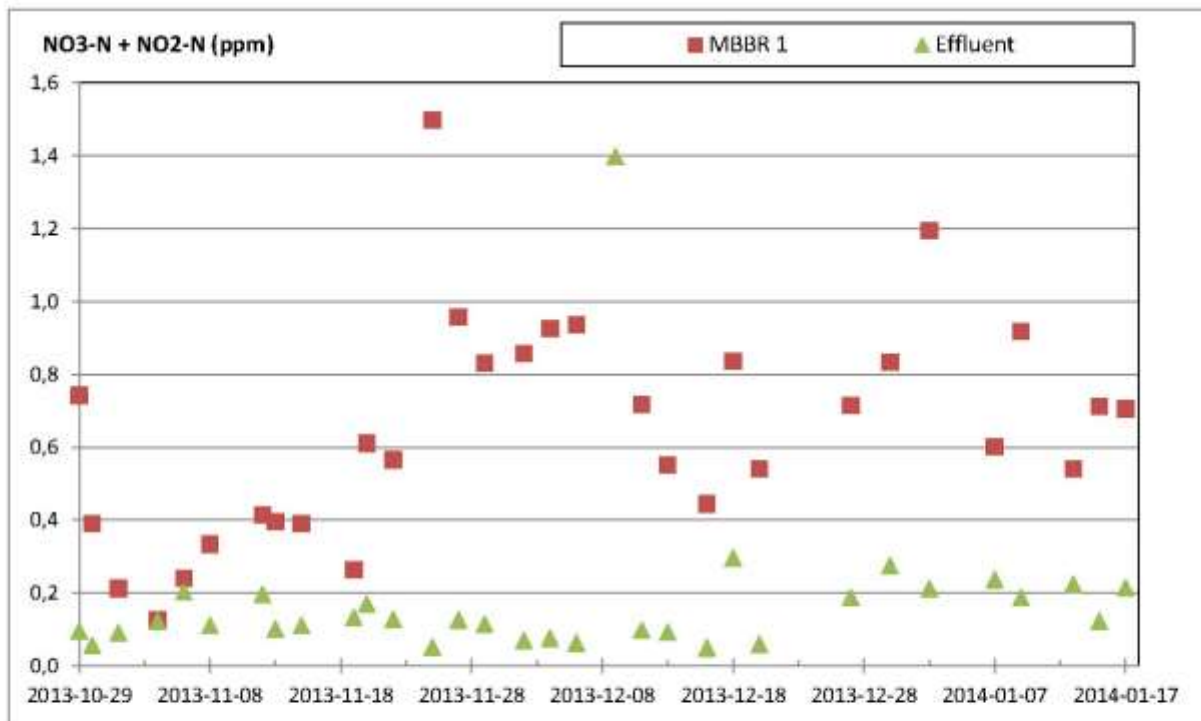
### Coal mine effluent

Treatment of coal mine effluent containing approximately 38 ppb total selenium and 23 ppm  $\text{NO}_3\text{-N}$  was studied in another two-stage MBBR using K5 media and Micro C as a carbon source. The process temperature was decreased gradually from 22°C to 6°C during the study, and the total hydraulic retention time was decreased from 30 to 4.5 hours.

The results (Figure 3) show that it was possible to consistently achieve concentrations of less than 5 ppb total selenium after chemical treatment and frequently below the detection limit of 3 ppb. The concentration of  $\text{NO}_3\text{-N} + \text{NO}_2\text{-N}$  was reduced to 0.4 to 1.2 ppm after the first reactor and then further reduced to around 0.2 ppm after the second (Figure 4). Between 50% and 85% of the selenium reduction also occurred in the first reactor, with the second reactor acting mainly as a polishing step for both nitrate and selenium.



**Figure 3. Total HRT, process temperature, and effluent concentrations of total selenium in coal mine effluent (green triangles represent samples that were below the detection limit, 3 ppb, for total selenium)**



**Figure 4. Concentrations of NO<sub>3</sub>-N + NO<sub>2</sub>-N in MBBR 1 and in effluent for coal mine wastewater**

#### A viable treatment option

The results show that MBBR can be a viable solution for biological selenium removal as well as nitrate removal from FGD and mine effluents. By combining the MBBR with traditional chemical treatment, very low effluent selenium concentrations can be reached. With so much focus on the selenium regulations, having a biological solution offers treatment options where they were previously limited, especially in the mining and energy markets.

**Note:** This article was adapted from a WEFTEC 2014 presentation, "Moving Bed Biofilm Reactor for Selenium Removal from FGD and Mine Effluents," by Caroline Dale, Maria Ekenberg, Mikael Sjölin, Flemming Wessman, and Jens Morán.

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