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The Official Publication of the Water Environment Association of Utah

# DIGESTED news

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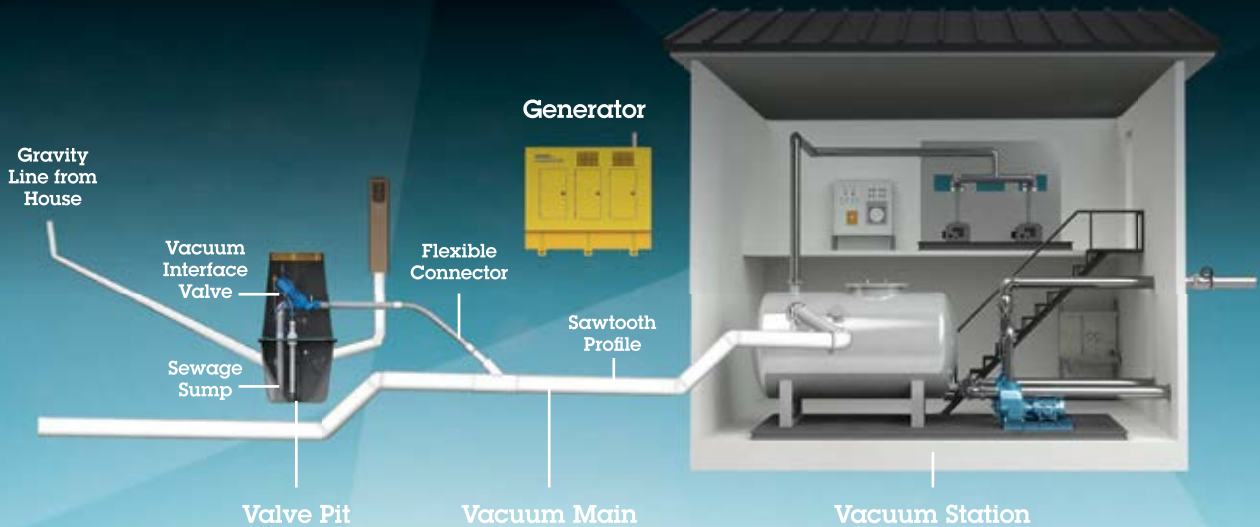


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jjenkins@goblesampson.com

Director  
**Gary Vance**  
gvance@jub.com

Editor  
**Bryan Mansell**  
mansellb@cvurf.org

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Tel: 866-985-9780

Fax: 866-985-9799

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Managing Editor, **Katie Woychshyn**  
Design/Layout, **Kiersten Drysdale**  
Advertising Sales, **Kris Fillion**

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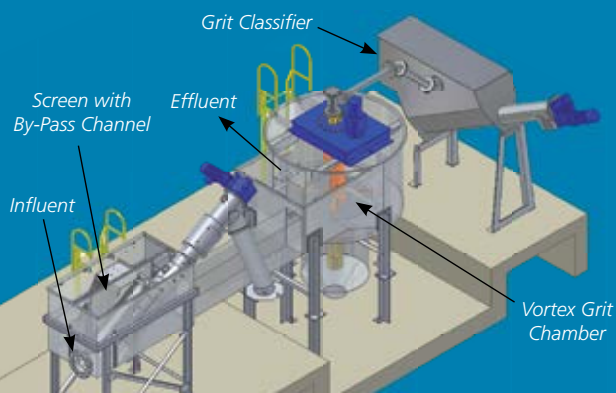
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Chris Reilley

# Our H2O Legacy



**F**or some reason, the word 'reflection' has been on my mind this week. I was looking at the last issue of *Digested News* and the beautiful picture on the front: a reflection of a gorgeous mountain range. I have always loved to be in the mountains, ever since I was a kid. It refreshes and recharges my soul like nothing else. I think we all have our ways of relaxing, letting go, or going somewhere to find peace. I have many places that fulfill this need for me but one of the most enjoyable has always been being in the mountains, surrounded by all the splendors of nature. Often, these places have been an important part of experiencing some of my fondest and deepest feelings, especially while sitting on a mountain top or at a lake seeking solace

and peace. These moments of reflection, both as a youth and as a little more seasoned adult, have truly brought me a renewed confidence in my maker, in myself, and in mankind. Moments like these have stirred feelings within me, feelings of great hope for each of us and for us as a people. These feelings are renewed as we try to make a difference in helping the world be a better place each day.

I was always taught as a youth to reflect on the past and learn from history – starting with my personal history and mistakes. A similar concept I learned is that a wise person learns from their mistakes, but a wiser person learns from both their own and other people's history, so that they don't repeat history's mistakes.

So, **2020**: what a year!

What can we learn from 2020? I raise my hat to all of you who are already trying to learn from this last year; but I still offer a challenge for us all. No, not an Operator Challenge – we still can't gather in large groups in person yet. But what can we learn from 2020 as individuals or small teams Stop and reflect to see where we can all improve to help make 2021 a better year. I have a great hope in people. I have a great hope in our members. I have a great hope in and for each of you. As my year of serving as the WEAU President comes to a close, I hope that each of you finds success and happiness in whatever way you choose to follow your dreams.

“ I have a great hope in people. I have a great hope in our members. I have a great hope in and for each of you. As my year of serving as the WEAU President comes to a close, I hope that each of you finds success and happiness in whatever way you choose to follow your dreams.

Our Annual WEAU Conference is going to be virtual this year. I hope that many of you will take the opportunity to learn from and connect with each other. Awards will be in full swing; and elections are coming out for the WEAU Board positions. Our annual conference council has been working hard to create a new type of conference that is virtual; and I am amazed at how well they are adapting to our current circumstances. I have been very impressed with all the people who have been working so hard to help our association push forward through a year of difficult challenges. I am truly honored to have worked and associated with our members as they persevered despite the hardship of 2020.

I am thankful to my manager who helped encourage me to step out of my comfort zone over 20 years ago. My first time attending an annual conference was 1998 (I think); and in 1999, Dan James encouraged me to get involved. I got on our Operator Challenge team,

which was a lot of fun not only that year but also many years following. Dan also somehow persuaded me to really stretch myself by putting on a presentation at the conference. I think he saw that I had the potential to grow and improve. I now look back thankful to him for his confidence, trust, and hope in me as a young person in the field and in the association.

I have gained many friendships due to my involvement in this association and have come to know many of you with the great networking and interactions that the association has to offer. I was given the opportunity to participate in the Operator Challenge for many years at both our local conferences and at the national conferences which opened my eyes even more to how big the undertaking of cleaning our water really is. I not only realized how big it was then, but I continue to see how important it is for our environment and for the health of the people we serve. We are protectors of our

water resources and we all help ensure that water quality in our state continues to be a high priority.

The vision of our association is: “The Water Environment Association of Utah is dedicated to the professional growth of its members and the preservation and enhancement of the water environment.” This association, because of all of you, has helped fulfill this growth for me as a member. My employer over the years has supported me in my endeavors to progress; and many of your employers have done the same for you. I am honored to have served this association as the President this last year, even though it was nothing like any of the previous years that I have experienced. Still, it was our year and is a part of our history, a history that we can reflect on with positivity as we look forward to the future with hope. Please continue to find new ways to help someone on their road to success. In doing so, we all grow together as we protect our H<sub>2</sub>O. [DN](#)



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# AAA (All About Acronyms)

Bryan Mansell

**W**e work in an industry of many acronyms. For newcomers to our field, it must be pretty confusing to sort out BOD-5, cBOD, COD, sCOD, rbCOD, TSS, VSS, RSS, RAS, WAS, SRT, HRT, TMDL, MGD, SLR, SOR... and the list goes on. I'm guessing other industries have similar 'jargon' terms that confuse and frustrate outsiders. In some respects, I suppose learning the dialect of your chosen industry is part of 'initiation' into the professional 'club'. Still, I've often wondered how technical terms and specifically acronyms develop in professional and interpersonal language over time. Is it driven by efficiency or laziness? Perhaps it's aimed at the exclusion of outsiders, or maybe it's a reflection of common understanding?

As a parent, I've learned that the teen and pre-teen texting world has its own host of acronyms. To me the terms seem lazy, and in many cases offensive. I'm not suggesting you should bother looking them up, since it will probably frustrate or shock you too. But to avoid blowing my lid when I come across them (now that I have a pre-teen with texting access), I've decided their acronyms should be open to private interpretation. So, I've redefined some common ones to more palatable (or just amusing) meanings that I can repeat to myself as a coping mechanism during this next phase of parenthood. I think I'll put these on a postcard that I can carry with me.

**LOL:** Language of Love

**SMH:** Solving Math Homework

**ROFL:** Reading Old-Fashioned Literature

**GOAT:** Go Over and Actually Talk

**OMG:** Over-achieving My Goals

**LMFAO:** Leaving My Facebook App Occasionally or Learning My Father's Actually OK

**LMK:** Love My Kids



**STFU:** So Thankful For U

**WTF:** Wednesday, Thursday, Friday

**WTH:** Waiting Til Honeymoon

**TGIF:** Texting Grandma Instead-of Friends

**GTFO:** Googling To Find Out

**STBY:** Standards Trump Boyfriend's Yearnings

**TFH:** Teeth Flossing Hygiene

**CYA:** Clean Your Abode

The next time you meet someone new to our industry, such as during the upcoming virtual WEAU Annual Conference, help them come up to speed with our dialect, and avoid using acronyms and 'jargon' without also confirming that they know what it is you're talking about. Otherwise, they could end up as lost as me trying to decipher my teenager's text messages. Even worse, they might redefine the terms based on their own preferred interpretation and embarrass themselves. [DIA](#)



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# COVID Sense

Presented by the Collection Committee

**1. What are some of the symptoms that COVID-19 survivors might face?**

For some who recover from COVID-19, symptoms like fatigue, shortness of breath, muscle pain, confusion, headaches, and even hallucinations are among the growing number of issues survivors face following the illness.

Source: [www.backensackmeridianhealth.org](http://www.backensackmeridianhealth.org) (07-09-2020)

**2. What neurological symptoms can COVID-19 cause?**

COVID-19 does appear to affect brain function in some people. Specific neurological symptoms seen in people with COVID-19 include loss of smell, inability to taste, muscle weakness, tingling or numbness in the hands and feet, dizziness, confusion, delirium, seizures, and stroke.

Source: [www.health.harvard.edu/topics/diseases-and-conditions](http://www.health.harvard.edu/topics/diseases-and-conditions)

**3. Should I go to the hospital if I have mild COVID-19 symptoms?**

Mild COVID-19 cases still can make you feel lousy. But you should be able to rest at home and recover fully without a trip to the hospital.

Source: [www.webmd.com](http://www.webmd.com)

**4. Can you contract the coronavirus disease from a package in the mail?**

Coronaviruses are thought to be spread most often by respiratory droplets. Although the virus can survive for a short period on some surfaces, it is unlikely to be spread from domestic or international mail, products or packaging.

Source: [www.cdc.gov](http://www.cdc.gov)

**5. Do antibiotics work against the coronavirus disease?**

Antibiotics do not prevent or treat COVID-19, because COVID-19 is caused by a virus, not bacteria. Some patients with COVID-19 may also develop a bacterial infection, such as pneumonia. In that case, a health care professional may treat the bacterial infection with an antibiotic.

Source: [www.fda.gov](http://www.fda.gov)

**6. Should I wear a mask to prevent the spread of COVID-19?**

CDC recommends that everyone wear a mask over their nose and mouth when in public, including during travel. Masks slow the spread of COVID-19 because they help keep people who are infected from spreading respiratory droplets to others when they cough, sneeze, or talk. Medical masks and N-95 respirators are for healthcare workers and other first responders, as recommended by current CDC guidance.

Source: [www.cdc.gov](http://www.cdc.gov)

**7. How long does COVID-19 recovery take?**

Most people with mild cases appear to recover within one to two weeks. However, recent surveys conducted by the CDC found that recovery may take longer than previously thought, even for adults with milder cases who do not require hospitalization.

Source: [www.health.harvard.edu](http://www.health.harvard.edu)

**8. What should you do if you feel like you might have COVID-19 prior to showing up to work?**

- a) Show up at work, walk around and tell your co-workers that you have not been feeling well the past couple of days and you think you might have COVID-19.
- b) Stay at home and call in to your supervisor, and get tested.
- c) Wait for the government to do something that might help.
- d) Call your Mom.

**9. What are the advantages of having to wear a mask?**

- a) Great way to hide much needed dental work.
- b) Will aid in helping you know if you need a breath mint.
- c) The ability to show off your favorite sports team.
- d) All of the above.

**10. What are the most common symptoms that have been reported six months after symptoms began?**

The most common symptoms were fatigue or muscle weakness (63%) along with trouble sleeping (26%), and anxiety or depression (23%).

Source: [www.webmd.com](http://www.webmd.com) (January 11, 2021)



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A Bear of a Quiz


# GRAB BAG

Prepared by Paul Krauth

1. **The carbon source that provides maximum denitrification rate is:**
  - A. Endogenous
  - B. Influent
  - C. Supernate
  - D. Methanol
2. **What is the first response an operator should do if the TMP and flux rate through a membrane is dropping?**
  - A. Increase vacuum
  - B. Decrease vacuum
  - C. Increase back pulsing
  - D. Decreasing DO
3. **What is the minimum C:N:P ratio needed for bacterial growth?**
  - A. 100:10:1
  - B. 100:5:1
  - C. 106:16:1
  - D. 100:10:5
4. **Which chemical would help neutralize a sour digester?**
  - A.  $\text{NaN}_3$
  - B.  $\text{NaCl}$
  - C.  $\text{NaOH}$
  - D.  $\text{Na}_2\text{S}_4$
5. **The optimum pH for nitrifying bacteria is?**
  - A. 6.5
  - B. 7.0
  - C. 7.5
  - D. 8.0
6. **Which one of these will reduce Phosphorus release?**
  - A. Alkalinity
  - B.  $\text{BOD}_5$
  - C. Nitrite
  - D. Ammonia
7. **Recarbonation uses what to lower pH?**
  - A. Carbonate
  - B. Bicarbonate
  - C. Carbon Dioxide
  - D. Calcium Hydroxide
8. **Which mechanical dewatering process will give the driest cake?**
  - A. Belt Filter Press
  - B. Scroll Centrifuge
  - C. Plate and Frame
  - D. Vacuum Drum
9. **What would indicate passing an acute toxicity test?**
  - A.  $\text{LC}_{50} > 0\%$
  - B.  $\text{LC}_{50} > 25\%$
  - C.  $\text{LC}_{50} > 50\%$
  - D.  $\text{LC}_{50} > 100\%$
10. **For full de-nitrification, a ratio of BOD to N should be at least?**
  - A. 4
  - B. 6
  - C. 8
  - D. 10

**ANSWERS:**


1-D, 2-C, 3-B, 4-C, 5-D, 6-C, 7-C, 8-D, 9-D, 10-A



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# PWO Representative-Elect Candidates

## Dustin Lewis

*Candidate*

Dustin is a collection system operator for Snyderville Basin Water Reclamation District. He has worked for them for 15 years and has earned a Grade IV Collections System Operator certification. His duties for Snyderville include cleaning and maintaining the sewer lines, replacing manhole collars, and performing other routine maintenance of their collection system. He is also well-versed in the asset management system, Cityworks. Dustin enjoys working with Cityworks to help improve and maintain the workflow and efficiency of their system maintenance. He has been a great resource for North Davis Sewer District to learn from during their implementation of Cityworks.

Dustin has participated in Operations Challenge six times at the WEAU conference along with representing Utah three times in WEFTEC. He is currently running for PWO Representative within WEAU. Dustin likes to take his jeep down to Moab and loves camping with family and friends. While out camping he enjoys spending time out on his boat. When he cannot get away camping, he likes to take short trips on his Harley to free his mind. Dustin is recently engaged to his fiancé, Destiny, with a little girl and two boys.



## Trace Workman

*Candidate*

Trace has worked for Central Davis Sewer District for the past 22 years. He's worked in dewatering, operations, and is currently Plant Superintendent. Trace has earned a Grade IV Unrestricted Treatment System Operator certification, a Grade IV Unrestricted Collections System Operator certification and Grade II Biosolids Land Applier certification.

In the past, he has served on WEAU's Biosolid committee where has enjoyed meeting operators and wastewater professionals from all over Utah. He has also competed on various operations challenge teams at the state and national levels where he has networked with people from all over the country. He has enjoyed the camaraderie amongst those that participate in the Operations Challenge.

Trace and his wife, Stephanie, have been married for 22 years. Together they have four children: Maili (21), Jaycee (19), Merl T. (14), and Jed (10). They enjoy camping, fishing, hunting and hanging out together as much as possible. Trace also enjoys archery, as well as riding motorcycles and wheelers with friends and family. He is always looking for the perfect deep untouched snowmobile line. [DM](#)





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## About the Operator Scholarship:

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### To Apply Submit an online application including:

- Requested Fund Amount
- Education and Experience
- A written essay of 500 words or less describing your passion for the job and purpose for funds request



### Scholarship Awards:

Applicants may request scholarship grants in a range of \$2,500 - \$5,000



### Funding Purpose:

Awarded funds may be used for certification examinations, training preparation for exams and associated learning materials and aids.

### Who May Apply:

New and aspiring water sector operators as well as current operators at all levels.



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SVI<sub>5</sub> comparison of aerobic granular sludge (left) and conventional activated sludge (right)

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# VIRTUAL ANNUAL CONFERENCE

**Tuesday, April 13 – Thursday, April 15, 2021**

Considering the ongoing COVID-19 pandemic, the 2021 WEAU Annual Conference will be held as a virtual conference this year. Over 35 different technical sessions will be presented in a virtual format through GoTo Webinar (see Technical Program, next pages). A WEAU Virtual Business Meeting will held at 1:00 pm on Thursday, April 15 to announce award winners, reorganize WEAU leadership and play some virtual games for fun and prizes.

On Tuesday, April 13, the Young Professionals will sponsor a hosted virtual networking event during the lunch hour for all WEAU members that would like to connect with other members of the organization.

While we cannot gather for the traditional conference and its offerings, the requirement for training for our members is as important as ever. Through the virtual conference, up to 1.7 CEUs or 17 PDHs will be available for those who attend.

Please visit [www.wEAU.org](http://www.wEAU.org) to register. Login Information for attending the event will be provided upon registration.

## PRICING

Conference Registration	Early Bird discount available before Midnight on March 26	
WEAU Life Member	Full Conference	\$0/person
WEAU Member Registration	Full Conference (Early Bird)	\$100/person
	Full Conference (After 3/26)	\$125/person
Guest Registration	Full Conference (Early Bird)	\$125/person
	Full Conference (After 3/26)	\$150/person
Student Registration	Full Conference	\$0/person

## OTHER

Virtual Hosted Networking Session (Sponsored by Young Professionals)	Tuesday, April 13 (Lunch Hour)	\$0/person
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## PRELIMINARY SCHEDULE

Topic	Asset Management	Nutrient Removal	Wastewater Facilities	Project Delivery	Water Quality	Residuals and Biosolids
8:00-9:00	<p>2020 ASCE Utah Infrastructure Report Card Overview</p> <p>Craig Friant – J-U-B Engineers, Inc./ American Society of Civil Engineers (ASCE) (Ryan Maw)</p>	<p>BNR Success at Salem</p> <p>Jason Broome – Forsgren Associates</p>	<p>Planning 40 Years of Improvements for Timpanogos SSD</p> <p>Trevor Lindley – Brown and Caldwell (Rich Mickelsen)</p>	<p>Continuing the Conversation: Engineers and Operations and Maintenance Staff Continue Collaborating During COVID-19</p> <p>Josh Donegan – AECOM (Jamey West)</p>	<p>An Innovative Nutrient Management Program for Utah Lake</p> <p>Jeff DenBleyker – Jacobs Engineering Group Inc. (Rich Mickelsen, General Manager, Timpanogos Special Services District)</p>	<p>Where Does Your Digestion Process Stand? A Virtual Walk Through the Life Cycle of Anaerobic Digestion</p> <p>Tom Chapman – Brown and Caldwell</p>
9:00-9:15	BREAK					
Topic	Collection Systems	Nutrient Removal	Wastewater Facilities	Miscellaneous Topics	Water Quality	Residuals and Biosolids
9:15-10:15	<p>Condition Assessments of Collections Systems Using Acoustics and Digital Manhole Scanning</p> <p>Jonathan Borden – RH Borden and Company, LLC</p>	<p>Less Treatment Can Be Better Treatment</p> <p>Ryan Bench – Carollo Engineers (James Dixon, Central Weber Improvement District)</p>	<p>Primary Clarification Pilot Testing: Could Primary Filters Be In Your Future?</p> <p>Adam Jones – Brown and Caldwell (Rich Mickelsen)</p>	<p>Measuring Community Trends in COVID-19 from Wastewater Influent Samples</p> <p>Jeff Ostermiller – Utah Division of Water Quality (Nathan LaCross)</p>	<p>An Update on the Utah Lake Water Quality Study (ULWQS)</p> <p>Mitch Hogsett – Forsgren Associates, Inc. (Theron Miller)</p>	<p>Post Aerobic Digestion: A Simple but Comprehensive Biosolids Management Solution</p> <p>Bryen Woo – Ovivo USA LLC</p>
10:15-10:30	BREAK					
Topic	Collection Systems	Nutrient Removal	Wastewater Facilities	Miscellaneous Topics	Water Quality	Residuals and Biosolids
10:30-11:30	<p>Bringing Light Underground, UV CIPP Lining</p> <p>Christopher Larson – C&amp;L Water Solutions, Inc. (BJ Riggins)</p>	<p>Doing More with Less: Biological Nutrient Removal at Silver Creek WRF</p> <p>Erin Andersen – Carollo Engineers, Inc. (Craig Ashcroft, Jacob Baer)</p>	<p>UV Disinfection 101</p> <p>Steven Winfree – Stantec</p>	<p>Measuring Community Trends in COVID-19 from Wastewater Influent Samples – CONTINUED</p> <p>Jeff Ostermiller – Utah Division of Water Quality (Nathan LaCross)</p>	<p>N-fixation Contributes to N Loadings of Utah Lake</p> <p>Hanyan Li – The University of Utah (Ramesh Goel, Theron Miller)</p>	<p>Use It Or Lose It? Biosolids Management Over the Long Haul</p> <p>John Richardson – Brown and Caldwell (Bill Fasth, Rob Beggs)</p>

The content of the technical program is subject to change. Visit [www.weau.org](http://www.weau.org) for updates.

# ANNUAL CONFERENCE APRIL 13-15, 2021

## PRELIMINARY SCHEDULE

11:30-1:00	LUNCH BREAK		LUNCH BREAK AND NETWORKING ACTIVITY		LUNCH BREAK	
Topic	Collection Systems	Nutrient Removal	Wastewater Facilities	Water Reclamation and Reuse	WEAU	
1:00-2:00	<p>Microbial Induced Corrosion in Sanitary Sewer Collection Systems: Causes, Effects, and Solutions</p> <p>Heather Christensen - Geneva Pipe &amp; Precast</p>	<p>Anaerobic Ammonia Oxidation – A Wonderful Innovative Tool to Manage Nitrogen Cycle in Wastewater Treatment Plants</p> <p>Soklida Hong – University of Utah (Ramesh Goel)</p>	<p>Upgrading Lagoon Based Treatment Systems to Meet More Stringent Limits for BOD, TSS and Nutrient Removal</p> <p>Tom Birkeland – Lemna Environmental Technologies, Inc.</p>	<p>South Jordan City's Pursuit of Own Water Supply Leads to Direct Potable Reuse</p> <p>Randy Zollinger – Carollo Engineers</p>	<p>WEAU BUSINESS MEETING AND KAHOOT QUIZ (WITH PRIZES)</p>	
2:00-2:15	BREAK					
Topic	Collection Systems	Nutrient Removal	Wastewater Facilities	Industrial Wastewater	Miscellaneous Topics	Residuals and Biosolids
2:15-3:15	<p>Your Crystal Ball "How Cloud-Based SCADA Allows Operators to See The Future" and Avoid Problems</p> <p>Kevin Liscovitz – XiO, Inc.</p>	<p>Adaptive Mixing and Better Biological Nutrient Removal</p> <p>Alden Meade – Xylem</p>	<p>Wastewater Screening Solutions for Smaller Installations</p> <p>Dave Barkey – JWC Environmental</p>	<p>Pretreatment &amp; You</p> <p>Spencer Parkinson – South Valley Water Reclamation Facility</p>	<p>Risk Management and Insurance Considerations for Major Capital Projects</p> <p>Brian Child Justin Zollinger – Olympus/CVWRF (Justin Zollinger)</p>	<p>Optimizing Polymer Mixing and Activation: Following the Science</p> <p>Jeff Rhodes – UGSI Solutions</p>
3:15-3:30	BREAK					
Topic	Collection Systems	Nutrient Removal	Wastewater Facilities	Wastewater Facilities	Safety and Security	
3:30-4:30	<p>Real Time Decision Support Systems for Intelligent Watershed Management</p> <p>Alex Puryear – Xylem Inc.</p>	<p>Construction, Commissioning and Start Up of the World's First Advanced Biological Nutrient Recovery (ABNRTM) Facility at the Village of Roberts, WI</p> <p>Jordan Lind – CLEARAS Water Recovery (Autumn Fisher)</p>	<p>Sustainable Solution for Grit Management Solves Plant Maintenance Challenges</p> <p>Pat Herrick – Hydro International</p>	<p>Jar Test Methods and Application</p> <p>Rebecca Yoo – Brown and Caldwell (Bryan Mansell, Garrett Jensen, and Henryk Melcer)</p>	<p>Risk Mitigation in Water and Wastewater</p> <p>Skyler Rember – Cedar City Corp.</p>	<p>Bench Scale Treatability of the Ferrous Chloride Technology</p> <p>Sarah Guzman – Cache Environmental Laboratories, P.C. (Adam Isaac, Brenden Bingham)</p>

The content of the technical program is subject to change. Visit [www.weau.org](http://www.weau.org) for updates.

# WEAU 2021

## YOUNG PROFESSIONAL OPPORTUNITIES

By Rebecca Yoo

### Quarterly YP Meetings

Join the Young Professionals group to connect, learn, and take a lunch break. Quarterly meetings are held virtually over the lunch hour. Leaders in the industry give 20-minute presentations, after which YPs can connect and share experiences. Contact [ypweau@gmail.com](mailto:ypweau@gmail.com) to receive updates on our quarterly meetings!



### Connecting at the WEAU Annual Conference: Easy and Intentional Peer Group Networking

Are you worried about meeting and connecting at the virtual conference? All conference attendees are invited to the peer group networking event held by Paul Jones with Bridgwell. He will bring a unique facilitation style to this breakout designed to help attendees connect and generate peer-driven discussions. Idea sharing, group problem-solving, and an expanded meaningful network are just some of the things you can expect to experience during this session. The best predictor of career success is becoming part of an open network; this breakout is your opportunity to do just that. [Dn](#)



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# GRANULAR ACTIVATED SLUDGE PROCESS

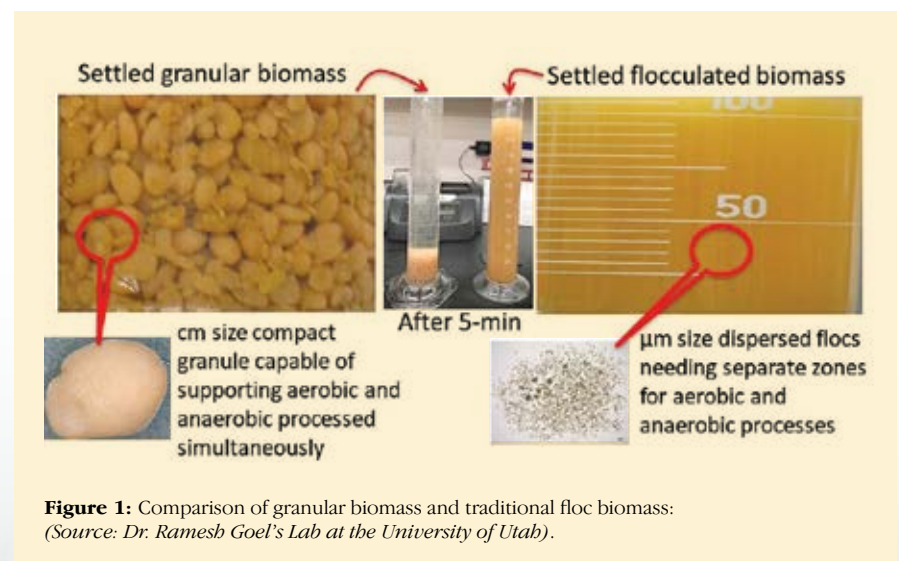
## A 21<sup>ST</sup> CENTURY INNOVATION IN ACTIVATED SLUDGE PROCESS

By Dr. Ramesh Goel, Professor of Civil & Environmental Engineering at the University of Utah

The history of activated sludge goes back to the late 1800s and early 1900s when wastewater treatment was a trial-and-error method and where biological treatment was a primitive science in this era. Generally regarded as a conventional norm for municipal wastewater treatment, the activated sludge process has drawn several engineering innovations, mostly post the implementation of *The Clean Water Act* of the 1970s. *The Clean Water Act (CWA)*, established in 1972, is the most comprehensive environmental statute in the US. According to *CWA*, wastewater must be treated to meet certain discharge limits to protect the environment. Wastewater treatment is not only related to environmental sustainability. It directly connects with human health also. Wastewater generated from individual residents (society) and small-scale businesses is known as municipal wastewater. The advancement in the activated sludge process (ASP) has taken place from simply blowing the air in the waste mixture to the state of art nutrient removal. The wastewater community's current thrust to make the ASP carbon and energy-neutral/positive is appreciated globally, with several wastewater districts moving positively in this direction. For example, Central Valley Water Reclamation's ongoing design and implementation in Utah to incorporate biological nutrient removal also encompass novel components such as phosphorus recovery in the sidestream treatment and energy recovery through co-digestion of food waste.

Several modifications and innovations have taken place in the activated sludge process over the last eight decades. The primary purpose has been to address expectations outlined in National Pollution Discharge Elimination Systems (NPDES) permit. Carbon neutrality, resource recovery, and process with smaller footprints are currently not required under NPDES permits. Nevertheless, the wastewater community has been proactive in these emerging areas of innovation to address climate change and resource recovery. In this regard, the current design in the form of the granular activated sludge process presents a leap forward in activated sludge process innovation/

modification. The fundamentals of granular sludge technology are based on formation of compact granules (rather than loose flocs) to support multi-ecological compartments (e.g., presence and absence of O<sub>2</sub>) in each granule. Aerobic, anoxic, and anaerobic zones co-exist in granules supporting processes requiring the presence and absence of oxygen and oxidized forms of nitrogen. Additionally, granular sludge settles fast, resulting in much smaller plant footprints (**Figure 1**). Most importantly, due to the high retention of biomass in granules, mature granules allow growth and retention of slow growers such as anammox and DAMO organisms.



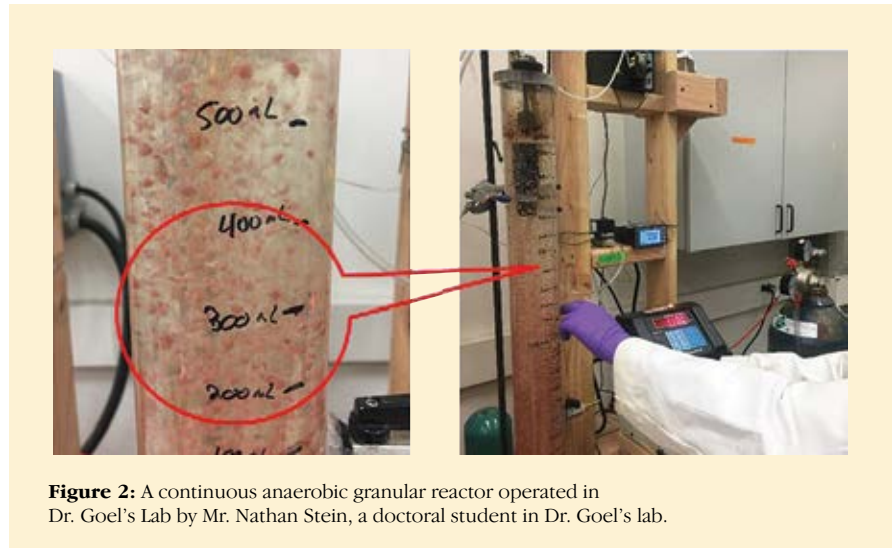
**Figure 1:** Comparison of granular biomass and traditional floc biomass: (Source: Dr. Ramesh Goel's Lab at the University of Utah).



# GRANULAR ACTIVATED SLUDGE PROCESS

**"Rapid urbanization has forced many municipalities to look for treatment processes with smaller foot and carbon prints (e.g., anaerobic processes). Granular Activated Sludge Process presents a perfect opportunity to accomplish this mission."**

According to the United States Environmental Protection Agency's (USEPA) 2016 report to Congress, an estimated 14,748 publicly owned wastewater treatment plants (POTWs) provide wastewater collection, treatment, and disposal to more than 238 million people in the US (USEPA, 2016). Unfortunately, many existing small and big POTWs have reached or are about to eclipse their expected life span. Additionally, rapid urbanization has forced many municipalities to look for treatment processes with smaller foot and carbon prints (e.g., anaerobic processes). Granular Activated Sludge Process presents a perfect opportunity to accomplish this mission.




**Figure 2:** A continuous anaerobic granular reactor operated in Dr. Goel's Lab by Mr. Nathan Stein, a doctoral student in Dr. Goel's lab.

Fast settling of granules circumvent challenges associated with filamentous bulking and large space needed for secondary clarifier.




As stated earlier, granular sludge offers several advantages over its flocculated biomass, including: (1) significantly fast settling, (2) smaller footprints, (3) opportunity to support simultaneous nitrification and denitrification, and, most importantly, (4) resistance to external shock loads such as toxic loading and temperature changes. Each granule acts as a mini biofilm reactor where different types of bacteria synergistically work together to carry out various biochemical reactions. Results also

show that granular sludge offers faster kinetics for contaminant removal, thus further providing the opportunity to design smaller bioreactors. As a result, the process requires less reactor volume, energy, and recycle pumping. Typical granule size could vary anywhere from 0.2 mm (minimum diameter) to few millimeters, with average size ranges from 0.6 mm to 3.0 mm (Figdore et al., 2017; Wei et al., 2020). The operational selection strategy includes shorter settling times where slow settling flocs are pushed out, and fast settling granules are retained. In terms of process microbiology, the diminishing settling time during process operation exerts selection pressure on



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***"The granular activated sludge process is fast evolving and presents the future of activated sludge systems. The process allows integration of process engineering and process microbiology in a smart way to enable several biochemical reactions to co-occur."***

the microbial community where they choose the path of "survival of the fittest," generate extra extracellular polymeric substances (EPS), resulting in more excellent adhesive properties than conventional flocs (Wei et al., 2020). Granules have a sludge volume index of about 30 to 50 ml/g instead of greater than 70 mL/g for conventional flocs (Dasgupta et al., 2019). It has been recently demonstrated by Wei et al., 2020 that treatment plants having enhanced biological phosphorus removing (EBPR) treatment process embedded tend to have granules naturally. Wei et al., 2020, in their survey of several EBPR plants in the US, found a wide range of granule abundance. These findings suggest that slight process manipulation in terms of aeration, feeding regime, and settler operation could significantly enhance granulation in existing treatment plants resulting in significant savings in process operation and sludge handling.

In summary, the granular activated sludge process is fast evolving and presents the future of activated sludge systems.

The process allows integration of process engineering and process microbiology in a smart way to enable several biochemical reactions to co-occur. The ease of operation and current findings should provide the wastewater community the confidence needed to embrace granular processes.

**Dr. Ramesh Goel** is an environmental engineering professor in the Civil & Environmental Engineering Department

at the University of Utah. He is very well integrated into the nation's wastewater community and considers the Utah wastewater community as his extended family. He has several granular reactors operational in his lab. For more information about the granular activated sludge process and other innovations and, in general, about nutrient managing strategies in wastewater treatment, please contact Dr. Goel at [ram.goel@utah.edu](mailto:ram.goel@utah.edu).

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Wei et al., (2020). Flocs in disguise? High granule abundance found in continuous-flow activated sludge treatment plant. *Water Research*; 179: 115865 [DOI](#)



# Taking a Step Toward Diversity, Equity, and Inclusion Within WEF

By Lynn Broaddus, PhD, MBA and Walter Marlowe, PE, CAE

Workforce development remains one of WEF's top priorities, and as we continue to deliver on our commitment to water professionals, we are also working to make sure that the water workforce of the future is one that reflects the diversity of the communities we serve.

As the conversation around diversity, equity and inclusion magnified after the police killing of George Floyd and others, WEF reaffirmed its commitment to leading the transformation in the water sector. But first we looked inward, examining WEF with critical eyes and determined minds. We decided that we must change internally before turning our focus outward.

As the next step in our journey toward becoming a fully diverse, inclusive, and equitable water organization, WEF's Board of Trustees has established the Diversity, Equity and Inclusion Subcommittee to provide guidance on our programs, communications, and membership. In August we hired *The Silverene Group* to work with the subcommittee to develop a strategic plan for diversity, equity, and inclusion. Together, they will assess WEF's current status and explore ways to ensure diversity, equity and inclusion is fully and permanently integrated into WEF's culture.

The 15 dynamic water professionals serving on the subcommittee represent the diverse perspectives and experiences that we hope to see more of within WEF and the water sector as a whole. This group will play a critical role as WEF works to achieve its strategic goals and we appreciate each member's leadership and commitment to creating meaningful change.

“As the next step in our journey toward becoming a fully diverse, inclusive, and equitable water organization, WEF's Board of Trustees has established the Diversity, Equity and Inclusion Subcommittee to provide guidance on our programs, communications, and membership.”

We are looking to WEF members to be an active part of this change, and the subcommittee will be asking for input in a variety of ways, including interviews, surveys and focus groups. You will hear more from the members of the subcommittee throughout the year as their work progresses, but you don't have to wait. If you have thoughts, suggestions or experiences that you would like to share, please reach out to either of us, or to an individual subcommittee member. This work will be strengthened in working together.



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- Laura Childs, WEF staff
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- Melody Gonzalez, Black & Veatch
- Steve Hamai, Seattle Public Utilities
- Rahkia Nance, WEF staff
- Aisha Niang, Houston Public Works
- Paige Peters, Marquette University/Rapid Radicals
- Karyn Riley, Washington Suburban Sanitary Commission
- Elaine Samuel, Eng Girl Problems
- Stephen Sanders, SUNY Morrisville
- Jeseth Delgado Vela, Howard University
- Ifetayo Venner, WEF Board of Trustees

Many of us want to be part of the solution but struggle with where to start. An excellent step is to read or listen to a book that brings a new perspective. Here are a few that we've found to be helpful in our own journeys:

- *The Color of Water* by James McBride
- *White Fragility* by Robin DiAngelo
- *The Autobiography of Malcolm X*
- *Braiding Sweetgrass* by Robin Wall Kimmerer
- *The Vanishing Half* by Brit Bennett
- *Anatomy of Injustice: A Murder Case Gone Wrong* by Raymond Bonner
- *Snow Falling on Cedars* by David Guterson
- *So You Want to Talk About Race* by Ijeoma Oluo



**Lynn Broaddus, PhD, MBA** is the 2020-2021 President of the Water Environment Federation (WEF), an international organization of water quality professionals headquartered in Alexandria, VA.

Lynn formed Broadview Collaborative Inc. in 2014 as a platform for advancing sustainable, resilient practices in the water sector. She serves as a strategic advisor and facilitator for private-sector, non-profit and philanthropic clients throughout North America and is known for bringing new ways of thinking to the crucial environmental challenges of our day.

Prior work includes leading The Johnson Foundation's environment program from 2008-2014, convening hundreds of leaders to address national water sustainability and resiliency under the umbrella of "Charting New Waters." Earlier, she held leadership roles with Milwaukee Riverkeeper®, The Nature Conservancy and NatureServe, and also has experience in energy conservation and teaching. She earned her doctorate from Duke University, her M.B.A. from the University of Wisconsin-Milwaukee, and her bachelor's degree in environmental sciences from the University of Virginia.

Lynn is Past Chair of River Network's Board, and member emerita (Past Chair) of the University of Wisconsin-Madison's Nelson Institute Board of Visitors. She recently completed three years as a non-resident senior fellow of the Brookings Institution. Lynn is based in Minneapolis.



**Walter Marlowe, PE, CAE** is the Executive Director of the Water Environment Federation (WEF), an international organization of more than 30,000 water quality professionals, headquartered in Alexandria, VA. Before joining WEF, Marlowe was the Executive Director of the American Association of Pharmaceutical Scientists and was previously the Executive Director of the Construction Specifications Institute and the Executive Director of the American Academy of Water Resources Engineers. He has a B.E. in Civil Engineering from Stevens Institute of Engineering and an MBA from George Washington University. [DRI](#)

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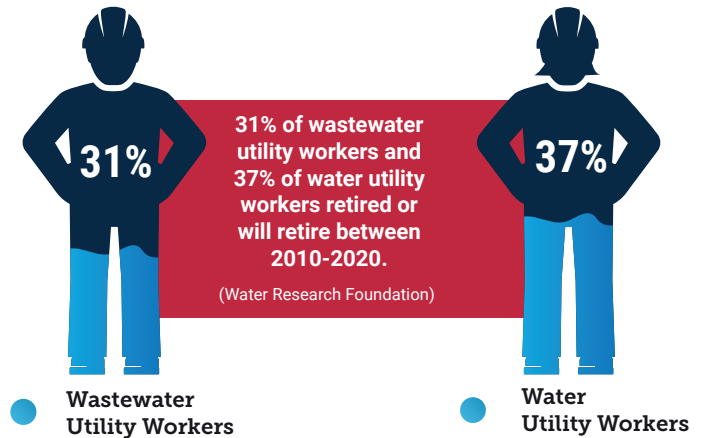
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The list below provides examples of water industry jobs along with their requirements and average salaries.

JOB	REQUIREMENTS *	AVERAGE SALARY **
Administrative Assistant	HS diploma or equivalent	\$36,000
Civil Engineer	Bachelor's degree and/or graduate degree	\$91,000
Environmental Engineer	Bachelor's degree or graduate degree	\$90,000
Environmental Specialist	Bachelor's degree in environmental science or related	\$76,000
GIS Specialist	Bachelor's degree in land survey, geography, civil engineering, or related	\$58,000
Pipe Fitter	On-the-job training or a trade school degree	\$57,000
Public Information Specialist	Bachelor's degree in Public Administration, Communications, or related	\$45,000
Water Meter Reader	HS Diploma	\$43,000
Water and Wastewater Plant Operator	HS diploma, state certification program requirements vary	\$48,000

\* GI Bill® may aid you in achieving this    \*\* Via Dept. Of Labor

## Learn more and connect with employers!

**Work for Water** | [workforwater.org](http://workforwater.org) - Veterans focus area with advice for Veterans interested in working in the water sector.

**AWWA Career Center** | [careercenter.awwa.org](http://careercenter.awwa.org) - AWWA's Career Center connects you to jobs across the United States.

**WEF Career Center** - | [jobbank.wef.org](http://jobbank.wef.org) - Resources to help you build and manage your career in water.

Volunteers in your area can provide you with a warm welcome to the industry. They can answer your questions about education and training requirements, connect you to networking and volunteer opportunities, and introduce you to employers hiring in your area.

If you would like to connect with a local volunteer, please email [veterans@awwa.org](mailto:veterans@awwa.org)

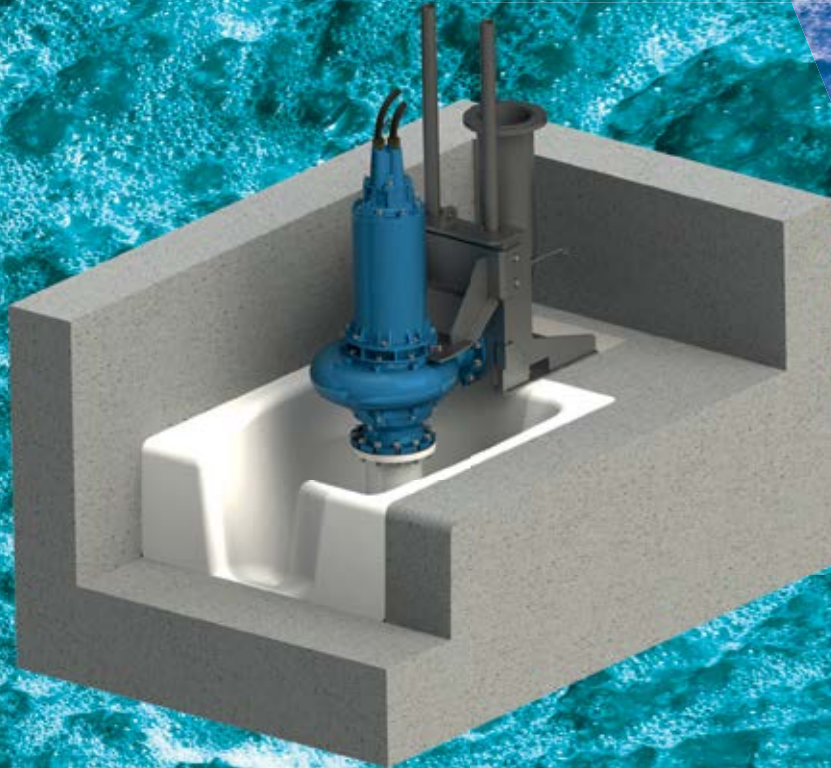


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# In Memoriam

**J**ames Edward Faulkner, 77, passed away on December 18, 2020 in West Jordan, UT from complications from the COVID-19 virus. Jim was a well-known and respected professional in the Utah wastewater industry and within WEAU. He began his career as a Wastewater Treatment Plant Operator working his way up to Treatment Plant Superintendent. After approximately 10 years, he moved to Cottonwood Improvement District as Plant Superintendent. Several years later, he was promoted to Operations and Collection System Manager, subsequently being appointed General Manager. He was especially proud of Cottonwood winning the “Outstanding Collection System” award from the Utah Water Environment Association multiple times. He worked at Cottonwood for over 40 years, retiring in 2018.

At the time of his retirement, he was the longest tenured certified wastewater treatment operator in the State of Utah. He served multiple terms as President of the Utah Water Environment Association and was an active member of the Water Environment Federation for more than 35 years. His service in wastewater public works spanned more than 50 years.

Jim will be missed and remembered by many for his character and contributions to the Utah water environment and WEAU. His brother, Gary Faulkner, continues to carry on the legacy of public service in our industry as Plant Superintendent for Central Valley WRF. [DA](#)



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Nickerson Company	14	801-973-8888	www.nicopumps.com
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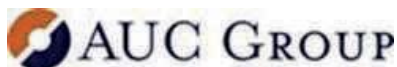
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