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501	Building a Successful Wastewater-based Epidemiology (WBE) Program
502	Bringing It All Together: Guide to Designing and Implementing S2EBPR Processes
503	Unique Approaches for Removal of Selenium and Other Constituents from Wastewater and Groundwater
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505	Knowledge Development Forum: The Plot Thickens Part II - Future of Granular Sludge
506	Wet Weather Treatment Innovations
507	Biogas: Market-based Decisions for Resource Recovery

508	Digital Transformation: Leveraging Smart Infrastructure and Data Analytics to Optimize Performance
509	Leveraging Collaborative Delivery to Achieve Project Goals
510	Pathogen Pep-Talk: How We Monitor, Model, and Convey Data

LEARNING EXCHANGES - LEARNING EXCHANGES -

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LE3	Distributed Infrastructure: It Isn't Just for Small Comm
LE4	Water Workforce: Rainbow Advocates
LE5	The Next Big Thing In Water: PFAS, Microplastics, COV
LE10	Regulations and Policy Development: What's on Your
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LE8	Cybersecurity: Something for Everyone
LE7	Water Workforce: People of Color
LE9	Critical Water Workforce Issues
LE12	Funding: How to Find It
LE14	WEFTEC 2022 Wish List: What Do You Want to See M
LE13	The Big Bang!
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WORKSHOPS - WORKSHOPS - WORKSHOPS - WOP

W01	It's Just a Game: Lean into Innovation (ONLINE)
W02	Creating a World Class Program Whether You're Class A or
W04	Understanding PFAS: Developing Management Practices ar

W05	Advanced Data Analytics to Better Understand WRRF Oper
W07	Using Online Analyzers to Meet Stringent Nitrogen and Phos
W08	WEF/WRF Dewatering Optimization: Practical Ways to Imp
W09	HOLD THE FLOW! Wet-weather Storage Solutions: Planning
W10	Pathogens and Microconstituents: Recent Scientific and Te
W11	Membranes for Water Reuse - Past, Present, and Future: A

W12	Solving Stormwater Synergistically from Coast to Coast
W13	Transforming into Communities of the Future through Wat
W14	WISE Approach to Improvement: Considering People and P
W15	Odor Control for Positive Public Relations
W16	Workforce Development: Addressing the Whole Persona -
W17	How to Increase Diversity and Foster Inclusion in Your Orga

Session Description

TECHNICAL SESSIONS - TECHNICAL SESSIONS - TECHNICAL SESSIONS - TECHNICAL SESSIONS

The only impossible journey is the one you never begin. Find out how digital transformation can benefit your utility in easy and manageable steps. Come meet with utilities from across North America as they share their journey through digital transformation. Attendees will see various stages of this journey, from first steps to final implementation.

The wastewater and water reuse industry continues to advance the scientific understanding of the risks, fate and transport, and management of PFAS. This fundamentals session will provide an overview of basic concepts and issues associated with the presence of PFAS in municipal wastewater and the role that public utilities play in implementation of management approaches to protect public health and the environment.

The tumult of 2020 has forced changes in the workplace and the workforce. From social distancing to social justice, and obstacles to opportunities, necessity has demanded we rethink our work practices and values. New acronyms like DE&I (Diversity, Equity, and Inclusion) and WFH (work from home) have come to the forefront of the labor lexicon. Still, the need for talented qualified individuals to accomplish the research and innovation, design and operation of the water environment industry remains. Join our expert panel to discuss the changes we have all experienced, the future of employee recruitment and retention, workplace culture and values, and succession planning.

Looking to put your asset management engine on the rails? Then this is the session for you! You will learn about calibrating the model with improved data collection and condition assessment. Get tips for making sure that the data you are putting in is of top quality (remember the old saying- "garbage in, garbage out"), and setting the groundwork for value-added results. This session covers a wide-range of asset management topics including stormwater and non-traditional assets.

Expert panelists will share about their experiences and insights on navigating the numerous ways utilities must plan and act to maintain the function of critical infrastructure in high-stress situations. Focus areas for the panel will include resiliency as it relates to climate change, capital planning , crisis management , workforce , cyber security and decentralization of critical infrastructure.

As demands on fresh water sources and effluent discharge regulatory pressures increase, more industries are considering alternative sources of process water. In addition to reducing water footprint and achieving sustainability goals, use of alternative water sources can increase water security and shield industry from competing freshwater demands. This session will explore the use of alternative water sources, including industrial and municipal wastewater treatment plant effluents and stormwater, to satisfy industrial process water requirements. Drivers, regulatory considerations, treatment technologies, and case studies will be discussed in an interactive panel format.

This session will begin with a case study on lessons learned from a utility meeting low effluent nutrient limits over the past two decades. The speaker will engage with the audience throughout the case study to gather their input in potential challenges and solutions. Three subsequent presentations will focus on innovative tertiary treatment solutions including natural wetlands and ultrafiltration. The session will conclude with a facilitated discussion on approaches to tertiary treatment.

Co-digestion can change biogas production and reduce purchased energy for a WRRF. However, it is vitally important to understand how the characteristics of the food waste or other high strength organic gas can impact design and operation. While providing insight into these issues as well as present the long-term implication of this process, speakers will use polling to gauge the participants knowledge.

Unlike many wastewater projects, stormwater projects take place "outside the fence" in public and private areas. These projects directly impact neighborhoods, homes, and places of work. Impacts can have both positive and negative effects on society. Developing successful stormwater measures must have meaningful neighborhood involvement. Participants will interact with session speakers via discussion moments held throughout their presentations.

Direct and indirect potable reuse are gaining popularity in several states across America. In this session, up to date information on a developing direct potable reuse project in Texas, a successful indirect potable reuse project in California, and potable reuse from the plant operator's perspective will be presented. In addition, participants will engage in conversation with both fellow attendees and the session speakers providing a high level of interaction and knowledge transfer.

How do we make our watersheds better? To answer this question, this session will take a look at using a regional approach with tools and the ability to collaborate on water quality issues and will include a special presentation of tools for assessing benefits and costs of green stormwater infrastructure by invited speaker [insert name]. During the session, participants will be encouraged to share their expertise during peer-to-peer discussion.

What is all the hype about regarding peracetic and performic acid? Come learn why so many facilities and industries are turning to peracids to meet their disinfection requirements. Understand how peracids compare to other disinfection technologies in regards to efficacy, cost, design requirements, and regulations. Hear from state regulators about their work in developing and implementing new guidance for using peracids at the municipal level

This session will explore topics on the technology differences in P recovery efficiency, product quality and purity, application of product, return of investment model, operational challenges, and future of P recovery technology.

The water sector is in the middle of a paradigm shift from focusing on treatment and meeting discharge permit limits to integrated operation that also enables a circular water economy via water reuse, resource recovery, and system level planning and operation. While the sector has gone through different stages of such revolution, from improving energy efficiency to recovering renewable energy and resources, when it comes to the next step of achieving carbon neutrality or negative emission, it falls behind other infrastructure sectors such as energy and transportation. The water sector carries tremendous potential to decarbonize, from technological advancements, to operational optimization, to policy and behavioral changes. This interactive session will include authors of a new book on this subject and three short case study presentations from Scotland and Europe and will encourage active participation from attendees.

Anaerobic technology has evolved to the point that it is now routinely considered by process engineers as one option in the toolkit for treatment of high-strength industrial wastewater, particularly in the biofuels, food and agriculture sectors. This panel discussion will present three case histories that illustrate the integration of anaerobic processes into industrial WWTP flowsheets. Audience members will be invited to share their own experiences – positive or negative – with anaerobic treatment systems at industrial sites.

Come listen to applied research focused presentations on the topic of PdNA. Then join in short discussions based upon the presentations to super-charge what you just heard in the presentation! This is a can't miss session with the latest research on full-scale implementation of PdNA!

This case study based session focuses on maximizing secondary clarifier capacity and performance using technologies such as high-rate solids contact stabilization and computational fluid dynamics.

PFAS is the hottest group of emerging contaminants in water and wastewater with very low advisory levels (nanograms) in drinking water in several states. During this lecture-style session, our speakers will discuss the fate of PFAS in wastewater resource recovery facilities and novel treatment technologies.

Utilities will use this session to share the benefits of taking a regional and whole water cycle approach to water management and planning. By sharing the process their utilities went through to evaluate big picture approaches, the speakers will give participants an idea of how they can also implement integrated plans. Quick buzz sessions held during the session will allow brainstorming moments for participants to share their thoughts and ideas.

During this proposed presentation, utility leaders will be introduced to the utility-tested and utility-developed Innovation Planning Tool and its functionality. We will clearly layout how this tool can be accessed and used by demonstrating each module. Participants will leave with an understanding of how the tool could provide their utility value by efficiently assessing their current innovation environment and level of innovation maturity, creating a future vision for innovation, and selecting action items and performance measures to achieve that vision. In the end, the Innovation Planning Tool provides a focused and aligned approach to utility innovation program development. This presentation will provide utility leaders a tool and instruction to easily plan for innovation creating organizations that are better equipped to develop and sustain more agile organizations ready to adopt new ideas.

For decades, wastewater professionals repeated the mantra that wastewater treatment protects the environment. While this is absolutely true, COVID-19 reminded us that we also have a critical role to play in public and occupational health protection. Join us for this action-packed 1.5-hour session featuring some of the most renowned environmental microbiologists in the US who will highlight what kinds of disease-causing microorganisms are present in wastewater, sludge and biosolids, what risks they pose to our workers and how well we remove these during wastewater treatment. They will specifically cover what makes viruses different from other pathogens and tell you about indicator organisms and how well they work. We will wrap up the session with a regulatory update from US EPA on the status of coliphage monitoring and what this means for utilities. This crash course in pathogens will equip you with the basic knowledge you need to consider public and occupational health during utility operation and management in a post-COVID world.

Come learn about the pros and cons of Digital Twins for water resource recovery facilities through a mock jury trial. This highly engaging session will put the concept of digital twins on "trial" and you the audience will become the jury and at the end- get to deliver your verdict!

In this two part knowledge development forum, we will focus on aerobic granular sludge X. As the wastewater industry looks to intensify treatment processes, aerobic granular sludge (AGS) has gained significant attention due to its sludge densification potential allowing greater treatment in a smaller footprint. Several process technologies for AGS are available including the more established sequencing batch reactor systems and newer continuous flow configurations currently being evaluated at several full-scale installations. This session is the first part of two and will provide the current state of the AGS SBR process, including pilot plant and full-scale results.

This session will provide an overview of three competing advanced primary treatment options, specifically chemically enhanced primary treatment (CEPT), primary filtration, and a newly developed A-stage primary treatment technology (called AAA or Triple-A). These technologies utilize different strategies to potentially enhance solids removal compared to conventional processes, with benefits ranging from reduced energy requirements of secondary treatment, increased biogas production, reduced footprint requirements, and increased wet weather treatment capacity.

Digestion is an established method for treatment of biosolids. It has matured and needs new/breakthrough technologies to enhance its performance. During this session, participants will discuss the promising latest developments that could be game changers for digestion with the speakers through short conversation breaks.

Department of Energy is sponsoring a number of research projects associated with energy recovery from waste products. This session will showcase four of the projects associated with innovative technology ranging from hydrothermal liquefaction to anaerobic membrane bioreactors and decarbonization of electricity and give the audience an understanding of how technology is being developed to improve resource and energy recovery from wastewater. Energy recovery from wastewater is a major goal of most utilities there are technologies being developed to enhance energy recovery including advances in anaerobic digestion hydrothermal liquefaction, as well as an understanding of biomass products that can energy biogas product. This session will introduce these technologies and give an understanding of how these advances can be implemented.

The increased regulatory scrutiny of stormwater, larger numbers of assets and the complexity of those assets results in an expanding workload amongst stormwater managers. This session highlights how to improve the functioning of stormwater assets for the long haul – through asset management, better design standards and workforce development. Quick buzz moments held throughout the sessions will allow participants to raise questions and concerns on the presented information.

Take a deep dive into Diversity, Equity, and Inclusion (DEI) issues to discover how you can create change within your organization. This session will analyze the successes and challenges of organizations that have initiated their own DE&I networks. After connecting with speakers, brainstorming with their neighbors, and sharing personal experiences participants will leave with an idea of DE&I programs that fit the needs of their organization.

Utility Mangers, Planners, and Designers would expand their current toolkit to include new ideas and approaches for collecting and using needed data for asset management through attending this session.

The pandemic disrupted life as we all knew it, including how we interacted and engaged with the public. The pandemic not only opened our industry's eyes as far as the need to raise awareness of its essential function in society, but it also forced utilities to transition into a virtual platform practically overnight. In this hybrid session, we will hear from several industry experts about the challenges of engaging the public such as how to interact with communities lacking high speed internet access or utilities' lacking full time employees dedicated to communications, to how other utilities developed creative (and exciting) approaches like drone-assisted virtual tours. We will cover the challenges, the responses and hopefully some insight into the future of public outreach in a post-COVID-19 world.

Now more than ever the production of potable reuse water will be scrutinized by all stakeholders to ensure that disinfection systems eliminate viruses and pathogenic microorganisms to protect human health. This session will present innovative technology and processes to include Critical Control Points, Automation, Artificial Intelligence and Model Predictive Controls to optimize the disinfection systems that are so important to the public's acceptance of potable reuse water. Participants will share thoughts on the presentation content during buzz moments with their peers and the speakers to stimulate discussion and interaction.

This session will have three individual presentations with a single question and answer period at the end. The goal will be to use all three papers to provide cross questioning and application of each to one another.

This session will review the risks and unknowns associated with COVID-19 in the wastewater industry, from the time the toilet is flushed, through the collection system, and through the water resource recovery facility. The session will include discussion of risks and unknowns regarding infection through aerosolization and contact with wastewater for COVID-19 and include a comparison of risks from other pathogens and pathogen types. Wastewater process inhibition observed in the US as a result of COVID-19 countermeasures will also be discussed. As the hot issues associated with COVID-19 change frequently, and new variants are changing the landscape, 30 minutes will be devoted at the end of the session to address hot topics through a facilitated discussion. So come with your thoughts, experiences and questions!

Data Analytics and the associated buzz words (Big Data, Machine Learning, Artificial Intelligence, ...) are mentioned everywhere. This session presents applications of data analytics for real engineering problems and shows both the advantages and disadvantages. Using the Conversation and Input format, session participants will be able to engage with each other after each presentation to share ideas and learn from each other.

Capturing or realizing real tangible return on investment from your asset management program can be difficult. This session focusses on looking at successful examples of captured ROI from the initial stages to implementation as well as a look at the total expenditure vantage point opposed to just CapEx and OpEx metrics.

At a time when trust in science and government is deeply challenged, how can we carry out our responsibility to communicate complex technical and scientific information – and help people to act on that information? This panel discussion with interactive polling will ask six Challenge Questions of experienced leaders in regulation, utility management, medical communication, and public outreach on how we can build – or rebuild - trust and credibility and build more effective and actionable messaging in an anti-science environment.

In 1964, Bob Dylan wrote "The slow one now will later be fast, as the present now will later be past". The past couple of years have been a bit, let's say, volatile. On-line shopping and increased deliveries in boxes, reduced travel, increased focus on renewable energy sources, carbon footprint, and supply chain security, and a global vaccination effort, among other changes have significantly impacted most industry sectors. Rapid production changes, in both positive and negative directions, have also impacted industrial water use, wastewater production and treatment needs. Join a panel of global experts as they discuss the current and future risks and opportunities in different industrial sectors.

The session will include an overview of a pilot system operated at HRSD followed by three brief presentations on results from studies conducted at that pilot facility. There will then be a presentation by current research from another group. The session will conclude with a facilitated discussion on the most urgent research questions to be addressed.

This prospective session will look to the future of the stormwater sector, examining needs and where we are going. Join us for a facilitated discussion on the future of funding, operations & maintenance, and innovation in the stormwater sector. The session will start with a 10-minute primer to set the stage. Participants will be encouraged to take part in conversations, share their own experiences, and add their perspectives throughout the session.

Effective planning requires appropriate consideration of the uncertainty of diverse possible futures. During the first part of a two-part session, participants will review case studies exposing them to the benefits of using uncertainty analysis. Participants will be encouraged to interact and share knowledge with speakers during short discussion periods.

Utilities are moving from siloed "problem - solution" mindsets to be more collaborative and agile and able to quickly leverage new ideas and respond to challenges. Leading utility participants in the Water Research Foundation's Leading Wastewater Utility Innovation Project (#4907) will share their insights on: 1) Using a culture of innovation to empower their workforce; 2) Leverage partnerships that foster innovation; and 3) Create strategies that address challenges, translate activities into customer value, and set long-term utility objectives.

For those interested in managing phosphorus and nutrient loading, this session will focus on using watershed-scale monitoring and modeling strategies. Covering everything from meeting regulatory requirements to providing environmental and economic benefits, participants will learn the basics of nutrient reduction. With polling throughout each presentation, the audience will be able to test their knowledge, gain insight, and interact with the speakers.

This force mains session will present different techniques used for force main rehabilitation as well as construction methods plus discussion on an emergency force main rehab project. In this session you will have the opportunity to talk to other participants and the presenters about the presentations and share experiences.

More efficient aeration control is a top priority for utilities to save energy and improve TN removal. This session provides the fundamentals, tools, and case studies on how to make ammonia-based aeration control (ABAC) work.

Find out what emerging contaminants may be affecting utilities and how to effectively communicate to the public and press to eliminate a negative situation.

Secondary clarifiers are often the weak link in the activated sludge wastewater treatment plants. Given factors such as influent variability, temperature variation, and periodic nutrient deficiencies, it can be challenging to generate a biomass that consistently flocculates, settles and compacts in the final clarifier. Maintaining steady clarifier operations and producing an effluent with little to no solids carryover can be difficult. This session will present two case studies illustrating innovative solutions to real-world clarification problems at industrial WRRFs, along with an approach to clarifier design that accounts for uncertainties in biomass settling and compaction properties.

As the wastewater industry looks to intensify treatment processes, aerobic granular sludge (AGS) has gained significant attention due to its sludge densification potential allowing greater treatment in a smaller footprint. Several process technologies for AGS are available including the more established sequencing batch reactor systems and newer continuous flow configurations currently being evaluated at several full-scale installations. This session consists of a two-part session where Session 1 will provide the current state of the AGS SBR process including pilot plant and full-scale results and Session 2 will include discussion on the latest testing results from continuous flow AGS systems as well as preliminary experiences in operating these systems.

This session will focus on energy reduction and conservation and the role Water Resource Recovery Facilities can play in reducing the use of carbon-based energy in society. The first speaker will present on application of modeling tools to reduce system-wide energy consumption now. The second speaker will talk about multiple pilots performed at a WRRF in Spain to assess viability of technologies to achieve energy self-sufficiency and reduce carbon footprint to zero. A facilitated attendee discussion on the priorities of Water Resource Recovery Facilities in terms of water quality improvement versus energy/renewables production and carbon footprint will follow. The session will conclude with a presentation on potential synergies of hydrogen fuel synthesis with attaining energy self-sufficiency followed by a discussion on the viability of decarbonizing Water Resource Recovery Facilities.

<p>Pharmaceuticals are one of the hottest groups of emerging contaminants in water and wastewater. The European Union has recently included antibiotics such as amoxicillin and ciprofloxacin in the water contaminant watch list. This session will discuss modelling of the fate of pharmaceuticals in wastewater resource recovery facilities and novel treatment schemes.</p>
<p>Producing an end product that has value is one of the major goals of using stabilization for solids management. Overcoming difficulties to produce a high-quality product is critical and this session will provide participants with guidance on producing high quality products. With polling throughout by the end of the session, participants will have an understanding of upstream process can impact results.</p>
<p>The session will highlight ways to address flood resilience in cities through both green and gray infrastructure. Considerations include modeling, climate change, project selection, and community context. Speakers with diverse geographical insight will include participants in their conversations on how resiliency and flood control approaches are being incorporated into communities.</p>
<p>Part two of Embracing the Uncertain will bring together engineers, scientists, and managers to share approaches used to plan for uncertainty. Continuing from part one of the series, participants will continue to review case studies to learn how to effectively apply uncertainty analysis. A discussion period held during the session will provide the opportunity for sharing experiences and asking questions.</p>
<p>Everyone agrees that water reuse is the future, but few understand the complex and disjointed federal, state, and local approaches to defining water reuse quality, establishing a regulatory framework, and identifying treatment and permitting requirements to achieve widespread water reuse. This panel discussion will elucidate the path forward based on actual project obstacles and strategies for success, as well as the national Water Reuse Action Plan (WRAP) that provides a road map to the future of Water Reuse. With opportunities for the participants to interact with the panelists throughout the session, multiple perspectives will be expressed.</p>
<p>This session will focus on three unique collection system construction stories from start to finish, including constructability considerations, innovative construction methods, and lessons learned. The projects include a real time control structure, curved microtunneling, and emergency repair of a 104-inch interceptor. If you are fascinated with construction and believe a photo is worth a thousand words, this session is for you!</p>
<p>Riding the UV Wave: Tracking the Evolution of The Technology (UV LED) and New Applications provides an overview of the evolution of UV disinfection technology (UV-LED, UV-HOD) and how it and can be used in the disinfection of potable, primary, secondary, tertiary, and advanced purified effluents. This session provides the participant up-to-date information on the technologies, evolving operational practices, and applications of UV disinfection.</p>
<p>This knowledge development forum will focus on balancing modern automation, data analytics, process needs versus cyber security requirements. Cyber security is an incredibly important piece of the puzzle for a utility, especially in light of the attacks such as the latest Florida attack. The outcome should be an IT architecture (Drawing) which allows better monitoring/optimized operation at highest level of security. The session will include a discussion of what a utility needs, what should be avoided, and how to overcome the "human error" factor. The overarching question is- is this more of an organizational issue or a technology challenge?</p>
<p>Wastewater odor issues run much deeper than simply stopping the stench. Panelists in this session will discuss strategies to ensure a positive outcome for all stakeholders including the obvious desire to control odors for neighbors and the not-so-obvious desire to avoid negative impacts to WRRF processes.</p>
<p>Come learn about new perspectives on activated sludge temperature modelling, biological treatability methods and WET test monitoring and compliance. This session will utilize case study analysis and facilitate a robust peer to peer discussion on the pros and cons of different approaches in each of these three areas: modeling, monitoring and (treatability) methods. Participants will share and gain knowledge from speakers and each other through case study analysis and open discussion.</p>
<p>This session focuses on the latest applied research advancements in PDNA. Various practitioners will share experiences and thoughts on applications, challenges, and optimized solutions. You as the participant, will have the opportunity to discuss applications, how to integrate PDNA into your process flowsheet, and challenges to implementation through case study analysis.</p>

During this traditional technical session, presenters will cover all things related to MBR. Anything and everything related to MBR will be in this session! You will hear about experiences such as the digital twinning of your MBR technology, dealing with cold weather applications, how to design for a large facility and lastly the performance comparison between MBR and MABR. This is a great overall MBR session.

This session looks at the basics of an Industrial stormwater program and the requirements of EPA's 2021 Multi-Sector General Permit (MSGP). Case studies help to define methods to overcome challenges, including at a naval installation and a solid waste facility. We will also review a decision tree/flowchart on chemically enhanced stormwater treatment processes for industrial activities. Participants will have the opportunity to test their knowledge with polling and quizzes held throughout the session.

What are the threats and vulnerabilities that will create challenges for your system or facility on the future? Find out how systems across the U.S. are addressing resiliency in their planning and projects. This session will offer project and location specific perspectives from both coasts, plus a national perspective on resiliency in the water environment industry. Participants will get to engage with the speakers during polling and quizzing to be held throughout the session.

For utility managers interested in expanding conventional tools used to arrive at financial decisions on projects, this session will introduce new ideas and approaches. Polling will take place throughout the session allowing participants to explore and gain insight on the technology being presented.

Microconstituents/micropollutants and contaminants of emerging concern continue to be found increasingly in water to be reused for non-potable and potable goals. Their impact to human health and the natural environment is cumbersome and alarming; thus, their removal and elimination from recycled water is of crucial importance. This session will present control strategies to ultimately improve the overall removal efficiency of micropollutants and other emerging contaminants to ensure safe water in reuse applications.

Join this interactive Technique Defense session. First, you will hear four short presentations related to the innovative techniques for calibrating models have been developed and commercialized over the last several years. The participants will begin to investigate the pros and cons of each approach.

The wastewater and water reuse industry continues to advance the scientific understanding of the risks, fate and transport, and management of microplastics. This technical session will provide an update on key issues associated with the presence microplastics in municipal wastewater and the role that public utilities play in implementation of management approaches to protect public health and the environment.

Come join a highly interactive panel discussion on instrumentation from the different perspectives of a supplier and utilities. You will also hear the perspectives of an urban (waste)water cycle and how it relates to instrumentation. You won't want to miss this highly engaging dialogue among all- including YOU!

The session will provide new insights on N2O emissions from WRRFs and ways to measure and mitigate.

The three main focuses of this session will be identifying, acknowledging, and finding solutions to inequity. Attendees are encouraged to attend this session where they will hear different experiences and success stories surrounding dealing with water inequity. There will also be an opportunity during short discussion breaks to share personal challenges and knowledge.

This Knowledge Development forum will take place in two parts. During part 1 speakers will present two bioaugmentation cases with different outcomes and allow participants to share their personal experience during discussion breaks. The last part will present the advancements in aerobic membrane-based technologies in pharmaceuticals, chemicals, and food process industries.

Through case study analysis and facilitated discussion, you will understand influent carbon availability impacts on nutrient removal performance. Explore whether the benefits of primary sludge and WAS fermentation outweigh the additional operational and maintenance requirements.

Upgrading wastewater treatment plants for capacity expansion or nutrient removal is challenged by process complexity, the need for larger tank volumes and increased energy consumption. Intensification of biological processes is paving the way to more energy-efficient operations at water resource reclamation facilities. This session will present on advances in small-footprint biofilm technology such as IFAS, MOB, MBBR currently being investigated and applied for process intensification and/or performance enhancement at WRRFs.

MS4 General Permit requirements from around the country will be the topic of discussion during this moderated panel discussion whose panelists will include representatives from WEF's National Municipal Stormwater, Green Infrastructure Awards Program winners, and others the session panelists will represent both Phase 1 and Phase 2 communities. Panelists will also provide participants attending this session with updates on recent permit requirements in their region.

Focusing on the tools used by two utilities, this session will focus on developing and managing CIP to achieve strategic objectives while maximizing their ROI. During the speaker presentations the audience will learn firsthand how utilities can effectively communicate the benefits of the capital program to the community and the economy.

Determining the appropriate pathogen removal credit to apply when implementing MBR projects to produce higher quality effluent can be a challenge. This session will be held in a modified format with the goal of stimulating discussion and interaction. Speaker presentations will address the most recent developments with log removal credits, short buzz moments will open networking moments, and polling will give participants the opportunity to assess their knowledge.

Wastewater contains a tremendous number of resources, such as water, energy, and nutrients. The coronavirus pandemic has helped highlight one more, often-overlooked resource flowing through our sewers: information. Wastewater-based epidemiology (WBE) (or wastewater surveillance) allows us to monitor substances of concern in communities by detecting and quantifying their concentrations in the wastewater and locations in the sewershed. Join us to learn about the critical steps involved in building a successful WBE program and how to avoid some of the pitfalls associated with sample collection, analysis, results interpretation, and communication of findings to decision makers and the public.

Are you considering implementing S2EBPR? Are you wanting to know about the design criteria, operational strategies and design considerations that go into into? Then this is the session for you! You will hear from experts and learn how full-scale facilities have implemented S2EBPR. They will discuss design criteria (HRT, SRT, mixing HP etc.), operational strategies (recycles, mixing, etc.), and design considerations (redundancy, foam/scum control, instrumentation and controls, etc.).

This session will describe laboratory investigations and full-scale applications of innovative coagulation/flocculation, adsorption and carbon dioxide (CO₂) sparging techniques for treatment of heavy metals, dioxins and furans, together with microbial and noble photocatalytic techniques for selenite and selenate reduction. Speakers will interact with audience members using polling questions throughout their presentations.

This panel discussion will provide an overview of the current status of the technology with respect to full-scale applications of MABR. The panelists represent a range of applications. The lively discussion will center on full-scale implementation of MABR for mainstream and sidestream applications.

In this two part knowledge development forum, we will focus on aerobic granular sludge X. As the wastewater industry looks to intensify treatment processes, aerobic granular sludge (AGS) has gained significant attention due to its sludge densification potential allowing greater treatment in a smaller footprint. Several process technologies for AGS are available including the more established sequencing batch reactor systems and newer continuous flow configurations currently being evaluated at several full-scale installations. In this final session of a two part series, discussion will include the latest testing results from continuous flow AGS systems as well as preliminary experiences in operating these systems.

High wet weather flows can exceed the capacity of conventional treatment processes and result in sewer overflows or permit non-compliance if wastewater facilities are not designed to handle these flows. This session will show how a variety of treatment technologies and operational approaches are being implemented at wastewater treatment facilities around the world, from the United States to South Korea. This session will explore wet weather treatment innovations in grit removal, direct wastewater filtration with both floating media and membrane filters, and operational optimization of trickling filter/solids contact processes. The session will emphasize how the combination of technology and innovative operational approaches can increase treatment facility resiliency to accommodate large variations in flow and improve receiving water quality in a cost- effective manner.

Resource recovery, especially energy recovery, is the goal of many WRRFs. The production of energy from biosolids, the type of energy, and the associated costs and/or revenues are critical. Our speakers will provide knowledge and insight not only into energy production but also the legislative and cost/revenue issues associated with it. With polling moment spread throughout the session, participants will get to test their knowledge.

Research-based frameworks and distinct utility case studies where advanced technology applications and analytics have been successfully deployed will be presented during this session. Each case study will highlight the integration of people, process, technology, and digital strategy to drive process improvement and efficiency gains. Alongside the speakers, participants will analyze and discuss the specific implementation planning frameworks and rollout methods and procedures of the presented case studies.

This session focuses on sharing experiences with alternative project delivery methods including CMAR and Progressive Design-Build. Speakers will present their experience using these methods, outcomes, and share lessons learned.

Based on the Pathogens and Indicators theme, this Pathogen Pep-Talk will focus on everything from monitoring and data collection phases all the way through public communication. By the end of the session, participants will be able to present data in its most accessible format to the public. In this session speakers will review successful case studies with their associated community outreach while attendees will share thoughts and experiences to expand their knowledge of the presented case studies during group analysis.

LEARNING EXCHANGES - LEARNING EXCHANGES - LEARNING EXCHANGES

Toolkit for the New Normal

Communities

COVID Testing, etc.

Mind?

Moving Forward?

WORKSHOPS - WORKSHOPS - WORKSHOPS - WORKSHOPS - WORKSHOPS - WORKSHOPS

Meeting the countless challenges of today requires a culture of innovation. From developing new products like fertilizer or water reuse to internal initiatives like digital twins, utilities (and all types of organizations) can learn valuable lessons from the Lean Startup method. This 6-hour game simulation of the Lean Startup method lets you work as an entrepreneur or intrapreneur to build, measure, and learn as you develop your Minimum Viable Product and grow your initiative. Learn the techniques by playing Startup Mundi and transform your organizational culture with a new innovation and digital mindset.

Beneficial use of biosolids continues to be contested across the country. The first step in defending the use of biosolids as a valuable product is by running a strong biosolids program. However, utilities often struggle to identify what a mature, proactive biosolids program looks like. This workshop intends to address the gap that can exist in biosolids programs between technical excellence and program maturity, allowing participants to assess their own programs, and identify discrete steps towards improvement.

PFAS are a group of synthetic chemicals that have been in use for nearly 80 years in a variety of consumer products and industrial processes. They are ubiquitous in the environment and public concern is rapidly increasing. Evidence suggests that exposure above specific levels of some PFAS may lead to adverse health effects. Experts will help attendees understand the PFAS challenges facing industries that may be a source of these compounds and develop management solutions

This workshop will provide the audience with up-to-date information on available practical methods and algorithms that are useful for examining WRRF plant-operational and performance data. The attendees will learn how to choose a data algorithm and will gain hands-on experience in using various methods for data analysis. Focus will be given to fault detection and assigning causes to special events found in data sets. Both experts and novices will gain insight from this workshop on the application of control charting, multivariate statistics, and neural networks.

Attendees will learn how to use on-line analyzers to meet increasingly stringent nutrient limits. Vendor-neutral fundamentals of analyzers will be presented along with how they can be integrated into different strategies for nutrient control. Hands-on exercises will be used to demonstrate analyzer technology limitations, misapplications, and trouble-shooting. Proper instrument placement for different process configurations will also be presented. Various control strategies using on-analyzers for to meeting permit requirements while optimize costs will be discussed. Real world case studies where on-line analyzers have been used to control nutrient removal processes will be presented.

Are you being asked to improve dewatering performance? This workshop will focus on practical ways to get better cake solids and capture, reduce polymer consumption, and reduce O&M costs. We will cover dewatering and polymer "101," show videos of sludge/polymer flocculation, present successful case studies, and describe proven optimization measures that you can implement. Whether you are a plant manager, operator, consultant, or manufacturer, this workshop is for you.

This workshop focuses on the conceptualization and implementation of wet-weather storage projects for collection systems including tanks, pipelines and tunnels. Participants will explore the benefits of wet weather storage solutions and gain further understanding of the analysis needed to site and properly size a wet-weather storage facility. Lastly, we will address planning and design considerations, including the fundamentals of storage tank and tunnel design, construction, operation, and maintenance using real project case studies.

The wastewater and water reuse industry continues to advance the scientific understanding of the risks, fate and control of pathogens and constituents of emerging concern (CECs). This workshop will provide the latest information on risks, fate and control of pathogens and CECS including, antibiotic resistant genes and bacteria, hormonally active substances, pharmaceuticals, microplastics, personal care products, per- and poly-fluorinated alkyl compounds (PFAS) (including fire-fighting foams) in wastewater, non-potable reclaimed water, and purified reclaimed water for potable water reuse.

Membrane technologies play and will be playing an important role in the water reuse industry. In particular, membrane technologies have become an integrated component for DPR and IPR. Membrane roles and limitations will be discussed to benefit those who are considering to expand water supply portfolios by water reuse or those who want to improve the existing water reuse facilities.

The workshop is a combination of lecture, interactive breakout session led by speakers/facilitators, and facilitated group exercises that allow attendees to go through their ongoing plans and receive feedback from speakers/facilitators as well as attendees. The ultimate goal is to provide insight and feedback to attendees so they can begin/update their approaches. Discussions will be led by utility leaders in the stormwater management arena to describe how they have planned for stormwater management areas; how they have learned through years of operating grey, green, and blue infrastructure; and how unique aspects of their locations have required one-of-a-kind approaches. Participants will learn about "hot topics" in the field related to challenges with operations and maintenance of tunnel and green infrastructure to how sea level rise will impact stormwater management. Participants will be engaged through break-away sessions to focus on topical areas most relevant to attendees.

The workshop will focus on understanding existing dynamics, and considering innovative approaches and partnerships to transforming into communities' of the future through a water equity mission, and maximizing community benefits with water infrastructure investment through: possibilities of community and utility partnerships/outreach, expanding collaboration and supplier diversity, affordability programs for vulnerable communities, facilitating community resilience in the face of climate change, and integrating these triple bottom line factors into long-term watershed management and planning.

The workshop will present business process modeling methods, standards, and practices. A modeling framework will be presented that can be used to document, analyze, and improve the performance of water sector utilities utility. The workshop will also present the results of research regarding workforce and organizational culture, components that have a profound impact on an organization's ability to implement changes and achieve improvements.

Does your facility or collection system have neighbors angry about odor? This workshop will focus on interaction with the public, especially irate neighbors and those who are being asked to pay for system improvements. The workshop will progress from dealing with individuals to system-wide programs for public relations and justification of capital improvements. During the workshop you will develop strategies of your own in conjunction with other workshop participants.

The workshop identifies the critical need for training and development programs that address the "Whole Person" - not just technical skills that drive position performance, but the additional soft skills that drive employee engagement, progression and retention. The Bureau of Labor and Statistics recently released data that shows nearly 1/3 of the existing workforce is eligible for retirement within the next ten years. That is 47.7 million positions within the U.S. that will likely be filled by generation "Z" and Millennials, 27% of whom indicated a lack of opportunity to learn and grow was the main reason for leaving their last job (recent LinkedIn survey).

Organizations with more diverse and inclusive workforces are seeing better candidate attraction and more engaged employees – driving performance and increasing their competitive advantage. If organizations desire results, diversity and inclusion is exactly where they should focus their energy. We invite utility managers, utility staff, and workforce development professionals to participate in this interactive workshop on how to increase diversity and foster inclusion in your workforce. Participants will leave the workshop with a ready to implement toolkit as well as a greater understanding of what steps they can take to make actionable change in their organization.

Learning Objectives	Date
CAL SESSIONS - TECHNICAL SESSIONS - TECHNICAL SESSIONS - TECHNICAL SESSIONS -	
After this session, participants will be able to (1) speak with utilities who are in various stages of their digital transformation, (2) share what to do and not to do when beginning a utility digital transformation, and (3) see digital solutions in action and the tangible outcomes realized by utilities.	10/18/2021
	10/18/2021
(1) Determine Effective recruitment strategies for competitive and limited applicant situations. (2) Workplace culture issues that matter to the workforce of the future. (3) Assess The lessons of 2020 regarding the decentralized workplace (work from home).	10/18/2021
During the session, participants will (1) summarize innovations in asset collection/condition assessment, (2) become aware of new/emerging stormwater assets to be included in an AMP, and (3) learn about available data inputs and integrate O&M processes that feed into ongoing AMP.	10/18/2021
At the end of this session, participants will be able to (1) understand planning to mitigate the effects of natural disasters and aid in recovery of critical infrastructure and (2) discuss the many facets of resiliency as they pertain to concerns of utility managers and leadership with a broad spectrum of short-term and long-term considerations for sustainability and thoughts on decentralization	10/18/2021
At the end of this session, participants will be able to (1) plan for and implement use of alternate water sources, including industrial wastewater effluent, municipal wastewater effluent, and stormwater, to support industrial manufacturing and production activities, (2) recognize technology applications to achieve wastewater and stormwater reuse, and (3) determine water quality and regulatory considerations for applications of industrial effluent reuse.	10/18/2021
During this session, the attendee will (1) learn lessons from existing facilities meeting low effluent TP limits, (2) identify potential tertiary treatment alternatives to meet low effluent TP limits, and (3) learn about contractual approaches to deploying innovative technologies.	10/18/2021
At the end of this session, participants will be able to (1) identify the implications of co-digestion, (2) recognize innovations in design of co-digestion processes and importance of food waste characteristics, and (3) determine how bench scale studies could be used to optimize the process.	10/18/2021
At the end of the session, participants will be able to (1) understand the co-benefits and negative impacts stormwater management can bring to an area, (2) identify effective public involvement techniques, approaches and pitfalls related to stormwater management decisions, and (3) analyze common stormwater management public concerns/priorities and how they are addressed in the design phases.	10/18/2021

After this session participants will (1) have learned the latest developments in Direct Potable Reuse, (2) understand how different agencies are implementing potable reuse, and (3) understand the operator's perspective for potable reuse treatment facilities.	10/18/2021
After this session, participants will be able to (1) present ideas for solving water quality issues at the watershed level, (2) spark discussion on creating a watershed-wide collaborative for addressing water quality issues, and (3) explain assessing green stormwater infrastructure that can maximize its benefits to communities and regions using a Triple Bottom Line approach.	10/18/2021
By the end of this session, attendees will be able to (1) assess the latest available peracid (peracetic acid and performic acid) based disinfection technologies, (2) compare peracids with other disinfection technologies, and (3) determine the current regulatory environment around peracids with specific examples of state based regulatory development.	10/18/2021
After this session, participants will (1) assess major P-recovery technologies and their financial models and (2) summarize lessons learned on advancement in performance and design considerations.	10/18/2021
At the end of this session, participants will be able to (1) recognize methods for Reducing carbon emissions from wastewater facilities, (2) determine how to Establish carbon footprint of wastewater facilities, (3) and identify Alternatives to conventional treatment technologies.	10/18/2021
After this session participants will (1) recognize how anaerobic processes are being integrated into industrial WWTP flowsheets to expand capacity, reduce equipment footprints, recover energy, and improve nutrient control. They will (2) understand how various process technologies can be used to achieve treatment objectives and (3) reflect on the shared experiences of participants who have applied anaerobic processes at their facilities.	10/18/2021
This session will (1) examine the latest developments in applied research to implement PDNA full-scale and (2) give examples of the operational and process design considerations.	10/18/2021
After leaving this session, participants will be able to (1) select innovative ways to improve clarifier performance, (2) summarize the application of computational fluid dynamics, and (3) Make connections with industry experts on	10/18/2021
The Master Lecture will (1) provide audiences with overview and evolution on a specific water/wastewater related topic/issue from a renown professional with life-time achievement and (2) introduce audiences to latest developments and trends, and future perspectives on the topic.	10/18/2021
Participants will be able to (1) summarize the state of the art on treatment technologies for aqueous phase PFAS through recent research from different sectors, (2) discuss the occurrence, fate, and treatment of PFAS in landfill leachate, and (3) assess current and future directions on treatment technologies for aqueous phase PFAS.	10/18/2021
At the end of this session, participants will be able to (1) understand the benefits of increased utility coordination and engagement with advisory groups, (2) recognize a utility's positive experience with regionalization, and (3) determine how integrated plans can help utilities prioritize infrastructure needs enhance watershed health, and meet regulatory requirements in a cost-effective, sustainable manner.	10/18/2021

At the end of this session, participants will be able to (1) recognize the utility developed Innovation Planning Tool, (2) generate value by efficiently assessing current innovation environment and maturity, and (3) develop Utility Innovation Tool as a mechanism to provide a focused and aligned approach to utility innovation program development.	10/18/2021
(1) Familiarize the audience with relevant bacterial, viral, protozoan, helminthic and fungal pathogens (2) Improve the audience's understanding of viruses and the characteristics that impact their disinfection and inactivation – how they differ from bacteria (3) Introduce the concept of indicators and explain when they correlate with pathogens and illness (4) Discuss pathogen log removals in wastewater and sludge treatment (5) Discuss workforce safety issues related to exposures to pathogens with a specific focus on collection system practices, wastewater treatment, residuals and biosolids handling and aerosolization. (6) Provide a regulatory update from the EPA on coliphages and recreational water quality criteria.	10/19/2021
This session will (1) describe the Digital Twin concept, (2) evaluate the pros and cons of using digital twins, and (3) determine if using digital twins makes sense for a utility based upon information provided during this session.	10/19/2021
At the end of this session, participants will be able to (1) describe the fundamentals of the SBR AGS process, (2) explain the differences in the process requirements for continuous flow AGS versus SBR AGS, and (3) interpret AGS implications on solids unit and handling processes and other whole plant impacts.	10/19/2021
At the end of the session, participants will be able to (1) new advancements in primary treatment technologies, (2) benefits of these technologies in terms of energy, wet weather, and impact on secondary treatment, and (3) operational aspects of these technologies compared to conventional primary treatment.	10/19/2021
At the end of the session, participants will be able to (1) share knowledge on advancements of digestion technologies through co-digestion, (2) recognize possible uses of an advanced characterization technique to improve the efficiency of digestion, (3) and discuss the current and future directions on anaerobic digestion.	10/19/2021
After this session, participants will (1) recognize new energy recovery processes, (2) compare energy-water-nexus and treatment technologies for energy recovery, and (3) analyze new research in anaerobic digestion to enhance energy recovery.	10/19/2021
During this session, participants will (1) gain an understanding the process and value of developing and implementing a watershed-based asset management plan, (2) receive guidance, lessons learned, and importance on standardization methods for design, O&M and monitoring as a continuous improvement process for a comprehensive green infrastructure program, and (3) experience workforce development lessons learned from implementing the NGICP program along with changes made to enhance the program performance and increase success.	10/19/2021

At the end of this session, participants will be able to (1) recognize disparity in how different employee groups are served, (2) practice having open conversations centered around DE&I topics, and (3) develop a DE&I action plan with the steps necessary to establish a DE&I group within your organization.	10/19/2021
At the end of this session, participants will be able to (1) determine the best technology to utilize when making decisions, (2) prioritize issues when making financial decisions, and (3) evaluate which machine learning applications	10/19/2021
Goal #1: To learn about the challenges of providing public education and outreach during a pandemic when virtual platforms are most common. Goal #2: To learn from experts and innovators in the industry as to how we are adapting to the challenges of providing public education and outreach in a virtual world. Goal #3: To learn about how we as an industry will move forward in the future to continue adapting our programming in a virtual, in-person and/or hybrid world.	10/19/2021
At the end of this session, participants will be able to (1) determine how important Critical Control Points and Automation are to an effective disinfection system focused on potable reuse, (2) identify ICT and how it can be employed to optimize large-scale chemical disinfection systems, and (3) summarize how artificial intelligence and model predictive controls can be applied to potable reuse processes.	10/19/2021
At the end of this session, participants will be able (1) to use knowledge of I/I observations and address troublesome parameters such as basin size, I/I normalization, volumetric vs. intensity and flow monitoring practices, (2) describe I/I reduction associated with rehabilitation/replacement of private laterals, and (3) summarize state of the art	10/19/2021
At the end of this session, participants will be able to (1) establish COVID-19 fundamentals and how they relate to collection systems and WRRFs and (2) determine some of the risks and unknowns regarding COVID-19 in the wastewater industry, including the risks of infection and treatment process inhibition in WRRFs.	10/19/2021
Participants will be able to (1) establish the available methods for data analytics, (2) decide how the methods can be used for practical engineering problems, and (3) determine when to consider data-driven methods after leaving this session.	10/19/2021
After the session, participants will be able to (1) identify successful applications of asset management plans through to execution and (2) recognize examples of TOTEx opposed to just CapEx and OpEx in AMP.	10/19/2021
After this session, participants will be able to (1) develop strategies for getting the public to hear and act on important messages despite all the 'noise', (2) build and re-build trust and credibility in an anti-science environment, and (3) develop targeted communication for affected populations.	10/19/2021
At the end of this session, participants will be able to (1) understand how the events of the past 18 months have impacted various industry sectors, water use, wastewater production and treatment, (2) reflect on upcoming trends in the industrial water and wastewater treatment market, and (3) identify the drivers that will impact investments into industrial wastewater treatment.	10/19/2021

During this session, participants will (1) identify the importance of phosphorus assimilation in high rate activated sludge systems, (2) identify population dynamics and practices for nutrient removal intensification in a combined AvN-S2EBPR process, and (3) determine pressing research questions that still need to be addressed for intensification of nutrient removal processes.	10/19/2021
By the end of the session, participants will (1) recognize current trends and the state of the stormwater sector, (2) be able to identify Emerging trends in stormwater funding, operations & maintenance, and innovation, and (3) understand others' perspectives on the future of the stormwater sector.	10/19/2021
After this session participants will (1) understand how uncertainty techniques can be applied to planning efforts, (2) align uncertainty techniques with situations/project stages for their use, and (3) evaluate case studies that show how techniques were applied.	10/19/2021
At the end of this session, the participants will be able to (1) recognize the connection between creating space for innovation and leading agile organizations, (2) understand how to use WRF 4907 tools for planning activities, and (3) determine tactics for broadly engaging their leadership and workforce and to develop ideas and accelerating impact.	10/19/2021
Leaving this session participants will be able to recognize and evaluate (1) the impacts of developing watershed-based strategies for addressing nutrient loading in receiving streams, (2) minimizing phosphorus treatment at treatment plants, and (3) modeling and monitoring to update regulatory nutrient criteria.	10/19/2021
After the session, participants will be able to (1) recognize innovative force main condition assessment techniques, (2) determine new approaches for force main rehab while main is in service, and (3) summarize best practices during an emergency force main rehab.	10/19/2021
At the end of this session, participants will be able to (1) determine fundamentals of ammonia-based aeration control, (2) recommend new ways to save on energy using ammonia-based aeration control, and (3) assess if your ABAC control system is working.	10/19/2021
Participants will be able to (1) identify how emerging contaminants play a role in the water cycle including biosolids, (2) determine how regulators are looking at emerging contaminants, and (3) give examples of tools to use when	10/19/2021
At the end of this session, participants will be able to (1) identify the types of difficult activated sludge solid/liquid separation problems encountered in practice can be solved, (2) recognize that solutions may go beyond textbook design and operational guidance, (3) and express an appreciation of the differences and similarities between activated sludge design and operational practice at municipal and industrial facilities.	10/19/2021
(1) Determine the setpoints for low DO (2) Determine How are nitrification, denitrification, and phosphorus removal kinetics impacted by low DO operation (3) Analyze the role carbon cycling play in successful low DO BNR system (4) Determine How we maintain good settleability in low DO BNR systems	10/19/2021
After this session, participants will be able to (1) explain how models can be applied to identify energy savings opportunities, (2) give examples about potential synergies between WRRF treatment and emerging green energy technologies, and (3) identify the roles WRRFs can play in advancement towards green energy and decarbonizing the economy.	10/19/2021

At the end of this session, participants will be able to (1) share updates on recent developments on novel water and wastewater treatment approaches for pharmaceuticals, (2) understand a new approach to model biodegradation and sorption of pharmaceuticals in water and wastewater, and (3) evaluate current and future directions on risk, regulation, and treatment technologies for pharmaceuticals.	10/19/2021
By the end of the session, participants will be able to (1) determine how to produce a marketable product, (2) analyze how upstream technology impacts composting, and (3) identify innovative solutions to improve dewatering.	10/19/2021
At the end of this session, participants will be able to (1) recognize two different ways to evaluate their current community for flood mitigation, (2) distinguish between the types of stormwater control measures that can be used for flood mitigation, (3) and evaluate how other communities are adding resiliency to their stormwater infrastructure/planning for increased rainfall for climate change.	10/19/2021
After this session participants will (1) understand how uncertainty techniques can be applied to planning efforts, (2) align uncertainty techniques with situations/project stages for their use, and (3) evaluate case studies that show how techniques were applied.	10/19/2021
After attending this panel, participants will be able to (1) determine what obstacles continue to make water reuse projects difficult to implement, (2) understand what strategies stakeholders can employ to succeed in implementing water reuse projects, and (3) discuss how the National Water Reuse Action Plan (WRAP) demonstrates the integrated nature of water reuse that can be used to facilitate water reuse projects.	10/19/2021
After this session, attendees will be able to (1) summarize constructability considerations to keep in mind when planning for a construction project, (2) give examples of different construction methods available for collection system projects, and (3) critique lessons learned during construction that can be applied to other projects.	10/20/2021
Attendees will be able to (1) recognize the evolution of UV technology and the development of new applications such as UV LED and UV-Hydraulic Optical Disinfection and (2) understand the wide range of applications UV disinfection ranging from the disinfection of potable, primary, secondary, tertiary, and advanced purified effluents.	10/20/2021
After this session, attendees will be able to (1) assess the balance between the automation needs and the cybersecurity requirements, (2) establish anticipated data and automation needs for the future and (3) cybersecurity constraints in the future.	10/20/2021
At the end of the session, participants will be able to (1) assess odor impacts on neighborhood stakeholders, (2) select good odor mitigation strategies and technologies, and (3) evaluate odor mitigation impacts on downstream WRRF processes.	10/20/2021
At the end of this session, participants will be able to (1) identify the existing needs for new modeling tools, using a temperature model case study, (2) assess case study exercises on how to resolve WET compliance issues, (3) and understand how different treatability test methods can enhance design and operation of full-scale systems.	10/20/2021
At the end of the session, participants will be able to (1) establish how PDNA fits in a flowsheet, (2) determine the main challenges for PDNA implementation and how to overcome them, and (3) identify actual benefits of PDNA.	10/20/2021

After this session, participants will be able to (1) establish overall design guidelines on MBR application and (2) determine how to use and control MBR using more advanced tool such as digital twin.	10/20/2021
After this session, participants will be able to (1) discuss the New EPA's 2021 Multi-Sector General Permit (MSGP) for stormwater discharges from Industrial Activities and permit applicability, (2) determine the best method for overcoming compliance challenges, and (3) create a decision tree/flowchart on chemically enhanced stormwater treatment processes for industrial activities.	10/20/2021
During this session participants will learn to (1) convey experiences with planning, design and construction approaches to improve system resiliency, (2) relate resiliency challenges across different parts of the country to relate common themes for all utilities, and (3) discuss different approaches to planning for resiliency and system vulnerabilities.	10/20/2021
At the end of this session, participants will be able to (1) determine the best technology to utilize when making decisions, (2) prioritize issues when making financial decisions, and (3) evaluate which machine learning applications to use to when making management decisions.	10/20/2021
After this session, participants will be able to (1) Examine microconstituents and their importance with a broader understanding, (2) identify various strategies that can be implemented for microconstituent removal, and (3) recognize how bench scale testing, pilot testing, and case studies are needed before scaling to full size.	10/20/2021
In this session, participants will learn to (1) decide what type of calibration technique to select for which conditions, (2) determine the cost of development, and (3) compare the benefits and drawbacks during alternatives analysis based on different types of calibration technique.	10/20/2021
During this session, attendees will (1) become familiar with latest information available on fate and transport of microplastics in wastewater, recycled water, and biosolids, (2) determine the risks and environmental concerns with microplastics in wastewater and recycled water, and (3) explain the advances on monitoring of microplastics that seek to protect water quality and the environment.	10/20/2021
During this session, participants will (1) discuss new trends in instrumentation, (2) find out utility experiences with instrumentation, and (3) discuss instrumentation across a range of locations in the Urban Wastewater system.	10/20/2021
After this session, participants will be able to (1) determine approaches to reduce N2O emissions from innovative N-removal processes and (2) evaluate measurement techniques for N2O emissions.	10/20/2021
At the end of this session, participants will be able to (1) discuss the importance of having and using the outlook of diverse staff members to identify areas of inequity, (2) acknowledge and spread awareness of inequity issues, and (3) find solutions to inequity within your service area.	10/20/2021
By the end of this session, participants will be able to (1) share success and failure perspectives on bioaugmentation, (2) understand circumstances under which bioaugmentation is best applied, and (3) discuss the latest applied developments in aerobic membrane process.	10/20/2021
(1) Identify the importance of readily biodegradable carbon (rbCOD) on biological nutrient removal efficacy. (2) Identify how facilities have overcome low rbCOD challenges to meet strict nutrient limits. (3) Discover the operational and maintenance considerations associated with sludge fermentation.	10/20/2021
At the end of the session, participants will be able to (1) determine what is the intensification potential of moving media for nutrient removal, (2) recognize how five different intensification or enhancement technologies improved performance, and (3) recall IFAS mainstream anammox with phosphorus removal research.	10/20/2021

After the session, participants will be able to (1) identify Stormwater compliance similarities and differences in different regions of the country, (2) critique Innovations around particularly challenging municipal stormwater permit requirements, and (3) establish a shared understanding of future directions of municipal stormwater compliance programs.	10/20/2021
In this session, participants will learn to (1) identify potential tools to help develop and manage a CIP, (2) determine how to optimize a CIP with strategic planning, and (3) communicate the benefits of a CIP to the community.	10/20/2021
When leaving this session participants will be able to (1) discuss the latest developments in obtaining pathogen log removal credits for MBRs, (2) understand how different log removal credit approaches compare, and (3) appreciate how ten-year-old membranes are holding up and still achieving pathogen log removal.	10/20/2021
(1) Define WBE and the steps involved in wastewater surveillance. (2) Discuss methodological challenges in sample collection. (3) Familiarize audience with sample processing standardization challenges. (4) Highlight the importance of normalization of results. (5) Discuss challenges in making results actionable and useful for decision makers. (6) Discuss how to communicate results to the public and privacy issues.	10/20/2021
After this session participants will be able to (1) compare design and operational results from full-scale S2EBPR processes, (2) determine design guidelines and considerations when implementing S2EBPR, and (3) evaluate process control and optimization strategies of EBPR facilities.	10/20/2021
After this session, participants will be able to understand the (1) application of coagulation/flocculation, adsorption and carbon dioxide (CO ₂) sparging to remove heavy metals, dioxins and furans from groundwater and wastewater, (2) microbial recovery of selenium nanoparticles through selenite reduction, and (3) noble metal (Au, Ag, Pt and Pd) deposited TiO ₂ photocatalysts for the reduction of selenate from water.	10/20/2021
After this session participants will be able to (1) evaluate the current status of the MABR tech for full-scale implementation and (2) recognize the actual intensification capacity of MABR in various applications.	10/20/2021
At the end of this session, participants will be able to (1) describe the fundamentals of the SBR AGS process, (2) explain the differences in the process requirements for continuous flow AGS versus SBR AGS, and (3) interpret AGS implications on solids unit and handling processes and other whole plant impacts.	10/20/2021
After this session, attendees will be able to (1) apply technologies to wet weather treatment, (2) summarize the wet weather treatment process from start to finish, and (3) explain how innovative use of technology allows for more resiliency in treatment operations under high flow conditions.	10/20/2021
After attending this session, participants will (1) recognize legislative issues associated with energy production and revenue, (2) assess the costs and challenges with operation and management of converting biogas to RNG, and (3) determine the advantages and disadvantages to co-digestion with food waste.	10/20/2021

At the end of this session, participants will be able to (1) provide practical examples of how digital technology and advanced analytics have been successfully applied within the Water Sector, (2) demonstrate how to successfully integrate data analytics tools and applications so they can be better leveraged across the organization, and (3) validate the importance of the human element in the deployment of advanced analytics and technology, to ensure the results obtained are in line with desired outcomes and to provide an interactive interface to ensure hands-on participation and review.	10/20/2021
At the end of this session, participants will be able to (1) recognize the benefits for a CMAR delivery process, (2) examine case study of a CMAR project from planning and pre-construction through commissioning, and (3) determine the drivers for a Progressive Design-Build delivery process.	10/20/2021
Leaving this session, participants will be able to (1) share knowledge on the state of the science in real-time predictive modeling techniques, (2) compose and present data in a format accessible to the public, and (3) identify the success and challenges of public communications around pathogens.	10/20/2021

- LEARNING EXCHANGES - LEARNING EXCHANGES - LEARNING EXCHANGES - LEARNING EXCHANGES - LEARNING EXCHANGES

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	10/12/2021
(1) Using the workshop-provided tools to benchmark their program using the maturity model concept, (2) seeing effective examples of how to apply the concept to a biosolids program (through case studies), (3) gaining familiarity with WEF publications and other tools to support their program, (4) effectively apply the maturity model to further develop their own biosolids program, and (5) identifying clear next steps and action items to improve their program's maturity.	10/13/2021
(1) Understand the relationship between PFAS and potential adverse human health effects. (2) Learn the latest regulatory actions. (3) Identify the potential legal risks, primarily for commercial and industrial stakeholders. (4) Apply the latest sampling techniques to case studies. (5) Understand the latest analytical techniques and their limitations. (6) Understand relative impact of source control compared to treatment approaches. (7) Learn potential treatment options and treatment limitations in context with sampling and analytical limitations and sources of contamination. (8) Work in a group and select an appropriate sampling and treatment solution to a PFAS contaminated industrial or commercial site. (9) Revise solution to account for industrial pre-treatment requirements, disinfection and residuals management. (10) Defend solution to other groups.	10/17/2021

<p>A focus will be placed on the practical application of data treatment algorithms that can be used to detect anomalies in the data sets and to assign causes to the anomalies. At the end of the workshop, the participants will have (1) learned how to choose an appropriate WRRF data model/algorithm to aid in analysis, (2) gained experience with WRRF data preparation methods that allow algorithm use (3) used a data model to identify features, special events/causes in a data set. To help in meeting learning objectives, the workshop participants can use the workshop slides and the related example data sets to try the exercise on their own after WEFTEC. [b]Any supporting materials (e.g. WRRF and simulated data sets, Excel sheets, python scripts) will be made available for download[/b].</p>	<p>10/17/2021</p>
<p>(1) Understand the fundamental measurement principles utilized for ammonia, phosphate and nitrate analyzers. (2) Define the difference between monitoring and control, and which technologies are applicable to each term. (3) Recognize technology limitations, and how they can affect measurements. (4) Identify potential errors and interferences for the technologies, and how they influence measurements. (5) Discover how position and control strategy of installed instrumentation in the treatment process affect the measured parameter, incorporating control strategies to improve the effectiveness and reduce operating costs of the treatment process.</p>	<p>10/17/2021</p>
<p>Attendees at this workshop will learn (1) What defines dewaterability (2) How upstream processes impact dewaterability (3) How different types of dewatering equipment work (4) How to complete mechanical optimization of existing dewatering systems (5) What polymer is, why it is used in dewatering, and how to make it most effective in its function (6) The state-of-the-practice technologies for polymer makedown and mixing with sludge (7) How to conduct sludge/polymer mixing tests to assess polymer effectiveness (8) Operational changes successfully implemented by others to improve dewatering at their facilities (9) Process, sampling, data analysis, and management changes successfully implemented by others to improve dewatering at their facilities</p>	<p>10/17/2021</p>
<p>(1) Learn what are the relevant data needed to identify storage as a wet weather management option, and how to properly locate and size a wet weather storage facility. (2) Understand the cost-effectiveness process that leads into successful wet weather storage projects by contrasting storage solutions with conventional conveyance solutions and demonstrate the benefit of properly implemented projects. (3) Learn other planning and design considerations, including the fundamentals of storage tank and storage tunnel construction, operation, and maintenance using real project case studies. (4) Bring added value to your wet weather storage facility to enhance your overall system operation and show ways to optimize its design/operation to meet different goals beyond the occasional wet weather event.</p>	<p>10/17/2021</p>
<p>Upon completion of the workshop participants will: (1) Be familiar with current information available on CECs in WWTP effluents and recycled water (2) Understand the risks and other implications of these constituents in wastewater and recycled water (3) Learn about emerging technologies and treatment approaches being developed to ensure CEC and pathogen removal (4) Become familiar with the status of recent regulatory plans and policies related to pathogens and CECs (5) Learn about advances on analytical testing and monitoring of pathogens and CECs that seek to protect public health and water quality (6) Learn about latest advances and initiatives related to quantitative microbial risk assessment and emerging analytical bioassays</p>	<p>10/17/2021</p>
<p>(1) An update on membrane technologies and the evolution of the technology (2) Analysis of current membrane applications when exploring Water Factory 21 and new Ground Water Replenishment Advanced Water Treatment Facility (Orange County, CA) (3) Have a better understanding regarding effectiveness and limitations when looking towards providing a barrier for both pathogens and microconstituents (4) Hear from Orange County Water District regarding the effectiveness of PFAS removal, via RO Membranes, based on field data currently being collected and tested at their Facilities (5) Demonstrate the importance of membrane integrity (6) Provide a perspective on how energy factors into the decision making process for a water reuse project and how it could change (7) An understanding of the future uses of membrane technologies for water reuse applications</p>	<p>10/17/2021</p>

<p>Attendees of this workshop will learn: (1) How to identify important considerations when creating or modifying a stormwater management plan; (2) Identify how to create and modify a stormwater management plan including how to organize the plan, how to prioritize items listed on the plan, etc; (3) Learn about how communities have balanced expansion v. rehabilitation v. replacement against other important items such as community benefit, cost, environmental factors, etc.; (4) Learn about the differences between blue, grey, and green infrastructure. Understand how selection of one strategy in a given area was determined; (5) Understanding how pilot studies to determine efficacy of different stormwater management approaches were selected, designed, and implemented. (6) Learn from utilities how the costs to construction, operate, and maintain different stormwater management systems has changed based on what they predicted and what their plans are moving forward; (7) Identify green infrastructure operation and maintenance requirements and quantitative understanding of efforts compared to grey infrastructure as shared by utility leaders.</p>	<p>10/17/2021</p>
<p>(1) Hear about successes and lessons learned from utility managers that are developing integrated water infrastructure management plans inclusive of addressing community vulnerabilities and collaborative approaches to multi-disciplinary solutions. (2) Build a deeper understanding of water equity issues and the need for holistic and cross-sector engagement in infrastructure and climate change planning. (3) Collaborate with facilitators and fellow attendees and to develop individual equity roadmaps/outlines, with follow-action items.</p>	<p>10/17/2021</p>
<p>Participants in the workshop will learn about the business process modeling concepts, the standard notation used for business process modeling, and will be introduced to a business reference model developed specifically for water sector utilities. They will see case studies to show how business process models were used to document, analyze, and improve business processes. Additionally, they will be able to learn about maturity models and assessment methods for organizational culture and workforce.</p>	<p>10/17/2021</p>
<p>Learning objectives will include participants being able to develop complaint forms and public relations programs based on the interviews, discussions, and interactive role-playing included in the workshop.</p>	<p>10/18/2021</p>
<p>(1) Gain a better understanding of the meaning of "Soft Skills" (2) Learn what other organizations are doing to promote and retain talent (3) Understand the cultural factors of leader development (4) Discuss the concepts and attributes of a learning organization, one that supports a well-rounded workforce in all water and wastewater areas including field services, engineering, plant operations and maintenance, and construction management. (5) Identify resources available to assist in developing a "holistic" training program, one that addresses a person's current needs (specific job/ task training) and meets the expectations of future progression within the organization (team leader, supervisor, manager, etc.). (6) Identify programs that enable employees to gain increased knowledge and high-value skills without waiting for vacancies to create promotional opportunities.</p>	<p>10/19/2021</p>
<p>Participants will leave this workshop with increased awareness of the impacts of bias on work culture, employee engagement and retention, innovation and success. They will recognize the role of both the individual and organization in either perpetuating or correcting for bias and leave with real world examples of how agencies are beginning to address their biases. Desired outcomes for participants include: (1) Gaining familiarity with bias and other institutional barriers to building a diverse and inclusive culture (2) Identifying biases within themselves and their organizations (3) Understanding the impact of bias on workplace culture (4) Understanding where they are and feel like improvement is possible (5) Understanding what steps they can take to make actionable change in their organization</p>	<p>10/18/2021</p>

Start Time	End Time	Total CE Hours (PDHs & CEUs)	Symposia Affiliation
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TECHNICAL SESSIONS - TECHNICAL SESSIONS - TECHNICAL SESSIONS - TEC

1:30PM	2:30PM	1.00	Collections Systems
1:30PM	3:00PM	1.50	Public Health and Disinfection
1:30PM	3:00PM	1.50	Collections Systems^Facilities Operations^Municipal^Utility Management
1:30PM	3:00PM	1.50	Facilities Operations^Utility Management
1:30PM	2:30PM	1.00	Future Issues^Utility Management
1:30PM	3:00PM	1.50	Industrial^Stormwater^Water Reuse
1:30PM	2:30PM	1.00	Facilities Operations^Municipal
1:30PM	2:30PM	1.00	Residuals and Biosolids
1:30PM	3:00PM	1.50	Stormwater

1:30PM	3:00PM	1.50	Facilities Operations^Future Issues^Public Health and Disinfection^Water Reuse
1:30PM	3:00PM	1.50	Watershed
4:00PM	5:30PM	1.50	Public Health and Disinfection
4:00PM	5:30PM	1.50	Facilities Operations^Municipal^Research & Innovation
4:00PM	5:30PM	1.50	Future Issues^Research & Innovation
4:00PM	5:00PM	1.00	Industrial
4:00PM	5:30PM	1.50	Facilities Operations^Municipal^Research & Innovation
4:00PM	5:30PM	1.50	Municipal
4:00PM	5:00PM	1.00	Research & Innovation
4:00PM	5:30PM	1.50	Research & Innovation
4:00PM	5:00PM	1.00	Utility Management

4:00PM	5:30PM	1.50	Utility Management
11:00AM	12:30PM	1.50	Public Health and Disinfection^Residuals and Biosolids
11:00AM	12:30PM	1.50	Facilities Operations^Municipal^Research & Innovation
11:00AM	12:00PM	1.00	Facilities Operations^Municipal^Research & Innovation
11:00AM	12:00PM	1.00	Municipal
11:00AM	12:00PM	1.00	Industrial^Research & Innovation^Residuals and Biosolids
11:00AM	12:00PM	1.00	Residuals and Biosolids
11:00AM	12:30PM	1.50	Stormwater

11:00AM	12:30PM	1.50	Utility Management
11:00AM	12:00PM	1.00	Research & Innovation^Utility Management^Watershed
11:00AM	12:30PM	1.50	Utility Management
11:00AM	12:00PM	1.00	Facilities Operations^Industrial^Public Health and Disinfection^Water Reuse
1:30PM	3:00PM	1.50	Collections Systems
1:30PM	3:00PM	1.50	Collections Systems^Public Health and Disinfection^Research & Innovation
1:30PM	3:00PM	1.50	Facilities Operations^Municipal^Research & Innovation
1:30PM	2:30PM	1.00	Facilities Operations^Utility Management
1:30PM	3:00PM	1.50	Collections Systems^Future Issues^Public Health and Disinfection^Utility Management
1:30PM	3:00PM	1.50	

1:30PM	2:30PM	1.00	Municipal^Research & Innovation
1:30PM	3:00PM	1.50	Stormwater
1:30PM	3:00PM	1.50	Utility Management
1:30PM	3:00PM	1.50	Utility Management
1:30PM	3:00PM	1.50	Watershed
4:00PM	5:30PM	1.50	Collections Systems
4:00PM	5:30PM	1.50	Facilities Operations^Municipal^Research & Innovation
4:00PM	5:00PM	1.00	Facilities Operations
4:00PM	5:30PM	1.50	Industrial^Municipal
4:00PM	5:30PM	1.50	Facilities Operations^Municipal^Research & Innovation
4:00PM	5:00PM	1.00	Facilities Operations^Municipal

4:00PM	5:30PM	1.50	Research & Innovation
4:00PM	5:00PM	1.00	Residuals and Biosolids
4:00PM	5:30PM	1.50	Stormwater
4:00PM	5:30PM	1.50	Utility Management
4:00PM	5:00PM	1.00	Industrial^Water Reuse
8:30AM	10:00AM	1.50	Collections Systems
8:30AM	10:00AM	1.50	Public Health and Disinfection
8:30AM	9:30AM	1.00	Facilities Operations^Municipal^Research & Innovation
8:30AM	9:30AM	1.00	Collections Systems^Facilities Operations
8:30AM	9:30AM	1.00	Industrial
8:30AM	9:30AM	1.00	Facilities Operations^Municipal^Research & Innovation

8:30AM	9:30AM	1.00	Municipal
8:30AM	10:00AM	1.50	Industrial^Stormwater
8:30AM	10:00AM	1.50	Utility Management
8:30AM	9:30AM	1.00	Utility Management^Watershed
8:30AM	10:00AM	1.50	Public Health and Disinfection^Water Reuse
11:00AM	12:30PM	1.50	Collections Systems
11:00AM	12:30PM	1.50	Public Health and Disinfection^Residuals and Biosolids^Water Reuse
11:00AM	12:00PM	1.00	Facilities Operations^Municipal^Research & Innovation
11:00AM	12:00PM	1.00	Facilities Operations^Municipal^Research & Innovation
11:00AM	12:30PM	1.50	
11:00AM	12:30PM	1.50	Industrial
11:00AM	12:00PM	1.00	Facilities Operations^Municipal
11:00AM	12:00PM	1.00	Municipal

11:00AM	12:30PM	1.50	Future Issues^Research & Innovation^Stormwater^Watershed
11:00AM	12:30PM	1.50	Utility Management
11:00AM	12:30PM	1.50	Public Health and Disinfection^Water Reuse
1:30PM	3:00PM	1.50	Municipal^Public Health and Disinfection^Research & Innovation
1:30PM	3:00PM	1.50	Facilities Operations^Municipal
1:30PM	3:00PM	1.50	Industrial
1:30PM	2:30PM	1.00	Facilities Operations^Municipal
1:30PM	2:30PM	1.00	Facilities Operations^Municipal^Research & Innovation
1:30PM	3:00PM	1.50	Municipal
1:30PM	2:30PM	1.00	Residuals and Biosolids

1:30PM	3:00PM	1.50	Research & Innovation^Utility Management^Water Reuse^Watershed
1:30PM	3:00PM	1.50	Utility Management
1:30PM	3:00PM	1.50	Public Health and Disinfection^Watershed

LEARNING EXCHANGES - LEARNING EXCHANGES - LEARNING EXCHANGES - LEARNING EXCHANGES

3:00PM	4:00PM	1.00	
3:00PM	4:00PM	1.00	
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3:00PM	4:00PM	1.00	
3:00PM	4:00PM	1.00	
3:00PM	4:00PM	1.00	
10:00AM	11:00AM	1.00	
10:00AM	11:00AM	1.00	
10:00AM	11:00AM	1.00	
10:00AM	11:00AM	1.00	

WORKSHOPS - WORKSHOPS - WORKSHOPS - WORKSHOPS - WORKSHOPS

12:00PM	6:00PM	0.35	
1:00PM	5:00PM	0.35	
8:30AM	5:00PM	0.6	

8:30AM	12:00PM	0.3	
8:30AM	12:00PM	0.3	
8:30AM	5:00PM	0.6	
1:30PM	5:00PM	0.3	
1:30PM	5:00PM	0.3	
1:30PM	5:00PM	0.3	

Focus Areas

TECHNICAL SESSIONS - TECHNICAL

Collection Systems; Intelligent Water; Stormwater, Green Infrastructure, and Wet Weather; Sustainability and Climate Change

Disinfection and Public Health; Microconstituents

Collection Systems; Facility Operations and Maintenance; Municipal Wastewater Treatment Design; Utility Management and Leadership

Asset Management; Intelligent Water; Resilience, Disaster Planning and Recovery

Resilience, Disaster Planning and Recovery; Sustainability and Climate Change; Utility Management and Leadership

Industrial Issues and Treatment Technologies; Stormwater, Green Infrastructure, and Wet Weather; Sustainability and Climate Change; Water Reuse and Reclamation

Municipal Wastewater Treatment Design; Nutrients

Biosolids and Residuals; Energy Production, Conservation, and Management; Research and Innovation

Public Communication and Outreach; Stormwater, Green Infrastructure, and Wet Weather; Sustainability and Climate Change

Disinfection and Public Health; Policy and Regulation; Sustainability and Climate Change; Water Reuse and Reclamation; Water Supply and Management

Asset Management; Nutrients; Policy and Regulation; Watershed Management, Water Quality, and Groundwater

Disinfection and Public Health; Municipal Wastewater Treatment Design; Policy and Regulation; Sustainability and Climate Change

Biosolids and Residuals; Facility Operations and Maintenance; Nutrients

Global Perspectives; Research and Innovation; Sustainability and Climate Change; Utility Management and Leadership

Energy Production, Conservation, and Management; Global Perspectives; Industrial Issues and Treatment Technologies; Nutrients

Facility Operations and Maintenance; Municipal Wastewater Treatment Design; Nutrients; Research and Innovation

Facility Operations and Maintenance; Municipal Wastewater Treatment Design

Microconstituents

Sustainability and Climate Change; Utility Management and Leadership; Water Supply and Management

Research and Innovation; Utility Management and Leadership

Laboratory Practices; Safety and Security; Watershed Management, Water Quality, and Groundwater

Facility Operations and Maintenance; Intelligent Water; Research and Innovation; Resilience, Disaster Planning and Recovery

Facility Operations and Maintenance; Intelligent Water; Research and Innovation

Advanced Level; Facility Operations and Maintenance; Municipal Wastewater Treatment Design

Biosolids and Residuals

Biosolids and Residuals; Energy Production, Conservation, and Management; Research and Innovation

Asset Management; Stormwater, Green Infrastructure, and Wet Weather

Policy and Regulation; Research and Innovation; Utility Management and Leadership
Asset Management; Intelligent Water; Policy and Regulation; Utility Management and Leadership
Public Communication and Outreach
Disinfection and Public Health; Facility Operations and Maintenance; Intelligent Water; Water Reuse and Reclamation
Collection Systems
Disinfection and Public Health; Facility Operations and Maintenance; Research and Innovation; Safety and Security
Facility Operations and Maintenance; Intelligent Water; Resilience, Disaster Planning and Recovery
Asset Management; Intelligent Water; Resilience, Disaster Planning and Recovery
Disinfection and Public Health; Public Communication and Outreach; Utility Management and Leadership

Nutrients; Research and Innovation
Policy and Regulation; Research and Innovation; Stormwater, Green Infrastructure, and Wet Weather; Urban Systems
Biosolids and Residuals; Energy Production, Conservation, and Management; Nutrients; Resilience, Disaster Planning and Recovery
Facility Operations and Maintenance; Research and Innovation; Resilience, Disaster Planning and Recovery; Utility Management and Leadership
Nutrients; Policy and Regulation; Watershed Management, Water Quality, and Groundwater
Collection Systems
Facility Operations and Maintenance; Intelligent Water; Research and Innovation; Resilience, Disaster Planning and Recovery
Facility Operations and Maintenance; Microconstituents; Policy and Regulation; Public Communication and Outreach
Facility Operations and Maintenance; Industrial Issues and Treatment Technologies; Municipal Wastewater Treatment Design
Facility Operations and Maintenance; Municipal Wastewater Treatment Design; Research and Innovation
Energy Production, Conservation, and Management; Municipal Wastewater Treatment Design; Research and Innovation; Sustainability and Climate Change

Microconstituents
Biosolids and Residuals; Facility Operations and Maintenance
Stormwater, Green Infrastructure, and Wet Weather; Sustainability and Climate Change
Biosolids and Residuals; Energy Production, Conservation, and Management; Nutrients; Resilience, Disaster Planning and Recovery
Policy Regulation; Water Reuse and Reclamation
Collection Systems
Disinfection and Public Health; Energy Production, Conservation, and Management; Facility Operations and Maintenance
Facility Operations and Maintenance; Intelligent Water; Resilience, Disaster Planning and Recovery; Safety and Security
Facility Operations and Maintenance; Odors and Air Quality; Public Communication and Outreach
Industrial Issues and Treatment Technologies; Policy and Regulation
Facility Operations and Maintenance; Municipal Wastewater Treatment Design; Nutrients; Research and Innovation

Municipal Wastewater Treatment Design
Industrial Issues and Treatment Technologies; Policy and Regulation; Stormwater, Green Infrastructure, and Wet Weather
Resilience, Disaster Planning and Recovery; Sustainability and Climate Change; Utility Management and Leadership
Asset Management; Policy and Regulation; Utility Management and Leadership
Collection Systems
Biosolids and Residuals; Disinfection and Public Health; Microconstituents; Water Reuse and Reclamation
Facility Operations and Maintenance; Intelligent Water; Research and Innovation; Resilience, Disaster Planning and Recovery
Facility Operations and Maintenance; Municipal Wastewater Treatment Design; Nutrients; Sustainability
Industrial Issues and Treatment Technologies; Research and Innovation
Facility Operations and Maintenance; Municipal Wastewater Treatment Design; Nutrients
Municipal Wastewater Treatment Design; Research and Innovation

Policy and Regulation; Stormwater, Green Infrastructure, and Wet Weather; Utility Management and Leadership; Watershed Management, Water Quality, and Groundwater
Asset Management; Utility Management and Leadership
Disinfection and Public Health; Microconstituents; Policy and Regulation; Research and Innovation; Water Reuse and Reclamation
Laboratory Practices; Public Communication and Outreach; Utility Management and Leadership
Facility Operations and Maintenance; Municipal Wastewater Treatment Design; Nutrients
Industrial Issues and Treatment Technologies
Energy Production, Conservation, and Management; Municipal Wastewater Treatment Design; Nutrients
Facility Operations and Maintenance; Municipal Wastewater Treatment and Design; Research and Innovation
Facility Operations and Maintenance; Municipal Wastewater Treatment Design; Resilience, Disaster Planning and Recovery
Biosolids and Residuals; Energy Production, Conservation, and Management; Policy and Regulation

