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Multi-State Salinity Coalition

Addressing the CHALLENGES in a time like no other

2022 ANNUAL SALINITY SUMMIT

February 24–25, 2022 Tuscany Suites & Casino Las Vegas, Nevada

The exchange of information is paramount in developing and implementing policies for successful desalination programs. The Multi-State Salinity Coalition's Summit proves to be an excellent venue for this exchange, and will prove to be a benchmark in enhancing the continued efforts in managing these resources. It would not be possible for MSSC to host the Summit without the support of our sponsors, dedication from our speakers and moderators, and participation of our guests.

On behalf of the Multi-State Salinity Coalition Board of Directors and Planning Committee, thank you for your continuous dedication. We look forward to a great Summit.

2022 Annual Salinity Summit
Multi-State Salinity Coalition

Tuscany Suites & Casino • February 24-25, 2022

Greetings, MSSC Summit Attendees

Greetings, and welcome to the National Salinity Summit! The 2022 National Salinity Summit Planning Committee did an excellent job of bringing together a strong program. This year's Summit will include sessions that focus on salinity management, desalination project implementation strategies and approaches, water/power co-location, addressing regulatory and environmental hurdles, and future strategies to manage desalination and concentrate management.

I would like to extend my thanks to all of the 2022 Annual Summit's generous sponsors. The success of the Summit would not be possible without their support and dedication to the MSSC. All of the sponsors are listed in this brochure. We also have them listed on the MSSC website and will provide a link to their sites as advertisement to them. Please take a moment to thank them during the event. In addition to the success of the event, their support allows the MSSC to hold the event at a reasonable cost to Summit attendees.

It has been a pleasure to serve as the Multi State Salinity Coalition President. I have enjoyed working with such an intelligent and talented planning committee. Please take the time to fill out the evaluation forms that are provided for you in the registration packets. Your comments will help us provide the best quality events in the future. I look forward to seeing you here at the Summit!

Best Regards,

Scott Reinert
President, Multi State Salinity Coalition

2022 Annual Salinity Summit
Multi-State Salinity Coalition

Tuscany Suites & Casino • February 24-25, 2022

Conference Schedule

Wednesday, February 23, 2022

1:00 p.m. – 7:00 p.m.	**Exhibitor and Poster Presentation Set Up**
4:00 p.m. – 7:00 p.m.	**Summit Conference Registration**
5:00 p.m. – 6:30 p.m.	**MSSC Board Meeting**
6:30 p.m. – 8:00 p.m.	**MSSC Board, Platinum Sponsor VIP Party**

Thursday, February 24, 2022

7:00 a.m. – 4:00 p.m. **Summit Conference Registration**

7:00 a.m. – 8:30 a.m. **Breakfast with the MSSC Board Members Round Table**

Moderator: **Mark Norton,** *Water Resources & Planning Manager, Santa Ana Watershed Project Authority*

Speakers:

MSSC Board Members

8:30 a.m. – 8:40 a.m. **Opening Remarks**

Scott Reinert, *President, Multi State Salinity Coalition* and *Hydrogeologist / Water Resources Manager, El Paso Water*

8:45 a.m. – 9:15 a.m. **Keynote Speaker**

Brian Biesemeyer, *Water Resources Director, Scottsdale Water,* "Scottsdale Water, Sustainable Water Management and Salinity. Topics will include Scottsdale Water's History, its Reliance on and the Importance of Sustainable Water Management Principles, and the Relationship between Sustainable Water and Salinity in a Desert City."

9:15 a.m. - 10:15 a.m. **Highlights of Bureau of Reclamation Session**

The U.S. Bureau of Reclamation declared the first-ever water shortage on the Colorado River basin, including Lake Mead.

Lake Mead is now under a Tier 1 water shortage. The declaration will prompt cuts to water releases to Arizona, Nevada and Mexico in the upcoming year to preserve water in the reservoir so that it can continue to generate power and provide water for essential uses.

Conference Schedule

Arizona will receive about 18% less water from the Colorado River, Nevada's releases will be reduced by about 7% and Mexico's will be reduced by about 5% in 2022.

The reservoir, which is the largest in the country, has reached historic lows this summer. Lake Mead is currently at only 35% of capacity, according to the Lower Colorado Water Supply Report. The Colorado River system as a whole has only 40% of its capacity due to low snowpack and a decades-long, climate change-fueled megadrought in the West.

Currently, the U.S. Drought Monitor lists 87% of the West as under severe drought conditions or worse.

Moderator: **Malynda Cappelle,** *Facility Manager, Brackish Groundwater National Desalination Research Facility, Bureau of Reclamation*

Speakers:

Mike Bernardo, *Deputy Chief, Boulder Canyon Operations Office (BCOO), Interior Region 8: Lower Colorado Basin, Bureau of Reclamation,* "The Colorado River Basin: System Conditions, Outlook, and Drought Response Actions"

Mike Mickley, *President, Mickley & Associates LLC,* "4 Bureau Projects, Survey of Municipal Desalination Facilities – 2018; Emerging Technologies for High Recovery Processing – 2021; Information Base for Concentrate Management – in final draft phase; Innovative Electro-Coagulation Membrane Pre-Treatment with Vacuum-Assisted Electro-Distillation Concentrate Management for Cooling Tower Blowdown Management – final testing and report writing phase"

10:15 a.m. – 10:45 a.m. **The Great MSSC Bottled Water Taste Test & Break**

The global bottled water market is large – the International Bottled Water Association says the U.S. market alone had $19.4 million in sales in 2019 and cites a figure of 13.6 billion gallons of non-sparkling bottled water sold in 2019 (figure is from the Beverage Marketing Corporation (BMC)). The BMC states the average wholesale price of non-sparkling bottled water is $1.18 per gallon.

Tap water is generally less than $10 per 1000 gallons. Customers buy bottled water for number of reasons, including preferred taste, convenience, or perceived health benefits. The 2022 Great Multi State Salinity Taste test will challenge your pallet once again. Come over and taste the samples of bottled water and tap water – do you think you can identify the tap water? Let's find out who the water sommeliers are in the MSSC!

Roger Peery, *CEO* & **Steve Finch,** *V.P., Principal Hydrogeologist-Geochemist, John Shomacher & Associates,* **Brian Klaes,** *Vice President, Moreno Cardenas Inc.*& **Brad Cross,** *Senior Hydrogeologist, Collier Consulting*

10:45 a.m. - 11:45 p.m. **Salinity in Agriculture Session**

This session explores ways to mitigate soil salt accumulation, and related deterioration of crop production, when irrigating with brackish water. It also discusses the impacts of leaching practices on drainage systems and gives an overview of beneficial end uses for saline drainage water.

Moderator: **Andrea Zimmer,** *Water Resources Engineer, CDM Smith*

Speakers:

Manoj Shukla, *Director ACES Global Program and Aggies Go Global, Professor of Soil Physics, College of Agricultural, Consumer and Environmental Sciences Plant and Environmental Sciences, New Mexico State University,* "Reuse of Brackish and Produced Water for Crop Irrigation"

Dr. Sharon Benes, *Professor - Soil Science and Crop Nutrition, Fresno State,* "The San Joaquin River Improvement Project (SJRIP) in California: Long Term Reuse of Saline Drainage Water for Forage Production and Water Quality Improvement"

Ali Montazar, *UCCE Irrigation & Water Management Advisor, University of California Division of Agriculture & Natural Resources,* "Soil Salinity as a Challenge for Sustainable Agriculture in the Low Desert of California"

Conference Schedule

11:45 a.m. - 12:15 p.m. **Luncheon Keynote Speaker**

Patrick Dent, *Assistant General Manager, Water Policy, Central Arizona Project,* "Impact of Tier 1 Colorado River shortage on Central Arizona Project and the Risks to the Colorado River Basin System, as well as the Salinity Outlook on the Colorado River and the Future of our Water Supplies with Regard to Augmentation, Water Recycling and Technological Innovations"

12:15 p.m. – 1:15 p.m. **Special Recognition & Luncheon**

Moderator: **Scott Reinert,** *President, Multi State Salinity Coalition* and *Hydrogeologist/Water Resources Manager, El Paso Water*

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–John Shomaker & Associates Inc.
–Metropolitan Water District of Southern California
–The Water Research Foundation

"Salt of the Earth Award"

"Student Scholarship Award"

1:15 p.m. – 2:15 p.m. **Armageddon in the Water Industry, Disaster Declaration Session: Water Industry Challenges Like It Has Never Been Challenged: Winter Storms in South, Wildfires, Mud Slides, Extreme Drought, Record Heat, Flooding, Corona Virus**

Moderator: **Robert Fowlie,** *Associate/Client Service Leader, CDM Smith*

Speakers:

Steve Finch, *V.P., Principal Hydrogeologist-Geochemist, John Shomacher & Associates,* "Overview of the Disasters this Past Year"

Conference Schedule

Scott Reinert, *President, Multi State Salinity Coalition and Hydrogeologist /Water Resources Manager, El Paso Water,* "Weather – Extreme Cold in Texas, Legislative Response, Senate Bill 3"

Tim Rynders, *Treatment Process and Piloting Discipline Leader, CDM Smith,* "Preparing for Wildfires in the Colorado Front Range – City of Westminster Case Study"

2:15 p.m. - 3:30 p.m. **PFAS 101 and Then Some**

PFAS (Per- and Poly Fluoro Alkyl Substances) are highly fluorinated organic compounds that have been released into the environment due to industrial, commercial, and residential uses of PFAS-containing products. Perfluorooctanoic acid (PFOA) and Perfluorooctanesulfonic acid (PFOS) are the most widely used and studied among the PFAS chemicals because they have been in use since 1950's; however, these substances are now banned from manufacturing in the US. Many other PFAS have replaced PFOA and PFOS while new ones are still being developed.

PFOS and PFOA are persistent in the environment and resistant to typical environmental degradation processes, often referred to as the "forever chemical". As a result, they are widely distributed across all trophic levels and are found in soil, air and groundwater at sites across the United States. The toxicity, mobility and bioaccumulation potential of PFOS and PFOA result in potential adverse effects on the environment and human health.

This session will focus on the basics of PFAS, where they come from, mitigation strategies, best management practices, the regulatory framework around PFAS and the legal steps that can be taken to help identify the source of the PFAS, who is responsible and how to get the potentially responsible party (PRP) to pay for mitigation.

Moderator: **Eric Dole,** *Water and Energy Practice Lead, Water Technology Team Leader, Garver*

Speakers:

Dr. Zaid Chowdhury, *Water Treatment Practice Lead, Garver,* "PFAS Background, Regulatory Horizon, Best Available Technologies (BATs) Including Destructive vs Non-destructive Treatment"

Conference Schedule

Bradley Cahoon, *Account Manager, Eurofins,* "Sample Variability"

3:30 p.m. - 3:45 p.m. **Break**

3:45 p.m. – 5:15 p.m. **PFAS Part 2 Case Study Lightning Round Session**

This session will focus on PFAS mitigation case studies where each speaker will give a 5-8 slide executive summary style presentation that touches on the background of the PFAS mitigation project, what was studied and ultimately implemented, was the treatment considered destructive or non-destructive, what were the CAPex and OPex costs (including residual handling) and results to date.

Speakers:

Jeff Biggs, *Administrator, Tucson Water,* "Potable & Reclaimed Case Study"

Lanaya Voelz Alexander, *Assistant General Manager of Planning, Engineering, & Construction, Eastern Municipal Water District,* "Mitigating PFAS Impacts to EMWD's Brackish Desalination Operations"

Jason Dadakis. *Executive Director of Water Quality & Technical Resources, Orange County Water District,* "Restoring a PFAS-impacted Groundwater Supply for Potable Use"

Roger Peery, *CEO/Principal Hydrogeologist, John Shomaker & Associates, Inc.,* "Contaminated Groundwater in the Ogallala Aquifer (High Plains Aquifer) Case Study"

Robert Fowlie, *Associate/Client Service Leader, CDM Smith,* "Westfield, MA PFAS Treatment Facility – Case Study"

Eric Dole, *Water and Energy Practice Lead, Water Technology Team Leader, Garver,* "Electro-coagulation Bench and Pilot Testing Results for PFAS Contaminated Well Water and Landfill Leachate"

5:15 p.m. - 7:00 p.m. **Reception**

Conference Schedule

Friday, February 25, 2022 NO SLIDE FRIDAY

7:30 a.m. - 12:00 p.m. **MSSC Summit Conference Registration**

8:00 a.m. - 8:40 a.m. **Breakfast**

8:45 a.m. – 9:00 a.m. **Results of The Great MSSC Bottle Water Taste Test**

Moderator: **Scott Reinert,** *President, Multi State Salinity Coalition and Hydrogeologist /Water Resources Manager, El Paso Water*

9:00 a.m. - 9:30 a.m. **Research and Innovation in Salinity Management Panel Discussion Session**

This panel discussion will review and discuss latest research and innovation in salinity management. Panelists will share utility, regional, and national initiatives to accelerate technology development and overcome implementation challenges.

Moderator: **Julie Minton,** *Research Unit Leader, The Water Research Foundation*

Speakers:

Julie Minton, *Research Unit Leader, The Water Research Foundation*

Erin Partlan, *Innovation Program Manager, The Water Research Foundation*

Jeff Biggs, *Administrator, Tucson Water*

Jeff Mosher, *General Manager, Santa Ana Watershed Project Authority*

9:30 a.m. - 10:00 a.m. **Legislative Session**

Lightning Round: State and National Legislative Overview on Desalination Matters

Speaker:

Glenn Farrel, *Executive Director, CalDesal* (joined by colleagues from MSSC States)

Conference Schedule

10:00 a.m. – 11:15 a.m. **MSSC Town Hall with Distinguished Salt of the Earth Alumni Session**

Water Supply, Industry, Concentrate, etc.

Fun and Conversational- Wide Range of Water Supply, Policy

Legislative Policy Updates that Promote MSSC Mission and Goals

Moderator: **Chuck Cullom,** *Executive Director, Upper Colorado River Commission*

Speakers:

Karl Longley, *Senior Engineer, California Water Institute & Professor. Emeritus,Lyles College of Engineering, California State University, Fresno,* "2018 Salt of the Earth Recipient"

Mike Mickley, *President, Mickley & Associates LLC,* "2019 Salt of the Earth Recipient"

Jeff Biggs, *Administrator, Tucson Water,* "2020 Salt of the Earth Recipient"

2022 Salt of the Earth Winner (to be announced February 24, 2022)

11:15 a.m. **Closing Remarks, Summary & Adjourn**

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Arizona Public Service generates clean, reliable and affordable energy for 2.7 million Arizonans. Our service territory stretches across the state, from the border town of Douglas to the vistas of the Grand Canyon, from the solar fields of Gila Bend to the ponderosa pines of Payson. As the state's largest and longest-serving energy provider, our 6,300 dedicated employees power our vision of creating a sustainable energy future for Arizona. Customers can depend on us all year long, particularly during our hot Arizona summers. We're proud to be among the top energy companies in the nation for reliable service. Advanced technologies are enhancing our ability to detect and respond to outages while maintaining a safe, more flexible grid. By continually investing in the energy grid, we ensure our customers have access to clean, reliable and affordable power whenever they need it.

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Carollo is an environmental engineering firm specializing in the planning, design, and construction of water and wastewater facilities and infrastructure. Our firm has over 1,100 employees and currently maintains 46 offices in 19 states. We are a full-service company with the experience and qualified professionals to successfully manage projects of any size.

During our 87-year history, Carollo has successfully completed more than 25,000 projects for public sector clients. Carollo is currently ranked within Engineering News Record's top 500 design firms. More importantly, ENR's annual Source Book ranks Carollo among the top 10 firms for water and wastewater treatment plant design. Unlike many of our competitors, Carollo provides only water and wastewater engineering services.

With our focus on water and wastewater, we recruit nationwide and hire technical staff who have the extensive background and training specific to this field. For that reason, the quality and professional standing of our core group of water and wastewater professionals equals or exceeds that provided by some of the largest engineering firms in the United States.

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el paso WATER

El Paso Water is the regional planner and provider to water, wastewater, reclaimed water and stormwater services to nearly 700,000 people in the greater metropolitan area. It is a component part of the City of El Paso and its governed by a seven-member Public Service Board. Its mission is to furnish, at a fair and reasonable cost to customers, high-quality potable water in sufficient quantities to satisfy domestic, industrial and fire protection requirements, along with collection of liquid waste for treatment and disposal without risk to public health and the environment.

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EASTERN MUNICIPAL WATER DISTRICT

Eastern Municipal Water District (EMWD) is the water, wastewater service and recycled water provider to more than 825,000 people living and working within a 555-square mile service area in western Riverside County. It is California's sixth-largest retail water agency and its mission is "To deliver value to our customers and the communities we serve by providing safe, reliable, economical and environmentally sustainable water, wastewater and recycled water services." With more than 50 years of experience, the board members and staff of EMWD are proud, confident and ready for the future.

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Founded in 1919, Garver is an employee-owned multi-disciplined engineering, planning, architectural, and environmental services firm with nearly 900 employees across the United States. Offering a wide range of services focused on aviation, construction, facilities design, federal, survey, transportation, water, and wastewater, Garver sits in the top 125 of the Engineering News-Record's prestigious Top 500 Design Firms list and is consistently recognized as a best firm to work for.

Every community deserves safe, affordable drinking water and clean rivers and streams. That's the mission Garver and our partnered utilities work toward every day. And every day, these utilities are faced with challenges of aging infrastructure, increasing water quality requirements, and concerns over funding. Garver's Water Team is uniquely built with client-focused, local teams that provide constant support, four design centers providing sophisticated design of all engineering disciplines, and a Water Technology Team comprised of national experts that can innovatively solve the most challenging water and wastewater quality concerns.

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We believe that the way we work can add meaning and value to the world. That ideas inspire positive change. That coloring outside the lines can illuminate fresh perspectives. And that small details yield important realizations. Above all, we believe that collaboration is the best way forward.

We specialize in engineering, architecture, environmental and construction services. While we are most well-known for adding beauty and structure to communities through high-performance buildings and smart infrastructure, we provide much more than that. We create an unshakable foundation for progress because our multidisciplinary teams also include scientists, economists, builders, analysts and artists.

Our employees, working in more than 200 locations around the world, push open the doors to what's possible each and every day.

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John Shomaker & Associates, Inc. (JSAI) is an employee-owned corporation, which has been providing professional services in the areas of fresh and brackish water-resource development, groundwater flow modeling, drilling specifications for large capacity wells, geochemistry, environmental assessment and reclamation, and expert witness testimony for over 41 years. Our technical staff consists of hydrogeologists, hydrologists, geochemists, geologists, and GIS/AutoCAD specialists. JSAI has ongoing projects in New Mexico, Texas, Nevada, California, South Dakota, Argentina, Chile, Guatemala, and British Columbia.

JSAI has developed drilling specifications for brackish water wells completed in unconfined and confined aquifers, hydrogeologic assessments for concentrate disposal wells, and performed field oversight and data collection for all aspects of drilling, completing and testing of concentrate disposal wells, and interpreted water quality and hydraulic property test data. The success of JSAI's water-resource and environmental projects comes from careful scientific practice and experience.

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THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

The Metropolitan Water District of Southern California serves 26 public water agencies — cities, municipal water districts and one county water authority — that then deliver supplies directly or indirectly to 19 million people in Los Angeles, Orange, Riverside, San Bernardino, San Diego and Ventura counties.

We have imported water from the Colorado River since 1941 and from Northern California since the early 1970s. We are the largest single contractor of the State Water Project and a major supporter of Southern California water conservation and water recycling programs, along with other local water management activities.

Whether it's historic drought or the longer-term threat of climate change, we're here to protect the region and provide high-quality affordable water in an environmentally responsible way.

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THE Water Research FOUNDATION

The Water Research Foundation is the premier not-for-profit research cooperative advancing the science of water to protect public health and the environment. Governed principally by utilities, the foundation delivers scientifically sound research solutions and knowledge to serve subscribers and stakeholders in all areas of drinking water, wastewater, stormwater, and reuse. The new foundation will have approximately 1,200 subscribers, 2,300 research studies, and a $700M portfolio.

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SCOTTSDALE WATER

Membrane Fouling Mitigation for Municipal Wastewater Reclamation Using Innovative Electromagnetic Field (EMF) and Reverse Osmosis Membranes (RO)

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The development of alternative water sources is critical to alleviate the demand for freshwater and improve water supply resiliency. Water reuse provides sustainable and local water supply. In addition, the reclamation of municipal wastewater has been widely recognized as a reliable, economically feasible, and environmentally sensitive means to maximize water resources and reduce freshwater demands while protecting remaining water sources from being polluted.

Reverse osmosis (RO) technology has been increasingly used in the advanced treatment of municipal secondary effluents due to its ability to effectively remove pathogens, dissolved organic carbon (DOC), trace organic compounds, and total dissolved solids (TDS). However, membrane fouling and scaling have been a significant challenge for the successful implementation of this technology because they deteriorate the performance of the membrane, lower water recovery, increase energy demand and treatment cost.

In this study, we evaluated different strategies for fouling control of RO membranes treating municipal secondary effluent. To address the intensive chemical demands (e.g., antiscalants, acids, and chemicals for softening), we used a non-chemical pretreatment with an electromagnetic field (EMF). EMF can be applied by magnetic fields using ferrite magnets or wires wrapped around or positioned near a pipe through which water flows or directly around membrane vessels.

The bench-scale testing demonstrated the EMF provides an effective pretreatment to control membrane fouling treating municipal secondary wastewater effluent. The EMF device increased water recovery from 60% without pretreatment to 68% with EMF, while combined with antiscalant, it increased to 89%. At 60% water recovery, flux decline was 80% using no pretreatment, 15% using EMF, and 8% using EMF combined with antiscalant. To better understand the water flux results, water quality analysis and membrane autopsy were conducted using ultraviolet-visible spectroscopy (UV/VIS full wavelength scan), fluorescence excitation-emission spectroscopy (F-EEM), scanning electron microscope, energy-dispersive X-ray spectroscopy, confocal fluorescence microscope, and chemical extraction analysis.

The results show EMF may significantly reduce chemical demands during the treatment of municipal reclamation wastewater controlling membrane fouling. Therefore, this technology can significantly reduce operational costs, energy demand, negative environmental impacts of water reuse technologies, increase the RO membrane lifetime, and meet the pressing need for a more effective and less expensive water reclamation method.

More is better: Membranal Approach to Effective PFAS Removal at the Highest Recovery Rates of 97%

Ronit Erlitzki, Auryan Mohseni & Martin Lawrence • AdEdge | A Chart Company
Yair Shnurmacher
ROTEC LTD. Ronit.Erlitzki@chartindustries.com • 404-554-7883

The City of Rome, in Northwest Georgia, is challenged with the presence of perfluoroalkyl and polyfluoaroalkyl substances (PFAS) in their surface water source, which cannot be treated by the existing conventional treatment processes at the Bruce Hamler Water Plant (flocculation, sedimentation, gravity mixed media filtration, and chlorine disinfection). The capacity of the water treatment plant is 18 MGD, although currently, it operates at an average demand of 7 MGD.

The goal of the pilot study was to demonstrate several PFAS treatment technologies, including GAC, ion exchange, and conventional RO. Our objective was to demonstrate the performance of ultra-high recovery Flow-Reversal Reverse Osmosis (FR-RO) process to remove PFAS at the highest possible recovery.

FR-RO is a proven technology with over 40 installations worldwide, including 3 full-scale systems and multiple pilot systems in the United States, including recognition by the Bureau of Reclamation (P2P Grant Award). The technology employs the simplicity of operation and conventional RO equipment with two unique and continuous process functions: Flow-Reversal and Block Rotation.

Reverse Osmosis (RO) is proven to remove PFAS effectively, but the high recovery FR-RO approach enables significant system performance improvements, resulting in optimized operating and infrastructure costs and savings such as higher recovery rates, lower concentrate volumes, savings on OPEX, and smaller footprint.

The feed water source of the FR-RO pilot system was UF pre-treated water from the Etowah and Oostanaulah rivers, where multiple PFAS species were detected. A three-stage FR-RO system had a 3:2:1 array with 4-inch energy saving BW membranes. The FR-RO pilot system operated onsite between February 10, 2021, and April 30, 2021, treating blended water from the two rivers and water solely from the Etowah River.

This paper will describe how the FR-RO technology works and present data highlighting the stable operation determined by documenting flows, flux, differential pressure, and more. While the conventional RO achieved a 90% - 93% recovery rate, the FR-RO operation resulted in superior removal of all PFAS species at a recovery rate of 97%.

Emulating Nature To Save The Salton Sea

Terry R. Gong
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Conceptually, the solution to save the Salton Sea is fairly simple: we must prevent the dissolved salts within this closed ecosystem from reaching supersaturation and precipitating out-of-solution by finding a way to keep them diluted, by adding a higher quality of water into it, or by removing the salts from the system itself.

Perhaps this is why our basic strategy so far continues to be fixated on the diversion of water, either from the Lower Colorado River (LCR), and/or new desalination facilities to be built and located throughout Southern California. Given the existing overdraft of stress, our treaty with Mexico, the legal battles that would ensue, etc., diverting water from the LCR is highly unlikely. With regards to designing and building new desalination facilities, not only would this approach be costly, it still doesn't reduce the volume or way salts currently enter into the system.

So, to help us make the correct choice, and to avoid committing our limited resources to an approach that is unrealistic and/or doomed to fail, let's re-examine another closed ecosystem – our planet Earth – and how she provides the water needed to maintain dilution, reduces salts, and keeps the oceans from precipitating out-of-solution. When we do, we will discover the: longest; on-going; never-ending; most efficient, viable, cost-effective, sustainable; already proven; and permanent way there is to restore ecosystems like the Salton Sea.

The poster will explain how: 1. The chemistry of volcanism creates water, reduces salts, and controls the pH of the entire planet. 2. The chemistry of volcanism can be applied to save the Salton Sea.

An Update on Brackish Groundwater Mapping in Texas

Alysa K. Suydam, P.G.; Erika Mancha
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Brackish groundwater for inland desalination continues to be a water supply of interest in Texas' 50-year state water planning efforts. In the 2022 State Water Plan, groundwater desalination is expected to provide approximately 157,000 acre-feet per year of water supply by 2070. Currently, brackish groundwater desalination can supply 100,769 acre-feet per year of water.

Crucial to the development of groundwater desalination is mapping the location and estimating the quantity and quality of brackish resources in the state. A contracted study from 2003 estimated that there are more than 2.5 billion acre-feet of brackish groundwater in aquifer storage in the state, but this study was limited and narrow in scope. Since then, the Brackish Resources Aquifer Characterization System (BRACS) department at the Texas Water Development Board (TWDB) has completed 13 studies of brackish aquifers, is currently working on 3 studies, and plans to complete at least another 9 studies by 2032. Aquifer mapping projects extend knowledge of brackish resources by studying oil and gas geophysical well logs to extend the known downdip limit of the resource. Aquifers in Texas are typically mapped to 3,000 mg/L Total Dissolved Solids (TDS), but BRACS studies aim to map aquifers to at least 10,000 mg/L TDS. With the additional detail of a BRACS study, our current estimates of brackish groundwater volumes in the state surpass the 2003 estimate. From the current 13 completed studies, we estimate there is more than 3.8 billion acre-feet of brackish groundwater in aquifer storage in BRACS studied aquifers.

Building on these studies, the TWDB will map brackish groundwater production zones (BGPZs) in the major and minor aquifers of the state by 2032. BGPZs are portions of aquifers that can supply significant volumes of brackish groundwater over 30- and 50-year horizons without significantly affecting freshwater resources, existing use, and are mapped to avoid injection disposal wells and injectate. To date, 31 BGPZs in 6 aquifers have been designated in the state. Pumping models from the mapped BGPZs estimate they could provide approximately 123,000 acre-feet per year of brackish groundwater, for a 50-year total of more than 6 million acre-feet.

In addition to mapping brackish aquifers, the BRACS department has contracted studies to aid in the characterization of brackish aquifers. Contracted projects range from analyzing deep cores for properties like porosity, investigating the usefulness of existing seismic data in mapping aquifers, groundwater comingling investigation, developing a guidance document on drilling and logging an ideal exploratory brackish groundwater well, and developing tools to map Class II disposal injectate. These contracted projects either aid in characterizing brackish groundwater or aim to help stakeholders better understand the resource.

Life Cycle and Techno-Economic Assessment for a Coupled Algal-Membrane System Vs. Conventional Wastewater Treatment and Potable Reuse Process

A. Lugo (alugo12@nmsu.edu)**, G.L.C.L. Bandara, I.S.A. Abeysiriwardana-Arachchige, N. Nirmalakhandan, X. Xu, J. Penteado, P. Xu (**pxu@nmsu.edu)
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The current wastewater treatment infrastructure is often deemed unsustainable and resource-inefficient due to its negative environmental impacts, high energy demand, and high economic investment. The conversion of wastewater treatment to water and resource recovery centers offers a promising pathway for sustainable sewage treatment and resource conservation, which will lead to ecological benefits, augmentation of local water supplies, enhanced environmental sustainability, and a better economic investment. This study involves the application of a life cycle and a techno-economic assessment methodology for two theoretical potable reuse systems to determine both the environmental footprint in terms of greenhouse gases and energy, as well as the possible economic impact of its implementation.

The main system consists of (i) an innovative algal-based wastewater treatment coupled with dual forward osmosis and seawater reverse osmosis for high-quality water production, and hydrothermal liquefaction to produce bioenergy from the harvested algal biomass; while the benchmark system referenced consisted of (ii) secondary biological treatment, microfiltration, brackish water reverse osmosis, ultraviolet/advanced oxidation process with granular activated carbon, and anaerobic digestion for waste management. The overall water recovery considered, based on the recovery efficiency of the membrane processes employed, were 88% and 76% for the main and benchmark system, respectively.

The energy, greenhouse gas emissions, and water production costs were normalized and compared considering 1 m3 of water recovered as a functional unit. The main system was estimated to consume around 4.59 kWh/m3 of energy and emit 1.37 kg of CO2 eq/m3, with energy and emissions coming mostly from the high energy demand of the seawater reverse osmosis. For the benchmark system, the energy consumption totaled 4.75 kWh/m3, and the system was estimated to generate emissions of 2.34 kg of CO2 eq/m3. The total water production cost favors that of the main system, with a cost of $2.06/m3, compared to that of the benchmark system which is $2.19/m3.

The results obtained in this study prove that the main system has a higher environmental resilience with the recovery of bioenergy and nutrients from wastewater achieving zero waste disposal, a higher overall water recovery, and a lower investment cost overall compared to a traditional potable reuse benchmark system. With the application of energy recovery devices and further optimization of the forward osmosis membrane in the future, the main system shows further improvement both environmentally and energy-wise. With adequate design and implementation, this system provides a paradigm shift in wastewater treatment and recovery in the future.

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