

FINAL PROGRAM



WORLD ENVIRONMENTAL & WATER RESOURCES CONGRESS

Minneapolis, MN | June 3-7, 2018

Protecting and Securing Water and the Environment for Future Generations



Hyatt Regency Minneapolis
www.ewricongress.org



On behalf of the Environmental and Water Resources Institute (EWRI) of ASCE conference organizers, sponsors, authors and presenters, we welcome you to the World Environmental and Water Resources Congress 2018.

Schedule at a Glance *(Subject to Change)*

How will you CUSTOMIZE your Congress experience? DOWNLOAD the 2018 EWRI Congress mobile app or BROWSE the EWRI Congress Itinerary Planner at www.eventscribe.com/2018/asce-ewri.

Saturday, June 2, 2018

8:00 a.m. – 5:00 p.m. Committee Meetings

Sunday, June 3, 2018

12:00 – 6:15 p.m. Registration – *Nicollet Promenade*
8:00 a.m. – 5:00 p.m. Committee Meetings
8:00 a.m. – 5:00 p.m. AAWRE Panel Exams – *St. Croix*
12:00 – 1:00 p.m. Membership Meeting – *Minnehaha*
5:00 – 6:30 p.m. EPANET and SWMM Model Updates – *Nicollet Ballroom*
6:30 – 8:00 p.m. Exhibit Hall Open – *Greenway Promenade*
6:30 – 8:00 p.m. Author Appreciation Reception (Ticketed Event) – *Greenway Promenade*
7:00 – 7:45 p.m. Professional Headshots – *Greenway Promenade*



Monday, June 4, 2018

7:30 a.m. – 6:00 p.m. Registration (Closed for lunch from 12:30 – 1:45 p.m.) – *Nicollet Promenade*
8:30 – 10:00 a.m. Welcome & Keynote Lecture – *Nicollet Ballroom*
10:00 a.m. – 4:00 p.m. Exhibit Hall Open – *Greenway Promenade*
10:00 – 10:30 a.m. Networking Break – *Greenway Promenade*
10:30 a.m. – 12:00 p.m. Concurrent Technical Session I
10:30 a.m. – 12:00 p.m. AAWRE Professional Ethics Session – *Northstar A*
12:15 – 1:45 p.m. Welcome & Awards Luncheon (Ticketed Event) – *Nicollet Ballroom*
2:00 – 3:30 p.m. Concurrent Technical Session II
3:30 – 4:00 p.m. Networking Break – *Greenway Promenade*
4:00 – 5:30 p.m. Concurrent Technical Session III
5:45 – 6:30 p.m. Stormwater Quiz Show – *Nicollet AB*
6:00 – 6:45 p.m. AAWRE Diplomate Induction & Awards Ceremony – *Nicollet CD*
6:00 – 10:00 p.m. Committee Meetings

Tuesday, June 5, 2018

8:00 a.m. – 4:15 p.m. Registration (Closed for lunch from 12:30 – 1:45 p.m.) – *Nicollet Promenade*
8:30 – 10:00 a.m. Concurrent Technical Session IV
10:00 a.m. – 4:00 p.m. Exhibit Hall Open – *Greenway Promenade*
10:00 – 10:30 a.m. Networking Break – *Greenway Promenade*
10:30 a.m. – 12:00 p.m. Concurrent Technical Session V
10:30 a.m. – 12:00 p.m. AAWRE Panel Discussion on Board Certification Session – *NorthStar A*
12:15 – 1:45 p.m. Luncheon Choice A: Environmental/Water, Wastewater & Stormwater Council Luncheon & Awards Lecture (Ticketed Event) – *Nicollet AB*
12:15 – 1:45 p.m. Luncheon Choice B: Hydraulics & Waterways Council/WDSA Luncheon & Awards Lecture (Ticketed Event) – *Nicollet CD*
2:00 – 3:30 p.m. Concurrent Technical Session VI
3:00 – 6:30 p.m. Technical Tour: St. Anthony Falls Laboratory, University of Minnesota (Ticketed Event)
3:30 – 4:00 p.m. Networking Break – *Greenway Promenade*
4:00 – 5:30 p.m. Concurrent Technical Session VII
6:00 – 10:00 p.m. Committee Meetings

Schedule at a Glance *(continued)*

(Subject to Change) For the latest schedule, DOWNLOAD the 2018 EWRI Congress mobile app or BROWSE the EWRI Congress Itinerary Planner at www.eventscribe.com/2018/ASCE-EWRI

Wednesday, June 6, 2018

8:00 a.m. – 5:15 p.m.	Registration (Closed for lunch from 12:30 – 1:45 p.m.) – <i>Nicollet Promenade</i>
8:30 – 10:00 a.m.	Concurrent Technical Sessions VIII
8:30 – 10:00 a.m.	WSP USA Student Design Competition – <i>Lake Shore A</i>
10:00 – 10:30 a.m.	Networking Break
10:30 a.m. – 12:00 p.m.	Concurrent Technical Sessions IX
10:30 a.m. – 12:00 p.m.	AAVRE Expert Witness Session – <i>NorthStar A</i>
10:30 a.m. – 12:00 p.m.	Student Poster Competition – <i>Greenway Promenade</i>
12:15 – 1:45 p.m.	Luncheon Choice A: Irrigation & Drainage Council Luncheon & Awards Lecture (Ticketed Event) – <i>Nicollet CD</i>
12:15 – 1:45 p.m.	Luncheon Choice B: Planning and Management Council Luncheon & Awards Lecture (Ticketed Event) – <i>Nicollet AB</i>
12:15 – 1:45 p.m.	Student Luncheon (Ticketed Event) – <i>Great Lakes C (4th Floor)</i>
2:00 – 3:30 p.m.	Concurrent Technical Sessions X
3:30 – 4:00 p.m.	Networking Break – <i>Greenway Promenade</i>
3:30 – 4:00 p.m.	Professional Headshots – <i>Greenway Promenade</i>
4:00 – 5:30 p.m.	Concurrent Technical Sessions XI
5:00 – 7:00 p.m.	Open Mentoring – <i>Nicollet CD</i>
6:00 – 9:30 p.m.	Key Social Event at the Mill City Museum (Ticketed Event)
6:00 – 10:00 p.m.	Committee Meetings



Thursday, June 7, 2018

8:15 a.m. – 3:30 p.m.	Registration (Closed for lunch from 12:30 – 1:45 p.m.)
8:30 – 10:00 a.m.	Concurrent Technical Session XII
10:00 – 10:30 a.m.	Networking Break – <i>Greenway Promenade</i>
10:30 a.m. – 12:00 p.m.	Concurrent Technical Session XIII
12:15 – 1:45 p.m.	Luncheon Choice A: Professional Development: Engineer Your Career Luncheon (Ticketed Event) – <i>Nicollet AB</i>
12:15 – 1:45 p.m.	Luncheon Choice B: Watershed Council Luncheon & Awards Lecture (Ticketed Event) – <i>Nicollet CD</i>
2:00 – 5:00 p.m.	Technical Tour: St. Anthony Falls Lock & Dam (Ticketed Event)
2:00 – 5:15 p.m.	Technical Tour: CHS Field (Lowerton Ball Park) Sustainability and Water Reuse Tour (Ticketed Event)
2:00 – 6:00 p.m.	Technical Tour: Hall's Island Reconstruction Project & Upper Mississippi River Tour (Ticketed Event)
2:00 – 6:00 p.m.	Technical Tour: Village of St. Anthony Sustainability Tour (Ticketed Event)



Maximize your Congress attendance by participating in a free technical workshop taught by a trusted subject matter expert. Technical workshops are listed on the technical program grid and are called out in the listing of Conference highlights on the following pages.

Committee Members



General Chair

Rebecca Teasley, Ph.D., A.M.ASCE



Technical Program Chair

Sri Kamojjala, P.E., D.WRE, M.ASCE



Local Organizing Committee Chair

Brett Staeden, A.M.ASCE



Technical Program Coordinator

**Veera Gnanaswar Gude, Ph.D., P.E.,
BCEE, M.ASCE**



Technical Program Coordinator

Melissa Wetzig, P.E.

EWRI Staff of ASCE

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Barbara Whitten, Technical Manager

Jennifer Jacyna, Manager of Member Services

Mark Gable, Senior Conference Manager

Nicole Erdelyi, Program Coordinator

Susan Dunne, Registrar

Erin Marks, Registrar

Drew Caracciolo, Sponsorship & Exhibit Sales Manager

Conference Highlights

The EWRI Congress 2018 features 13 concurrent technical sessions tracks for the duration of the EWRI Congress covering 20 unique technical areas. Authors will also be displaying their research and practice issues related to their areas of interest in the form of technical posters.

SUNDAY, JUNE 3, 2018

AAWRE Panel Exams

8:00 a.m. – 5:00 p.m., *St. Croix*

EPANET and SWMM Model Updates

5:00 p.m. – 6:30 p.m., *Nicollet Ballroom*

Author Appreciation Reception (Ticketed Event)

6:30 p.m. – 8:00 p.m., *Greenway Promenade*

MONDAY, JUNE 4, 2018

Opening Plenary Session

8:30 a.m. – 10:00 a.m., *Greenway Ballroom*

Learning and Planning for Resiliency in the Aftermath of the 2017 Extreme Weather Events

Panelists:



Carol E. Haddock, P.E.,
Director of Public Works in the
City of Houston



Kent Nelson, P.E.,
Deputy Executive Director and
COO Florida Keys Aqueduct
Authority



Morris Maslia, P.E.,
Research Environmental Engineer
at the CDC National Center for
Environmental Health (retired)

Welcome and Awards Luncheon (Ticketed Event)

12:15 p.m. – 1:45 p.m., *Nicollet ABC*

Keeping the Great Lakes Great: Using Stewardship and Science to Accelerate Restoration



Keynote:
Deborah H. Lee
Director, NOAA Great
Lakes Environmental
Research Laboratory

Stormwater Quiz Show

5:45 p.m. – 6:30 p.m., *Nicollet AB*

AAWRE Diplomate Induction Ceremony

6:00 p.m. – 6:30 p.m., *Nicollet CD*

Conference Highlights *(Continued)*

TUESDAY, JUNE 5, 2018

Environmental/Water, Wastewater & Stormwater Council Luncheon & Awards

Lecture *(Ticketed Event)*

12:15 p.m. – 1:45 p.m., *Nicollet AB*

Hydraulics & Waterways Council/WDSA Luncheon & Awards Lecture *(Ticketed Event)*

12:15 p.m. – 1:45 p.m., *Nicollet CD*

Technical Tour: St. Anthony Falls Laboratory, University of Minnesota *(Ticketed Event)*

3:00 p.m. – 6:30 p.m.

Buses will assemble one-half hour prior to departure in front of the Hyatt

WEDNESDAY, JUNE 6, 2018

WSP USA Student Design Competition

8:30 a.m. – 10:00 a.m., *Lakeshore A*



Irrigation & Drainage Council Luncheon & Awards Lecture *(Ticketed Event)*

12:15 p.m. – 1:45 p.m., *Nicollet CD*

Planning and Management Council Luncheon & Awards Lecture *(Ticketed Event)*

12:15 p.m. – 1:45 p.m., *Nicollet AB*

Student Luncheon *(Ticketed Event)*

12:15 p.m. – 1:45 p.m., *Great Lakes C*

Open Mentoring

5:00 - 7:00 p.m., *Nicollet CD*



Key Social at the Mill City Museum *(Ticketed Event)*

6:00 p.m. – 9:30 p.m.

Buses will assemble one-half hour prior to the start of the event in front of the Hyatt, and will continuously loop until 10:00 p.m.

Conference Highlights *(Continued)*

THURSDAY, JUNE 7, 2018

Watershed Council Luncheon & Awards Lecture (Ticketed Event)

12:15 p.m. – 1:45 p.m., *Nicollet CD*

Professional Development: Engineer Your Career Luncheon (Ticketed Event)

12:15 p.m. – 1:45 p.m., *Nicollet AB*

Technical Tour: St. Anthony Falls Lock and Dam (Ticketed Event)

2:00 p.m. – 5:30 p.m.

Buses will assemble one-half hour prior to departure in front of the Hyatt

Technical Tour: CHS Field (Lowerton Ball Park) Sustainability and Water Reuse Tour (Ticketed Event)

2:00 p.m. – 5:30 p.m.



Buses will assemble one-half hour prior to departure in front of the Hyatt

Technical Tour: Hall's Island Reconstruction Project & Upper Mississippi River Tour (Ticketed Event)

2:00 p.m. – 6:00 p.m.

Buses will assemble one-half hour prior to departure in front of the Hyatt

Technical Tour: Village of St. Anthony Sustainability Tour (Ticketed Event)

2:00 p.m. – 6:00 p.m.

Buses will assemble one-half hour prior to departure in front of the Hyatt

Technical Workshops

SUNDAY, JUNE 3, 2018

Cybersecurity Essentials for Water Engineers and Scientists

Instructor: Amin Rasekh

1:30 p.m. – 5:00 p.m., *Lakeshore A*

How to Build Reliability in the Results of Numerical Modeling

Instructors: Kaveh Zamani & Fabian Bombardelli

1:30 p.m. – 5:00 p.m., *Lakeshore B*

Hydrologic Engineering Center Real-Time Simulation (HEC-RTS)

Instructors: Fauwaz Hanbali & Chan Modini

1:30 p.m. – 5:00 p.m., *Lakeshore C*

MONDAY, JUNE 4, 2018

Guidelines for Controlling Erosion and Sediment

Instructors: Don Baker & Shirley Clark

2:00 p.m. – 5:30 p.m., *NorthStar B*

Solving Water Treatment Problems with Computational Fluid Dynamics

Instructors: Xiaofeng Liu & Jie Zhang

2:00 p.m. – 5:30 p.m., *Lakeshore B*

TUESDAY, JUNE 5, 2018

Introduction to EPANET Water Distribution Modeling

Instructors: Arnold Strasser & Walter Grayman

8:30 a.m. – 12:00 p.m., *Greenway EF*

NOAA Atlas 14: Precipitation Frequency Estimates of the United States

Instructor: Sandra Pavlovic

8:30 a.m. – 12:00 p.m., *Lakeshore A*

Sustainability and Drinking Water Treatment Issues in the Midwest

Instructors: Anita Anderson, Nathan Casey, Kevin Church, Chad Donnelly, Glen Gerads, Ted Henefin, Yigliola Malca, Enoch Nicholson, and Lee Odell

2:00 p.m. – 5:30 p.m., *Lakeshore A*

WEDNESDAY, JUNE 6, 2018

Hydrologic Engineering Center's Meteorological Visualization Utility Engine (HEC-METVUE)

Instructors: Caleb DeChant, Brett Palmberg & Fauwaz Hanbali

8:30 a.m. – 12:00 p.m., *Greenway AB*

Riverbank Filtration for Water Supply in the United States

Instructors: Chittaranjan Ray & Matthew Reed

8:30 a.m. – 12:00 p.m., *Greenway EF*

Introduction to the Hydrologic Modeling System (HEC-HMS)

Instructor: Thomas Brauer

2:00 p.m. – 5:30 p.m., *Lakeshore A*

THURSDAY, JUNE 7, 2018,

Bulletin 17C: Updated Federal Guidelines for Flood Frequency Analysis

Instructor: John England

8:30 a.m. – 12:00 p.m., *Lakeshore A*

A Practical Field Guide to Open-Source Software Development in the EPANET World

Instructors: Sam Hatchett, Kate Klise and David Hart

10:30 a.m. – 12:00 p.m., *Lakeshore C*

General Information

ASCE Bookstore

ASCE will operate its popular bookstore at the EWRI Congress. The bookstore is a great opportunity to browse through the many new and classic titles on display covering all topics in civil engineering.

Badge Policy and Ribbons

Your EWRI Congress registration name badge is your admission to the educational sessions. Please wear your badge at all times while in the Hyatt Regency Minneapolis Hotel. Tickets are required for all EWRI Congress events, meals, and special events. Where tickets are required, please be sure to bring your tickets with you to each event as you will not be admitted without a ticket. Ribbons will be available at the Registration Desk. ASCE recommends you remove your badge when leaving the hotel.

Cancellations/Refunds

The deadline to request a refund was Wednesday, May 2, 2018. Written refund requests were to be received by ASCE Headquarters, and were subject to a \$100 processing fee. Speaker and author registration fees are also nonrefundable after Thursday, March 1, 2018, due to necessary advance production of the proceedings and the program. Please visit www.ewricongress.org/registration for complete refund policies.

City Information

For more information on Minneapolis, MN, or the surrounding area, please visit the location page on the EWRI Congress website at www.ewricongress.org/location.

EWRI Sustainable Congress Policy Statement

ASCE-EWRI is committed to sustainable Congresses in accord with the ASCE policy on The Role of the Civil Engineer in Sustainable Development. ASCE defines sustainability as a set of economic, environmental, and social conditions in which all of society has the capacity and opportunity to maintain and improve its quality of life indefinitely, without degrading the quantity, quality, or availability of natural resources and ecosystems. Sustainable development is the process of converting natural resources into products and services that are more profitable, productive, and useful, while maintaining or enhancing the quantity, quality, availability, and productivity of the remaining natural resource base and the ecological systems on which they depend.

To that end, ASCE-EWRI works with hotels and convention centers that strive to make our events green and include amenities such as reusable pitchers and water coolers rather than plastic bottles.

No Smoking Policy

ASCE supports a "No Smoking" policy. Smoking is prohibited in the Hyatt Regency Minneapolis Hotel, and at all indoor venues hosting EWRI events.

On-Site Registration Hours

Sunday, June 3, 2018	12:00 – 6:15 p.m.
Monday, June 4, 2018	7:30 a.m. – 6:00 p.m.
<i>(closed for lunch 12:30 - 1:45 p.m.)</i>	
Tuesday, June 5, 2018	8:00 a.m. – 4:15 p.m.
<i>(closed for lunch 12:30 - 1:45 p.m.)</i>	
Wednesday, June 6, 2018	8:00 a.m. – 5:15 p.m.
<i>(closed for lunch 12:30 - 1:45 p.m.)</i>	
Thursday, June 7, 2018	8:15 a.m. – 1:00 p.m.

Proceedings

As an exclusive benefit for all conference registrants, online access to the complete proceeding will be made available in the ASCE library at <http://asce.library.org/page/2018ewricongressproceedings> for 60 days beginning on the first day of the conference.

Professional Development Hours (PDHs)

You may earn 32.5 PDHs, which are nationally recognized units of record, by attending the EWRI Congress concurrent sessions and other programmed sessions. Please note there are differences from state to state in continuing education requirements for professional engineering licensure. ASCE follows NCEES guidelines on continuing professional competency. Because continuing education requirements for P.E. license renewal vary from state to state, ASCE strongly recommends that individuals regularly check with their state requirements that affect P.E. licensure and the ability to renew licensure. For details on your state's requirements, please go to www.ncees.org/Licensing_boards.php.

Program Changes

ASCE reserves the right to cancel programs and/or sessions because of low registration. In the unlikely event of a cancellation, all registrants will be notified and will receive a full refund, if applicable. Programs and sessions are subject to change and ASCE reserves the right to substitute a program, session, and/or speaker of equal caliber to fulfill educational requirements.

Recording of Sessions

Video or audio recording of any educational session is strictly prohibited without prior written permission from both ASCE and the session presenter(s).

Visiting International Fellowship

Each year, EWRI's International Council (IC) invites applications for Visiting International Fellows from faculty, professionals, and student researchers from developing countries. The fellowships are intended to increase the participation of water resources and environmental professionals from developing countries in EWRI Congress, and promote sustained professional and cultural exchange. Visit www.ewricongress.org/program/visiting-international-fellowship for more information about the Visiting International Fellowship.

2018 EWRI Congress Committee Meeting Schedule

Saturday, June 2, 2018

8:00 a.m. – 5:00 p.m.

EWRI Governing Board	St. Croix Room
AAVRE Board of Trustees	Minnehaha Room

Sunday, June 3, 2018

8:00 a.m. – 12:00 p.m.

Urban Drainage Standards Committee	Greenway Ballroom A
Evapotranspiration in Irrigation & Hydrology	Greenway Ballroom C
Renewable Technologies Council	Greenway Ballroom D
Disaster Ready Stormwater Management	Greenway Ballroom E
Environmental Water Resource Systems	Greenway Ballroom F
IID Computations Task Committee	Greenway Ballroom G
Professional Practice Council	Greenway Ballroom H
Risk Uncertainty Probabilistic Approaches	Greenway Ballroom I
Hydraulic Structures	Greenway Ballroom J
Journal of Sustainable Water in the Built	Mirage Room

Environment Editors Meeting	
Land Subsidence Task Committee	Regency Room
International Participation Committee	Lake Superior A
Groundwater Symposia & Continuing Education Committee	Lake Superior B

1:00 p.m. – 5:00 p.m.

International Perspectives on Water and the Environment (IPWE)	Greenway Ballroom A
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Management Practices for Controlling Erosion & Sediment Standards Committee Meeting	Greenway Ballroom B
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Women-Water Nexus	Greenway Ballroom C
Urban Water Resources Research Council	Greenway Ballroom D
History & Heritage Committee	Greenway Ballroom E
World Water Council Activities	Greenway Ballroom F
EWRI Awards Committee	Greenway Ballroom G
Two-phase Flow in Urban Water Systems	Greenway Ballroom H
Groundwater Management Technical Committee	Greenway Ballroom I

Journal of Water Resources Planning & Management Editorial Board	Greenway Ballroom J
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Use of Recycled Water for Irrigation of Turf & Landscape Plants	Mirage Room
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Managed Aquifer Recharge Standards Committee	Regency Room
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Congress Steering Committee	Lake Superior A
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Water Pollution Engineering Committee	Lake Superior B
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Remote Sensing of Evapotranspiration	Skyway Room
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Municipal Water Infrastructure Council	Greenway Ballroom B
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Monday, June 4, 2018

6:00 p.m. – 10:00 p.m.

Hydroclimate Committee	LaSalle Room
Manual of Practice 77 Update TC	Skyway Room
Groundwater Quality Technical Committee	Lake Superior B
Groundwater Hydrology	Northstar A
Stormwater Media Filtration Committee	Northstar B
Visiting International Fellow	Mirage Room
Environmental Health & Water Quality	Lakeshore A
Atmospheric Water Management	Lakeshore B
EWRI 20th Anniversary Planning Task Committee	Lakeshore C

New Professionals	Greenway AB
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Cybersecurity of Water Distribution Systems	Greenway CD
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Communications Council	Greenway EF
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Computational Fluid Dynamics Task Committee	Greenway GH
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Journal of Hydraulic Engineering Editors Meeting	Greenway JJ
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Tuesday, June 5, 2018

6:00 p.m. – 10:00 p.m.

Managing Reservoir Sediment: Technical, Economic, & Policy Issues	Skyway Room
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Local Activities Council	Lake Superior B
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Emerging & Innovative Technologies Committee	Northstar A
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Hazardous, Toxic and Radioactive Waste Committee	Northstar B
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SWHTC	Mirage Room
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EWRI TMDL Analysis & Modeling Task Committee	Lakeshore A
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Environmental Permitting Committee	Lakeshore B
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KSTAT Committee	Lakeshore C
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UWRRC BMP Database Teaching Tools Task	Greenway AB
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Hydraulic Fracturing TC & Hydraulic Fracturing: Methods	Greenway CD
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River Basin Planning, Policy, & Operations	Greenway EF
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Calibration/Verification of Free-Surface Hydraulic Models	Greenway GH
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Journal of Irrigation & Drainage Engineering Editorial Board	Greenway JJ
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Chinese American Water Resources Association	Regency Room
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Water Quality and Drainage Committee	Nicollet CD
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Advanced Drainage Systems

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The American Academy of Water Resources Engineers (AAWRE)

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The American Society for Engineering Management (ASEM)

www.asem.org

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