# CENTRAL STATES WATER

The Official Magazine of the Central States Water Environment Association, Inc.

## 22nd Annual Education Seminar

April 11, 2017 | Monona Terrace | Madison, WI

**PLANT PROFILE:**

Village of **Wauconda**

## PLUS:

- WEFTEC Review
- Student Design Competition
- GWS Problem Statement: Dominical
- Investigating and Increasing Dewatered Cake Solids
- STEM Superheroes

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the water quality people

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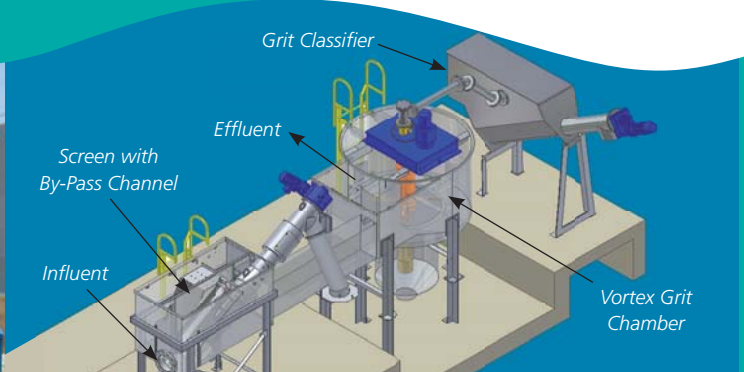


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## FEATURES



## DEPARTMENTS

### Messages



### CSWEA News

**WEFTEC Review:**



### Section News




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Craig Kelman & Associates

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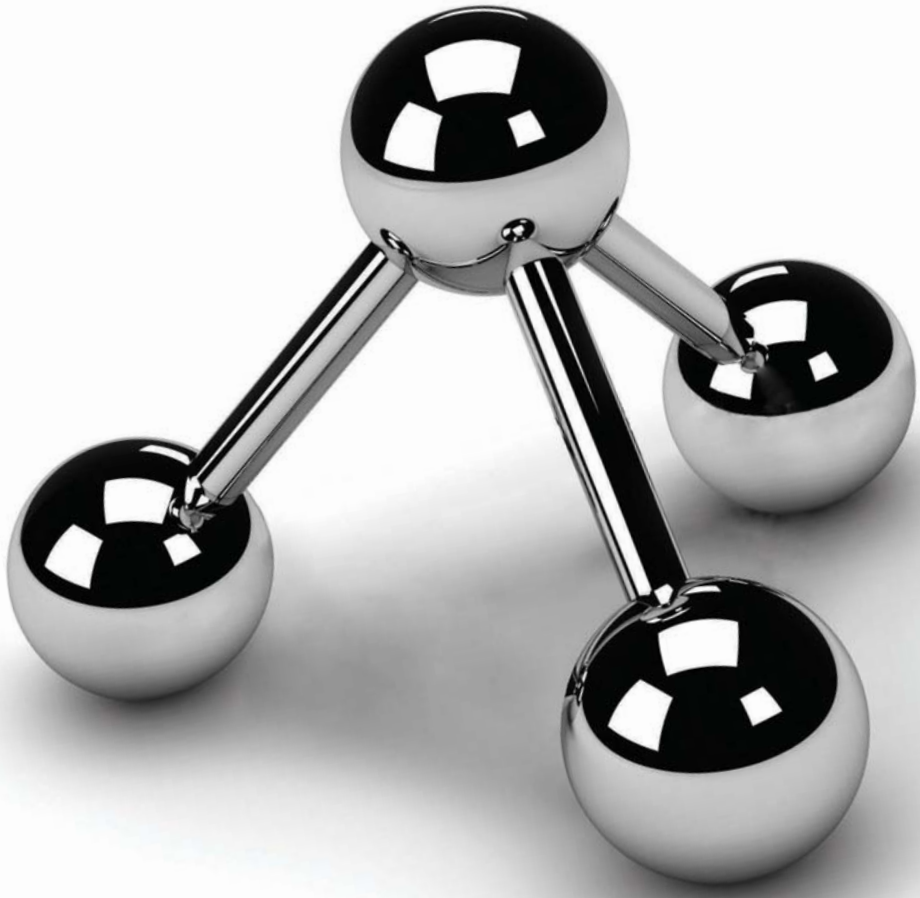

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Save the Dates
May 22-25, 2017

# Central States 90th Annual Meeting

By Pat Oates

## "We're Gonna Rock this Town…Rock it Inside Out"

*– Stray Cats,1982*

After our last local arrangements committee meeting, I realized we were the 90th group of people to be planning this conference. Ninety years ago was 1926, the country was still recovering from WW I, Calvin Coolidge was president, and women were trying to get the right to vote. Flappers were all the rage, "Five Foot Two Eyes of Blue" was the most popular song and innovations included the pop-up toaster and the PEZ candy dispensers; and a small group of Midwesterners who recognized the value of clean water were hosting the first Central States Water Pollution Control Association, Annual Meeting. I've spoken with many who have planned previous conferences, and I cannot begin to imagine planning this conference without computers, the Internet, emails and texts. Hats off, to those who have planned this conference prior to technology!


With that said, it is an honor to be planning the 90th annual meeting, and all indications are that we have a fabulous technical program coming together. Many thanks to the current Local Arrangements Committee members who are working hard to bring us a memorable conference. The conference will be held at the beautifully renovated InterContinental hotel in St. Paul, MN.

Monday has turned into a jam-packed day; starting with the sunset session of the Leadership Academy that will be an interactive introduction to the concept of Continuous Improvement, led by Cristine Leavitt, Continuous Improvement Manager for Metropolitan Council Environmental Services (MCES). Monday afternoon will offer the choice of our traditional golf outing, a tour of the MCES Eagles Point Wastewater Plant which has advanced secondary treatment and features elements of sustainable building design; and a third new addition to the conference, which is called "Swales, Rails and Ales" and is a walking tour of the Stormwater BMPs in downtown St. Paul. The Stormwater Committee has created a landmark event, which showcases installed and functioning new stormwater technologies. Monday evening we will have our time-honored Meet and Greet Social.

Tuesday we will start the day with our keynote speaker Dr. Julian Sandino, Vice President, Wastewater Global Practice Lead and Technology Senior Fellow at CH2M who will be speaking about new directions in Resource Recovery and the increasing pace of change in our industry. We also have an Operations Track that includes a session on understanding water-hammer and the invitational Resource Recovery Track, will be moderated by Dr. Samuel Jeyanayagam, Vice President and Senior Principal Technologist at CH2M, and WEF Fellow. The Resource Recovery Track will also include a panel discussion at the end of the day. Tuesday evening, we will wind up with our Vendor Social and then adjourn for a paddleboat ride on the Mighty Mississippi.

Of course, the conference would not be complete without our vendor exhibits which will be open all day on Tuesday and until noon on Wednesday. We are working on some new exhibits and events that promise to energize our exhibit area.

On Wednesday, we start with our State Section Meetings and then continue with our technical program that includes a Leadership and Management Track, with Ethics Training that will be presented by Kristine Kubes, of Kubes Law, and a session on Conducting Effective Investigations that will be conducted by Sydnee Woods, MCES Legal Counsel. The technical program will also include tracks on Nutrients and Collection Systems. At lunch we have the induction into the 7S Society, and we end the day with our Awards Banquet followed by professional entertainment.

I invite all of you to attend the 90th CSWEA Annual Meeting and remember that we really are "Gonna Rock this Town!" CS

# 90th Annual Meeting

May 22-25, 2017 | InterContinental Hotel | St. Paul, MN

**Save The Date**
**Utility Registration Pricing.**
***Send More, Save More!***

## A CALL FOR DISRUPTION...

### KEYNOTE: JULIAN SANDINO

The conditions that have determined today's water industry service needs and corresponding solutions will likely change due to drastically different environmental, social, and financial requirements in the future. Thus, it should be anticipated that the technologies that have served us well until now will not necessarily be adequate for tomorrow's needs. In the face of a difficult-to-envision future, risk management becomes an integral part of a strategy for any utility to successfully navigate the uncertainties that arise when planning.

In his key address, Dr. Sandino will argue for the need for water utilities seeking to position for the future to abandon the traditional long-term master plan, and replacing it with a more dynamic strategic positioning approach based on shorter planning horizons and multiple future scenarios. This allows short-term decision making without compromising the ability to reach any of the plausible futures cost effectively by minimizing throw-away costs. He will also discuss how "disruptive" technologies (rather than the continued tweaking of existing solutions) are likely the answer to our industry needs to prepare for the future while providing the necessary flexibility and adaptability to deal with planning uncertainty. Development of these new technologies can be time and resource consuming for a utility. Therefore, Julian will call for our industry to further adopt collaborative applied research strategies, including participation in subscriber-based research programs among others, to share the knowledge and resources that will be necessary to develop the new solutions set required to meet the challenging demands of the 21st century water industry.

**Biography**

As Vice President, Wastewater Global Practice Lead, and Technology Senior Fellow at CH2M, Dr. Julian Sandino brings more than 30 years of experience leading and assisting teams in over 300 sanitary infrastructure and environmental projects throughout the world including process evaluation and design for a wide variety of water resource recovery facilities.

Dr. Sandino received a Doctorate in Philosophy and a Master of Science in Environmental Health Engineering at University of Kansas, and a B.S. in Civil Engineering from Universidad de Los Andes, Bogota, Colombia. He is a licensed PE in the States of Kansas and Arizona, and is a BCEE by the American Academy of Environmental Engineers. He is also a Fellow of WEF and has served two terms in the Board of Trustees and as Chair of the International Coordination Committee of WEF. In 2008, he received the prestigious Engelbrecht International Achievement Award from WEF.

## *New* STORMWATER TOUR SWALES, RAILS AND ALES

A Stormwater Tour of St. Paul and Minneapolis
Monday, May 22, 2017 | 1:00-5:00 p.m.

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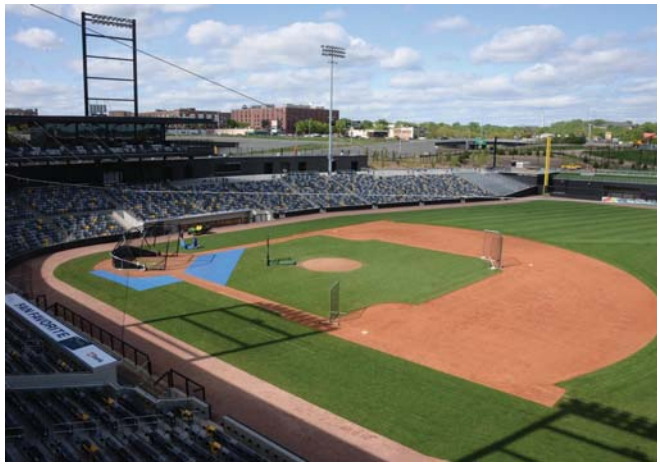


Please join us as the Minnesota Section Stormwater Committee will be hosting a walking and light rail tour of innovative stormwater management in St. Paul. The tour will begin at CHS Field, the "Greenest Ballpark in America." See all of the latest innovative stormwater management, information kiosks, and stormwater reuse practice for water turf and flushing toilets. From CHS Field, we will board the Green Line Light Rail Transit and

tour Stormwater Green Infrastructure. See firsthand the world's largest, award-winning green infrastructure practices for the Green Line along University Avenue. After the University Avenue stop, we will visit a Bang Brewing, a very unique and green brewery incorporating many best practices for stormwater and water conservation. Enjoy one their brews and light snacks before heading back to the InterContinental Hotel.

New

## RESOURCE RECOVERY PANEL

### SAMUEL JEYANAYAGAM, RESOURCE RECOVERY PANEL MODERATOR

Dr. Jeyanayagam is a Vice President and Senior Principal Technologist at CH2M. He has over 38 years of academic and consulting experience and has completed projects in seven countries. His recent project experience includes serving as co-principal investigator on three WE&RF resource recovery projects: Extractive Nutrient Recovery (NTRY1R12); Recovery of Carbon and Other Commodity Products (NTRY3R13); and Recovery of Plasmids and Rare Earth Elements (NTRY8R15).

Sam has written and presented over 180 papers and co-authored over 27 WEF manuals. He also served as Task Force Chair of WEF's special publication, The Nutrient Roadmap. He is on the Editorial Board of the Water Environment Research and Water Environment & Technology journals.

Sam is a WEF Fellow, registered professional engineer, and Board Certified Environmental Engineer. He received his MS and PhD degrees from Virginia Tech. Sam is regularly featured as an instructor in University of Wisconsin wastewater treatment courses.

**Resource Recovery at WRRFs – Nutrients and Beyond**

The focus of wastewater treatment continues to be in a state of flux. Sanitation and public health concerns of the early 1900s gave way to pollution control in the 1950s and 1960s. The end of the 20th century saw water reclamation and biosolids management move to the forefront. In the 21st century, population growth, rapid urbanization, improved quality of life, and linear resource consumption are causing a range of global and regional pressures including climate change, deterioration of urban infrastructure, rising energy demand, and resource depletion.

The transformation from "what must be removed" (waste) to "what must be recovered" (resource) is already happening through the implementation of mature technologies for the recovery of nutrients, water, and energy. Concurrently, efforts are focused on a range of initiatives to promote and accelerate the development of science and functional systems related to the recovery of new resources. However, for the most part, the concept of scarcity is not a major driver and most utilities in the US are focused on maintaining the status quo and implementing incremental changes only on an as needed basis to achieve compliance. Such an approach puts utilities on an ever-narrowing path with no opportunity or need for innovation. In order to cope with the practical realities of the 21st century and beyond, a truly cyclic economy must be established. Disruptive and game-changing approaches are needed to allow today's wastewater treatment plant to evolve as water resource recovery facility (WRRF) of the future.

The adoption of disruptive technologies for the 21st century resource recovery will result in a competition for the captured carbon. Hence, carbon management and energy optimization will take center stage. In addition, ongoing efforts to extract nutrients must dovetail seamlessly with future resource recovery approaches. This special invited speaker session brings together a group of experts to present the next generation resource recovery that are already drawing industry attention. Topics covered will include phosphorus recovery, carbon management and energy optimization, recovery of non-nutrient commodities, and practical impacts of implementing nutrient recovery through the use of case studies.

The Resource Recovery track is a new addition to the annual meeting. It is an invitational program and will showcase where we currently are in Resource Recovery technology and where we want to go with this new concept. The session will be moderated by Dr. Sam Jeyanayagam who is a Vice President and Senior Principal Technologist at CH2M. Featured speakers include Dr. Anne Schauer-Gimenez from Mango Material who will talk on producing bio-degradable plastic from uncleaned digester gas. Dr. Nicole Buan from the University of Kansas will speak on producing high-value bioproducts from wastewater and waste biomass. Catherine O'Connor the Director of Engineering for the Metropolitan Water Reclamation District of Greater Chicago (District) and Tom Sigmund Executive Director Green Bay Metropolitan Sewerage District will present on Resource Recovery efforts at their facilities.

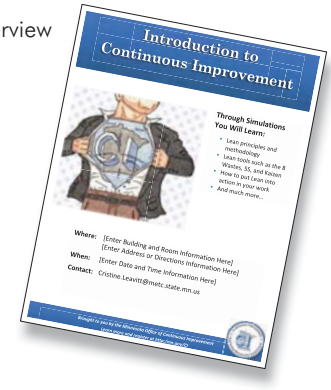
## LEADERSHIP TRACK

### CONTINUOUS IMPROVEMENT CRISTINE LEAVITT

Cristine Leavitt has over 25 years of experience helping leaders and teams improve performance. She has led over 60 continuous improvement projects at 19 different organizations and trained over 2700 people on CI methods and tools. Cristine has a background in Economics and Organizational Development. She received her Six Sigma Black Belt certification in 2014, and has served as an evaluator for the Malcolm Baldrige National Quality Award.

This session introduces Lean principles, methods, and tools through fun hands-on exercises and facilitated discussions that help participants see and remove process wastes. Content covered includes:

- Continuous improvement overview
- Lean methodology (PDSA)
- Lean concepts and tools:
  - Voice of the customer
  - Process measurement
  - 8 wastes
  - 5S
  - Value
  - Kaizen
  - Standard work



# 90TH ANNUAL MEETING HIGHLIGHTS

The 90th Annual Meeting of the Central States Water Environment Association, Inc., will be held May 22-25, 2017 at the InterContinental Hotel in St. Paul, Minnesota. This year, we will be introducing a half-day panel on resource recovery, stormwater and watershed topics and tour, as well as our utility pricing, leadership and ethics sessions, and utility management track.

### OPERATIONS & MAINTENANCE:

- Efficiency (pumps, motors, lights, UV disinfection, HVAC, etc.)
- Technology/SCADA/Web-based Maintenance Programs/ GIS Applications
- Troubleshooting
- Case Studies
- Summary of Completed Projects
- Optimization
- Nutrient Removal
- Process Control
- Start-up Issues

### UTILITY MANAGEMENT:

- Succession Planning
- Project Funding
- Utility Rate Development and Reviews
- Employee Retention
- Communication

### ENHANCED RESOURCE & ENERGY PRODUCTION:

- Resource Recovery – Raw Materials, Nutrients, Energy
- Digester Gas Production Technologies
- Co-digestion
- Heat Recovery Technologies
- Alternative Energy Use

### RESIDUALS, SOLIDS, & BIOSOLIDS:

- Environmental Management Systems
- National Biosolids Partnership
- Standard or Advanced Treatment and Stabilization

### COLLECTION SYSTEMS:

- Collection System Rehabilitation Technologies/Methods
- CMOM Program Development and Implementation
- Collection System Design and Operation
- Green Infrastructure - Examples in Practice
- Infiltration/Inflow Management
- Stormwater & Combined Sewer Overflow Management

### GENERAL:

- Laboratory Issues/Bench-Scale Studies
- Pretreatment, Industrial Treatment, & Pollution Prevention
- Regulatory Issues
- Security Issues
- Engineering Ethics Training

### WATERSHEDS & STORMWATER MANAGEMENT:

- Anti-Degradation and Other Regulatory Issues
- Habitat or Groundwater Protection or Restoration
- Non-Point Pollution Source Modeling
- Water Quality Trading and Watershed Management Issues and Initiatives, including Adaptive Management
- Green Infrastructure Solutions and Best Management Practices
- Total Maximum Daily Loads Involving Point and Non-Point Sources
- Education and Outreach

### SOFT SKILLS/LEADERSHIP:

- Leadership Skills
- Managing the Ill or Injured Employee
- Anti-Harassment and Discrimination Training for Managers
- Getting the Most Out of Employee Performance Evaluations
- We Negotiated the Agreement – Now What?
- Handling the Grievance and Arbitration Process
- Managing in a Union Environment
- The Basics of Labor Law
- 10 Things Every Manager Should Know About Labor Law
- Top 10 Employment Law Issues
- Stumbling into Violations: Do Hand-books and Policies Violate Labor Law?
- Management Rights for Managers
- Social Media and the Workplace

### RESEARCH & DESIGN:

- Nutrient Removal Technologies
- New/Innovative Technology Research and Application
- Sustainability in Design and Construction
- Toxics/Emerging Pollutants Monitoring and Control
- Treatment Design
- Wastewater Reuse, Applications, Technology, & Regulatory Issues

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# SEND MORE PEOPLE AND STILL SAVE $$$

## UTILITY REGISTRATION PRICING

Based on the success in 2015 and 2016, CSWEA will continue to offer flat rate utility pricing for the Annual Meeting. The pricing allows utilities to pay a flat fee for registration with the cost determined by their treatment plant design size. For that price, **a utility may send as many people as they want to the annual meeting**. The utility would still have to purchase event and meal tickets separately for each individual. The only included meals would be the continental breakfasts, coffee/snacks, and box lunches.

Five tiers have been set up for the Utility registrations.

## PRICING TIERS FOR ANNUAL MEETING

**MICRO UTILITY** (<1 MGD or Collection Only) @ $150
**SMALL UTILITY** (1-5 MGD) @ $250
**MEDIUM UTILITY** (5-10 MGD) @ $500
**LARGE UTILITY** (10-25 MGD) @ $800
**MEGA UTILITY** (>25 MGD) @ $1500

## COST COMPARISON (OLD vs. NEW) – using simple pricing

An Example of the cost savings is below.

## OLD PRICING

Sample pricing for a 7 MGD Treatment Plant
Old Pricing with 6 attendees:

| Attendee | Reg Type | Reg Cost | Events | Meals | Subtotal |
|---|---|---|---|---|---|
| District Manager | Full | $325 | $110 | $120 | $555 |
| Asst Manager | Full | $325 | $95 | $105 | $525 |
| Chief Operator | Full | $325 | | $45 | $370 |
| Maint Manager | Wed Only | $190 | | $45 | $235 |
| Operator 1 | Wed Only | $190 | | | $190 |
| Operator 2 | Tues Only | $175 | | | $175 |
| **TOTAL** | | **$1,530** | **$205** | **$315** | $2,050 |

## *NEW UTILITY PRICING* With 2 more Operators and 1 Trustee Attending

| Attendee | Registration Type | Registration Cost | Event | Meals | Subtotal |
|---|---|---|---|---|---|
| **Utility Regn** | 5-10 MGD | $500 | | | $500 |
| **District Manager** | Full | | $110 | $120 | $230 |
| **Asst Manager** | Full | | $95 | $105 | $200 |
| **Chief Operator** | Full | | | $45 | $45 |
| **Maint Manager** | Wed Only | | | $45 | $45 |
| **Operator 1** | Wed Only | | | | |
| **Operator 2** | Tues Only | | | | |
| **Operator 3** | Wed Only | | | | |
| **Operator 4** | Tues Only | | | | |
| **Trustee** | Wed Only | | | $120 | $120 |
| **TOTAL** | | **$500** | **$205** | **$435** | **$1,140** |

## Questions? Contact Amy Haque at *ahaque@cswea.org*


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**573.474.9456 x232**

# Core Values of Service

By Doug Henrichsen and Eric Lynne

Since 1928, the Water Environment Federation (WEF) and its members have protected public health and the environment. As a global water sector leader, WEF's mission is to 1) connect water professionals; 2) Enrich the expertise of water professionals; 3) Increase the awareness of the impact and value of water; and 4) Provide a platform for water sector innovation.

So what is the state of the Federation? As we all know, one of WEF's goals is to support Member Associations (MAs) across the globe, including CSWEA. WEF is responsible for the planning and execution of WEFTEC, numerous specialty conferences, and a host of other activities that are designed to engage MAs. Recently, WEF developed their Strategic Plan for moving forward. Although WEF is a non-profit organization, it is run as a business to ensure its longevity. Thus, WEF is operating as a sustainable, fiscally responsible business. WEF's Strategic Plan, which includes Critical Objectives and Strategic Goals, is summarized at the end of this report.

## CORE VALUES OF SERVICE

WEF has identified the following four core values of service:

- Leadership
- Passion
- Scholarship
- Collaboration

This article highlights the first of these, the **Leadership** service area. WEF leaders and the House of Delegates (HOD) are focused on helping the membership thrive by promoting leadership across each of the mission areas.

No matter your view of WEF, there is no doubt that it is the leader in the industry for providing unlimited possibilities for professional growth. Unlimited in the sense that CSWEA will support unique ideas and leaders that align with our goals. From a national perspective, CSWEA is an elite member association, so don't overlook opportunities for leadership when opportunity knocks.

## WEF/WE&RF LIFT AFFILIATE

As an example of how CSWEA plans to continue providing its leaders the best information, CSWEA is actively pursuing membership as a WEF/WE&RF LIFT Affiliate. LIFT, the Leaders Innovation Forum for Technology helps to provide many of the above mentioned goals as useful information about the industries latest research and technology. As a MA LIFT Affiliate, CSWEA will serve as a link between the utilities, universities, and LIFT projects to ensure our members are aware of opportunities that work towards our common goals.

## HOUSE OF DELEGATES MEETING

At WEFTEC, Eric and Doug attended the HOD Meeting, where the 2016 Progress Report was unveiled. Although it may seem that WEF is a well-oiled machine, WEF is still finding ways to further improve the sustainability of the organization. This year's business plan was modified to become a three-year Business Plan for longer term budgeting and planning. The 2017-2019 Business Plan provides WEF leaders, staff, and committees direction for implementing practices that best satisfy our members' interests.

Although WEFTEC 2016 in New Orleans was not a record-breaking conference, it was very well attended, and WEF remains very strong financially compared to other non-profit organizations. In recent years, WEF has made great strides towards diversifying and is close to obtaining a target of 50% reserve funds by 2020. In the financial report, WEF identified several ways to increase revenue, including: targeting new members and conferences in stormwater and water resources or from operator certification courses. While WEF develops these and other new sources of income, a dues increase of 5% for WEF membership will occur in January 2017.

WEF's 2017-2019 Business Plan also set a few priorities, each of which aim to address WEF's mission statements:

- Membership growth and diversity
- Aging infrastructure and workforces

- Young professional development
- Sustainable utility revenue business models
- Finalizing and promoting publications for the Water Reuse Roadmap, the Nutrient Roadmap, and the Energy Roadmap
- Strengthening WEF's partnerships with MAs and the Water Reuse Association, as well as reaching out to international organizations in Germany/European Union, Korea, Denmark, and Singapore to connect water professionals
- Investing in services for members and MAs while maintaining a sustainable and nimble business model

Priorities during this term of the 2017-2019 Business Plan that are applicable to CSWEA were identified as:

- **Membership Growth** – WEF is currently working with CSWEA to offer an introductory free one-year membership to non-members from our 3 states who attend WEFTEC 2017.
- **Increase Offerings** – Increasing diversity and expanding practice growth areas to strengthen the operations challenge, biosolids, resource recovery, and pursue opportunities in operator certification, including the development of national certification standards.
- **Stress Public Education** – Sharing WEF's recent initiative to help everyone understand the value of water.
- **Accelerate Resource Recovery** – WEF's publications and LIFT program are structured to educate and bring cutting edge technologies to the end-users, which will expedite the implementation of sustainable practices. WEF is also encouraging municipalities to use the term Resource Recovery facility to better reflect our purpose.
- **WEFTEC Relevance** – Historically, WEFTEC has been THE location for high-quality expertise and unprecedented exhibitor displays in the water industry. WEF intends to better promote these characteristics and avoid complacency.

WEF has taken a fiscally responsible approach to expanding its three-year Business Plan to pursue these priorities, by utilizing excess profits and retiring previous strategic items.

## WEFMAX 2017

Finally, four (4) locations have been chosen to host WEFMAX in 2017. WEFMAX offers an opportunity for MA leaders at all levels to join together, share success stories and ideas on how MA members can be better served. These fast paced, interactive meetings are open to all members and provide for both enlightenment and networking with other leaders of the water profession from throughout North America and beyond. The locations and dates are as follows:

- March 29-31, 2017: San Juan, Puerto Rico (Puerto Rico W&EA)
- April 26-27, 2017: Cincinnati, OH (Host is Ohio WEA)
- May 10-12, 2017: Winnipeg, Manitoba, Canada (Host is Western Canada WEA)
- May 31-June 2, 2017: Austin, TX (Host is WEA of Texas)

All are encouraged to attend at least one of these events. CS





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**POTABLE WATER MIXING/ICE PREVENTION**

*"These mixers give peace of mind, especially in winter."*

Cary Johnson, water operations mgr., Rochester Public Utilities, Rochester, Minnesota

**POTABLE WATER/THM REMOVAL**

*"GridBee in-tank aeration is effective and affordable."*

Tony Linder, WTP division chief, Dept. of Water Supply, County of Maui, Hawaii

**WASTEWATER MIXING/BASINS AND LAGOONS**

*"We reduced our nitrate levels and lowered our energy costs."*

John Willis, wastewater plant supervisor, Ventura, California

**LAKES AND RAW WATER**

*"We reduced WTP operating costs caused by algae blooms."*

James A. Brown, water production manager, Newton County, Georgia

**WASTEWATER MIXING/WET WELLS**

*"Don't let wipes clog your pumps."*

Curtis Rooth, foreman, Sewer Dept., Cromwell, Connecticut

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# Water is Finite – Recycle Every Drop

By Mohammed Haque

Recently I was listening to a podcast by the TED Radio Hour called *Finite*. It described how many of our resources are finite. Resources such as antibiotics, oil, and water. The great part of this podcast was that it made you realize that finite resources create the need and climate where we become innovative and learn to do more with less. So in areas where there is less clean water, people get by on a lot less water and create new ways to harvest water. Such is the case with fog harvesting, where water is harvested using nets from fog. It's clear to me that in today's environment, innovation is proving to be a big factor in how long we can stretch out our finite resources.

This podcast also made me realize that in today's world over 70% of our clean water is used for agriculture. So while we are innovating around how to harvest water, we also need to work on water recycling and reuse. Great strides have been made this decade on recovering resources and water reuse. If you step back from our daily routines and projects, and look at our water landscape, you will see that as water professionals we have such a profound impact on society's efficient use and reuse of water. Equally important is that we try to clean our water so that the next time we encounter that drop of water, we are not having to clean something we should have cleaned the first time around. Sometimes, as industry professionals, we get bogged down in regulations and strive only to do what is needed. I'm not saying there is not a cost-benefit to what we do, but I also challenge us to look at water as a finite resource and that we should strive to recycle every drop well.

At WEFTEC this year, we honored many of our peers who exemplify that type of attitude. People who are innovative and take pride in doing their jobs well. I'd like to congratulate them all.

- Schroepfer Innovative Facility Design Medal – Randall A. Wirtz
- WEF Fellows – Tom Wilson/Paige Novak/Rusty Schroedel
- WEF Safety Award – Glenbard Wastewater Authority
- Ops Challenge Team
- Student Design Team from UofM
- Utilities of the Future: City of Fond du Lac
  Downers Grove Sanitary District
  Glenbard Wastewater Authority
  NEW Water
  Metropolitan Council
  MMSD
  MWRD
  City of Stevens Point

UN WATER
19 November
**WORLD TOILET DAY**

On November 21, I got ridiculed by a bunch of 6th graders and it was great! Mrs. Chakoian of Lundahl Middle School in Crystal Lake, IL was kind enough to let me come in for the second year and talk to her four science classes about World Toilet Day (November 19), the importance of sanitation, and the importance of our profession. It was a great day and I appreciate the opportunity to get the time to teach the kids about our profession. If any of you are interested in doing the same, please reach out to me and we can get you started with a presentation and some ideas. You can email me at *mhaque@cswea.org*.

Please make sure to read about Tricia Garrison and her colleague's great work at NEW Water (Green Bay, WI) with STEM Superheroes. NEW Water's initiative is just awesome, and if you want to know more, make sure to check out their YouTube videos, especially those about the awesome cast of characters they have (Commander Cleanwater, Sinister Sediment and Phosphorus Fury). Pure awesomeness! Learn more at *www.gbmsd.org/education/*. CS

# GWS Update
## Volunteer & Donor Spotlight

By Liz Bohne

Another year, another student design competition! Each year students from participating universities are invited to participate in the CSWEA student design competition which takes place annually at the Education Seminar in April. This year, GWS has put together a problem statement for our THIRD project. This project will take place in Dominical, a small rural community in Southern Costa Rica just 20 minutes north of the Bahia Ballena, where our second project is in the works.

Dominical has a great need for wastewater treatment due to its potential for tourism and anticipated growth that will be occurring over the next few years. The student design competition problem statement is included at the end of this article! Take a look to learn more details about the project site, and get an idea of how you might tackle the problem.

As GWS continues to grow, we would like to recognize some of the people who have helped to get us to where we are today. Without our dedicated volunteers and generous donors, we would not be able to make the impact on human health and water quality that we're on our way towards. Check out our first volunteer and donor spotlights to learn a little bit more about our members!

# GWS Volunteer Spotlight: Zack Wallin

Our volunteers dedicate their time and resources with a hope that they can make a difference, but that's not to say they don't get something back from their involvement. Being a GWS volunteer provides wastewater professionals with a place to channel their passions, increase their networks, and develop their skills further in a market they typically may not have the chance to experience. It's a great place for young professionals to learn, and get involved in CSWEA early! One of our new young professional volunteers deserves a shout-out! Zack is a 2016 graduate from UW Platteville and was a winner of the 2016 student design competition. He traveled to Costa Rica in August with the GWS team and has since remained very actively involved, even though his duties as student design winner were complete after WEFTEC. He played a crucial role in the completion of the preliminary design for the Bahia Ballena project during the competition phase, and continues to be flexible and dedicated to the project's success. Now he is working in Mason City, Iowa with Short Elliot Hendrickson as he begins his career as an engineer. He is working primarily on water and wastewater projects doing a mixture of office and field work. I got the chance to speak with Zack a little more about his involvement with GWS and what he's doing now that University is over.

**Liz:** How did you decide to work on the GWS project for your senior design project?

**Zack:** I originally decided to study environmental engineering because I wanted to provide people in the USA, and abroad with access to clean water. As my time in college progressed, I discovered that I also really enjoy the wastewater side of things, and that there is a big need for improved sanitation worldwide that often goes unnoticed. When I saw the opportunity to be a part of the solution to a wastewater issue in Costa Rica as a senior design project, I could not resist.

**L:** What type of treatment system did you and your team recommend and how did you decide that was best?

**Z:** Well to start, here are a few quick things to note about the project, to help readers understand: Costa Rica has few wastewater treatment facilities, many homes are on failing septic systems, so most Costa Rican communities do not know how to operate wastewater facilities. Most communities do have potable water systems, and have successfully managed them for some time now. The particular community that we worked with attracts

and depends on revenue from tourists. The fast growing community is seeking to attract even more tourists. Electricity in Costa Rica can be unreliable, and is double the cost of electricity in the USA.

Now to answer your question, we first looked at potential sites, and created a decision matrix as to which site was preferred. We considered items such as odor, whether or not lift station(s) would be needed, the size of the site, and cost and ease of official acquisition to name a few. We wanted to select and design a process that would minimize adverse socioeconomic impacts, capital and O&M costs, power demands, and operator expertise to provide a solution that would fit the community well. In addition, we looked at treatment options that could produce the desired effluent quality and fit onto each of the sites. A mechanical treatment facility such as activated sludge requires a small area, but can be complicated to operate, whereas a lagoon is easy to operate, but requires much more land. The sites that were potentially available had a mixture of desirable and undesirable qualities, so we had to try to find a balance. One of the two finalist sites had a large enough area to fit a completely mixed aerated lagoon, and would require one lift station immediately preceding the treatment facility. However, the site was in prime real estate near the ocean and near the heart of the community, meaning potential for lost tourist revenue, and slower growth. At the time, acquiring the land was no guarantee as well. The other finalist site was too small for a lagoon, and would require a long force main with a higher elevation change than the other finalist site. However, the second finalist site was already owned by the government, was downwind of the community, and the land had little real estate value.

We went with a trickling filter system on the second finalist site that included primary and secondary sedimentation tanks, and an equalization basin. This system is easier to operate than traditional activated sludge, and requires less land than aerated lagoons, so our team felt that this system was a good compromise.

**L:** In what ways did traveling to Costa Rica with GWS add to what you learned during


your undergraduate education, and particularly, your senior design project?

**Z:** Traveling to Costa Rica with GWS really emphasized the importance of communication, especially communication with various government entities, community members and other stakeholders. An idea is useless if it cannot be communicated accurately to people with different backgrounds and different experiences. I also learned more about the design process throughout the project and then during the visit to Costa Rica. Our team had redesigned our proposed solution a couple times through the semester, and then we ended up having to redesign again after competition as new information came out. We will have to redesign at least one more time due to new information we got during our visit. At times it was frustrating having to change things we had already worked so hard on, but it was good for us to realize that engineers have to be able to adjust and make good decisions as the project changes.

**L:** Yeah, I agree the trip was frustrating at times, but definitely an incredible experience. On that note, why did you decide to stay involved in GWS?

**Z:** I decided to stay with GWS because I believe the work they are doing is going to make a big difference. There are billions of people that lack adequate sanitation, which can lead to preventable illness and disease. To undertake in the mission to try to save lives, and keep our world clean is an honorable cause. In addition, the people of GWS are great to work with. They have a wide variety of skills and backgrounds that I have already greatly benefited from, and I continue to learn from their experiences and guidance.

**L:** It's definitely great to work for something you can believe in and be proud of. What are you working on now for GWS?

**Z:** Right now, I am helping with setting up the next student design competition. Because I went through the competition as a student, I have a unique perspective on how the competition was run, and how it can be improved.

**L:** And now that you're done with school and out in the real world, has your work with GWS helped you in your job and if so, how?

**Z:** I would certainly say GWS has helped me with communication skills. Being exposed to the project, and working with other engineers across the Midwest has forced me to sharpen my communication skills. This has been really important, especially when interacting with contractors and at times, community members.

As a recent graduate, I do not have a ton of experience. GWS has given me an opportunity to gain experience faster than just working a job. From the work that I have done, am doing, and will do along with relationships with other engineers who help me along, I am learning and gaining experience which will pay dividends as I run into various challenges. Even now the additional experience has helped keep me calm when challenges arise, and I can contemplate solutions with a level head.

**L:** Why did you choose to make water/wastewater your career?

**Z:** I decided to make a career in water/wastewater for several reasons. I love the outdoors, and want to do my part in stewarding it well. I enjoy the technical side of things in the field. My belief in God has taught me that He wants to provide everyone with their most important needs. I want to reflect that by playing a role in providing people with essential needs such as sanitation and clean water.

**L:** What advice would you give to students who are about to begin work on their senior design projects?

**Z:** Find a way to get along with your design team. If you cannot get along with your design team, the project will be rough, and its chance at success will fall. If everyone works well together, the project has a better chance to succeed. Everyone is different, and has unique talents and mindsets that they can bring to the project. When there are conflicts, address them and seek to understand the other side first. I was fortunate in that our design team was able to work together well, which was really good for our project.

# GWS Corporate Donor Spotlight:

## Trotter and Associates


**Discussion with Scott Trotter**

Scott Trotter is the founder and president of Trotter and Associates, Inc. (TAI) which has been a corporate sponsor of GWS since it was started in 2013. He is a leader in the water industry and well known in CSWEA. Scott served on the CSWEA executive board from 2002 through 2010 serving as an officer, treasurer, delegate and president. He was the CSWEA president in 2005/06. In 2011, Scott was selected to serve on the WEF Board of Trustees. While he has completed his board term, he continues to be active at the national level serving on a variety of committees and leading numerous task forces. Since the formation of TAI in 1999, Scott has created a team of young engineers who he encourages to be involved in organizations such as CSWEA and WEF, including GWS. I spoke with him about his journey in the industry, and why he is a GWS supporter.

**L:** So Scott, how did you originally get involved in the water and wastewater industry?

**S:** I spent the first three years of my career as a resident engineer overseeing construction of several large water and wastewater projects for Robert H. Anderson & Associates located in St. Charles, Illinois. Utilizing this practical field experience, I became part of the firm's design team and was mentored by Bernie Bosch and Dennis Novak. As part of the design process, I was encouraged to question the status quo and focus on improving our team's designs by better understanding the needs of the operators, increasing flexibility of the processes and evaluating new technologies.

**L:** So from there, how did you get involved in Central States?

**S:** As a project engineer, I was working closely with Chuck Hansen of Petersen and Matz and Jay Jones from Ley and Associates, both of whom were manufacturers' representatives in our area. Chuck and Jay are the ones who pulled me into CSWEA by inviting me to become part of the local arrangements committee for WETEC in 1993. When WEFTEC was scheduled to return in 1997, Chuck had become an officer in CSWEA and asked me to take over as the Co-Chair of the WEFTEC LAC with Greg Cargill of Illinois WEA. During this event, Greg and I created the annual CSWEA/IWEA Reception at WEFTEC, which I continued to chair until a few years ago. I continued to serve as Co-Chair for WEFTEC in 2002 and 2008. I also was invited to become involved with a number of other committees within CSWEA including the technical program committee.

**L:** And what benefits do you think your involvement in Central Sates has had?

**S:** In 2002, I was asked to serve on the CSWEA executive committee, which provided an opportunity to get to know and work with the members and leaders from Illinois, Wisconsin and Minnesota. Through those relationships, I developed a significantly larger pool of friends and resources in the industry. These relationships have contributed to my professional development with respect to technical expertise, organizational skills and leadership style. Every step along the way someone opened the door and invited me to join the team. I think CSWEA is a great way to develop camaraderie among industry professionals. It provides a forum for people to network and collaborate on regulatory issues, best practices and emerging technologies. Together we have a much larger impact than we would as individuals, and we have been able to significantly advance the water quality profession.

**L:** Why did you choose to support GWS?

**S:** I think that once GWS gains critical mass, it will be able to make a significant impact on the lives of those it is intended to serve and those doing the work. GWS' model is different than other organizations like Water For People. It is focused on using

the efforts and talent of our local volunteers to make a difference. Our financial support makes that volunteerism possible. I know the people involved. They are working hard and committed to using their talent to make a larger impact on the world.

It's a great opportunity for younger engineers to collaborate and get involved beyond their responsibilities at TAI. It's provides them the opportunity to grow professionally, create a larger professional network and gain leadership and organizational skills beyond those developed within the firm. All of which makes them a more valuable member of TAI's team. So through sponsorship, we are able to create an opportunity, which translates to experience and value within the firm. In short, I think the value to the volunteers is equivalent to the value to the community.

**L:** I definitely agree with you there, it's been a great experience to be involved with the group. What have you enjoyed the most about your involvement in the water industry over the past 25 years?

**S:** I would have to say the friendships that I have formed and the impact on the industry that I have had through both providing and implementing solutions and well as being involved in WEF and CSWEA. There are a number of great examples, but each of them starts with a team effort and ends with positive, tangible change. CSWEA and WEF have made some remarkable changes during this period and I am glad that I was part of that transformation.

**L:** Where do you see the industry going?

**S:** I'm excited to see where we are headed with respect to nutrient recovery, the water energy nexus, and implementation of the roadmaps that have been created through thought leadership. Nutrient pollution is an issues that has been talked about for almost as long as I've been working in wastewater. The Hypoxia zone has been an emerging concern for over 15 years and now we're finally starting to implement changes that will address the issue. I think that our plants will become more efficient and effective as we continue to develop emerging technologies and processes. And, all of these changes are driven by public awareness that we can do better and that we can replace our aging infrastructure with technology that protects the public health and improves the environment.

It's really a great time for people entering the industry because there is a need for future leaders. I think there is a huge gap between the ages of 40 and 55. The next generation will have a much larger impact as environmental awareness is growing, and their desire to be more collaborative through constant communication. Sometimes people criticize the Millennials because they are looking for instant gratification, but I think this is a good thing! They have a knack to evaluate alternatives and find solutions that are more efficient and effective. I'm very excited about what we've built at TAI. We have a great team of young engineers who are learning quickly, and soon I'll be the coach. CS





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# The Central States Water Environment Association

November 4, 2016

Greetings,

I would like to introduce you to the Student Design Competition sponsored by the Central States Water Environment Association (CSWEA). This year, the CSWEA competition will be held on the afternoon of Monday, April 10, 2017, the day before the CSWEA Education Seminar at Monona Terrace Convention Center in Madison WI. This is a great opportunity to participate in the Competitions and attend the Education Seminar the following day.

The Student Design Competition is described in detail on the attached announcement. There are three different categories in the Design Competition; Wastewater Design, Environmental Design and the Global Water Stewardship Project. This is a unique opportunity for students at the college level to demonstrate their engineering skills and practices by researching and preparing a design for a water quality based project and presenting their project to water industry professionals. The competition at the CSWEA level is intended to feed into the national competition at the annual WEFTEC conference, which this year is scheduled for September 30-October 4, 2017 in Chicago, Illinois.

The Student Design Competition is designed to be a function of the WEF Student Chapters program. We understand that you may not have a WEF Student Chapter at the present time. A Student Chapter is not required to compete for CSWEA. WEF requires students to have a WEF student membership to participate at WEFTEC; however CSWEA does not require it to participate in either of these two events. CSWEA will provide student membership enrollment in WEF for teams/individuals who represent CSWEA at WEFTEC.

The State Sections (Wisconsin, Illinois and Minnesota) of CSWEA have budgeted funds to assist individuals or teams from their State to present at the CSWEA competition event in April. We understand it is hard to schedule students to participate and will be as flexible as possible in working with you and your students to afford the opportunity to participate on the design competition date. Design projects from first semester are eligible along with Design projects that are being developed as part of a second semester class. Please read over the attached announcement and provide this information to any interested students in the water quality field that you feel may benefit from such an experience.

I look forward to hearing from you with any questions or if you need additional information on how to participate in either of these two events. I can be contacted by phone at 815-762-5919 or email at *mholland@dekalbsd.com*.

Best regards,
Mike Holland
CSWEA Student Design Competition Chair CS

ANNOUNCEMENT

# 2017 CSWEA & WEF Student Design Competition

## Rules of the Competition

### INTRODUCTION

The WEF Student Design Competition is intended to promote "real world and hands on" design experience for students interested in pursuing an education and/or career in water/wastewater engineering and sciences field. This competition requires teams of students to design and present a program meeting the requirements of a problem statement. **There are three levels of competition**; a conventional **Wastewater Design** category which includes traditional wastewater design projects, an **Environmental Design** category which would include contemporary engineering design topics like sustainability, water reuse, wetland construction and Engineers Without Borders projects, and the **Global Water Stewardship** category which would use the problem statement identified in the attached document titled "Global Water Stewardship: Dominical, Costa Rica."

Detailed 2017 WEF competition guidelines will be provided to competitors when published, usually in May.

### WORKLOAD

The project should include a problem statement, a development of alternatives and a recommended solution. The depth of the effort should be comparable to preliminary design. A key criterion in the judging of the competition is the manner and level of effort spent in evaluating the alternatives. Students are expected to work with little assistance from an advisor and/or professor, and the students are expected to work together as a team to find a solution to their problem. Students may use whatever references or resources they choose.

### REQUIREMENTS

- Teams may consist of more than four members, but only four students may present at the competitions.
- Student teams will compete through oral presentations. Each presentation will be 20 minutes followed by a 10-minute question and answer period. The presentation should be in Power Point format.
- The winning teams of the CSWEA competition will be required to submit a design notebook complying with the WEF competition requirements set forth in the WEF design competition entry guidelines.

### DEADLINE

**March 31, 2017:** Submittal of the Entry Form for the 2017 Student Design Competition is due. Submit to Mike Holland at *mholland@dekalbsd.com*.

### TIMELINE

- **April 10, 2017:** CSWEA Design Competition will be held at the Monona Terrace, Madison, WI.
- **May 22-25, 2017:** The winning team from the CSWEA Competition will be invited to present at the CSWEA Annual Meeting in St. Paul, Minnesota.
- **September 30-October 4, 2017:** The winning teams from the CSWEA Competition will be offered the opportunity to compete at WEFTEC-2017 in Chicago, Illinois.

### PRESENTATION

The student design teams will present their projects at the Design Competition on Monday afternoon April 10 prior to the CSWEA Education Seminar in Monona Terrace; Madison, WI.

### SELECTION

Representatives from CSWEA will judge the design competition based on these four elements: Content, Organization, Delivery and Effectiveness, and Discussion.

### NOTIFICATION

The results of the competition will be issued to participants by the following Friday.

### AWARDS

- Each team that competes in the CSWEA Competition will receive free registration, one night of lodging and reimbursement of up to $100.00 each in travel expenses for attendance at the CSWEA Design Competition and Education Seminar. These expenses are paid by the State Sections of CWSEA.
- The winning team (max. of 4 members) from each category of the CSWEA competition will receive free registration from WEF and travel and lodging expenses paid by CSWEA to compete at the WEFTEC conference in Chicago, Illinois (September 30-October 4, 2017).
- Additionally, the winning team from the Global Water Stewardship category will also receive a travel and lodging stipend to accompany the next GWS team trip in August to Costa Rica for site analysis and investigations.
- Prizes for the winning team at WEFTEC will vary depending on sponsorship opportunities. Monetary awards typically provided by WEF for the top 4 design teams are: 1st place $2,500, 2nd place $1,500, 3rd place $1,000, 4th place $750. CS


**FOR ADDITIONAL INFORMATION, CONTACT**
**Mike Holland** CSWEA Student Design Competition Chair
Telephone: 815-762-5919
Email: *mholland@dekalbsd.com*

GLOBAL WATER STEWARDSHIP

# Global Water Stewardship: Dominical, Costa Rica 2016/17 Problem Statement


**Project Understanding**

Population: 450 with expected growth to 3,500-4,500 in 10-15 years
Number of water services: 134
Water usage: Design = 200 L/person/day
Approximately 5 people per home
Average Precipitation: 3,900 mm/yr
Average Temperature: 79 degrees Fahrenheit
Typical influent BOD: 358 mg/L
Typical influent TSS: 204 mg/L

There are very few centralized treatment systems in Costa Rica. In the rural areas, septic systems are very common, with greywater often being discharged directly overland. The leach fields are very small and very shallow. Although law states the leach fields must stay within each individual property, they often do not. Also, the groundwater table is often high, which does not allow for the proper detention of the leachate. The groundwater table in the area varies depending on the tide. In the tourist areas with higher populations, holding tanks are used along with trucking to a treatment system.

The area of concern is a specific dense portion of Dominical, Costa Rica. Dominical is a community in the central-south part of Costa Rica about 27 miles south of Quepos, directly located off the Pacific Ocean in the province of Puntarenas, and is growing beach community. The community is surrounded by plantations, estuaries, mangroves, and marshes. Much of the community is focused on visitation of tourists, and many locals also find employment through African oil palm plantations in the area.

The community is still growing with several larger developments currently planned to be built. There is a desire that these future developments would be connected to a sanitary system, however, they are not scheduled to be at this time. There is some curb and gutter, and a good portion of the commercial area are dirt roads. However, there is one brick paver road recently installed along the beach in Dominical. The stormwater flows through open ditches, into the local estuary, and eventually to the Pacific Ocean.

The community consists of a mixture of homes and businesses, with the businesses being located adjacent to the Rió Barú. The homes and businesses all vary in size and setup, with some having individual septic tanks for greywater and sanitary, while some only have a sanitary septic tank. Most businesses do have both. One exception to this set up is the Hotel Diuwak in the community, which relies on a biogarden to infiltrate and dispose of all of their wastewater.

Aerial photos show the locations of the businesses and home.

The septic tanks in the community are either poured in place concrete or plastic structures with no standard sizing, location or plumbing being used. The use of plastic for septic tanks is much cheaper than concrete. However, the plastic ones break more frequently due to the change in pressure from pumping the septic tanks. The homeowners are responsible for pumping their septic tanks, and are legally obligated to do so, but there is no control to ensure that they do. The charge of the clean-out service ranges around $75 per home, and should occur twice a year. Businesses pump about one to two times a month, and pay around $200 each time.

In Costa Rica, especially in the rural areas, toilet paper is not disposed of in the toilet. This is due to low water pressure, smaller pipe sizes, and general goal to reduce solids going into septic tanks or treatment system. Toilet paper is disposed of along with the other solid waste. A lot of refuse in rural areas is burned.

It is Costa Rican law that the property owner is responsible for their individual connection to the sewer main, however it is necessary to plan for funding the entire connection. It is also Costa Rican law that once a sewer main is constructed in front of a property, the property owner has to pay for the service whether they connect to it or not.

**For the full problem statement, please visit *www.cswea.org/SYP/Competition***

# 22nd Annual CSWEA EDUCATION SEMINAR

April 11, 2017 | Monona Terrace, Madison

# NUTRIENTS: RECOVERING RESOURCES THROUGH INNOVATION

**Charles B. Bott, PhD, PE, BCEE**
**Director of Water Technology and Research HRSD**

Dr. Charles B. Bott is the Director of Water Technology and Research at the Hampton Roads Sanitation District (HRSD) in southeast Virginia, where he currently is managing technology innovation for HRSD's thirteen wastewater treatment plants (249 MGD combined capacity) and collection system. Charles is also an Adjunct Professor of Civil and Environmental Engineering at Virginia Tech and Old Dominion University. Charles was formerly an Associate Professor in the Department of Civil and Environmental Engineering at the Virginia Military Institute (VMI) and a consulting engineer with Parsons Engineering Science.

## Keynote

### Pragmatic Utility Sustainability through Rapid Implementation of Emerging Technology

This presentation will provide an overview of regulatory and financial challenges at HRSD and a summary of recent implementation of emerging technologies, both presented in the context of a risk management through research and development and intensification of treatment processes. Specific topics to be considered include sidestream deammonification, struvite recovery, dewaterability impacts due to biological phosphorus removal and anaerobic digestion, advanced aeration controls, thermal hydrolysis, and aerobic granular sludge processes.

## Afternoon

### Shortcut Nitrogen Removal Processes: Sidestream Deammonification and Mainstream Nitrite Shunt & Deammonification

The cost of energy and resources (e.g., external carbon and alkalinity) for nitrogen removal from wastewater is increasing while nitrogen limits are becoming more widespread and more stringent. Optimization of energy usage and possible recovery of energy from indigenous carbon contained in wastewater has become the focal point of many advanced wastewater treatment facilities. There is a general consensus that conventional nitrification/denitrification processes are energy and resource intensive and moving to the next generation of short-cut nitrogen removal (i.e., repression of nitrite oxidation) technologies are being explored as a feasible alternative. The very efficient partial nitritation-anaerobic ammonia oxidation (anammox) or deammonification based technologies have already been proven to treat high ammonia strength reject water and can be considered state-of-the-art (Lackner et al., 2014), while mainstream implementation is currently under development by several research groups around the world. This presentation will provide a detailed overview of several mature technologies for sidestream deammonification, including implementation at HRSD and lessons learned, and will review the latest approaches being considered and demonstrated for mainstream deammonification and nitrite shunt.

**Blair Wisdom**
**Senior Engineer**
**Metro District**

Blair Wisdom is a Process Engineer at Metro Wastewater Reclamation District's 220 MGD Robert W. Hite Treatment Facility in Denver, Colorado. She has received a B.S. degree in Civil and Environmental Engineering from the University of Texas, Austin and a M.S. in Environmental Engineering from the University of Massachusetts, Amherst. Prior to joining the district, Blair worked as a design and process engineer at Black & Veatch for nine years. Blair is currently focused on the ongoing Phosphorus Initiative at the District and the associated pilot testing activities.

### Metro District's Phosphorus Initiative – Finding the Most Effective and Sustainable Management Approach for Phosphorus

The Metro Wastewater Reclamation District located in Denver, Colorado, serves a population of 1.8 million people with their 220-mgd treatment facility. An effort has been ongoing to evaluate alternative treatment strategies to reduce the phosphorus load on the South Platte River. Metro District has evaluated the value of employing different treatment technologies to reach various levels of effluent phosphorus concentrations – such as EBPR, tertiary flocculation and sedimentation with filtration, and watershed solutions. As a result of this study, Metro District concluded that enhanced mainstream Bio-P reliability with struvite mitigation helps them achieve chemical and energy savings, reduces phosphorus content in biosolids, minimizes sludge production, and recovers a resource for society. This talk will dig into the details of these evaluations and the direction Metro District is taking to help their watershed.

**Jeremy Cramer**
**Wastewater Superintendent**
**City of Fond du Lac**

Jeremy Cramer has a B.S. in Biology and M.S. in Business Management. He is a certified Wisconsin wastewater and water operator and has spent the past 16 years working in the water and wastewater field.

**Autumn Fisher**
**Wastewater Operations Research Coordinator/ Lead Laboratory Analyst**
**City of Fond du Lac**

Autumn Fisher has been at Fond du Lac for the past nine years and was the 2016 WEF Laboratory Analyst Excellence Award Recipient. She is a graduate of UW-Oshkosh with a degree in Chemistry and will complete her Masters of Science in Project Management in May.

### Fond du Lac's Pursuit of Nutrient Removal and Recovery

With an increased emphasis on nutrient removal and resource recovery, Fond du Lac is exploring a variety of options to optimize the water reclamation process. The Fond du Lac Regional Wastewater Treatment Facility, a 2016 "Utility of the Future," has explored a multitude of pilot and full scale phosphorus removal technologies/chemicals in an effort evaluate how to meet their upcoming WQBEL of 0.04 mg/L P for their final effluent discharge. In addition to exploring effluent phosphorus removal, Fond du Lac will be constructing and

installing a deammonification system in 2017 and has plans for nutrient harvesting and biosolids drying in the future.

**Kathy Lake, MMSD Environmental Specialist**

Kathy Lake is the Environmental Specialist for the Madison Metropolitan Sewerage District. She is a professional engineer and holds a Bachelor of Civil Engineering degree from the University of Minnesota and a MBA from University of Wisconsin-Madison. For over 20 years, she has been pursuing solutions to water challenges as both a consultant and municipal employee.

### Watershed Adaptive Management – A Regional Water Quality Solution

The Yahara River Basin which includes Madison, Wisconsin and the Madison chain of lakes, is included in the Rock River TMDL due to numerous reaches impaired for phosphorus and sediment. The Madison Metropolitan Sewerage District has been working to bring all sources of phosphorus together into one resilient solution. Building on the success of a four-year pilot project, the Yahara WINs watershed adaptive management project is investing in the low-cost mix of practices aimed at improving water quality throughout the basin to achieve permit compliance for all partners. Partners include three wastewater treatment plants and over 20 MS4s.

**Christine deBarbadillo Director of Clean Water and Technology, District of Columbia Water and Sewer Authority**

Christine deBarbadillo provides water quality oversight and review for Blue Plains by managing the pretreatment, laboratory, and research and development programs. She assists the Assistant General Manager in delivering technology projects and achieving water quality objectives to meet current and future plant goals. Ms. deBarbadillo assists the Innovations Chief in developing and overseeing projects to foster a culture of innovation and advance the delivery of innovation services. Ms. deBarbadillo joined the Authority in 2012. She has 25 years of experience in wastewater engineering, with a focus on nutrient removal process design, pilot testing and plant operations issues.

### Strategies for Meeting Total Nitrogen Limits

Many parts of the country have faced the need to remove nitrogen to meet water quality requirements. This presentation will review the various technologies available for reducing total nitrogen. These strategies range from retrofitting activated sludge basins with Modified Ludzack-Ettinger process, to more intensive processes that consider post anoxic denitrifying filters. This talk will review a number of strategies including simultaneous nitrification/denitrification, use of Integrated Fixed Film Activated Sludge (IFAS) process or Moving Bed Biological Reactors, and the need for supplemental carbon addition. Case studies will be presented for facilities achieving a range of total nitrogen removal, including DC Water's DEMON process for sidestream nitrogen removal using the short cut Anammox nitrogen cycle.

**Dr. Jeremy Guest Assistant Professor, Department of Civil & Environmental Engineering, University of Illinois at Urbana-Champaign**

Jeremy Guest is an Assistant Professor in the Department of Civil and Environmental Engineering at the University of Illinois at Urbana-Champaign. He is the Thrust Leader for Sanitation and Resource Recovery for the Safe Global Water Institute and the Environmental Sustainability Lead for the Soybean Innovation Lab, funded by the U.S. Agency for International Development (USAID). His research focuses on sustainable technologies for engineered water systems, with an emphasis on biotechnology development for resource recovery from wastewater. Dr. Guest is the recipient of a National Science Foundation (NSF) Faculty Early Career Development Program (CAREER) Award, and is the 2016 recipient of the Paul L. Busch Award for innovation in applied water quality research from the Water Environment & Reuse Foundation (WE&RF). His research has been sponsored by a number of agencies including the NSF, the U.S. Environmental Protection Agency, and USAID. Dr. Guest's formal training includes a B.S. and M.S. in civil engineering from Bucknell University and Virginia Tech, respectively, and a Ph.D. in environmental engineering from the University of Michigan.

### The Evolution and Intensification of Algal Technologies

Algae have evolved to thrive in nutrient-deplete environments (lakes, open ocean, etc.) by rapidly taking up nutrients whenever they are available and by assimilating many forms of N and P, including those operationally classified as "non-reactive" or "recalcitrant" at conventional WRRFs. A critical challenge to the advancement of intensive (i.e., small footprint) algal treatment systems is a lack of understanding of how to design and operate systems that reliably – over daily and seasonal cycles – achieve effluent quality requirements for a given locality. This presentation will provide an overview of algal treatment technologies and introduce emerging configurations that can advance the limit of technology (LOT) for nutrient removal and achieve rapid N and P recovery with short retention times. CS



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**Join us for the Speaker Reception**
April 10, 2017
5:30 - 7:00 pm
Monona Terrace

**Student Design Competition**
April 10, 2017
Monona Terrace
See page 18 for more info

# See you in Madison

## April 11, 2017

# CSWEA/IWEA Welcome Reception

By Mike Holland

The 2016 WEFTEC CSWEA/IWEA Welcome Reception was a success once again. Thanks to our many sponsors and all other members who worked the phones, emails and sign-in table to make this event a success. This year's event, held at the Hilton New Orleans Riverside, was the 22nd year that CSWEA and IWEA joined to host this event. An impressive turnout of over 300 members, sponsors and friends were in attendance. There was food and drink aplenty and the noise level was high as friends met and made plans for the week of WEFTEC. Of course, this was all made possible by our generous sponsors. Even with the great turnout their donations allowed us to sustain our thirsty members and still break-even for the event. Make a note now to plan to attend the 22nd Annual Welcome Reception at WEFTEC 2017 in Chicago, October 1, 2017.

## *Thank You Sponsors!*

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# WEFTEC Student Paper/ Design Competition

By Mike Holland

Central States was once again well represented at the WEF Student Design Competitions at WEFTEC 2016 in New Orleans.

CSWEA developed the competition criteria based on WEF guidelines and Student chapters were notified of the competition during the fall semester of the 2015-16 school year. The Student Design Competition is intended to promote "real world and hands-on" design experience for students interested in pursuing an education and/or career in water/wastewater engineering and sciences field. There are two levels of the WEF competition, conventional wastewater design, which includes traditional wastewater design projects, and environmental design, which includes contemporary engineering design topics such as sustainability, water reuse, wetland construction and Engineers Without Borders projects. However, CSWEA also holds a third category for the Global Water Stewardship project.

CSWEA had two entries in environmental category and four in the GWS category of the competition which was held the day before the Education Seminar in Madison. In the environmental category, the team from the University of Minnesota – Twin Cities consisting of Maria Garcia-Serrana, Zeinab Takbiri, Abby Tomasek, Anne Wilkinson presenting their project on "A New Approach for Retrieval of Harmful Algae Bloom Concentrations Using Satellite Observations" was determined to be the competition winner. In the GWS competition it was a tie between the University of Wisconsin – Platteville team consisting of Jordan Fure, Titus Rubietta, Gage Thompson and Zack Wallin and the Milwaukee School of Engineering team of Jill Vande Boom presenting their projects "Global Water Stewardship – Bahia Ballena, Costa Rica." Members from this team also accompanied CSWEA members to Costa Rica over the summer to refine the design for the Bahia Ballna project and assist with site investigations for next year's problem statement.

The winning teams presented their projects at the WEF competition held during WEFTEC where they faced stiff competition from schools throughout the country. Both teams did great but for the first time ever a team from CSWEA was the winner! The students from the University of Minnesota – Twin Cities were the winners of the WEF Environmental Category and will receive a plaque and $2,500 reward.

## Environmental Design Winners


The team from the University of Minnesota – Twin Cities


The University of Wisconsin – Platteville, and Milwaukee School of Engineering team

The University of Minnesota – Twin Cities team's project, "A New Tool for the Retrieval of Harmful Algae Concentrations using Multi-Satellite Observations," won in the environmental design category and Southern Methodist University's team project, "City of Fort Worth Village Creek Water Reclamation Facility Primary Treatment Upgrades," won in the wastewater design category. This was the first win for the University of Minnesota – Twin Cities (Central States Water Environment Association) and the third win for Southern Methodist University (Water Environment Association of Texas).

Members of the University of Minnesota – Twin Cities received certificates and a $2,500 award. CS

# Operations Challenge

By Todd Sheridan, PWO Representative

Shovelers take second place in Process Control, third place in Laboratory, and place 16th overall; Pumpers take sixth in Process Control, eighth place in Laboratory, and place 20th overall at the 2016 Operations Challenge (OC).

While I've only been involved with the Operations Challenge for two years, I am continuously amazed at the dedication, passion and intelligence displayed by our CSWEA OC team members. Other teams competing at the national level work with each other day in and day out, practicing year round, while the CS teams practice only twice, in some cases never having met one another until the first practice session.

It is a testament to their desire to win that they continuously manage to place despite coming from different plants and even professions spread throughout three states. It is wonderful to witness the nonstop flurry of e-mails, text messages, and videos posted to Facebook at all hours of the day as the teams constantly strive to streamline their tasks, discuss the events and share information before the competition.

Our teams this year, the Shovelers and the Pumpers, had five veteran members returning and three new members joining the fray: Autumn Fisher of the City of Fond Du Lac, WI, Luke Markko of the Village of Wauconda, IL and Zach Matyja of RJN Group in Wheaton, IL.

The five events are: Process Control, Laboratory, Collections, Maintenance and Safety. The process control event had a new twist this year, as part of the exam was performed on a laptop utilizing Hydromantis process control simulation software.

This year for the first time, practices were held at the City of Janesville wastewater treatment plant in Janesville, Wisconsin. Joe Zakovec and the crew were very gracious in letting the teams use their beautiful laboratory, and were able to dedicate space in one of their garages to build a replica of the safety event platform, which helped immensely in helping the new team members visualize and practice the event.

I would like to offer sincere thanks to everyone who has supported the Operations Challenge teams this year and in years past. Without the dedication of the sponsors, CSWEA and state sections, people cheering the teams on at the competition, and the significant others of the team members having to listen to talk of pipetting and sawing pipe for two straight months, none of this would be possible.

## 2016 Team Roster:

### Pumpers

Captain Marc Zimmerman, City of Janesville WWTP; Autumn Fisher, City of Fond Du Lac WWTP; Luke Markko, Village of Wauconda WWTP; Zach Matyja, RJN Group; and Coach Tom Dickson, City of Oconomowoc, WI.

### Shovelers

Captain Chris Lefebvre, Stevens Point WWTP; Chris Kleist, City of Duluth; Jason Neighbors, Glenbard Wastewater Authority; Matt Streicher, Glenbard Wastewater Authority; and Coach Jim Miller, Wenck Associates.

### Shovelers

- Best Fans Awards – (a big shout out to all our great fans!)
- 2nd Place in Process Control
- 3rd Place in Laboratory CS





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# 2016 WEF Community Service Project

By Chris Marschinke

In the shadow of the New Orleans Superdome, the 9th annual WEF Community Service Project kicked off another record-setting WEFTEC Conference. On the grounds of City Hall, more than 120 volunteer WEF members from across the country once again donated their time and energy to leave WEFTEC's host city just a little bit nicer than they found it. Funded entirely by sponsorships and donations, the project seeks to leave a positive and lasting effect on the community. This year more than 40 sponsors and donors made possible a project that will become a focal point of New Orleans' urban landscape.

Organized by the Students & Young Professionals Committee (SYPC), this year's service project was one of the highest-profile to date. Being on City Hall's doorstep meant every detail had to be coordinated with the City of New Orleans and the Sewerage and Water Board of New Orleans, as well as suppliers, vendors, and contractors. Preparing for 60,000 Beyoncé fans to walk past the site that evening meant it had to be done right, and on schedule.

## WEFTEC 2016: NOLA Grows Green

This year's project, "NOLA Grows Green: The City Hall Stormwater Project," created two separate bioswales designed to receive runoff from city garages and buildings. The first of these, more than 1,200 square feet in size, will provide biofiltration of runoff and reduced loading on the city's stormwater system. The biofiltration system is designed to remove 80% of total suspended solids (TSS), 60% of phosphorus, and up to 50% of the nitrogen load. The storage provided by the bioswale will hold 100% of the rainfall volume from a two-year, 24-hour storm, and 60% of a 10-year, 24-hour storm. The garage impervious area tributary to this bioswale typically flows directly onto the adjacent sidewalk, rendering it unusable during routine rainfall events. This results in pedestrians having to cross the street to avoid flooding, and creates potential safety hazards. The second bioswale measured roughly 200 square feet in size, and provided infiltration area for runoff from the roof of an adjacent city building.

Twin Shores Landscape & Construction Services was contracted to excavate over 100 yards of soil prior to WEF's arrival on site. Then, on the Saturday preceding the conference, 120 volunteers descended onto City Hall. Volunteers installed drain pipe, aggregate and engineered biofiltration soil to create the bioswale. Native vegetation was planted throughout the site, including more than 400 irises and lilies, and five 12-foot Black Gum trees. Rip-rap filled crab traps provide energy dissipation to ensure the long-term stability of the plantings. With energy draining by the end of the morning, 50 members from the WEF House of Delegates provided relief and reinforcement. The students and young

NOLA GROWS GREEN
THE CITY HALL STORMWATER PROJECT

professionals worked alongside the delegates to complete the project on time. Executive Director of the Sewerage and Water Board of New Orleans Cedric Grant, and WEF President Paul Bowen led the group in a ribbon-cutting ceremony, dedicating the project to the surrounding community.

## Maintaining the Legacy

While the project is completed in eight hours, the site selection, design, approval, and permitting processes take more than a year to complete. A partner firm in each community makes possible the design of all the improvements. Dana Brown & Associates once again provided this invaluable service in New Orleans, and assisted during construction with an on-site crew of their own. With the time and resources dedicated to making the project a reality, maintaining each site has become vital to the continued success of the service projects.

To this end, the WEF SYP Service Project subcommittee has begun contracting with local landscaping contractors to provide annual maintenance of past sites as funding allows. This does not provide all of the services required, however, which will rely on the local Member Associations to assist with clean up and replanting. Plans are in the works for Central States WEA YP's to hold annual maintenance events at Chicago sites, ensuring the work of WEF members across the country remains as beautiful as the day they were built.

A special thanks goes out to the 2016 WEF SYP Sponsors: AECOM, ARCADIS U.S. Inc., Black & Veatch, Brown and Caldwell, Carollo Engineers, CDM Smith, CH2M, Evoqua Water Technologies, Greeley and Hansen LLC, Hazen & Sawyer, HDR Engineering, WSP Parsons Brinkerhoff, and NYC Department of Environmental Protection. Service Project donors also included: AE2S, AECOM & Parsons Joint Venture, Apex Engineering Group, Brentwood Industries, Chemtrol, Corzan/Lubrizol Advanced Materials Inc., Duperon Corporation, E & I Corporation a Division of McNish, Engineering America, Inc., EOSi, FKC Co. Ltd., Flottweg Separation Technology, Greater New Orleans Foundation, Hach, Home Depot, Hydro International, Jacques-Imo's, Michael Baker International, Tnemec Company, Trotter & Associates, Inc., and World Water Works, Inc. In-kind donations were received from Dana Brown & Associates, Mark Jenkins Nursery, Louisiana Growers, Wood Materials, Construction EcoServices, New Orleans City Planning Commission, The City of New Orleans., and the Sewerage & Water Board of New Orleans. CS

The Finished Bioswale on Poydras St at NOLA City Hall.





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# Village of **Wauconda** Wastewater Treatment Plant

## BACKGROUND

The Wauconda Wastewater Treatment Plant was originally constructed in 1953. The plant has been upgraded several times since then, with the last major expansion occurring in 2006. The plant is located adjacent to commercial and residential areas in the southwest portion of the Village at the intersection of Slocum Lake Road and Brown Street. The plant has a permitted design average flow of 1.9 million gallons per day (MGD) and a design maximum flow of 5.963 MGD. Fiddle Creek, a tributary of the Fox River, receives all of the discharge.

Back row left to right: Alex Pryde, Brad Fink, Nathan Mau, Jason Spratt, Frank Burton, Jacob Mann
Front row left to right: Luke Markko, Anna Kootstra, Humberto Reyes & Connie Watkins



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The Wauconda Wastewater Treatment Plant consists of two parallel but interconnected treatment plants. The original treatment plant ("Old Plant") was upgraded in 1985 and utilizes a bio-tower/trickling filter process. When the plant was expanded in 2006, a parallel activated sludge process ("New Plant") was constructed. Flow is split and balanced between the two plants, combining at a UV disinfection facility prior to discharge. The solids treatment process is common to both plants. The plant also has excess flow treatment facilities for flows in excess of 5.963 MGD.

The treatment process consists of influent pumping, screening, grit removal, primary clarification, activated sludge, fixed film and solids contact, secondary clarification, chemical phosphorus removal, filtration, UV disinfection, post aeration, sludge thickening, aerobic digestion, sludge storage, and land application of sludge.

In addition to the wastewater treatment plant, Wauconda also owns and operates a wastewater collection system including over 56 miles of 6-inch through 30-inch diameter sanitary sewers and 1,442 manholes. The collection system also contains 18 wastewater pumping stations and approximately five miles of forcemain. Staff also maintain an industrial pretreatment program.

## INFLUENT PUMPING

### Dry Weather Pump Station

Dry Weather Pump Station

The dry weather pump station is a submersible pump station equipped with three pumps (2 @ 1,000 gpm, and 1 @ 2,800 gpm). The dry weather station pumps the influent flow to the activated sludge plant's headworks facility for preliminary treatment. The balance of the flow not pumped to the activated sludge plant is diverted by gravity to the bio-tower plant's headworks facility. Variable frequency drives (VFD) control the flow and are paced to match the influent sewage flow conditions.

### Wet Weather Pump Station

When influent flows exceed the design capacity of the treatment plants during wet weather flow events, the excess flows are diverted to the wet weather pumping station. The wet weather pump station is a duplex submersible pump station with two 2,800 gpm, 60 HP pumps. The wet weather flows are lifted to a flow control structure which diverts the flow to the excess flow treatment facilities.

## BIO-TOWER TREATMENT TRAIN

Bio-Towers/Trickling Filters

The bio-tower treatment train is designed to treat an average daily flow of 1.4 MGD and a design maximum flow of approximately 4.0 MGD. The bio-tower treatment train includes screening, grit removal, primary clarification, trickling filters with a solids contact tank, secondary clarification, and sand filtration.

### Preliminary Treatment

The headworks treatment facility provides preliminary treatment via an aerated grit tank for grit removal and a mechanical bar screen. The removed grit is washed and disposed of in a dumpster along with the debris removed by the bar screen.

### Primary Treatment

Four 504 sq. ft. rectangular primary clarifiers receive the flow from the headworks facility. The primary clarifiers remove the readily settleable suspended solids and scum. Primary sludge pumps convey the collected sludge and scum from the primary clarifiers and pump it to the aerobic digesters.

### Bio-Tower Pumps & Bio-Towers

The effluent from the primary clarifiers is pumped to the top of the two bio-towers/trickling filters. There are six, 1,600 gpm pumps with three pumps dedicated to each bio-tower. The pumps operate on variable frequency drives to enhance operational efficiency. Each bio-tower is 50 feet in diameter with a media depth of 28 feet. The bio-towers are filled with a plastic honeycomb media which supports a bio-film of microorganisms that provides biological treatment of wastewater as it flows down through the media. The wastewater is circulated through the media which induces an updraft through the media further enhancing the biological treatment process. The effluent from the bio-towers and the bio-film that sloughs off is conveyed to the solids contact tank.

### Solids Contact Tank

Solids Contact Tank

The solids contact tank is an aerated basin which receives the effluent from the bio-towers and a portion of the settled sludge from downstream secondary clarifiers to aid in settling. Additionally, ferric chloride is added to the solids contact tank to provide chemical phosphorus precipitation with removal in the final clarifiers and sand filters.

### Final Clarifiers Nos. 1 and 2

Final clarifiers Nos. 1 and 2 receive the effluent from the solids contact tank and provide final settling prior to the filtration at the sand filters. The 50-foot diameter circular clarifier units are equipped with rotating mechanisms which collect the settled sludge for removal. A portion of the sludge is returned to the solids contact tank. Airlift pumps return the balance of the settled sludge to the primary clarifiers. The clarified effluent overflows the weirs and is conveyed to the sand filters.

### Sand Filters Nos. 1 and 2

Sand Filters

Prior to disinfection, the effluent from final clarifiers Nos. 1 and 2 is filtered through two sand filters, which were constructed in 1985. The traveling bridge sand filters utilize a granular media to provide effluent polishing and further reduce suspended solids, BOD, and phosphorus in the treated effluent. Backwashing of the filter cells removes and returns the captured solids to the head of the plant for additional treatment and removal. The filtered effluent is conveyed to the UV disinfection facility where it combines with the filtered effluent from the new plant prior to disinfection.

## ACTIVATED SLUDGE TREATMENT TRAIN

The activated sludge train is designed to treat an average daily flow of 0.5 MGD and a design maximum flow of approximately 2.0 MGD. The activated sludge treatment train includes screening, grit removal, activated sludge, secondary clarification, and sand filtration.

### Preliminary Treatment

The headworks treatment facility at the new plant utilizes a 4-foot diameter cylindrical fine screen with a screen opening of one quarter inch for removal of screenings. A 10-foot diameter vortex grit chamber provides grit removal. The removed grit is further washed and disposed of in a dumpster with the debris removed by the bar screen. The effluent flow from the vortex grit unit is measured by a Parshall flume.

### Flow Balancing

Following the Parshall flume, flow to the new plant is regulated by a magnetic flow meter and control valve. The balance of the flow is directed to a flow control structure which routes the flow to either the old bio-tower plant or the excess flow facilities.

### Aeration Tanks

Aeration Tanks

A combination of raw waste water, ferric chloride, and return activated sludge are mixed prior to entry into two parallel channels. Coarse bubble diffusers are utilized to promote mixing and maintain desired dissolved oxygen levels. The two parallel aeration tanks are single pass basins with a water depth of 20 feet and an average MLSS concentration of 2,000 mg/l.

### Aeration Blowers

Four 900 cfm, 60 HP blowers are installed to provide air to the aeration tanks and aerobic digester Nos. 3 and 4. All four blowers discharge to a common air header that supplies air to the aeration tanks and aerobic digester Nos. 3 and 4.

### Final Clarifier

Final clarifier No. 3 receives the effluent from the aeration tanks and provides final settling prior to the filtration. The 50-foot diameter, circular clarifier unit is equipped with a rotating mechanism which collects the settled sludge for removal. A portion of the sludge is returned to the aeration tanks. Sludge pumps transfer the remaining portion of the waste activated sludge to aerobic digesters Nos. 1 and 2 for further treatment and stabilization. The clarified effluent overflows the weirs and is conveyed to effluent sand filter.

### Sand Filter No. 3

Prior to disinfection the effluent from final clarifier No. 3 is filtered through sand filter No. 3, which was constructed in 2006. The travelling bridge sand filter further reduces suspended solids, BOD and phosphorus in the treated effluent. Backwashing water is returned to the head of the plant for treatment and removal. The filtered effluent is conveyed to the UV disinfection facility where it combines with the filtered effluent from the old plant prior to disinfection.



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## UV DISINFECTION

Flows from the bio-tower treatment train and the activated sludge treatment train are combined prior to the UV disinfection facilities. The UV Disinfection system is a single channel, two-bank system sized for a design flow of 6.0 MGD. The two banks are each equipped with six modules and eight 250-watt lamps per module. The ultraviolet light emitted from the module lamps and transmitted through the treated effluent provides disinfection of the plant's discharge.

## POST AERATION/DISCHARGE

Prior to discharge to Fiddle Creek, the final effluent is aerated to increase dissolved oxygen levels. The post aeration tank is equipped with a diffuser and blower to provide aeration of the final effluent. Immediately downstream of the post aeration tank is a Parshall flume to provide flow metering prior to discharge to Fiddle Creek.

## EXCESS FLOW TREATMENT

Flows exceeding the design maximum flow of the bio-tower and activated sludge treatment trains receive excess flow treatment. During excess flow events the Wet Weather Pump Station pumps the influent to a flow control structure which balances and maximizes the influent flows between the two plants and routes the excess flows to the Excess Flow Treatment Facilities. The Wauconda WWTP has the capability to treat excess wet weather flows in the amount of 3.53 million gallons per day.

### Excess Flow Clarifier

Excess Flow Clarifier

The first treatment step for the excess/wet weather flows is through the excess flow clarifier. The 50-foot diameter, circular clarifier unit is utilized to remove both the floatable and settable solids. The scum and sludge pumps transfer these materials to the digester for treatment and stabilization. The clarified effluent is then conveyed to a chlorine contact tank.

### Chlorine Contact Tank

The effluent flows from the excess flow clarifier are routed through a chlorine contact tank for disinfection prior to discharge. The excess flows are dosed with chlorine to maintain a residual chlorine level of 0.75 mg/l. The disinfected flows from the chlorine contact tank are combined with the main plant discharge downstream of the UV channel. The excess flows are metered and sampled independent of the main plant outfall.

## SOLIDS HANDLING

The solids handling and treatment system at the Wauconda WWTP receives and treats the waste sludge from both the bio-tower and activated sludge treatment trains. The components of the solids handling system consist of sludge pumping, sludge thickening, aerobic digestion, blowers, and liquid sludge storage. Sludge land application is provided on contracted basis.

### Sludge Pumping

Sludge pumping is accomplished with a variety of different types of pumps. Primary sludge pumping from the primary clarifiers is performed with plunger pumps. Return activated sludge (RAS) pumping at the solids contact tank is done with airlift pumps. Centrifugal pumps are used for the RAS pumping at the activated sludge plant. Sludge transfer pumping between the digesters, sludge storage and gravity belt thickener is accomplished with positive displacement type pumps.

### Gravity Belt Thickener

Gravity Belt Thickener

A gravity belt thickener is used to thicken sludge ahead and within the digesters. The gravity belt thickener removes free water from the sludge which reduces the volume of sludge and enhances sludge stabilization and treatment.

### Aerobic Digesters

Sludge treatment and stabilization is accomplished by aerobic digestion. There are four aerobic digesters at the Wauconda WWTP with a total volume of approximately 422,000 gallons.

Aerobic Digesters Nos. 1 and 2

Digesters Nos. 1 and 2 are circular units and were constructed with the old plant. Digesters Nos. 3 and 4, constructed with the new plant, are rectangular units, and are located in the lower level of the pre-treatment building beneath the gravity belt thickener and odor control equipment.

Air to Digesters Nos. 1 and 2 is provided with two dedicated centrifugal blowers. Air lances in the digester units provide aeration and mixing of the sludge. The digesters are covered to retain heat for enhanced sludge treatment. The units are operated in series with raw sludge feed to digester No. 1 and then transferred to digester No. 2 before being conveyed to the sludge storage tanks.

Digesters Nos. 3 and 4 receive air from the aeration blowers for the activated sludge tanks. A common discharge header is used to supply air to both the digesters and the aeration tanks.

### Sludge Storage

Liquid Sludge Storage Tank

Two liquid sludge storage tanks are provided to store the digested sludge prior to removal for final land application. The storage tanks are in-ground concrete tanks with a total volume of 1,030,000 gallons. The sludge transfer pumps remove the stabilized sludge from the digesters and pump it to the storage tanks. Sludge is stored throughout the winter and is land applied during the spring, summer and fall months as weather allows. The village uses the services of a contract hauler to remove and land apply the liquid sludge.

## PERSONNEL

The Village of Wauconda's Sewer Division operates under the Direction of The Director of Public Works and Superintendent of Operations. The Division is comprised of two sections, a Water Reclamation Treatment Plant and a Lift Station/Collections System. Both Water Reclamation and Collections are staffed with a total of seven full-time employees,

- Brad Fink, Director of Public Works
- Alex Pryde, Superintendent of Operations
- Connie Watkins, Assistant to the Director
- Jacob Mann, Foreman of Water Reclamation
- Nate Mau, Foreman of Collections System
- Luke Markko, Class 1 Operator
- Anna Kootstra, Lab Technician
- Frank Burton, Maintenance Service Technician
- Humberto Reyes, Maintenance Service Technician
- Jason Spratt, Maintenance Service Technician CS





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# A Practical Approach for the Detection and Estimation of Harmful Algal Blooms using Satellite Observations

By Zeinab Takbiri, Anne Wilkinson, Abigail Tomasek, Maria Garcia-Serrana

A student environmental design team from the University of Minnesota representing CSWEA was selected as the winners of the Environmental Category of the Student Design Competition that took place during WEFTEC 2016 in New Orleans, LA this September. The group is made up of four Ph.D. candidates in Civil Engineering working at the St. Anthony Falls Laboratory.

The proposed design incorporates freely available satellite imagery and long-term in situ field monitoring data to develop a tool that would provide rapid detection of potentially toxic harmful algal blooms (HAB) in freshwater systems. This tool can be used to: i) identify HAB hot spots through historical observations, ii) improve field sampling by focusing efforts to monitoring locations with historical HAB problems, and iii) inform physical HAB prediction models through better estimation of near real-time HAB concentrations.

## Harmful Algal Blooms: Global Ecologic and Public Health Impacts

Cyanobacteria blooms or Harmful Algal Blooms (HAB) are accumulations of microscopic microalgae that populate the surface of freshwater ecosystems and have been reported on every continent, except Antarctica (Carmichael et al., 1992). HAB are a global environmental concern that negatively impacts water quality, and ecological and human health. HAB not only increase turbidity, lower biodiversity, and deplete inorganic carbon and oxygen in surface waters, they are also potentially toxic (Wilkinson et al., 2016). Cyanobacteria produce a suite of toxins ranging from dermatoxins, heptatotoxins, and neurotoxins. One example of this is microcystin, a liver toxin that is detrimental to humans and animals and is 100,000 times more toxic than cyanide. One notable case demonstrating the severity of HAB occurred in Toledo, OH in 2014 where 400,000 citizens were issued a "do not use order" for their drinking water due to microcystin contamination.

> "Phycocyanin absorbs at a distinct wavelength, allowing these to be distinguished from other benign phytoplankton by both in situ field instruments and satellite observations."

Eutrophication of freshwater bodies has worsened in recent years due to the increased use of agricultural fertilizers and industrial activities (Qiao et al., 2005). Climate change brings an uncertain future for HAB. However, it is highly probable that it will exacerbate the negative impacts of HAB. Rising temperatures, enhanced stratification, increased CO2 in the atmosphere, and increasing dependence on new surface water sources for drinking water are all favorable conditions for toxic HAB exposure (O'Neil et al., 2012).

The occurrences of toxic HAB are unpredictable and highly spatially and temporally variable. Timely prediction and detection of a toxic bloom is difficult because they are transient, and they can occur in remote areas of freshwater bodies and be transported near shore, where contact with people is more frequent.

The cyanobacteria that are capable of these blooms also produce a very specific fluorescent photosynthetic pigment called phycocyanin, which gives them their nickname blue green algae. Phycocyanin absorbs at a distinct wavelength, allowing these to be distinguished from other benign phytoplankton by both in situ field instruments and satellite observations.

## How can satellites detect HAB?

Remote sensing using satellite imagery allows for information about the Earth's surface to be acquired without direct surface contact. This technique has been widely applied to obtain valuable information about the dynamics of a variety of terrestrial and aquatic environments. Earth observing satellites measure the amount of radiation that an object reflects, absorbs, scatters, or transmits (Sabins, 1978). The measured radiation from one object at different wavelengths is called the spectral signature of the object. This important property of matter allows for the identification, separation, and estimation of the abundance of different substances at local and global scales. For example, clear water only reflects in the visible light range and strongly absorbs near infrared (NIR) radiation. When a bloom of blue green algae – containing phycocyanin –

is present in the water, it can be isolated from other algae types based on its distinct spectral characteristics measured by satellite sensors.

### Framework development

A practical tool for near real-time HAB estimation over lakes was developed using satellite observations and a database of field-measured phycocyanin concentrations. This tool combines different sources of data (satellites and buoys) and reduces the limitations associated with each individual source in order to improve the estimation of HAB over entire lakes at large spatial scales. The specific objectives are:

1. Integrate historic and current in situ field data from already installed buoy monitoring gauges with freely and publicly available satellite observations from Moderate Resolution Imaging Spectroradiometer (MODIS) to create a data dictionary. We can then use the dictionary to approximate HAB concentrations over large bodies of water, where it would otherwise be infeasible to determine whole lake dynamics using either buoys or discrete sampling.
2. Develop a framework for the estimation of HAB that also works in situations of cloud coverage and heavy rains, which are problematic for sensors in the visible spectrum band. This will be performed using passive microwave observations (GPM GMI) that can penetrate through heavy rains and clouds.

To create the look-up dictionary, publically available field data from 17 buoys deployed in western Lake Erie (Figure 1) was downloaded for 2015. Most buoys record water quality data every 10 minutes and measured multiple water quality parameters including water temperature, dissolved oxygen, specific conductivity, pH, and phycocyanin and chlorophyll concentrations (measured in relative fluorescence units, or RFU). However, only phycocyanin concentrations were used to create the dictionary. Data for the MODIS sensor onboard the Terra satellite was downloaded for each day in 2015. MODIS has a 250 m grid size resolution and each buoy is located in a separate MODIS cell. Terra satellite's approximate flyover time for this portion of Lake Erie is 10:30 AM. For each buoy, phycocyanin concentrations 30 minutes before and 30 minutes after the closest field measurement to the flyover time were averaged to determine the entry

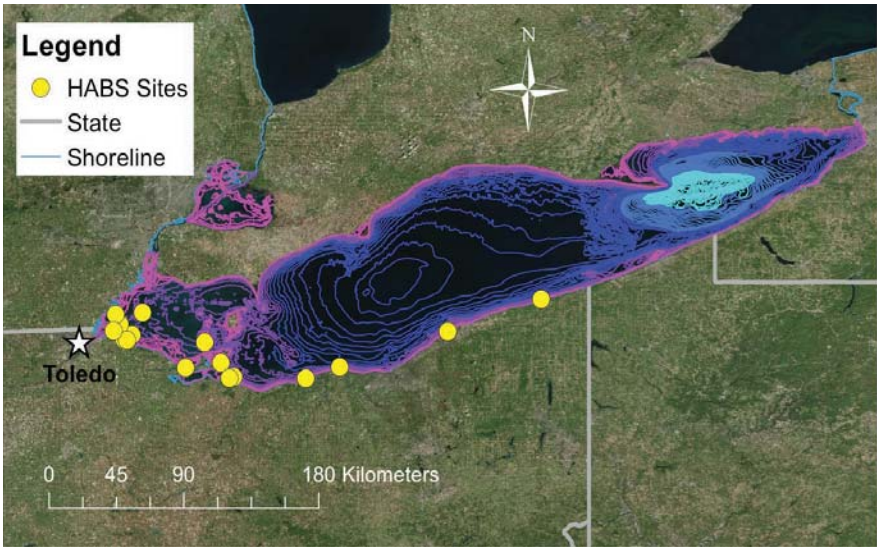


Figure 1. Map of in situ buoy locations in Lake Erie, USA.

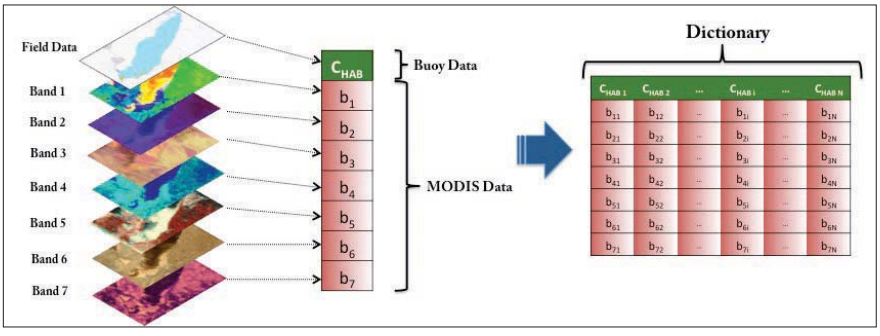


Figure 2. Schematic of the creation of the dictionary. Each vector of the dictionary is formed by a field-measured concentration of blue-green algae and seven surface reflectance values obtained from seven MODIS bands (wavelengths). Our current dictionary has been developed using vectors created from 2015 data from the 17 Lake Erie buoys.

"The results show much greater HAB concentrations during the summer months than during the winter months."

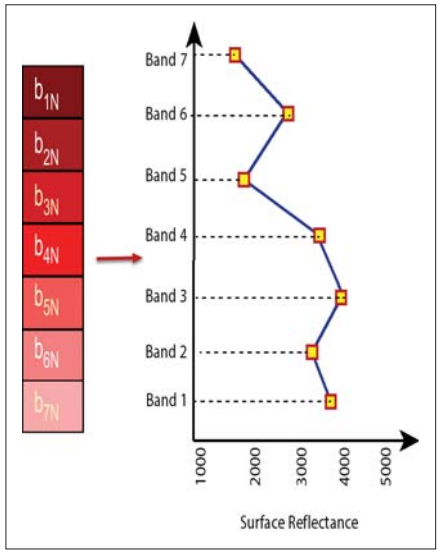


Figure 3. Spectral shape of an observation vector of one randomly chosen pixel from MODIS. This spectral shape is formed by the values of surface reflectance at different wavelength of MODIS.



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for the phycocyanin concentration in the dictionary for a particular day. Each buoy's average concentration was then matched to that day's spectral signature of the buoy's corresponding MODIS cell.

For cloudy days, passive microwave observations will be downloaded from GPM GMI and the same process used for the MODIS data will be used to develop the dictionary and estimate HAB concentrations. The only difference from the MODIS method would be a coarser resolution, since the passive microwave data that is able to penetrate through clouds and heavy rains are available at coarser grid size (~5 km) compared to MODIS data. Therefore, the results of the cloudy days from passive microwave observations cannot be as spatially accurate as MODIS data, but it will still provide a good approximation of the locations of large-scale HAB. After the dictionary has been compiled (Figure 2), the tool applies this information to estimate HAB concentration from satellite observations through K-nearest neighbors.

To estimate the occurrence of HAB in an unmonitored location, we first determine the observation vectors from MODIS for the area of concern. We then use our previously described dictionary and find the k most similar vectors (by shape of the spectrum and their values) to the observed vectors, which is determined by calculating the Euclidean distance and K-nearest neighbors. We estimated the unknown HAB concentration (in RFU) using a linear approximation method (see Ebtehaj et al., 2015; Takbiri et al., 2016) at a location using the surface reflectance values ($b_1$ to $b_7$, Figure 3) from MODIS at that location.

If or when more accurate satellite observations with better spatial resolution (like Global Precipitation Measurements, GPM), or better in situ field data for HAB concentrations become available, the dictionary can be updated using the same developed framework.

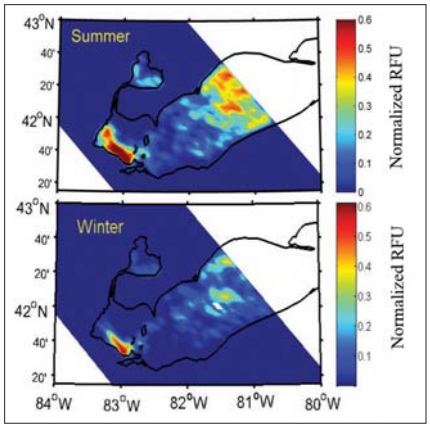


Figure 4. (a) HAB for July-September (summer) and (b) October-December (winter) in Lake Erie for 2015. The results show that the proposed algorithm is strongly capable of capturing the hot spots and the seasonal dynamics of HAB concentrations in RFU. The red spots represent the high algae concentrations in the water.

> "Once more diverse types of lakes with different geophysical characteristics, temperatures, etc. are added to the current dictionary, our framework is capable of estimating HAB in ungauged lakes or those with limited available field data."

**Feasibility and utility of our design**

While the buoys in Lake Erie provided discrete concentrations at 17 locations, our developed tool was used to estimate daily HAB concentrations for one MODIS tile that covers a large portion of the lake in 2015. Averages of these daily results from the simulation are shown for July 1 to September 30 (Figure 4a) and from October to December (Figure 4b). As expected, the results show much greater HAB concentrations during the summer months than during the winter months. Also, the highest concentrations are in the western portion of the lake. This area is shallower and warmer, favorable conditions for HAB formation, than the rest of the lake. Figure 4 shows that the proposed design tool is (1) capable of detecting the hot spots of HAB concentrations, and (2) captures the temporal changes in HAB concentrations from summer to winter.

Once more diverse types of lakes with different geophysical characteristics, temperatures, etc. are added to the current dictionary, our framework is capable of estimating HAB in ungauged lakes or those with limited available field

data. If rapid HAB detection is needed for a lake, MODIS data will be acquired over the period of concern, our tool would be applied to convert those satellite observations to HAB concentrations.

Once more diverse types of lakes with different geophysical characteristics, temperatures, etc. are added to the current dictionary, our framework is capable of estimating HAB in ungauged lakes or those with limited available field data. If rapid HAB detection is needed for a lake, MODIS data will be acquired over the period of concern, our tool would be applied to convert those satellite observations to HAB concentrations.

## Conclusions

Using data from different sources that complement each other can help achieve solutions and develop practical applications. In this project, we introduced a new approach to combine satellite observations and in situ data to estimate HAB concentrations. This is advantageous in several aspects ranging from research of HAB dynamics to public health awareness including:

- Identification of HAB hot spots through historical observations.
- Rapid Detection of HAB in lakes to inform timely public health warnings.

From left to right: Maria Garcia-Serrana, Anne Wilkinson, Zeinab Takbiri, Abigail Tomasek

- Observation of large-scale HAB dynamics and optimization of in-situ sampling strategies for specific areas.
- Information for physical HAB prediction models through better estimation of near real-time HAB concentrations.
- A framework reproducible for any lake and adaptable as new technologies and data becomes available.


## Acknowledgements

We would like to express our gratitude and appreciation to both CSWEA for their motivation and support and the WEF Student Design Competition, with special thanks to Mike Holland, Mohammed Haque, and Lauren Zuravnsky. We would also like to thank the competition judges for their valuable feedback and our project advisor Michele Guala.


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# Investigating and Increasing Dewatered Cake Solids at the MCES Empire Wastewater Treatment Plant

By Rebecca Alm, Heidi Hutter, P.E., Patricia Oates, Adam W. Sealock and George Sprouse, Ph.D., P.E.
Metropolitan Council Environmental Services

The Empire Wastewater Treatment Plant (Empire) (Figure 1), one of eight wastewater treatment plants owned and operated by the Metropolitan Council Environmental Services (MCES), treats wastewater generated in southern and southwestern parts of the St. Paul/ Minneapolis seven-county metropolitan area. The plant experienced a significant decrease in the total solids of the wet cake produced by their dewatering equipment after conversions and additions were completed between 2005 and 2008 in response to new effluent phosphorus limits. MCES pursued both research activities and operational changes to understand causes of the decline and to improve cake solids produced at Empire.

MCES's response to new effluent phosphorus limits for Empire implemented between 2005 and 2008 included: converting the plant from a two stage, high-rate activated sludge followed by nitrifying activated sludge to single sludge enhanced biological phosphorus removal (Bio-P) activated sludge, an increase in liquid treatment capacity, and solids thickening and solids processing improvements. Plant staff first noted a change in the dewatered cake total solids produced by the plant's dewatering equipment (belt filter presses) during project implementation. After the project was complete, the impact continued (Figure 2). A complicating factor was a change at one of the industrial dischargers in the service area. Around 2005 the industry changed its processes and began sending a large load of soluble, readily biodegradable organic material to Empire.

MCES's initial response to dewatering performance at Empire included dewatering equipment tuning and optimization and evaluation of different polymers. When those did not identify a solution to the performance issue, MCES began a research program to investigate potential causes and develop methods for improvement. This program led to the operation of pilot digesters (Figure 3). from 2012 through 2014. The research program and its results are discussed in detail by Alm et al. (Alm, Sealock, Nollet, & Sprouse, 2016).

MCES's research program focused on the potential causes and solutions to dewatering performance found through a literature review. MCES found that poor dewatering performance at Bio-P plants with anaerobic digestion was an emerging issue being reported by others (Benisch, Schauer, & Neethling, 2014), (Downing & Marten, 2014), (Higgins, Bott, Schauer, & Beightol, 2014). Specific topics investigated by MCES's pilot tests are listed in Table 1.

MCES used full-scale and pilot-scale investigations to examine the new industrial discharge's impact on dewatering performance at the plant. At the full scale, the high strength soluble organic material was diverted away from Empire from May through October 2012. The diversion of the material from Empire's influent reduced WAS production and (as shown in Figure 2). increased cake solids performance. At the pilot scale, pilot tests were run for a range of thickened primary sludge to thickened

Figure 1. Empire WWTP Aerial Photograph

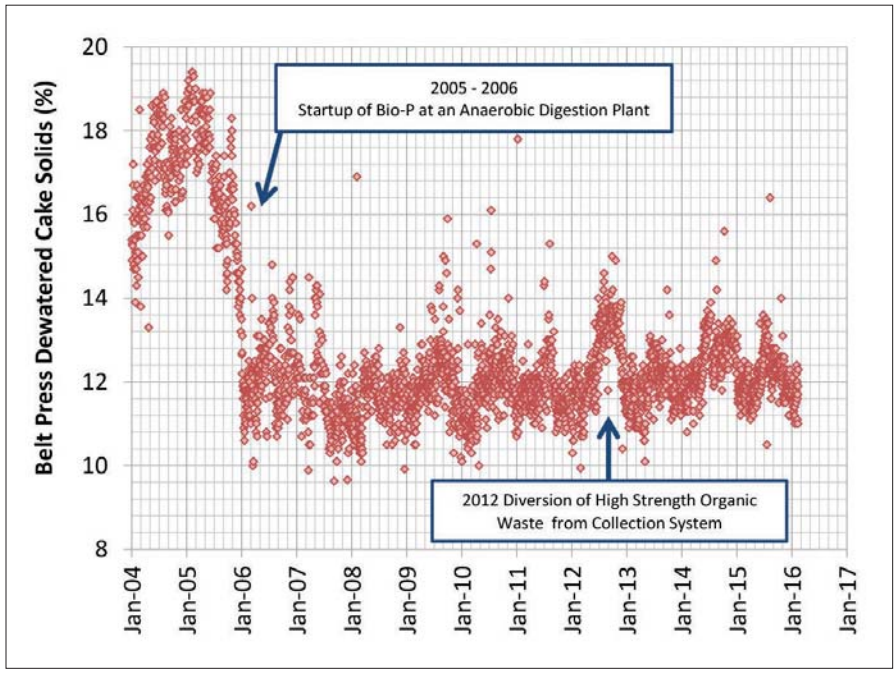


Figure 2. Empire WWTP Dewatered Cake Total Solids Timeline

| |
|---|
| Blend of thickened primary sludge and thickened waste activated sludge (100:0, 70:30, 50:50, 0:100) |
| Impact of a commercially available bio-augmentation additive |
| Pre- and post-treatments intended to either further degrade extra-cellular polymer substances and/or lyse cells |
| Increased solids residence time (18 day, 28 day) |
| Chemical additions to digestion intended to alter water chemistry and/or improve dewaterability |
| Storage of waste activated sludge prior to thickening to alter water chemistry in the digestion process |
| Combining chemical addition with storage of waste activated sludge prior to thickening |

Table 1. Topics Investigated by MCES's Pilot Digestion Research Program

Figure 3. Pilot Digesters Used in the MCES Research Program

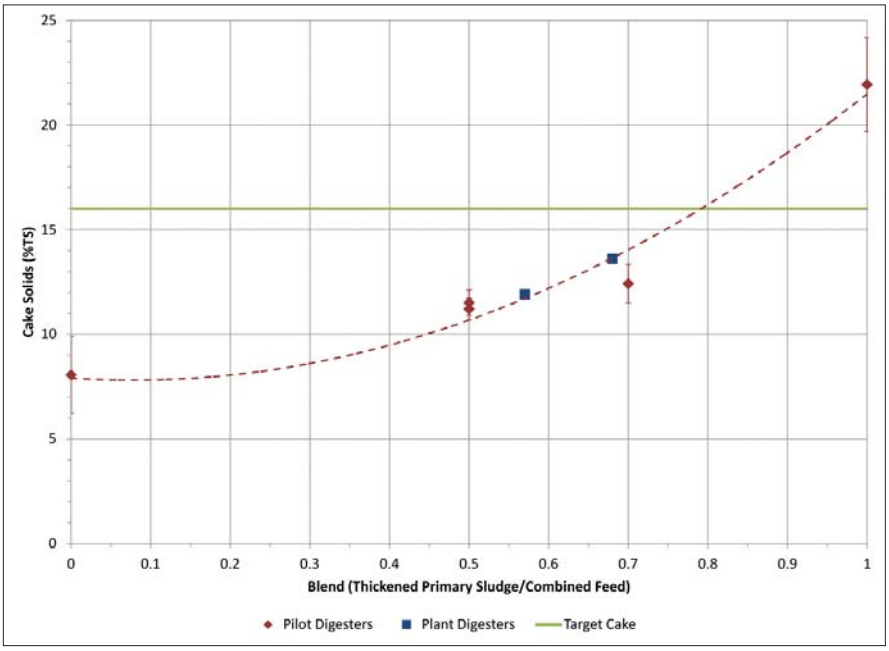


Figure 4. Full-Scale and Pilot-Scale Dewatering and Blend of Feed Sludge

waste activated sludge blends, including one that mimicked the blend observed during the diversion of the high strength material. Figure 4 provides pilot scale results and full-scale observations from periods with and without the high strength waste coming to Empire.

MCES used this data and additional calibrated plant modeling results to conclude the industrial waste did not have a direct impact on dewatering performance. Rather, the additional amount of waste activated sludge that it produced contributed to Empire's dewatering performance.

Figure 5 summarizes the cake solids results of all pilot digestion trials conducted by MCES. "TWAS Experiments" treated thickened waste activated sludge (TWAS) as currently produced at Empire. "STWAS Experiments" treated TWAS produced by anaerobically storing waste activated sludge (WAS) for three to four days prior to thickening. Anaerobic storage promotes the release of potassium, magnesium and phosphate from the solids prior to thickening. This allows those compounds to be diverted from the thickened solids stream, altering the water chemistry in the digestion process.

Figure 5 shows that methods of increasing cakes solids from the current 12% total solids level to greater than 16% total solids were identified. Of these, the most practical methods for full-scale implementation are storage of WAS prior to thickening and the addition of ferric chloride to the digestion process.

In addition to dewatering performance, the overall impacts of full-scale implementation need to be considered. Use of pilot digesters allowed MCES to quantify impacts on: volatile solids reduction, chemical addition amount and cost, and total



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wet cake production including the added chemical fixed solids. Table 2 summarizes the business case evaluation of several alternatives identified by pilot research.

Table 2 shows that there is not an overall economic driver for the dewatering improvement alternatives identified to date. Storage of WAS prior to thickening has the greatest potential for improved dewatering performance. MCES will continue to study this alternative at both full and pilot scale.

In addition to pilot studies of process modifications, MCES investigated and pursued operational measures to improve cake solids. In 2013 MCES staff visited their colleagues in Owatonna, Minnesota who were using their seasonal biosolids storages facilities in a way that enhanced drying during storage. The technique used spreaders to distribute the solids in thin layers over the storage area.

MCES piloted a similar pad management strategy on its biosolids storage pads with excellent results. MCES's practice includes spreading the material in layers for drying and then stock piling dried material. Figure 6 shows the spreading process in action. Figure 7 illustrates a stockpile of dried material.

The new solar drying technique has demonstrated a significant increase in drying, with cake solids increasing from approximately 12% total solids off of the dewatering process to over 20% total solids after solar drying. This increase in total solids and the resulting decrease in associated volume has increased storage capacity and reduced the number of truck trips required during beneficial land application. This pad management technique has become an integral part of plant operations and a facet included in the future of solids processing at the Empire WWTP.

## Conclusion

MCES experienced a decrease in dewatering performance following the addition of enhanced biological phosphorus removal at its Empire Wastewater Treatment Plant. Literature review and discussion with others indicated that dewatering performance problems at plants with enhanced biological phosphorus removal and anaerobic digestion was an emerging issue for our industry. MCES conducted a multi-year pilot study program to investigate process changes to increase dewatering performance. The program identified and developed alternatives that could increase cake solids above a target threshold of 16% total solids. At the full-scale, most alternatives were

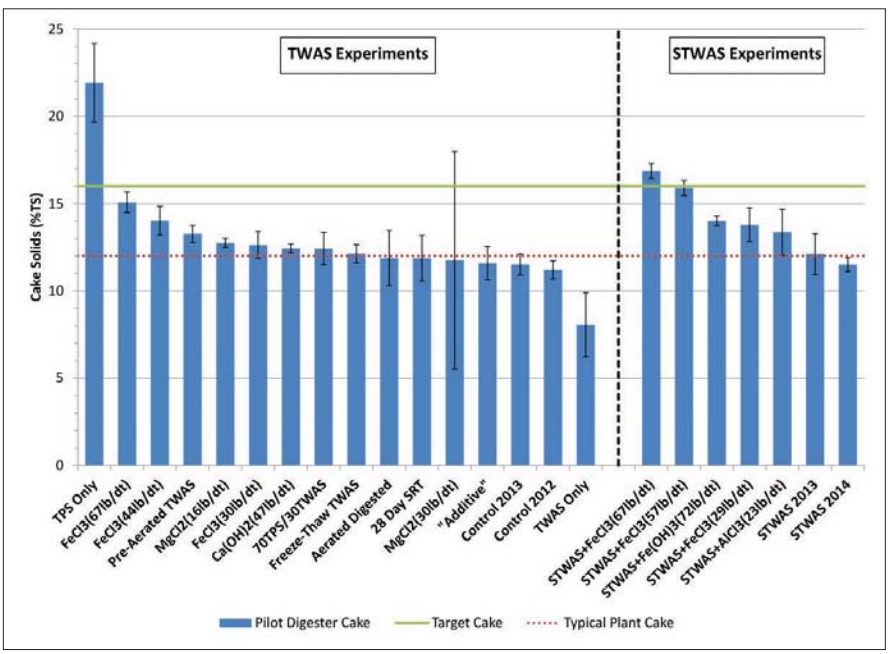


Figure 5. MCES Empire Pilot Digestion Trial Cake Solids Results

Figure 6. Biosolids Storage Use to Enhance Drying – Solids Spreading

| Item | Status Quo - No Change | Implement Storage of WAS before Thickening | | Implement Storage of WAS before Thickening with Mid-Range Ferric Dose | |
|---|---|---|---|---|---|
| | | Best Case from Pilot Data | Median Case from Pilot Data | Best Case from Pilot Data | Median Case from Pilot Data |
| Storage Implementation | $0 | $130K | $130K | $130K | $130K |
| Ferric System Modifications | $0 | $0 | $0 | $9K | $9K |
| Annual Polymer Cost | $109K | $102K | $137K | $97K | $120K |
| Annual Ferric Cost | $0 | $0 | $0 | $240K | $240K |
| Annual Land Application Cost | $400K | $280K | $390K | $320K | $400K |
| Alternative Total 20-Yr Net Present Value | $8,350K | $6,620K | $9,040K | $11,140K | $12,860K |

Table 2. Business Case Comparison of Several Alternatives


Figure 7. Biosolids Stockpiled in a Manner to Reduce the Impact of Rain

economically unviable because of chemical costs and potential impacts on volatile solids reduction. Anaerobic storage of waste activated sludge prior to thickening caused changes in the water chemistry of downstream digestion which lead to promising results. MCES will continue to investigate and look for opportunities to test anaerobic storage of WAS at both the pilot and full-scale.

In addition to investigation of process train modifications, MCES also piloted and adopted an optimized management approach for its biosolids storage pads. Through thoughtful use of spreading and stockpiling, MCES is able to achieve drying during seasonal storage that increases cake solids from the 12% total solids off the dewatering equipment to over 20% total solids. This optimized operational technique has increased storage capacity, reduced land application transportation costs, and is an important aspect of solids processing at the Empire Wastewater Treatment Plant.

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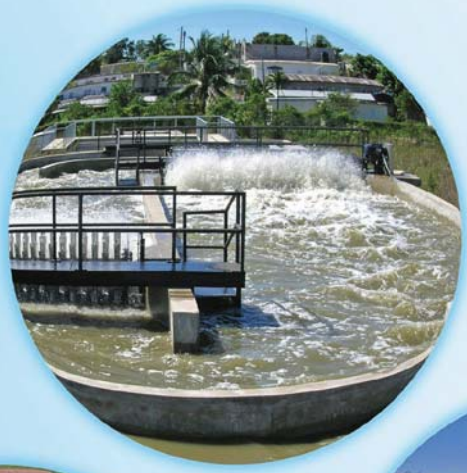

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# Regulatory Update

Brandon Koltz, Brandon Koltz Water & Environmental Consulting LLC

The pace of regulatory activity has slowed leading up to the elections this year. Nevertheless, there are items to update from the WEF Government Affairs Committee meeting and U.S. EPA dialogue at WEFTEC. The Government Affairs Committee discusses upcoming issues in subcommittees (regulatory, legislative, policy, and member association liaison) and organizes the U.S.EPA session. Topics typically include funding, pending rule making, and local regulatory issues.

## Funding

A continuing topic is support for funding for wastewater infrastructure. The elevated lead levels in Flint's drinking water has elevated awareness of the need for infrastructure investments. That hasn't necessarily translated to recognition of funding for wastewater related improvements. The following table illustrates funding in the President's budget proposal, and the House and Senate draft Fiscal Year 2017 budgets (millions of dollars). Budgets have not been approved; there is a continuing resolution providing funding at FY 2016 levels.

Of the total, Illinois, Minnesota and Wisconsin receive approximately 4.5%, 1.8% and 2.7% respectively of the total appropriation for continued capitalization of the State Revolving Fund programs. *Water Infrastructure Finance and Innovation Act (WIFIA)* is a new source of financing, leveraging Treasury rates to finance larger projects ($20 million and above). The appropriation is for a pilot program. U.S. EPA has published rules for comment for this program and has been holding information sessions across the country. WEF continues to educate congressional leaders on the value of SRF investment. Economic activity from infrastructure investment returns over 90% of the investment to the Treasury. The President's proposed budget would change the deductibility level of tax free municipal bonds for upper income earners from fully deductible to 28%. This would increase the cost of municipal bonds, since most purchasers are from the upper income brackets. WEF has opposed this proposal in the past and Congress has not accepted this proposal. Reductions are also proposed for funding through the Agricultural Act for Conservation Programs that reducing nonpoint pollution loadings. WEF has continued to support restoration of funds for these programs. A copy of the status of a multitude of bills in the House and Senate and status as of this fall is available and can be obtained from Brandon Koltz.

## Regulatory Issues

Nutrient removal and watershed management remain a focus of U.S.EPA. On September 22, Joel Beauvais/U.S.EPA Deputy Assistant Administrator Office of Water issued a memorandum to the state environmental commissioners and water directors entitled *Renewed Call to Action to Reduce Nutrient Pollution for Incremental Actions to Protect Water Quality and Public Health*. The memo notes the continued threats to public health from algal toxins and elevated nitrate levels in drinking water. Thirty to almost 50 percent of lakes and streams had high levels of nitrogen and/or phosphorus; ecological impacts are noted specifically for lakes. U.S. EPA is making some funding available to states for technical assistance and asks the Regions to identify high priority actions. The memo calls for the states to expeditiously work to:

- Prioritize watersheds for nutrient load reductions.
- Set challenging yet realistic load – reduction goals that improve water quality.
- Reduce point and nonpoint sources of nutrient loads.
- Provide for accountability and public reporting in its nutrient load reduction program.
- Continue to develop numeric nutrient criteria that clearly identify nutrient levels that are consistent with a state, tribe or territory's uses of its waters under the *Clean Water Act* and serve as clear guides for protecting and restoring those uses for its citizens.

The memo and discussion from Mr. Beauvais at WEFTEC emphasizes watershed approaches, prioritization and incremental improvements. There is an increased emphasis on drinking water impacts from elevated nutrient

| Program | FY16 Request | FY16 Enacted | Fy17 Request | FY16 Enacted Vs FY 17 Request | % Change | House FY 17 Draft | Senate FY 17 Draft |
|---|---|---|---|---|---|---|---|
| **Clean Water SRF** | $1,116 | $1,350 | $979 | *($414)* | *-29.7%* | $1,000 | $$1,350 |
| **Drinking Water SRF** | $1,186 | $863 | $1,020 | *$157* | *18.2%* | $1,070 | $1,020 |
| **WIFIA** | | | $20 | | *100%* | $50 | $30 |
| **Total Combined** | $2,302 | $2,210 | $2,019 | *($257)* | *-8.6%* | $2,090 | $2,400 |

**"A continuing topic is support for funding for wastewater infrastructure. The elevated lead levels in Flint's drinking water has elevated awareness of the need for infrastructure investments."**

concentrations. U.S. EPA is surveying POTWs with respect to nutrient removal and discharge concentrations through a 308 request. EPA wishes to evaluate the effectiveness of nutrient optimization measures at POTWs. It was stressed that this request is not part of an enforcement program.

U.S. EPA published for comment three options to update **MS4 stormwater NPDES permitting**, as required by a court order. U.S. EPA stated that in that decision, the court determined that the regulations for providing coverage under small MS4 general permits did not provide for adequate public notice and opportunity to request a hearing. Additionally, the court found that EPA failed to require permitting authority review of the best management practices (BMPs) to be used at a particular MS4 to ensure that the small MS4 permittee reduces pollutants in the discharge from their systems to the "maximum extent practicable" (MEP), the standard established by the Clean Water Act for such permits. The three options proposed are:

- Traditional General Permitting, with enhanced requirements for stormwater management planning, additional BMP demonstration, and conformance to water quality requirements.
- A procedural approach utilizing a notice of intent for coverage and listing of BMPS.
- A state option approach to utilize either or both of the above approaches.

WEF and most stormwater organizations favored the flexibility of the third option. EPA is scheduled to publish a final rule on November 17.

The budget reconciliation bill passed by Congress included a requirement for CSO communities in the Great Lakes watershed to **notify occurrence and volume of CSO discharges**. EPA held an informational and listening session at the Region 5 offices in mid-September and solicited comments with respect to content, timing and means of providing the notice of a discharge. Comments included a need to allow flexibility recognizing the varying resources for CSO communities of different sizes. U.S. EPA is expected to publish their proposed notification rules for comment in mid-December.

Communication with the state regulatory agencies and with the EPA Region is often difficult and inconsistent. The Member Associations in EPA Region 7 (Iowa, Nebraska, Kansas and Missouri) have organized an annual meeting with Region 7 personnel for the past ten years. State regulators from the four states attend the meeting. Each Member Association takes turns in organizing the agenda, with input from Region 7 and the state regulatory agencies. Representatives from the four Region 7 Member Associations at the Government Affairs Committee meeting during WEFTEC spoke to the improved communication among the regulators and regulated community, greater clarity, and greater consistency of regulatory decisions across the states. WEF is advocating that Member Associations explore establishing similar meetings and will assist with facilitation. Central States is leading an effort to meet with Region 5. Indiana, Michigan and Ohio Water Environment Associations have committed to collaborate in this effort. Additional information will be posted on the Central States website as we organize what we hope will be a an annual productive meeting. CS

# STEM Superheroes: Inspiring & Engaging Youth for Water

## NEW Water partners with Boys & Girls Club for an action-packed camp

By Tricia Garrison, NEW Water

NEW Water, the brand of the Green Bay Metropolitan Sewerage District, has joined forces with the Boys & Girls Club of Greater Green Bay to educate, engage, and inspire children in an action-packed STEM Superheroes Summer Camp. The camp was made possible due to a grant from the Central States Water Environment Association's Wisconsin section.

For seven jam-packed days in July 2016, 15 children from the Boys & Girls Club of Greater Green Bay earned their "Defenders of the Bay" certificates for completing the STEM Superheroes Summer Camp. Another 15 children from the Club's "Creative Crew" captured the event on video.


NEW Water Treatment Leader Aaron Eichhorst stars as Commander Cleanwater in the STEM Superheroes Summer Camp.


The camp culminated in the children making a presentation of what they'd learned to the NEW Water Commission.

From building their own sewers to inspecting microorganisms, the curriculum provided instruction in science, technology, engineering, and mathematics. NEW Water staff from all divisions chipped in to help, including helming roles such as Commander Cleanwater, Sinister Sediment, Phosphorus Phury, and Watershed Warrior Woman. Staff led and joined children in hands-on activities from the STEM-based curriculum. STEM knowledge and skills have been identified as a need for many jobs of the future.

"This partnership with NEW Water has hit on something special – we're addressing an identified community need for more opportunities to learn STEM skills in a fun, interactive way," said Eric VandenHeuvel, Chief Academic Officer of the Boys & Girls Club of Greater Green Bay. "The children have learned about the importance of water, and in particular, the role NEW Water plays in keeping our waterways clean."


"NEW Water is delighted to partner with the Boys & Girls Club on this important initiative," said Tom Sigmund, Executive Director of NEW Water. "We believe that



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water is our most valuable resource, and we need more water champions among the younger generation."

The curriculum (created by NEW Water's Communication & Education Specialist, Stefanie Stainton) was peppered with messy, relevant, and catchy themes and activities, including "Professor Polymer and the Science of Secret Agents," blueprint reading, an automation demonstration, and a mathematical challenge to calculate flows.

Old Western-style wanted posters hung around the camp, of Phosphorus Phury and Sinister Sediment. Kids learned that these villains are polluting our water, and that it's up to the STEM Superheroes campers to help Commander Cleanwater and the elite team at NEW Water to defend our water.

To share the experience with the entire NEW Water staff, a movie premiere was arranged to show the videos produced for the children (*http://tinyurl.com/jcu34u5; http://tinyurl.com/jfsqb4x*). Boys & Girls Club staff and campers mingled with NEW Water staff – and a popcorn machine was on hand for the big day. A snazzy movie premiere poster was displayed in the NEW Water lobby – proving to be a lively conversational topic with visitors.

The Boys & Girls Club and NEW Water are discussing ways to spread this initiative even wider, so that other Clubs and other clean water agencies may partner up as well.

"Opportunities like these are a great way to get our staff to interact with our community, and get kids excited about the careers we offer. Our staff are fiercely proud of the work they do each day to protect our water. When kids find out how cool these careers are, and see the connection to what we do – it's a real morale boost for our employees," said Bruce Bartel, NEW Water's Treatment Manager. CS

NEW Water
*The brand of the Green Bay Metropolitan Sewerage District*

For Central States members wishing to host their own STEM Superheroes Camp, NEW Water is happy to share the behind-the-scenes of how they did it! To learn more about how the camp went, view the video at *http://tinyurl.com/h96z696*. Contact: Tricia Garrison at 920-438-1064; *tgarrison@newwater.us*

# Evidence-based Engineering

By Christopher Harrington

"Extraordinary claims require extraordinary evidence."
*- Carl Sagan*

I am always looking for better solutions to problems. I am drawn to emerging and cutting-edge technology as it relates to the engineering and science of the water environment. There are pros and cons to this tendency. The pros are I am always learning new things, and I remain interested in what I am doing. One of the cons is that it is not easy to say confidently in advance, "Yes that will work."

Due to the varying nature of water quality, local environments, utility rates, labor costs, etc. even a technology that worked well in one application is not guaranteed to work in a nother. But uncertainty alone should not preclude one from forging ahead. That said, emerging and cutting-edge technologies require pragmatic and thoughtful evaluation.

There are methods to increase one's confidence as one progress into uncharted territory. I'll call these methods Evidence-based Engineering. Unlike Evidence-based Investing and Evidence-based Practice (in healthcare) my Google search indicates that evidence-based engineering is not widely used. I'd like to make a case that we use it more. Both investing, as I have seen as a member of my company's 401(k) committee, and the practice of healthcare, as I have learned from my wife (a certified nurse midwife), have improved significantly from greater attention to evidence.

In some ways, rules of thumb and the professional experience of the grey-haired advisors at your workplace may indirectly incorporate the collective evidence observed by those who came before us. Well-written reference books (WEF and WERF publish some great ones) could also do the same thing. Other sources of evidence are conference presentations that we may see at the events that CSWEA MN hosts. WEF's LIFT program appears to offer an even more thorough way of obtaining information than even our conferences. Check LIFT out at: *www.wef.org/LIFT*.

That said, as our field advances into more and more niche areas, it becomes less and less likely that anyone in your office/facility, at our conferences, or in your textbooks will be able to convince you that an application will work. Therefore we need more evidence-based engineering. The beauty of relying on evidence not experts is that experts are finite in number, while the process of evidence-based engineering is available to all of us. We just need to understand and apply the approach.

Two evidence-based engineering methods are described below:

1. Perform pilot testing in advance of committing to a technology, replicating as closely as possible the conditions that will be used in the real application.
2. Use of evidence-based computer based models to predict physical processes that have reasonably defined relationships to measurable qualities. Qualities such as flow, pressure, concentration, temperature, etc.
   a. Whenever possible collect data needed to calibrate models.
   b. If calibration is not possible, use the model to learn general tendencies not specific outcomes.

"The developing Resource Recovery and Energy (R2E) Committee will focus on the emerging technologies that go along with becoming a water resource recovery facility, instead of a wastewater treatment plant."

CSWEA MN is also moving into uncharted territory. Our new and growing Stormwater Committee is bringing a whole new suite of members into the fold. And the application of stormwater quantity and quality control is evolving as well. Contact Mark Doneux or Bridget Osborn to learn more. Also, the developing Resource Recovery and Energy (R2E) Committee will focus on the emerging technologies that go along with becoming a water resource recovery facility, instead of a wastewater treatment plant. Contact Tracy Hodel to learn more.

I am writing this just prior to the Conference on the Environment, and look forward to seeing many of you there. I also look forward to participating in the 34th Innovative Approaches to Wastewater Problems seminar on February 7 at the Saint Cloud Holiday Inn. Please come to our conferences and share your own experience with evidence-based engineering. CS

# Outstanding Youth

by Matt Streicher

Although this publication will have come out long after our return, I would like to discuss this past August's Global Water Stewardship trip to Costa Rica. For this summer's trip, we had a record number of volunteers and students participate – a total of seven volunteers and four students. While I'm sure you have read about some of the trip highlights in previous articles, there were several items I wanted to point out that were of significance to me. First and foremost is the great effort that some of the newer members of the group have put forward, particularly the young professionals of the group. In particular, two newer members of CSWEA and GWS who stood out were Liz Bohne and Alex Knicker.

In previous trips we've only had one fluent Spanish speaker. This year Liz joined the efforts, and provided the group with a second, and although she claimed her Spanish felt "rusty," I can assure you she excelled in communicating with locals. Whether she was put on the spot with a random conversation to obtain information, or asked to lead the presentations to Spanish speaking students, she was always effective in getting across GWS' message. Prior to traveling, GWS committees had come up with some great ways to demonstrate our goals to young children, which the children both enjoyed and were able to learn from at the same time. Trip participants, along with Liz, did a great job presenting and demonstrating those goals to all students – both English and Spanish speaking

The other standout young professional to me, Alex, contributed in a number of ways leading up to and during this trip – and to the organization as a whole. As our social media chair, Alex did a great job of documenting activities and sharing them across all of our different platforms. She effectively sent our message to all of GWS' followers and members, which was noticed and appreciated by those who couldn't join on the trip. Alex showed ambition in every activity, meeting, and discussion that related to GWS' causes. She contributed to the trip in countless ways, in addition to performing her duties as social media chair.

Having these two young professionals be so involved and engaged with the trip, and GWS altogether, is very encouraging to see. The participation by young professionals not just shows the draw GWS' cause has to the younger generation, but also helps secure the future of the organization as they continue to become more involved.

While mentioning those two members in particular, it's not meant to diminish the continuing dedicated efforts all of the trip participants put forth – from seasoned veterans, other new travelers, the students who joined us, as well as those members who were not able to make the trip but still continued the work behind the scenes at home. GWS' Executive Director, Chair, and Vice Chair positions all put in a tremendous amount of time as well, and provide strong leadership to ensure success. GWS is lucky to have a growing number of volunteers willing to put in the hard work and time to help the organization succeed.

Another part of the trip that stood out to me was the recognition GWS is gaining in the Costa Rican regions we've been working in. Several local publications asked for articles about us, tourist industries participated in contributions, and our presence seemed to be well known among community officials. While walking through the communities that have previously been visited, residents remember what GWS is and what we're there to do. It was extremely humbling to see those community members be excited and grateful for our continued work. It was very exciting to personally be part of this trip for a third time, and to see how much it has evolved and grown since the first trip with just four CSWEA volunteers and a Peace Corps volunteer to translate. While I may not be able to travel down every year moving forward, it is reassuring to see how strong the involvement has become and know that the efforts we began with are being continued by such a determined group.

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There were many other great accomplishments made during this trip, however, since they have already been covered in previous articles, I won't go into more detail. And of course, tremendous gratitude goes out to CSWEA and its Executive Director, Mohammed Haque, for helping make what GWS is today. I encourage you to visit the new website, follow GWS on social media, and talk to members to stay in touch with our dedicated efforts. AND DONATE! CS

# Teach The Children Well

By Alan Grooms

I'm writing this on Election Day 2016, and I don't think I'd be too far out on a limb to say that if you have been paying even the slightest attention to the election campaigns, that this has seemingly been a period of negative piled upon negative, no matter where you align politically. It is really easy to focus on the negative and take for granted (or even forget completely) the positives all around us. So in considering the topics I could write about, I decided to point out just a few of the many positives that we have experienced as a section in 2016.

In April, Milwaukee served as the host city for the annual WEF Residuals and Biosolids conference. Having the conference in Wisconsin provided an opportunity for many students and professionals to attend a major WEF specialty conference that they might otherwise have missed out on. Many Wisconsin section members were active participants in organizing and executing the on-the-ground arrangements for the conference, and the effort was well received by WEF staff and attendees.

Our Young Professionals and Student group has also been active in 2016. In February they organized a Brew 2 Poo tour in Stevens Point to highlight the mutually beneficial arrangement between a brewery and the municipal wastewater plant. August brought the annual YP Brewer Outing, where young professionals and seasoned professionals had a chance to socialize before a baseball game. In November the same group organized a tour of comparative phosphorus recovery technologies, touring a pilot facility at the Sun Prairie plant, as well as a full-scale phosphorus recovery installation at the Madison Nine Springs plant.

At WEFTEC in New Orleans CSWEA claimed as members three of the 15 new 2016 WEF Fellows inducted, with Rusty Schroedel representing the Wisconsin section.

Also in conjunction with WEFTEC, and announced just before the event, was recognition for the inaugural Utility of the Future Today recognition program. Sixty-one utilities from around the world received this recognition; eight of them were part of CSWEA, with four in Wisconsin alone. The four representing Wisconsin are City of Fond du Lac, NEW Water (Green Bay), Milwaukee Metropolitan Sewerage District, and City of Stevens Point. Congratulations to these utilities on this well-deserved recognition!

As you see, there is a lot of positive that has gone on so far in 2016. And that is without even touching on the events and functions that we seemingly assume will go on as well-executed and successful events (such as the Government Affairs Seminar and the Spring Biosolids Symposium, to name two of many). All of these events and gatherings need is volunteers who believe in the task and who are willing to step in and help make these events happen. That could be a lead role (chair of a committee or subcommittee) or a worker bee role. Everyone appreciates the value in a well planned and executed event, so why not volunteer and play a role in the successes coming in 2017?

Writing that makes me realize that by the time this issue comes out and you read these words, we will be well into the holiday season. Many people make resolutions at the start of the New Year to improve or develop an area of their personal or professional life. Why not resolve to step into a new challenge, get to know some new people, and take on an active volunteer role in the section as a committee member? The aforementioned young professionals cadre in this section are doing impressive things, demonstrating a "Why not?" attitude that is refreshing and energizing. Why not join us as a volunteer in the section, make some new connections, and help us grow and build upon the success of 2016 and previous years? CS

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*Updated on November 24, 2016*

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Curtis Ahart
Grant Balkema, UIUC
Shawn Berg, Hydro Thermal
Sara Bossenbroek
Jennifer Debellis
Bill Hendirick, Magnetrol International
Hannah Lohman
Shane Oyler, Shive-Hattery
James Postiglione, HR Green
Ricardo Santiago, Milwaukee MSD
Nolan Sovcik, UIUC
Roger Tippett, Nalco
Shaun Whelan, Hydro Thermal

## October 2016

Russell Cuhel, Great Lakes Water Institute
Kevin Fischer, Bolton & Menk
Stephanie Getty, Syneco Systems
Brian Goldman, Greeley and Hansen
Sarah Raper, PDC Laboratories
Ricardo Santiago, Milwaukee MSD
Marcia Willhite

## November 2016

Jeremy Greenhouse
Govardhan Katta, Siemens Water Technologies
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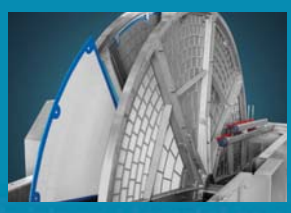

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