CENTRAL STATES WATER

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

weftec 2023 Highlights

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Downers Grove Sanitary District

PLUS:

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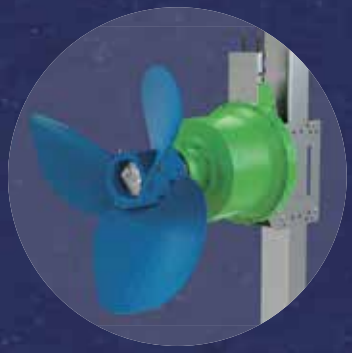

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Thriving Throughout

By Amy Underwood

As I'm writing this and watching red maple leaves drift down to our deck, I'm struck with the realization that my term as CSWEA President is more than half over. WEFTEC has come and gone, the 97th CSWEA Annual Meeting is less than six months away, and by the time you read this, there may be snow on my deck.

Thank you to everyone whose hard work made WEFTEC more enjoyable for others. Thank you to the YPs that represented CSWEA while volunteering for the annual WEF Community Service Project; your dedication and energy are appreciated. The efforts of Mike Holland and Mohammed and Amy Haque on the CSWEA/IWEA WEFTEC reception were well-received. I enjoyed catching up with old friends as well as meeting new clean water colleagues. Thank you to Jeremy Cramer, Marc Zimmerman, and the Operations Challenge team members for all the time and effort you put into practice and the competition. We had a great turnout of CSWEA members cheering the teams on. I had the pleasure of attending the Operations Challenge awards reception. I was touched by the comradery among everyone in the room as they joined together to celebrate their commitment to their careers and clean water.

Congratulations to all those CSWEA members who received awards or were honored at WEFTEC. The CSWEA Shovelers took first place in the Operations Challenge laboratory event. The Universidad de Costa Rica team, which was sponsored by CSWEA, placed third in the wastewater category in the WEFTEC 2023 Student Design Competition. The City of St. Cloud, Capitol Region Watershed District and the Glenbard Wastewater Authority were recognized

There is much to learn every year at Downers Grove Sanitary District's annual open house, an event which is especially popular with scout troups.

"Public education is a core part of CSWEA's mission. Our public education committee is small but mighty, and they have been doing great work."

by the Utility of the Future Today program. Lynn Broaddus received a WEF Fellow, and Tracy Ekola was inaugurated onto the WEF Board of Trustees.

The Local Arrangements Committee (LAC) Chair Liz Heise and the committee are diligently working on preparations for the Annual Meeting which will be on May 13-15, 2024 at the Renaissance Schaumburg Convention Center. The theme will be Flowing into the Future. I'm excited to see what the LAC and the technical program committee do with this theme.

I enjoyed reading about Samidha Junghare's "stint in public education" in the Fall edition of this magazine. I can relate to her experience. Since coming to the Downers Grove Sanitary District, I have become passionate about public education. It is one of the things that the District was doing very well before I was hired and I've been honored to continue. Public education provides transparency to our customers, so they know how and why we are spending their money. The District has hosted an annual open house at our wastewater treatment center every year since 1990 (with the exception of the two COVID-19 years). Our open house is popular with scout troops who earn a badge for going on the tour of the treatment plant. In addition to the open house, the District sends out an annual newsletter to all our customers which presents our budget and rate increases. The newsletter also provides information on our assistance programs, construction projects, what not to flush, and performance of the treatment plant. Throughout the year, we also provide public education to the younger generation through plant tours for local colleges, high schools, and middle schools.

Public education is a core part of CSWEA's mission. Our public education committee is small but mighty, and they have been doing great work. The committee puts on the Water's Worth It essay contest for middle schoolers annually. The contest has had 1,055 submissions from 168 schools across Illinois since its inception in 2020. The contest will be held in all three states in 2024. If you have not done so yet, check out the 2023 contest winners' essays in the Summer edition of this magazine. The public education committee also hosted a booth at Water Palooza, which was held at a Chicago elementary school on the Friday before WEFTEC. A newly constructed collection system model was used to demonstrate to students how water travels by gravity, what happens when it gets to a lift station, how stormwater can create I/I, and how wipes clog pipes. The model is available for any CSWEA member facility or committee to borrow. During CSX in July, attendees generated many great public education ideas. To make them a reality, however, the public education committee could use more volunteers. If you are interested, please reach out to the Public Education Committee Chairs. You can find their contact information on *www.cswea.org*. I hope you volunteer and find the enjoyment in it that I do. CS

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Water Environment Federation
the water quality people

Rich Hussey

Anna Munson

Preparing for 2024

Written by Anna Munson and Rich Hussey

As your WEF delegates, Rich and I are tasked with providing resources for our WEF Member Association and connection to WEF leadership. This update provides a summary of WEF administrative activities since the summer and highlights of WEFTEC 2023.

WEF continues to be led by Interim Executive Director Pat Nichols. John Ikeda will be joining WEF leaders in December as the new Managing Director of Programs. He brings extensive experience in developing water sector partnerships and financing initiatives in the US and around the world. The WEF Board of Trustees (BOT) also welcomed several new members whose terms began at WEFTEC 2023, including our own Tracy Ekola from the Minnesota Section of CSWEA.

WEF Board of Trustees 2023-2024. Back Row (L-R): Stephen Sanders, Corey Williams, Diego Rosso, and Pat Nichols. Middle Row (L-R): Christine Volkay-Hilditch, Keith L. Hobson, Howard Carter, and Janet Hurley Cann. Front Row, (L-R): Kalpna Solanki, Ifetayo Venner, Aimeé R. Killeen, and Tracy Ekola. (Photo: *www.wef.org.*)

HOD ACTIVITIES AT WEFTEC

The House of Delegates (HOD) gathers each year at WEFTEC to welcome new delegates, thank those whose terms are ending, and plan for the coming year. The HOD met for a full day of activities on Saturday, September 29. Donnell Duncan passed the HOD speaker gavel to speaker-elect Alexie Kindrick. Alexie stressed the importance of remaining curious and open as we embark on the next year of WEF leadership.

The HOD accomplishes work through various committees and work groups made up of HOD members. Committees are established in the HOD Bylaws and do not change year to year. Work groups, however, are modified each year based on the objectives of the HOD. Each Committee and work group provided a short report at the WEFTEC HOD meeting on their accomplishments from the previous year. A few highlights of the Committees' work are:

1. The Budget Committee received many more MA grant applications than the grant program fund could support. They were impressed by the quality of the applications. Grants were awarded for planning/

training, MA operations, and seed grants ranging from $3,000-$16,000. CSWEA was awarded an $8,000 seed grant to support our Student Design Competition.
2. The Nominating Committee reviewed applications and made nominations for all HOD Committee roles and delegates at large. CSWEA member Mandy Sheposh was voted in as the HOD Nominating Committee Chair for the 2023-2024 year.
3. Two new committees were added to the Bylaws. The Communications Committee and the Water Advocacy Committee will begin their work this year.
4. The WEFMAX Committee is planning the theme for each 2024 WEFMAX. The dates and locations are set: Old Town Alexandria, VA (April 10-12, 2024), Park City, UT (May 15-17, 2024), and St. Petersburg, FL (May 29-31, 2024).

HIGHLIGHTS FOR THE WORK GROUP EFFORTS IN THE 2022-2023 TERM ARE:

1. The Strategic Plan Rollout Task Force (work group) accomplished the phased plan to develop a roll-out strategy, educate members on the new strategic plan, and obtain feedback. Recommendations from this work group will be addressed this year.
2. The Water Advocacy Work Group continued efforts from the previous year to engage MAs to participate in water advocacy at the federal, state, and local levels. They completed the charter and framework to develop the work group into an HOD Committee, which was approved by the HOD at the pre-WEFTEC business meeting.

> "Following the summary of the accomplishments from previous year, the HOD got to work brainstorming and preparing for the year to come."

3. The HOD of the Future work group focused on adjusting priorities and procedures to align with the new strategic plan, improve communication, and establish a path forward for the HOD.

Following the summary of the accomplishments from previous year, the HOD got to work brainstorming and preparing for the year to come. New work groups were assembled to continue progress on key initiatives. Those workgroups include the strategic plan work group, tasked with crafting a new mission statement and defining the HOD core values to reflect those of all WEF MAs, and the workforce development work group that will explore ways to support MAs in efforts to attract and retain a robust and inclusive workforce.

Rich and I participate in the work groups to ensure the outcomes benefit our MA. We are open and available to hear what you think WEF is doing today that adds value to our profession and the environment. We also want to hear if there are areas where WEF is falling short. We are here to advocate for CSWEA members. Please reach out and let us know how we can help. CS

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Recruiting the Next Generation of Leaders

By Chris Lefebvre

I remember when I was applying for the workforce, being one of more than a hundred applicants. Things have changed since then. Today, we are lucky to have two applicants for one position and hopefully one of them is qualified for the job.

One of the most important things we do as leaders in the wastewater profession is educating people about the importance of our chosen field. In today's job market, this education is vital to our industry. Talking about the satisfaction we get from working in this field is a great way to inspire the next generation of employees. At Stevens Point Public Utilities, we have taken this issue to heart and actively recruit for the industry in as many ways as possible. In 2022, we started leading tours of our facility for college students taking "Introduction to Soil and Water" through the University of Wisconsin-Stevens Point's (UWSP) College of Natural Resources. Because this is a mandatory course for all students in the Natural Resources program, these tours give us direct access to hundreds of natural resource minded students each year. During these tours we discuss how a wastewater treatment facility operates and what a career in wastewater is like. We make sure to include things like wages, job availability, and benefits but more importantly – we discuss the difference that our industry makes in keeping the waters of WI swimmable and fishable. The connections with these students will hopefully pay off with more students enrolling in the Waste Management program at UWSP.

We have also recently switched our priorities when it comes to hiring interns. In the past we looked for individuals with a desire to be in wastewater, we now look for candidates that may be on the fence about our industry in hopes that showing them what the field can offer will encourage them to seek a career in wastewater. Our last intern came from the Water Resources program at UWSP with no experience in wastewater. When he graduated last May, he had already lined up a job as a wastewater operator for an East WI community. Our utility also hires seasonal employees each year as groundskeepers. These employees are introduced to the water and wastewater industry during their time with Utility by including them on summer maintenance projects and through conversations with operations staff. Over the past decade we have hired two of these seasonal employees as full-time operations staff and had one more take a job with a neighboring community. We are currently looking to expand our reach further into the local high schools through apprenticeship/work study programs but that hasn't come to fruition. While this is a good start to solving our industry's hiring issues, we can't do it alone. If each of you does a little bit of recruitment, we can help ensure that our industry will continue to thrive in the future.

This being the winter edition of the magazine means that the weather has turned from the beautiful colors and temperatures of fall in WI to a dark and cold leafless winter. What better way to warm up and chase away those winter blues than to go see some of your favorite colleagues at a CSWEA event. We have some great ones coming up. The Operations Seminar will be held at UWSP here in Stevens Point on February 22, and we have the Government Affairs Seminar in February also. I look forward to seeing you there!

Thank you for your continued dedication to doing the little things that make our industry great. CS

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Mentoring Excited Youth

By Samidha Junghare

How does someone graduating high school know what they want to do next? If they decide on college, how do they figure out what to major in? Once starting their career how do they know what type of work they are most passionate about, what will lead to a productive and fulfilling career? This has been on my mind lately. Currently, I have a senior in high school and we have been touring some college campuses and starting the application process. I also have a junior in college who has had one internship and is trying to line up one more before heading into her senior year and into the workforce after that.

One of the answers to the above questions is for these young folks to have plenty of support from us, the "seasoned professionals." You all probably have had people and experiences that helped guide you along your own career trajectory so you know how important this can be. Water professionals are a very passionate group – so many of you judge science fairs, give treatment plant tours, host internships, participate in workforce development teams, act as mentors – kudos to you!

CSWEA has a lot of initiatives in this regard and it's exciting to see our hard-working members put in the time and enthusiasm to make these even bigger and better. MN Section Public Education committee plans to support the Water's Worth it Essay Contest (grades 6-8) for the first time this year. They also will be selecting Stockholm Junior Water Prize nominees (grades 9-12). The Student & YP committee participated in a very successful Metro Children's Water Festival for grade 4 students in the Twin Cities. They also are promoting the Midwest Student Design Competition (college level), which traditionally has not had huge participation from Minnesota schools. The Conference on the Environment was last week and there was a Student & YP Mentor Breakfast along with a YP Happy Hour, grad student poster display, and a college Student Challenge competition. The Student Challenge had four teams participate who did a paper on their problem solution along with a "tabletop" Q&A interactive judging session. I happened to be sitting at one of the lunch tables with one of the teams and when winners were announced they were so excited they started calling and texting their parents immediately, how rewarding is that! The Innovative Approaches to Wastewater Operations conference is coming up in February, as usual there will be student presentations and YP events incorporated in the program.

If you have any initiatives supporting students and young professionals that you would like to promote or share, please contact me or any of the relevant committee chairs, you can find our contact info at *www.cswea.org*. CS

> "So many of you judge science fairs, give treatment plant tours, host internships, participate in workforce development teams, act as mentors."

Changing of the Season

By Jason Neighbors

As the days get shorter and the nights get cooler, we are approaching one of my favorite times of year! It is the changing of the season, fall colors, and the closing of this year's projects that cause me to reflect on the events of the year. It seems to go by so fast while you are in the moment. It is amazing how much ground we cover in such a short time. This fall provided great opportunities within CSWEA. From the webinar series, the operator training sessions, the Operations Seminar, the Section Meeting, and of course WEFTEC, we had plenty of chances for knowledge exchange and networking alike.

The operator training sessions help those studying for the certification exams, aid those wishing to brush up on their processes and techniques and assist those trying to get in CEUs. Held monthly via a webinar format, the operator trainings cover a wide variety of topics. Knowledgeable wastewater professionals graciously volunteer their time to present topics that help give back to the community that we all share. Keep your eyes out for an upcoming operator training on the events page.

This year also brought us the Annual Operations Seminar. As always, it did not disappoint. The City of Naperville, IL kindly agreed to host the event. We focused on PFAS and had three great presentations followed by a tour of the Spring Brook Water Reclamation Center. The presentations were all on point and the speakers were very knowledgeable. I found the Q&A after each presentation to be very enlightening. And of course, as a wastewater operator, I love getting to tour other wastewater facilities. It is easy to pick up little tricks and techniques that you can take back home to your own facility! I cannot wait for next year's seminar!

Then there is WEFTEC, an event which holds a special place in my heart. Not only is it a great place for knowledge exchange, networking, and seeing firsthand the emerging technologies – it also brings us the Operations Challenge. As well, the event gets kicked off by the CSWEA Reception. It is this event that gets me excited for the days to come. This year, Mohammed and Amy Haque found a great venue to host the event! Having had the pleasure to compete on the CSWEA Operations Challenge teams in the past, it is great to catch up with old teammates as well as meet the newest members. There has been no equal in my career to being part of these teams. From the lifelong friends I have made, the skills that I have honed, and to rekindling my love for this job, Operation Challenge holds it all. Make time to see these men and women show their skills and talents off in an exciting competition.

With this year closing let's look forward to all that CSWEA has planned in the new year! We start with the Annual Meeting in May 2024. I hope to see you all there. CS

2024 WATER'S WORTH IT®

CSWEA ESSAY CONTEST

Central States Water Environment Association Invites you to join the WATER'S WORTH IT campaign by writing a short essay about your watershed.

Guidelines:

- **Students must reside in Illinois, Wisconsin, or Minnesota and be in grades 6-8th.**
- Select a Prompt for your essay: **research or creative writing**. Students may only submit one essay for the 2024 contest.
- Essays must be between 400-800 words. Source citations are suggested but not required. Citations do not count towards essay word count.
- Font size should be between 10-12 and font should be legible (ex: Arial or Times New Roman).
- **Essays must include a cover page containing: Essay Title, Student's Name, grade, school, and which prompt the student chose.**
- Essays must be submitted in Word or PDF format by the end of the day, April 1st, 2024.

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Essay Topic: How is your Watershed?

Did you know your home is located in a watershed? A watershed is an area of land that drains or "sheds" water into a specific body of water. All the rain and melted snow that seeps into the ground drains into streams and rivers or into underground reservoirs called aquifers. Other precipitation ends up on hard surfaces like roads and parking lots, from which it may enter storm drains that feed into streams. Following gravity, the water eventually flows into larger bodies of water like lakes, bays, and oceans. How we use the land within our watershed directly impacts the health of our water. Some examples of impactful land use are agriculture, forestry, urbanization, recreation, and industrialization. Unfortunately, 40-50% of our nation's waters are impaired or threatened. This could mean that the water is not suitable to drink, swim in or to consume the fish that was caught there. Not all is lost, though. With proper watershed management and public education, we can work together to keep our waterways clean and safe for the plants, animals, and communities that rely on them.

Research Prompt

Research your watershed. Using the EPA's "How's my waterway" online tool, explore your local watershed. Give details on the name, size, and health of your watershed. Explore your water ways; are they impaired? How does this affect wildlife and society. Are there conservation, restoration, or watershed management efforts? Reflect on how this affects you personally and how you can help keep your watershed healthy. Conclude with your thoughts on what you have learned about your local watershed.

Creative Writing Prompt

Use the EPA's "How's my waterway" online tool to explore your local watershed (name, size, health). Using the information you have learned, pick a waterway within your watershed that holds specific importance to you and **write a creative story revolving around this waterway.** Pieces should highlight how the waterway is used, its health, and the importance of proper watershed management. The story should leave the reader feeling compelled to help keep their own watershed clean and healthy.

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Questions? contact Stephanie Cioni at scioni@dgsd.org

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CSWEA Wrapped




By Anndee Huff Chester, CSWEA YP Chair; Rahim Ansari, WI Section YP Chair; Quentin Hahn, MN Section YP Chair; Nicholas Domalewski, IL Section YP Chair

As 2023 comes to an end, the Young Professional and Student Committees want to give you a CSWEA Wrapped for the past year.

YP SUMMIT

Each year CSWEA sponsors a group of YPs and Students to attend the YP Summit for Water Industry Professionals to help us learn about emerging concerns in our industry and make lifelong connections with our peers. Check out this year's Summer issue for details on our trip to Sacramento and reach out to your respective Section leadership to find out how to apply for next year's YP Summit.

AO SMITH TOUR

YPs and Students got to tour AO Smith's 43,000 SF facility dedicated to water technology development in water treatment, water heating, and air purification, followed by a happy hour. Thank you, AO Smith, for hosting!

AWWA EARTH DAY PARK CLEAN UP

A group of CSWEA-MN YPs helped at AWWA's Earth Day Park Clean Up. Shoutout to these environmental stewards for taking care of our environment from both inside the office and outside the office.

CSWEA ANNUAL MEETING

The Annual Meeting in the Twin Cities was filled with great networking, technical presentations, and events! Attending YPs helped clean up invasive plant species at Silverwood Park and then met up for a trivia night at the Amsterdam Bar! Shoutout to MN Section YP Chair Quentin Hahn for all his hard work organizing YP events at the Annual Meeting.

OSTEGO EAST WWTF TOUR

With help from AE2S, MN YPs and Students were able to tour the Ostego East WWTF, a 900,000 gallon per day Class A Major Facility utilizing a conventional activated sludge process achieving spectacular nutrient removal! Thank you to the City of Ostego for hosting.

SUN PRAIRIE WPCF TOUR

CSWEA WI Section YP and Students Committee and WWOA collaborated on a tour at the Sun Prairie Water Pollution Control Facility this past summer with attendees from all levels of experience and backgrounds! Thank you again to the City of Sun Prairie for hosting and MSA Professional Services and Veolia Water Technologies for sponsoring the event. Shoutout to our technical presenters Andy Szekeress from Veolia and Kevin Grant from Next Turbo.

BREWER'S OUTING

The annual Brewer's outing hosted by Mulcahy-Shaw was a blast as always! Raffle prizes, cornhole, and lots of brats were enjoyed by all! Shoutout to Mulcahy-Shaw for doing an amazing job each year. Environmental Engineering students from Marquette University were able to attend the game with tickets sponsored by Rachel Lee (LAI, Ltd.) and Joan Hawley (Superior Engineering), thank you to these champions of students and young professionals!

METRO CHILDREN'S WATER FESTIVAL EXHIBIT

Hundreds of fourth graders (and their teachers) from around the MSP metro area rotate through learning stations (booth/table) organized by different companies, non-profits, etc. to provide an activity for a period of 15-20 minutes. MN-CSWEA YPs and Outreach committee members hosted a station about water testing, which described the concepts of turbidity, pH, and hardness while allowing the kids to see the test results visually with pH tablets, hardness strips, and visual indicators for turbidity.

COON RAPIDS CIPP REHAB CONSTRUCTION TOUR

Shoutout to the Met Council for giving YPs and Students a tour of their construction site as they rehab the 8,000 feet of sanitary sewer pipes and structures in the City of Coon Rapids. Thankfully everyone wore their closed-toe shoes!

Many more events including happy hours, equipment showcases, and webinars were organized and attended by our CSWEA YPs and Students! Thank you to all the YPs and Students who helped organize these events. Keep an eye out for more events and opportunities in 2024!

Sincerely,
Your CSWEA YP and Student Chairs CS

CSWEA ATTENDS 2023 weftec®

the water quality event™

WEFTEC 2023 took place in Chicago this year, welcoming thousands of attendees from all over the globe to share knowledge, explore cutting-edge technologies, and collaborate on creating a life free of water challenges. Here's a quick recap of some of the highlights from this year's event.

CSWEA/IWEA Holds Welcome WEFTEC Reception

Submitted by Mike Holland

The 2023 CSWEA/IWEA WEFTEC Welcome Reception in Chicago was held at the Lacuna Lofts on Sunday, October 1 from 5:00 pm to 8:00 pm. Attendees signed in at the door and the event included appetizers, hors d'oeuvres and an open bar service. From the sign-in sheets and pre-registrations there were well over 500 attendees. Thanks to the generous donations from the 61 sponsors, we were able to raise nearly $27,000 for this year's event.

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CSWEA WELL-REPRESENTED AT STUDENT DESIGN COMPETITION

By Jonessa Haas

CSWEA and Global Water Stewardship (GWS) had great representation at this year's WEFTEC Student Design Competition. Overall, 27 teams from many states across the US, as well as teams from Canada and Costa Rica, participated in the international competition.

CSWEA provided stipends to the winning teams of the WEF Categories at the Midwest Student Design Competition (MSDC) last April. Milwaukee School of Engineering (MSOE) competed in the WEF Wastewater category, and their design was presented by Molly Stewart. Stewart presented on an alternatives evaluation for expanding biosolids management and Milorganite production at the South Shore Water Reclamation Facility (SSWRF) of the Milwaukee Metropolitan Sewerage District (MMSD). MMSD's Biosolids Advanced Facilities Plan (BAFP) recommends implementing a biosolids processing system at SSWRF to increase Milorganite capacity. The findings indicate that solar drying offers a practical and cost-effective solution for biosolids management at SSWRF, aligning with MMSD's sustainability goals and providing significant savings in capital and maintenance expenses. Further research is recommended to assess long-term sustainability. These insights inform MMSD's decision-making process for expanding biosolids processing at SSWRF.

The University of Wisconsin Madison (UW) competed in the WEF Water Environment category, and their design was presented by Megan Beaulieu, Anna Cardinal, Joshua Nemser-Sher, and Emily Strand. Their team presented a flood management system for the Koshkonong Creek Watershed, aiming to mitigate annual flooding, enhance environmental sustainability, and promote community well-being. The system included a weir, an embankment, a flood basin, a recreational park and alleviates flood intensities of up to two-year floods while greatly reduces the impact of greater flood events. The 75-acre flood basin has 500 CY of flood water storage and retains 8 feet of water throughout the year for recreational use. This design is a cost-efficient, environmentally friendly solution. Existing soil on site is repurposed to create project features, and peat soil is preserved for farming use. One significant environmental benefit of the system is the reduction of phosphorus levels in Koshkonong Creek, achieved through erosion reduction and ferric chloride treatments. The integrated system facilitates the restoration and preservation of the natural habitat along the creek, which promotes biodiversity and ecological integrity. The inclusion of a recreational park not only offers leisure opportunities, but also educates the community about watershed management and environmental conservation. By implementing this comprehensive flood management system, the Koshkonong Creek Watershed can expect significant reductions in flood damage, providing long-term economic benefits to the community and the environment.

The Universidad de Costa Rica (UCR) also competed in the WEF Wastewater category, and their design was presented by Madison Arce Jimenez, Alejandro Rodriguez Vargaz, Mauicio Alpizar Murillo, and Sofia Abarca Rodriguez. Costa Rica faces a serious sanitation problem, presenting one of the most significant challenges in the region. Therefore, investment and study in wastewater treatment plants must be a priority topic, both for environmental conservation and for the improved quality of life for its inhabitants. The importance of this work lies primarily in providing guidance for the potential decision-making process in selecting the wastewater collection and treatment system for the Bijagua community. As part of the work, a population projection was conducted using census data and growth rates as input to determine the design flow rate. Site analysis was then carried out, selecting the land that best fits the requirements and constraints of such projects. Additionally, the layout and design of the sanitary sewer system were developed, leading to the selection of a treatment train through a multicriteria analysis that defined the technology suitable for the area and the country's conditions. Finally, the construction, sewerage, and operation and maintenance costs were determined, which led to the establishment of a tariff per household. UCR won third place in the wastewater competition with their refined presentation skills and detailed design. CSWEA and GWS could not be more proud and grateful to have such awesome teams to work with and are looking forward to next year's competition!

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OPERATIONS CHALLENGE

By Jeremy Cramer, PWO Representative

Each year at WEFTEC, the Operations Challenge showcases the skills and expertise of wastewater professionals from around the world. The Operations Challenge is a competition event where teams that consist of four members compete in five timed and graded wastewater events. This competition is fast paced and exciting and promotes teamwork between wastewater professionals.

This year was the 36th annual competition at WEFTEC in Chicago. Each team represented a WEF Member Association or comparable operator organization and competed in one of three divisions based on their level of competition experience. The Operations Challenge competition featured a record-shattering 55 teams, including more international teams than ever before.

CSWEA historically has put forth two teams, the Pumpers, and Shovelers. This year was no exception and the two teams represented CSWEA well at the competition. Both teams competed in Division III this year. Overall, there were 10 Division I teams, 23 Division II teams, and 22 Division III teams.

The teams were coached by Marc Zimmerman from the Janesville WWTP. Marc is an excellent coach and spent a considerable amount of his time preparing and coaching the teams to ensure they did well. The Pumpers team consisted of team captain Kate Despinoy from Stanley Consultants, Kevin Stevens from Racine Wastewater, Casey Kleven from the City of Janesville, and Chris Tippery from raSmith. The Shovelers team consisted of captain Ethan Perrine from the Village of Spencer, Ben Edwards from the City of Stevens Point, Rylee Schoo from the Downers Grove Sanitary District, and Marco Rendon from the Downers Grove Sanitary District.

In the Operations Challenge, the teams compete to earn the highest score in collections systems, laboratory, process control, maintenance, and safety events. The process control event tested mathematical skills and the understanding of wastewater treatment processes. The event consisted of both written and electronic portions. The teams used a wastewater treatment process simulator to visualize real-world problem scenarios and made real-time decisions to fix them. The laboratory event had the teams analyze a range of wastewater parameters. The event required competitors to demonstrate their competence in lab-based tasks such as sampling, sample preparation, data collection, and data interpretation, as well as their familiarity with common laboratory equipment. The safety event required teams to respond to a hypothetical emergency in which a co-worker had collapsed inside a maintenance shaft. Acting as a rescue team, competitors had to safely enter a confined space, retrieve the incapacitated co-worker, diagnose, and fix a safety hazard within the confined space, and re-seal the maintenance shaft. For the first time, this year's safety event also included a scored virtual reality component, in which one member of each team used high-tech hardware to demonstrate their ability to properly select and handle the right tools for a rescue job. In the collection systems event, teams vigorously cut an 8-inch PVC pipe to fix a leak and then connected a 4-inch lateral and programmed an autosampler. In the maintenance event, the teams completed normal maintenance tasks to diagnose problems at a lift station wet well, readjusted a conditioning pump, and replaced a damaged impeller and pump nozzle.

Both teams performed well during the competition. The Shovelers came home with the first-place trophy in the laboratory event. This is incredibly impressive when you consider most of the other teams practice almost weekly or daily together, while the Pumpers and Shovelers only get together for two training practices prior to WEFTEC and the Operations Challenge. The Pumpers and Shovelers outside of the two practice events must practice alone and communicate long distance with their team members and coach with questions or solutions.

The teams practiced in Janesville for two 2.5-day training events. Many thanks to the Janesville administration team and plant staff for all the help setting up the equipment and for graciously hosting the training events.

The two teams would not have been able to compete at this amazing event if it were not for the generosity of the sponsors that sponsored the teams. CSWEA is fortunate to have such great supporters in the organization to ensure that CSWEA members can experience the event. With CSWEA being made up of WI, MN, and IL members and the Pumpers and Shovelers all from different facilities, it is a great way for the team members to connect and form lasting friendships as well as compete at a high energy and high-profile competition. Once again, the CSWEA teams had some of the best fan support at the event! There were several CSWEA members at all the events, loudly cheering the teams on. Thank you to all that made it possible for CSWEA to send two teams to the 2023 Operations Challenge and thank you all for supporting them!

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36
2023 CHICAGO


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PLANT PROFILE:

Downers Grove Sanitary District

The Downers Grove Sanitary District (DGSD) was organized in 1921 under the *State of Illinois Sanitary District Act* of 1917 when properties in the Village of Westmont were connected to the Village of Downers Grove sanitary sewers. Upon its formation, ownership of the Village of Downers Grove sanitary sewer system and disposal plant, which were constructed in 1904, were transferred to the District. In addition to the Village of Downers Grove and part of the Village of Westmont, the District's service area eventually expanded to include portions of Woodridge, Lisle, Darien, Oak Brook, and Lombard – all located in DuPage County, IL. Today, the District serves approximately 64,000 people which includes 20,000 residential, commercial, industrial, and institutional customers.

COLLECTION SYSTEM

The District owns, operates and maintains all the sanitary sewers in its service area. The collection system consists of nine lift stations and approximately 250 miles of sewer, some of which are the original 1904 sewers. As identified in the District's Capacity, Management, Operation and Maintenance Plan or CMOM, the District cleans one fourth of the sewers annually, televises the sewers on a 13-year cycle, and invests at least 0.75% of the replacement value of the sewers back into the collection system annually in order to ensure the long-term sustainability of this asset.

Infiltration and inflow (I/I) is a chronic operational issue that is actively managed. The District's flow monitoring program provides information used to prioritize where I/I removal

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The Staff of Downers Grove Sanitary District.

efforts should be concentrated. Early efforts to remove I/I were focused on public sewers. Through these efforts, which were not successful, the District determined that I/I removal from private property was necessary in order to guarantee success. In the early 2000s, the District updated its ordinances to provide the following customer assistance programs, which benefit the District by allowing access to private property to identify and eliminate sources of I/I:

1. The Cost Reimbursement Program for the Installation of Overhead Sewers or Backflow Prevention Devices offers financial assistance to the building owner by cost sharing with the owner to upgrade their plumbing to current requirements that will protect their building in the event of surcharging in the public main caused by a blockage or extreme weather. The program also benefits the District by eliminating the potential cost to the District from a damage claim by the owner due to a public sewer backup.
2. The Building Sanitary Service Repair Assistance Program is designed to allow the District to conduct repairs to defective service lines. Since the program's inception 21 years ago, 4,097 repairs have been completed, which represents approximately 20% of the connected buildings. Customer feedback on this program has been very positive.
3. The Private Property I/I Removal Program allows the District to perform corrective work on private property. Grouting, lining or replacing portions of the building service are measures that are performed by the District's contractors to meet its I/I removal objectives. I/I reduction projects which have included rehabilitation to both public and private sewers have successfully removed up to 65% of the I/I in comparison to previous projects which were focused on public sewers only and resulted in no I/I reduction.

WASTEWATER TREATMENT CENTER

In 1922, the District constructed a new treatment plant and decommissioned the Village's plant. Construction began on the current Wastewater Treatment Center (WWTC) in 1954. Almost immediately after construction was completed, plans to expand were underway so that the 1922 plant could also be decommissioned. The WWTC underwent several major expansions through the early 1990s until it reached its current design average capacity of 11 MGD. Flows up to 22 MGD receive full treatment. With excess flow treatment, the WWTC has a peak capacity of 110 MGD.

Wastewater receiving full treatment is processed through bar screens, raw sewage pumping, aerated grit tanks, primary clarifiers, a single stage nitrification activated sludge plant with secondary clarifiers, intermediate clarifiers, sand filters, seasonal disinfection using sodium hypochlorite followed by dechlorination. Fully treated effluent is discharged to the East Branch of the DuPage River.

Biosolids distribution center.

DGSD's exceptional quality biosolids

Excess flow passes through the bar screens before being pumped to excess flow clarifiers, where it receives primary treatment and is disinfected before discharging to either the East Branch of the DuPage River or the St. Joseph Creek.

Primary sludge from the primary clarifiers is treated in a dedicated set of anaerobic digesters. Waste activated sludge (WAS) is thickened in a volute thickener and co-digested with grease in its own anaerobic digestion system. Anaerobically digested sludge is dewatered either in gravity sludge drying beds, by a belt filter press (BFP) or reed beds in lagoons.

A portion of the BFP cake is stockpiled in the drying beds while the rest is land applied on farms field as Class B biosolids. Sludge is aged in the drying beds for at least two years before being spread on a pad and dried further by turning it over with an auger for a few days. The resulting biosolids product is screened.

BIOSOLIDS DISTRIBUTION PROGRAM

In 1981, the Illinois EPA permitted the District's Sludge Management Plan. The District's plan was unique for the time. Under the Plan, the District gave its sludge away for free to residents and landscapers for use as a soil supplement in flowerbeds, on lawns, shrubs, hedges and other landscaping areas. The aged and screened biosolids meet the Class A pathogen requirement of the US EPA Part 503 regulations through testing for *Salmonella*, enteric viruses and viable helminth ova. In conjunction with the pathogen testing, the biosolids are also tested for metals to demonstrate that the District's biosolids are Exceptional Quality biosolids. Biosolids may be picked up by customers at the District's pickup station on Curtiss Street in Downers Grove. For orders three cubic yards or larger, the District will deliver biosolids within a reasonable distance from the WWTC.

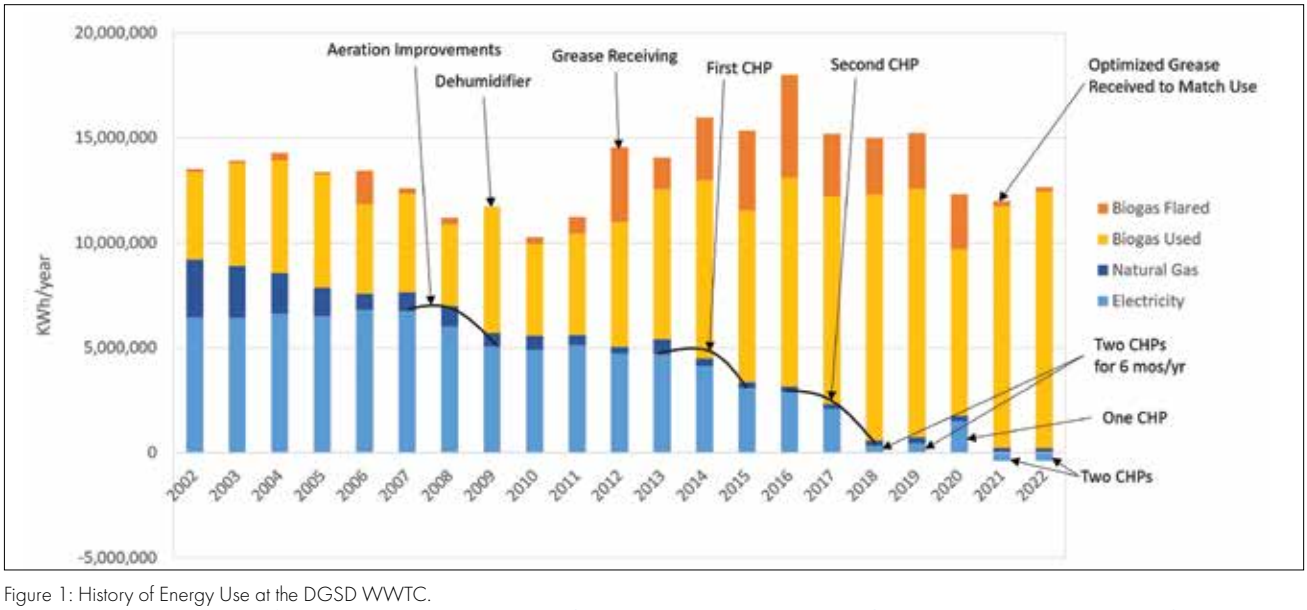

Figure 1: History of Energy Use at the DGSD WWTC.

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BECOMING A NET ZERO ENERGY FACILITY

The Downers Grove Sanitary District began its journey to make the WWTC a net zero energy facility in 2007, when projects to reduce energy consumption were identified. The first project focused on reducing the energy used for aeration of the activated sludge plant. The District installed fine bubble diffusers in the aeration tanks, a high efficiency turbo-blower and a dissolved oxygen (DO) control system. This provided a significant reduction in electricity consumption as shown by the drop-in electricity between 2007 and 2009 in Figure 1. Subsequent energy efficiency projects included lighting upgrades, geothermal/effluent water heat pumps for building HVAC, replacement of the natural gas fired desiccant dehumidifier with one that uses biogas, and replacement of the grit blower with a high efficiency blower.

In 2010, the District piloted co-digestion of restaurant grease trap waste in the anaerobic digester where the WAS is stabilized. The pilot was successful, and the District began co-digestion of WAS with grease trap waste and commercial food waste (collective called "grease") permanently in 2012. The WWTC digester gas or biogas production has more than doubled since it began co-digestion, as seen in Figure 1.

With the excess biogas being produced from the grease, the District was able to install its first combined heat and power (CHP) engine generator in 2014. The 280-kWe CHP used biogas to generate electricity, and waste heat from the CHP was recovered to heat the digesters. In 2016, the District's Board of Trustees passed a resolution to achieve and sustain the WWTC as a net zero energy facility. In order to realize this goal, the District installed a second CHP engine rated for 375-kWe in 2017. The WWTC successfully operated as a net zero energy facility for twelve months before the older CHP engine failed. The first CHP engine was replaced with a 375-kWe CHP in late 2020. The WWTC was a net zero energy facility for all of 2021 and 2022. As shown in Figure 1, the WWTC produced more electricity in 2021 and 2022 than it used. Excess electricity is purchased by the utility.

DUPAGE RIVER SALT CREEK WORKGROUP

The District is a founding member and active participant in the DuPage River Salt Creek Workgroup (DRSCW), which is dedicated to managing the valuable stream resources of the East and West Branches of the DuPage River and Salt Creek. While other wastewater treatment plants in IL have received phosphorus limits in their NPDES permits, the District was able to negotiate with IL EPA a schedule that provides additional time before implementation of phosphorus limits in exchange for active participation in the DRSCW to better understand the impacts of nutrients in the watershed and to help fund restoration projects in the receiving stream, with the goal of achieving the most cost-effective environmental improvements with limited available resources.

DGSD COMMITMENT

For over 100 years, the Downers Grove Sanitary District has been committed to providing a better environment for the communities it serves. Today, the District has 39 employees across operations, maintenance, sewer system, laboratory, and administration. The District staff continues to be committed to providing the best possible service to its customers in an open and honest manner while protecting the environment and doing so as cost effectively as possible. CS

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97th Annual Meeting Technical Topic Preview

The 97th Annual Meeting of the Central States Water Environment Association will be held May 13-15, 2024 at Renaissance Schaumburg in Schaumburg, Il. Schaumburg is an excellent venue and we have organized an exceptional technical program, offering utility pricing, leadership and ethics sessions, an operations track, resource recovery track, and utility management track. Technical topics may include:

OPERATIONS and MAINTENANCE by OPERATORS and MAINTENANCE:

- Time management or new process startup
- Efficiency (pumps, motors, lights, UV disinfection, HVAC, etc.)
- Technology/SCADA/Web-Based maintenance programs/ GIS applications
- Troubleshooting – Traditional facilities (activated sludge, BNR), new processes (nutrient recovery) etc.
- Case studies of retrofitted facilities
- Startup Case Studies
- Optimization

ADVANCEMENTS in LIQUIDS TREATMENT

- Enhanced primary treatment
- Secondary treatment advancements and intensification
- Nutrient removal
- Tertiary treatment
- Alternative disinfectants

WATERSHEDS and STORMWATER MANAGEMENT:

- Implementing new MS4 permit requirements
- Adopt a storm drain, pond etc. program case studies
- Anti-degradation and other regulatory issues
- Using grants and other funding sources to implement stormwater management as part of CIP projects
- 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

UTILITY MANAGEMENT:

- Communications
- Employee retention and development
- Succession planning
- Project funding
- Utility rate development and reviews
- The *Infrastructure Investment and Jobs Act*
- Significant industrial users and industrial pretreatment
- Emergency response/repairs

ENHANCED RESOURCE and ENERGY RECOVERY:

- Resource recovery – sourcing raw materials, nutrient recovery
- High strength waste and pretreatment programs
- Digester gas production and treatment technologies
- Lessons learnt from co-digestion
- Heat recovery case studies
- Alternative energy use
- Energy management and savings to utility management or enhanced RER

COLLECTION SYSTEMS:

- Collection system rehabilitation technologies/methods
- Collection system rehabilitation case studies
- Educating the public on how to protect the system
- CMOM program development and implementation
- Collection system design and operation
- Green infrastructure case studies
- Infiltration/inflow management case studies
- Stormwater and combined sewer overflow management
- Stormwater conveyance

RESEARCH and DESIGN:

- New/innovative technology research and application
- Nutrient removal technologies
- Sustainability in Design and construction
- Toxics/emerging pollutants monitoring and control
- Treatment design
- Wastewater reuse, applications, technology and regulatory issues
- Wastewater surveillance

RESIDUALS, SOLIDS and BIOSOLIDS:

- Pollutants of Emerging Concern – PFAS
- Environmental management systems – National Biosolids Partnership
- Public education and awareness, case studies
- Fertilizer production – Class A case studies
- Standard or advanced treatment and stabilization

GENERAL:

- Laboratory issues and bench-scale studies
- Pretreatment, industrial treatment, and pollution prevention
- Pollutants of emerging concern – PFAS, chlorides etc.
- Public education to address emerging concerns – chlorides, water softener use, leachate, flushable wipes, etc.
- Regulatory issues
- Security issues
- Engineering ethics training
- Collection system/treatment plant odor control

SOFT SKILLS/LEADERSHIP:

- Leadership skills
- Managing the ill or injured employee
- Generational integration
- Anti-harassment and discrimination training for managers
- Getting the most out of employee performance evaluations
- Union negotiations
- Handling the grievance and arbitration process
- Managing in a union environment
- Labor Law
- Management rights for Managers
- Social media and the workplace CS

SAVE THE DATE

29TH ANNUAL CSWEA
EDUCATION SEMINAR

The Future of Nutrient Removal: *Decarbonization, Intensification, and Emerging Technologies*

Presented by the Central States Water Environment Association

8:00-8:10 am	Welcome and Introductions
8:10-8:55 am	Nutrient Removal: Decarbonization, Intensification, and Emerging Technologies |Tim Constantine, Jacobs
8:55-9:30 am	The Importance of Biofilms and Granules for Nutrient Removal |Mari Winkler, University of Washington
9:30-9:50 am	Poster Session & Break
9:50-10:25 am	Low Energy, Low Carbon Biological Nutrient Removal | Dan Noguera, UW Madison
10:25-11:00 am	Ultra-Low Nutrient Removal: Past, Present, Future | Kendra Sveum, Loudoun Water
11:00-11:30 am	**Morning Panel Q&A**
11:30-12:40 pm	Lunch with Poster Session
12:40-1:15 pm	Carbon Diversion Drivers, Testing, and Whole Plant Impacts | Matt Magruder, Milwaukee MSD
1:15-1:50 pm	Scaling the Benefits of Partial Denitrification/Anammox (PdNA) to Full-Scale Facilities | Jim McQuarrie, AECOM
1:50-2:05 pm	**Early Afternoon Q&A**
2:20-2:45 pm	Biofilms, Densification, and the Alphabet Soup of YBSD Testing of MABR and inDENSE | Cyrus McMains, YBSD
2:45-3:10 pm	New Advances in MBR Application | Susan Danzl, SEH
3:10-3:35 pm	There's Some Good in This Data, and It's Worth Fighting For | Corey Bjornberg, PE
3:35-4:00 pm	**Panel Session Q&A**

MONONA TERRACE CONVENTION CENTER,
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APRIL 9
2024

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REDUCING Risk Associated with Being First

By Guy Carpenter, PE,
Water Technical Services
Director, Consor Engineers

Utility managers don't want to be first, and for good reason. CSWEA members work for ratepayers who expect us to provide reliable services in a cost-effective way. Experimentation that may lead to negative consequences to public health, the environment, and additional costs isn't worth the risk. And with so many technologies to evaluate, it is hard to differentiate the legitimate from the gimmick. The CSWEA Innovation & Technology Committee exists in part to foster and promote the adoption of technologies that improve operational efficiency, compliance reliability, and reduce costs. One of the safest ways to adopt technology is to invest, test and evaluate the risks together, in partnership with other utilities and with entities organized to support such partnerships. For example, if you're interested in a new phosphorus reduction technology, there are likely several other utilities that want to look at that technology. Why not pull together, pool your funds and time, and run a pilot project to test and evaluate results together – while gaining confidence in the partnership and collaborative approach?

Earlier this year, CSWEA entered an agreement with The Water Council in Milwaukee to help CSWEA members connect with emerging technology companies, engage in research and piloting opportunities, and get plugged into events and training that will increase members' awareness of and access to innovations that are revolutionizing the water industry. CSWEA member participation in The Water Council's programs will reduce the overall risk and cost of considering new innovations to address increasingly complex operations, compliance, and efficiency needs.

> **"THE WATER COUNCIL is not the only PARTNER to share the risk and enjoy the REWARD of EVALUATING new technologies."**

The Water Council is not the only partner to share the risk and enjoy the reward of evaluating new technologies. The Water Research Foundation has an unsolicited research program and a tailored collaboration program that can be tapped for sharing expenses associated with testing novel ideas and adopting early-stage innovations. Another possible partner, Current, a non-profit out of Chicago, that offers collaboration to find solutions that effectively monitor or treat water. There are other incubators, accelerators, and technology assessment organizations out there, and CSWEA can help you connect with them.

If you are interested in learning about new technologies and innovations in the water industry, or if you would like to make a stronger connection to research and piloting opportunities to solve problems your utility is grappling with, please contact the CSWEA Innovation & Technology Committee Chair, Rick Manner at *rmanner@u-csd.com* or the Committee liaison to The Water Council, Guy Carpenter at *guy.carpenter@consoreng.com*. We'd love to help you get connected! CS

Midwest STUDENT DESIGN Winner

MIDWEST STUDENT DESIGN COMPETITON

MARQUETTE UNIVERSITY

GLOBAL WATER STEWARDSHIP CATEGORY (OVERALL): Marquette University

On April 10, a team of five civil engineering students from Marquette University competed in the Global Water Stewardship (GWS) category of the annual Midwest Student Design Competition held in Madison, WI. With work stemming from their senior design project, the team was fortunate to participate and exhibit their hard work in the competition to which they were awarded first place in the US category and tied the overall competition. As a result, the team earned a trip to Bijagua, Costa Rica to present their design in addition to publishing their work in the article you are currently reading. With a wide range of specialties within civil engineering, the team is made up of two environmental engineers who are Colton Herbert and Mia Ketelhohn, one water resources engineer who is Claire Connelly, and two civil engineers who are Matt Cerven and Mackenzie Allen. The team was mentored by Matt Castillo of MSA Professional Services, Inc and sought advice from Marquette University professors including Dr. Daniel Zitomer, Dr. Patrick McNamara, and Dr. Anthony Parolari. Together, the team, along with guidance from mentors, has produced a viable solution to the needs of the community of Bijagua to which this article exhibits.

CENTRALIZED WASTEWATER TREATMENT AND COLLECTION SYSTEM DESIGN – BIJAGUA, COSTA RICA

The city of Bijagua, located between the provinces of Guanacaste and Alajuela in northern Costa Rica, rests in a valley of the Guanacaste Mountain Range where it is encompassed by a lush, tropical environment of diverse flora and fauna. The relatively small city of about 5,400 residents takes great pride in their community; however, they are currently burdened by waste management and therefore require a solution.

The community is in need of a long-term, centralized method of wastewater treatment. Current approaches to waste management consist of private septic tanks where the waste is improperly treated due to poor management and regulations, in addition to the poor soil quality which impacts leach field distribution and treatment of the wastewater. Concerns for management with a growing population and tourism industry also present the need for a centralized system. The overall facility design must account for the high rainfall rate of approximately 3,000 mm per year and leave room for growth, as requested within the GWS problem statement. Other goals given were minimizing operation and maintenance (O&M) costs, set to a maximum of $18.25 per resident per month, while reducing energy consumption due to the socioeconomic status of the community. In response to the community's needs, the team analyzed three alternative treatment systems and multiple locations for a centralized facility. The proposed recommendation for the final location and treatment option was selected, consisting of a wastewater collection system and treatment facility. By accounting for cost minimization, limiting O&M, complying with effluent standards, and considering tourism and community growth, the community of Bijagua has a design which is sufficient for the 20-year design period and even beyond the design year 2042.

OBJECTIVE

The goal of the project was to design a wastewater collection and treatment system that satisfies the needs of the community of Bijagua. A design which meets effluent requirements, accounts for tourism and community growth, accommodates fluctuations in flow, provides room for growth, and minimizes the entire system's cost and complexity will be most feasible for prospective implementation.

FACTORS OF DESIGN

To ensure the proposed designs are environmentally, economically, and culturally sustainable, some important factors were held in high regard throughout the design process. These factors include design simplicity, O&M, community pride, and location.

They were awarded first place in the US category and tied the overall competition.

Design simplicity is a significant factor for the entire system's sustainability upon implementation. This is due to the fact that minimizing the overall system complexity will reduce the burden on the plant operators and ensure adequate treatment within a centralized facility.

Operation and maintenance are important factors for design sustainability due to concerns with the operation of existing private septic tanks. Their mismanagement and neglect mean that a treatment facility minimizing the need for plant operator intervention will be most successful.

Community pride was held in high regard throughout the design process. The community greatly values its people and local flora and fauna. As a result, designs which adequately treat the wastewater, yet minimize concerns for odor and insects as well as reflect the lush, tropical environment which encompasses the community, were selected.

Location, climate, and land cost are important factors of design which were taken into consideration. The tropical environment requires accounting for significant precipitation, while the higher temperatures and greater light intensity lends itself to improved treatment. Additionally, the cost of land costs is much lower in Costa Rica compared to in the US. As a result of these location characteristics, designs which take advantage of the tropical environment and lower land costs were utilized.

COMMUNITY GROWTH

The design of a wastewater collection and treatment system is controlled by the wastewater flows which they must accommodate. Prior to establishing design flowrates for the community, growth in terms of residents, tourists, and commercial establishments were projected for the GWS requested design year of 2042. The design population accounts for both residential and tourism growth, considering tourists as residents, projected to be a total of 8,120 people as of 2042. This includes the projected population of 6,720 residents, in addition to the carrying capacity of tourists that the community can handle per day of 1,400 for the year 2042, based off historical data from the GWS problem statement and the Costa Rican Institue of Tourism (ICT) for Bijagua. Additionally, an assumption of five percent growth in commercial establishments over the 20-year design life resulted in accounting for 58 businesses as of 2042. These values were essential components of the design flowrates which controlled the entire system's sizing and design.

DESIGN FLOWRATES

The flows utilized to size the entire system involve a design flow and a peak hour flow (PHF). These flowrates incorporate factors such as the design population, residential and commercial water usage, and infiltration and inflow rates, accounting for the 20-year design life of the system with a design year of 2042.

The design flowrates are reliant upon the residential and commercial flows which comprise them. The GWS problem statement provided estimates of 73.3 gal/person/d and 352 gal/business/d for residential and commercial water usage, respectively. By applying the given water usage to the projected number of residents and businesses in 2042, the average daily base flow was determined to be 0.523 million gallons per day (MGD). This includes an assumption that 80% of the water used per person is sent to the treatment system, as requested within the GWS problem statement, in addition to assuming 5% unknown flow.

The design flowrates also account for infiltration and inflow (I/I) into the system. This I/I flow accounts for fluctuations in groundwater infiltration and inflow during storm events. The I/I, determined to be 0.198 MGD, is comprised of typical PVC infiltration rates, supplied by GWS, of 0.106 gal/sec/mile, or 0.25 L/sec/km. It was applied to a conservative pipe length estimate of 33 km throughout the collection system, accounting for additional infiltration from home-lateral piping.

Figure 1: Marquette University team (L-R): Colton Herbert, Mia Ketelhohn, Matt Cerven, Claire Connelly, and Mackenzie Allen.

An assumed 5% unknown flow was also included. The summation of the average daily base flow and I/I resulted in a design flow of 0.721 MGD.

Following WI DNR codes, a peaking factor applied to the design flow relative to the projected population must be utilized to account for the maximum flows that the entire system may receive. By applying a peaking factor of 3.5 relative to the projected population of about 8,200 residents as of 2042, the PHF was determined to be 2.52 MGD.

TREATMENT ALTERNATIVES

In order to determine the three best treatment alternatives for the community of Bijagua, the design factors mentioned prior were held in high regard, reflected in a weighted decision matrix for relevant treatment alternatives for the community. The factors ranked highest to lowest in terms of importance to the design team included the following: energy consumption, O&M, design simplicity, insect and odor management, efficiency and effectiveness of wastewater contaminant removal, and footprint relative to forms of primary, secondary, and combined primary/secondary treatments. The forms of primary treatment analyzed consisted of an anerobic pond, high-rate anaerobic pond, and primary sedimentation. Forms of secondary treatment analyzed consisted of a facultative pond, constructed wetlands, biofilters, and aerated lagoons. The combined forms of primary/secondary treatment analyzed were an oxidation ditch and upflow anaerobic sludge blanket reactor, not requiring separate primary treatment due to the relatively low given influent BOD and TSS concentrations of 280 and 220 mg/L, respectively.

The highest weighted scores were assigned to the anaerobic pond for primary treatment, constructed wetlands and facultative ponds for secondary treatment, and the oxidation ditch for combined primary/secondary treatment. The only form of tertiary treatment considered

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were maturation ponds as they are the most cost-effective and relevant option. These ponds naturally remove nutrients and disinfect, which was similar to all forms of treatment except the oxidation ditch. The oxidation ditch does not require additional nutrient removal to meet effluent requirements and therefore was supplied solely with UV disinfection. The resulting treatment alternatives considered are more formally known as **waste stabilization ponds** (anaerobic pond, facultative pond, and maturation ponds), **modified waste stabilization ponds** (anaerobic pond, constructed wetlands, and maturation ponds), and an **oxidation ditch** with UV disinfection.

In consideration of the three alternatives selected, the oxidation ditch was first excluded due to an O&M cost above the allotted budget, in addition to the high energy requirement and complex and regular O&M. Therefore, after comparing traditional waste stabilization ponds against the modified waste stabilization ponds, the modified version containing constructed wetlands were selected for many reasons. Although each have similar capital and O&M costs, the constructed wetland design better suits community values through use of local flora, which mimics the natural landscape. They also require a smaller overall footprint and are more efficient with lower hydraulic retention times. Additionally, more recent literature recommends use of hybrid systems between constructed wetlands and maturation ponds to provide more consistent effluent quality, in addition to improving efficiency of removals (Tanner, C.C, et al., 2005), justifying the selection of the anaerobic pond, constructed wetland, and maturation pond treatment alternative.

COLLECTION SYSTEM

The city of Bijagua rests in the valley of the Guanacaste Mountain Range, which makes it a good candidate for conventional gravity-fed wastewater collection. The resulting collection system design consists of a pipe network rendered in Stormwater CAD, designed to WI code NR 110.13 for sewer design criteria. It spans the city length, with the entire system flowing by gravity except for three locations with elevation gain. These locations require one lift station per elevation gain and two pumps per lift station for redundancy, totaling three lift stations and six pumps.

The entirety of the collection system includes approximately 25 km of PVC piping, excluding home laterals at the request of the GWS problem statement. Each of the 245 pipes within the system were sized according to Manning's equation to ensure that the flowrate is maintained between pipes. This will accommodate additional demand from the following pipe section. As a result, most of the system, about 17,100 m, will operate at the minimum diameter of 20 cm (8 in) piping, in accordance with WI DNR codes. Additional pipe sizing to accommodate the increased demand within various sections of the collection system resulted in approximately 3,700 m of 46 cm (1.5 ft) piping and 3,700 m of 91 cm (3 ft) piping. With minimum distances amongst manholes of 120 m (400 ft) or less, application of 243 manholes accommodating this NR 110.13 requirement in addition to the requirement for installation of manholes at the end of each line, at pipe intersections, in addition to changes in grade, size, or alignment were met.

The entirety of the collection system piping would coexist alongside the community's existing stormwater collection system between the road shoulder and each home to assist with maintenance on both, apart from about 25% of the pipes which would need to be placed beneath the roadway. With the direction of all flows north to reach the wastewater treatment facility location, this collection system should be a viable design for deliverance of wastewater from homes and businesses to the treatment facility.

PROPOSED TREATMENT FACILITY DESIGN

Wastewater treatment can be a complex process as it is composed of many steps to achieve adequate removal of wastewater contaminants. Although, the process can be broken down into four components including preliminary, primary, secondary, and tertiary treatment, exhibited in the treatment train view in Figure 2. This wastewater treatment facility design incorporates each component of the treatment process to meet effluent requirements, as seen in Table 1, while incorporating redundancy, following WI DNR standards, and accounting for fluctuations in flow. Due to limitations with site topography information, the design team was under the assumption that the entire system would flow by gravity.

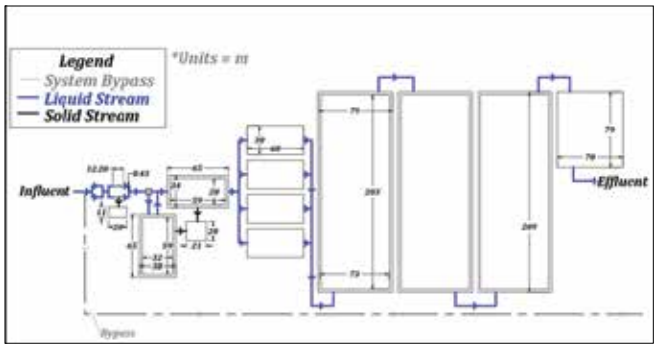

Figure 2: Proposed treatment facility treatment train.

Preliminary treatment is designed to remove large and nonbiodegradable material that can harm downstream equipment, and it also includes flow devices. This preliminary treatment design incorporates a bypass structure, bar screens, grit chambers, a peak flow storage basin (PFSB), and sludge drying beds. The physical treatment components of preliminary treatment include the bar screens and grit chambers which were designed following WI DNR codes for manually cleaned systems.

The variability and unpredictability of flows were accounted for in preliminary treatment through mechanisms like the bypass structure and PFSB. The bypass structure was designed for flows greater than the peak hour flow (PHF) of 2.52 MGD. The following bar screens and grit chambers were sized in order to accommodate the PHF. The flow will then meet an overflow structure which was designed based on the design flow of 0.721 MGD. Any flow greater than that would be diverted through the overflow structure to the PFSB. The PFSB was sized conservatively, assuming the peak hour flow occurs over a 12-hour period, and will be a gravity-fed system, released back into the treatment train by gravity over time if overflows occur. All downstream treatment was designed based off the design flow of 0.721 MGD. Sludge drying beds were utilized for the grit chamber, where grit will be manually cleaned every 15 days, while the sludge drying bed for the PFSB will be utilized for any residual settled sludge during overflows. Once the sludge drying bed capacities are met, dried biosolids will be tested for pathogen content, and land applied according to EPA Part 503 Regulations for biosolid classification. Otherwise, biosolids may be landfilled upon drying and UV disinfection within the sludge drying beds, where leachate will be sent to primary treatment.

PRIMARY TREATMENT

Primary treatment is a method of wastewater treatment which takes advantage of gravity settling. An anaerobic pond was designed as an enhanced method of primary treatment to not only settle solids and BOD, but to biodegrade these contaminants through anaerobic digestion. The pond was designed off the design flow of 0.721 MGD, with a hydraulic retention time of one day and a daily influent BOD loading rate of 280 grams per cubic meter, which is within the maximum daily BOD loading rate of 331 grams per cubic meter for odor minimization (Mara, 2004). The applied 3 m depth is sufficient for sludge layer formation and with Bijagua's average temperature of 23.1 degrees centigrade, anaerobic digestion can operate off natural heating. The formation of sludge requires removal every three years when a 1 m depth is met and will be transferred to the corresponding sludge drying bed. After dewatering and UV disinfection within the drying bed, biosolids can be land applied if proper pathogen removal is met, otherwise landfilled with leachate returned to the influent of the anaerobic pond.

It is important to consider that the largest concerns for odor result from the anaerobic pond. Although anaerobic digestion produces a smelly byproduct gas of hydrogen sulfide, the concerns for odor are minimized through proper design and O&M. With a minimum depth above the sludge layer of 1.5 m, odors can be reduced (Mara, 2004). Through ensuring the pond is not organically overloaded, below 331 grams per cubic meter per day for the average temperature of 23.1 degrees centigrade, in addition to sulphate concentrations below 500 mg SO_4^{2-}//L, odors will not be an issue (Gloyna and Espino, 1969). If improper operation and overloading does occur, analysis into odor concerns would be examined through sulphate analysis in the drinking water and influent wastewater, in addition to exploration into better management practice.

SECONDARY TREATMENT

Secondary treatment follows primary treatment for removal of colloidal solids and soluble BOD that was not removed through gravity settling and degradation in the anaerobic pond. This system utilizes a horizontal subsurface flow (HSF) constructed wetland to remove both BOD and TSS to effluent requirements through aggregate media and plants. This method treats the wastewater and was selected over a free water surface wetland as the subsurface design eliminates mosquito breeding and odor concerns (Mara, 2004). The system was designed through four separate wetlands in parallel for redundancy, easier O&M, and to meet design standards. The basis of their design incorporates the design flow of 0.721 MGD, where each constructed wetland has a hydraulic retention time of 1.2 days, incorporating one third more flow capacity to account for maintenance needs with design redundancy. The wetlands were designed following the Handbook for Constructed Wetlands and EPA design manuals and fact sheets regarding sizing, depths, and aggregate selection.

Use of specific and native emergent macrophytes was an important aspect of the wetlands. The selected macrophyte for implementation was the common reed, or *Phragmites australis*. This is a hardy plant which is native to regions within the Gulf of Mexico and South America (Tanaka et al, 2011). It can handle fluctuations in flow and has typical root depths which correspond well with the depth utilized for the wetlands. Due to the hardy nature of the plant selected, the wetlands are capable of handling fluctuations in flow. Wetland systems are typically more sensitive to changes in flow due to the base flow requirement for plants, and this mediates that concern.

Another important aspect of the wetlands is the intensive maintenance which will occur after 10 years involving bed media replacement. This is typical for HSF wetlands as adsorptive capacities of the aggregate

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are met (Mara, 2004). Removals within Table 2 reflect this reduction in removals when adsorptive capacities are met, and the bed media replacement would be covered by the contingency fund saved by the community within the monthly user fees (explained further in the Cost Analysis section).

TERTIARY TREATMENT

Tertiary treatment is the final process in order to remove the targeted wastewater contaminants. It includes maturation ponds for nutrient removal and disinfection as well as rock filtration for effluent polishing. The ponds were designed to remove fecal coliforms while also removing nitrogen and phosphorus. Rock filtration follows to remove residual BOD and TSS from the maturation pond effluent, where all effluent requirements are met prior to discharge to the Rio Celeste River.

The maturation ponds were designed as three ponds in series, each at hydraulic retention times of 5.12 days. This was done based on design standards and for sufficient reduction in fecal coliforms. Ponds in series are much more efficient and require less land area for treatment (Mara, 2004). Each pond was designed to handle the design flow of 0.721 MGD and were sized off Marais' method within Domestic Wastewater Treatment in Developing Countries by Duncan Mara. Maturation ponds typically have a depth of 1 m which enables light penetration and aerobic conditions throughout the pond (Kayombo et al, 2004). This is an ideal environment for eutrophication which the ponds take advantage of through algal growth and resulting nutrient and fecal coliform reduction. Mechanisms such as a pH above 9, high light intensity with high dissolved oxygen concentrations, and time and temperature are significant contributors to the removal of fecal coliforms (Kayombo et al, 2004). The following rock filter works in a similar manner to the constructed wetlands and was sized based on EPA fact sheet design and removal of residual BOD and TSS (Mara, 2004). The design team was unable to determine the drinking water source for the community, although discharge to the Rio Celeste River would occur downstream of drinking water intake if the river were the source.

CONCENTRATIONS			
	Influent	Effluent	WWTF Effluent
BOD5 (mg/L)	280	50	24.7
COD (mg/L)	550	150	82.3
TSS (mg/L)	220	50	19.6
TN (mg/L)	50	40	12.1
TP (mg/L)	20	10	6.95
Fecal Coliform (MPN/100 mL)	5E+7	1000	112

Table 1: Given Influent and Required Effluent Concentrations amongst actual WWTF Effluent Concentrations.

CONCENTRATIONS AFTER TREATMENT				
	Influent	Primary Treatment	Secondary Treatment	Tertiary Treatment
		Anaerobic Pond	Constructed Wetlands	Maturation Ponds
BOD5 (mg/L)	280	94.6	49.2	24.7
COD (mg/L)	550	237	164	82.3
TSS (mg/L)	220	110	19.6	19.6
TN (mg/L)	50	-	40.3	12.1
TP (mg/L)	20	-	13.9	6.95
Fecal Coliform (MPN/100 mL)	5E+7	9.16E+6	1.52E+6	112

Table 2: Concentrations of Contaminants after Treatment.

WASTEWATER TREATMENT FACILITY LOCATION

The GWS problem statement provided eight potential land parcels, all north of the dense city center, to house the proposed wastewater treatment facility. After comparing the different parcels through a weighted decision matrix weighing various factors from highest to lowest including cost of land, size, room for growth, site accessibility, odor concerns, and discharge locations, the highest scored land parcel was selected of the eight.

The parcel selected is the largest, sized at approximately 520,000 m^2. It was chosen because it fits the selected treatment, provides ample room for growth, and because it is a good distance from the city, minimizing odor, noise and nuisance concerns following WI DNR standards for isolation of facilities. As seen in Figure 3, application of the recommended treatment design to the selected location will ensure the first centralized wastewater treatment facility of Bijagua should be sufficient for the 20-year design period and even on to the future, with adequate room for future expansion.

CONSTRUCTION SCHEDULE

The construction schedule for this project was created assuming a typical 40-hour, Monday through Friday, work schedule. However, if delays were to occur, Saturdays would be used as working days as well. This follows current Costa Rican Labor Laws, which say that employees can work a maximum of 48 hours per week, Monday through Saturday.

Bijagua is located near the Volcán Tenorio National Park which draws significant tourism to the surrounding area. Keeping this in mind, the construction schedule was based off the tourism season to minimize the overall impact of construction on tourism. ICT data states that the busiest tourism season runs from November through April. The start date for the project therefore was designed to begin towards the end of the tourism season on April 15, 2024. The total duration of the project was projected to be 460 days, with the project concluding on January 16, 2026. The final few weeks of the project would be considered the start-up, commissioning, and testing phase of the project. During that phase, construction will be completed, and the wastewater treatment system will run while being closely monitored by the O&M staff to ensure that the system is functioning properly and removing contaminants at the designed rate. As long as everything goes smoothly during the start-up and testing phase, the project will conclude.

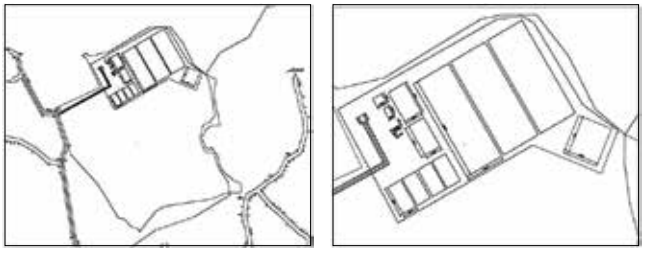

Figure 3: Treatment facility location on the chosen parcel of land.

COST ANALYSIS

To assist with the construction cost estimate for the project, historical cost data was provided for materials generally used to construct a wastewater treatment facility and collection system. It was assumed that the unit costs provided for each line item included the cost of equipment, fuel, and labor, given from the year 2020. Therefore, inflation was added to the line-item unit costs to reflect present day unit costs. Other construction supply companies such as Ozinga Concrete, Northern Concrete Pipe Inc, and Grainger Industrial Supply were contacted to obtain relevant unit costs for needed materials. The total capital cost for all of the components of the project was estimated to be $11.8 million. The most expensive line item for the project was the removal of existing septic tanks, which accounts for just over four million dollars of the total capital cost. Figure 4 shows a visualization of how the line items make up the total capital cost.

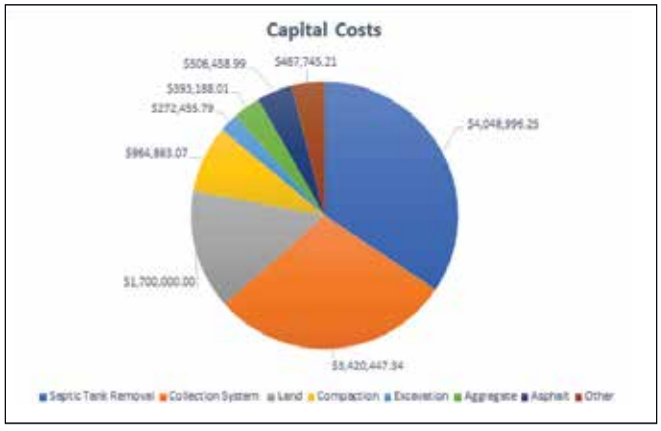

Figure 4: Capital cost breakdown of facility and collection system expenses.

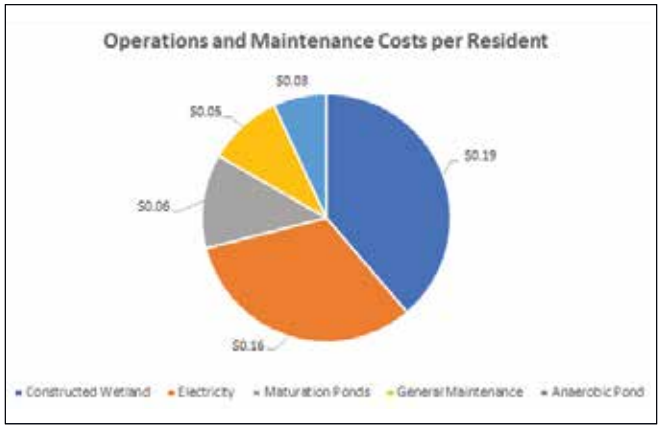

Figure 5: operation and maintenance cost breakdown per resident per month

In addition to calculating the capital cost needed to construct the wastewater treatment facility, the O&M cost was also determined consisting of labor, water quality testing, and electricity costs. To ensure design sustainability, the community wanted to minimize the O&M cost for the facility, setting a maximum cost of $18.25 per resident per month. The O&M cost for the facility was calculated to be $0.49 per resident per month, represented through Figure 5 broken down into its components. However, it was proposed that the monthly O&M cost have a small fund attached to it, bringing the monthly cost to $2 per resident per month. The fund was added to the O&M costs so the community could begin accumulating money for any future repairs needed on the facility through a contingency fund, for work such as constructed wetland bed media replacement and any additional expenses. Even with the proposal of the additional O&M cost, the total cost per resident per month is still very favorable for the community and would alleviate concerns for management and system issues that the future may hold.

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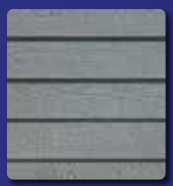
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GLOBAL WATER STEWARDSHIP

GWS 2023-2024 Problem Statement

Horquetas, Costa Rica

By Sarah Guzmán, GWS Co-Chair

Greetings, on behalf of Global Water Stewardship (GWS), I would like to introduce you to the GWS category of the Midwest Student Design Competition (MSDC). The GWS Category presents a unique opportunity for students at the college level to demonstrate their engineering skills and practices by researching and preparing a design for a real-world sanitation project in a Costa Rican community and to present their project to water industry professionals. This year, the Midwest Student Design Competition will be held on Monday, April 8, 2024.

Note that GWS will continue with the competition structure that was used in the 2021 and 2023 competitions that allows for international university to compete in their own competition (i.e. non-US universities only). This year the competition will be held at the end of January. The international competition will be held in a hybrid in-person/virtual format to accommodate international teams who are unable to travel to the selected venue. The winner of this year's International Competition would then go on to compete at WEFTEC in October 2024.

The GWS Category in the MSDC requires design teams to design and present a project meeting the requirements of the real-life problem statement titles, Global Water Stewardship: Horquetas, Costa Rica. Winning teams will receive a stipend of up to $1,000/student, for up to four (4) students, for travel and lodging expenses to accompany GWS volunteers and wastewater professionals on their annual August service trip to Costa Rica and to present their project to local community representatives.

We will be as flexible as possible in working with international universities to afford the opportunity to participate in the international competition. Please read over the attached guidelines and let us know if you have questions. Should you have questions or if you need additional information on how to participate in these events, please email me at *communitydesign@globalwaterstewardship.org*.

Las Arrieras Nature Reserve – Horquetas, Costa Rica

Best Regards,
Jonessa Ruhl
Community Design Chair
Global Water Stewardship

Project Understanding

- Location: Horquetas, Costa Rica
- Population Estimate: 18,520 (Year 2023) *[Source – (INEC, 2014)]*
- Number of Water Services
- Residential – 5,615 services
- Commercial – 74 services *[Source – (ASADA Horquetas, 2023)]*
- Water Usage:
- Residential – 29 m^3 monthly average per household. *3.3 inhabitants* per household.
- Commercial – 40 m^3 monthly average per property. *[Source – (ASADA Horquetas, 2023)]*
- Annual Average Precipitation: 3,000 mm *[Source – Climate-Data.org]*
- Average Temperature: 22.0 Degrees Celsius *[Source – Climate-Data.org]*
- Wastewater production can be estimated, assuming 80% of water consumed per person will be sent to the sanitary system.
- Infiltration flow for PVC pipe material is 0.25 Liters/sec/km
- Typical Influent Characteristics:
- BOD_5 = 280 mg/L
- COD = 550 mg/L
- TSS = 220 mg/L total nitrogen
- Total Nitrogen = 50 mg/L
- Total Phosphorus = 20 mg/L *[Source – (ASADA Horquetas, 2023)]*
- Required Effluent Characteristics; (defined in "Reglamento de Vertido y Reuso de Aguas Residuales (RVRAR)")
- BOD_5 = 50 mg/L
- COD = 150 mg/L
- TSS = 50 mg/L
- Total Nitrogen= 40 mg/L
- Total Phosphorus = 10 mg/L
- Fecal Coliform = 1000 MPN/100mL (If water is to be reused, effluent fecal coliform must be less than 105 MPN/100mL)

Costa Rica has very few centralized wastewater treatment systems. In rural areas, septic tanks are a common way of treating wastewater; greywater is often discharged directly overland. The leach fields are very small and shallow and although the law states leach fields must stay within each individual property, they often do not. Shallow bedrock, poor soils, poor cleaning and maintenance practices, and poor designs often contribute to improper treatment of septic tank effluent. Further exasperating the issue, it is not uncommon for sludge cisterns to dump collected material in rural areas and pollute the surrounding environment instead of trucking the sludge to a distant WWTF.

The community of choice for this year's problem statement is Horquetas, Costa Rica. Horquetas is in the third district of the canton of Sarapiquí, in the province of Heredia (Northern Costa Rica). It is the largest district in the canton by area. It presents a mountainous territory in its southwestern area, while to the north and east, the terrain goes downhill and ends in the plains of Sarapiquí.

The community does not have a large tourist population but they are seeing rapid expansion as residents from San Jose are moving to less populated urban areas such as Horquetas. Use an estimate of 180,000 tourists per year as an initial value for projections. The community's primary source of income comes from pineapple and banana cultivation and they also host fitness and educational seminars throughout the year. Residential population data can be found in the Google Drive- link seen below. Use your best engineering judgment regarding projections.

Almost every home and business located within Horquetas is connected to a private septic tank. Recent studies suggest that there is evidence of malfunctioning septic tanks due to negligence of routine maintenance, which causes contamination by septic tank effluents that do not infiltrate the ground but are washed away by runoff. This situation of mismanagement of wastewater has caused concern on the part of its inhabitants, the tourism sector, the Municipality of Sarapiqui, AyA and the local ASADA, all of which advocate for a centralized wastewater treatment system and public collection system.

The local utility has been proactive in seeking a centralized wastewater treatment solution and would like a preliminary conceptual design of a treatment system along with a collection system. **The design team must propose three (3) locations for the treatment site. Additionally, the design team must propose three (3) alternative treatment systems** (each system may be one type of treatment or a series of treatment processes).

The design must also specify outfall/discharge location. The community values the great variety of flora and fauna in the area and the design team should hold this community interest in high regard while considering treatment alternatives. The ultimate design should not impede or negatively affect any of the community interests.

Given the complexity and status of the project, the design team must work on **an optimal site selection** and **a preliminary design proposal**. The design should be as intensive as possible. For example, calculate pump power requirements, select pumps to meet the design parameters, size pipes based on anticipated flows, accurate elevations, and stationing through the provided survey information, etc.

The Horquetas ASADA has identified land available for purchase that will act as potential sites for the centralized treatment system. General areas of available land can be seen in *Figures 3 through 6*. Note that much of the land is at a lower elevation than the service area and there are many open fields. This will minimize the amount of pump stations and flora removal needed to construct the system. For the design team's final recommendation for ideal site location, one should consider proximity to the Horquetas community while also considering cost to acquire new land. Additionally, the community is working on locating a new site for parcel No. 1. It should be close by and have a similar terrain as the current proposed parcel. GWS will update the design teams as we receive this information.

In Costa Rica, especially in 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 entering septic tanks or treatment systems. Used toilet paper is typically collected in trash cans and is disposed of along with other solid waste. Design of wastewater collection and treatment improvements should follow Costa Rican design standards as much as possible, however most teams will use typical U.S. standards for the basis of their design (for example, NR110, Recommended Standards for Wastewater Facilities, etc.). The collection system should be designed so that the piping size will allow for toilet paper to be flushed.

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 if you have water service once a sewer main is constructed in front of a property, the property owner must pay for the service whether they chose to connect to the system or not.

Project Approach

For this project, GWS is soliciting designs for a long-term solution to the sanitation problem in this region. In general, the solution approach should be to design a centralized treatment system with a complete collection system.

Additional Project Considerations

The specific areas of concern with the collection and wastewater treatment system are described as follows:

1. The treatment facility must be adequately sized for anticipated flow, future growth, and with seasonal rainfall variability considered.

2. Seasonal variability of flows due to tourism should also be considered.

3. Treatment facilities should be designed to be able to treat to the desired effluent limits as described in this document.

4. Due to the socioeconomic status of the community, user fees must be lower than 10,000 Colones (Costa Rican currency) per month. Assume the capital cost is covered by some outside source and the user fee will include O&M costs.

5. The location of the treatment facility must be easily attainable and needs to be in an area that is not at risk of flooding and landslides. Additionally, be aware of and protect existing drinking water sources. Treatment site locations also need to be evaluated for ease of construction and potential impacts on nearby homes and businesses. The average and maximum flows for the proposed collection system need to be determined.

6. The community is planning to apply for sustainability grants for partial funding of this project. It will be important for the application to have green infrastructure built into the facility design. This could include, but is not limited to, Photovoltaic power cells, repurposed construction materials, low energy processes, etc.

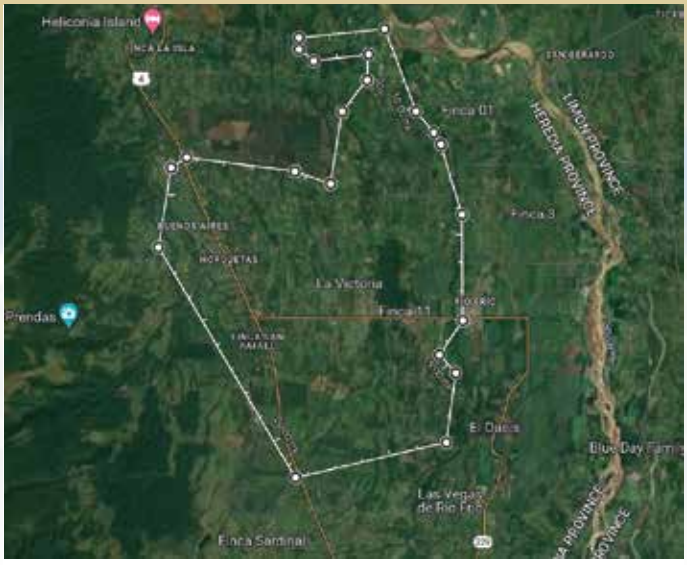

Figure 1: Satellite View of Community Extents for Horquetas.

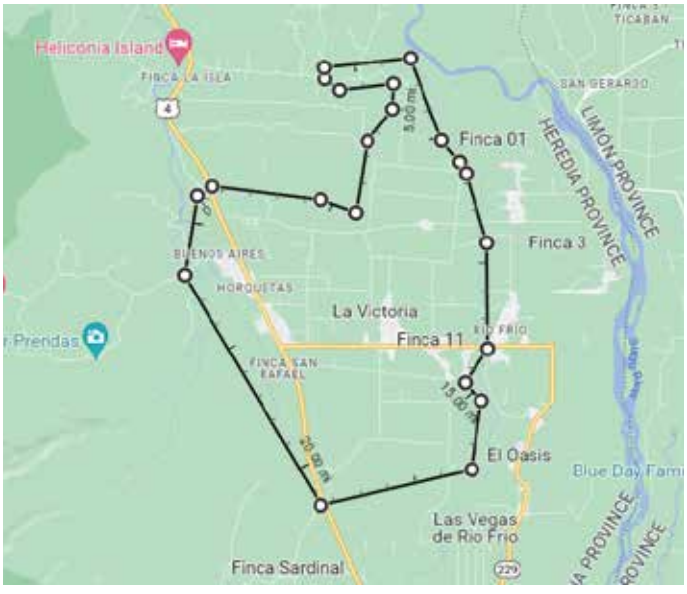

Figure 2: Maps View of Community Extents for Horquetas.

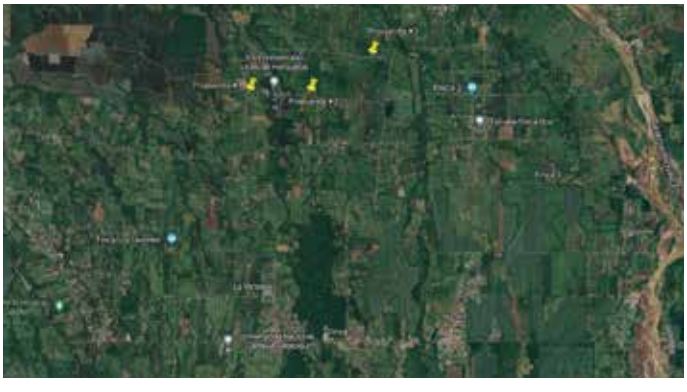

Figure 3: Map displaying potential treatment sites.

Design Objectives and Constraints

The following are the items that should be discussed or implemented as part of the design project. The design that best accomplishes these goals will have the highest likelihood of long-term success.

1. The project must take into consideration the local climate (temperature, high water table, heavy rainfall) and high variability due to tourism.
2. Avoid offensive odors and minimize impacts on landscape aesthetics.
3. All equipment must have a level of redundancy to maintain treatment if equipment fails or is under repair.
4. The solution must utilize a minimum of space and energy.
5. The project capital cost must be minimized.
6. The system must be easy to operate and maintain. There is no wastewater training available in the area or wastewater operators' associations. Local staff will have to be trained on the system operation and maintenance, but may be available only on a part-time basis, so the system should be mostly self-operational.
7. The wastewater treatment equipment must be easily replaceable with parts readily available.
8. Treatment equipment must be compatible with the existing electrical system. 120V is readily available but 240V and 480V are not.
9. Consider simplicity (less O&M the better) in design whenever possible.
10. It is recommended that the teams design for the year 2044 (20 years). Provide justification with any variances. Consideration should be given to future plant process expansions beyond 2044 in the design and site selection.
11. Use best engineering judgment in consideration of separation requirements for potable water and sewer main. Potable water typically runs along the road Right-of-Way.
12. Designate the following in the report/presentation:
    a. Three (3) proposed treatment plant sites.
    b. Designate one (1) of those three (3) proposed sites as the recommended site location.
    c. Three (3) alternate treatment processes.
    d. Designate one (1) of those three (3) proposed treatment processes as the recommended treatment process.
    e. Clearly state the capital cost estimate for full construction of the WWTF and accompanying collection system.
    f. Clearly state the monthly user fees that the community should charge residents that will be a funding source for general O&M of the WWTF and collection system.

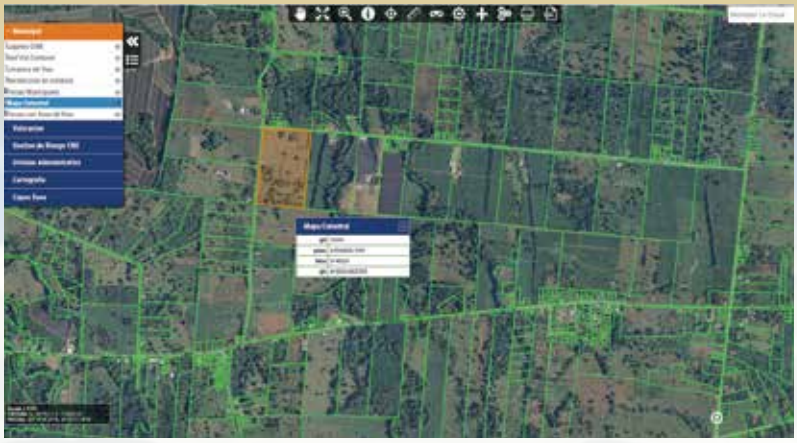

Figure 4: Close-up map displaying potential treatment site Number 1.

Figure 5: Close-up map displaying potential treatment site Number 2.

Figure 6: Close-up map displaying potential treatment site Number 3.

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TICOSAN 2023

First Wastewater Conference in Costa Rica a Success

By Joseph Lapastora and Sara Guzman

TicoSan was the first-ever wastewater conference in Costa Rica, and it was created, led, and organized by GWS. TicoSan focuses on wastewater management, research, development projects, and case studies in Costa Rica and the US. The conference provides a platform for professionals, students, and stakeholders in the water sector to come together, exchange ideas, and learn about different projects and initiatives that promote sustainable water management practices. This conference offers a direct opportunity for Costa Rican wastewater professionals to connect with technology providers and collaborate on their country's newly established wastewater initiatives.

TicoSan received over 175 industry professionals from six different countries. This conference offers international water companies and professionals the opportunity to promote their services and network with local agencies, municipalities, engineers, and manufacturers in Costa Rica, who are looking to develop wastewater projects in the country. TicoSan is a unique opportunity for the water industry in Costa Rica since it promotes and embraces the advancement of wastewater treatment in the country while supporting international collaboration and networking. Additionally, TicoSan is mapping the blueprint for other countries in Latin America to replicate the conference, with the ultimate goal of expanding GWS footprint in those countries that lack centralized solutions to keep their waterways clean.

TicoSan 2024 is already in the works and will be hosted on April 22-23, 2024 in San Jose, Costa Rica. The Call for Abstracts for TicoSan 2024 will be opening this Fall 2023. Additionally, sponsorship and exhibitor opportunities will be available starting in November 2023. Get a snapshot of the different opportunities for TicoSan 2024 below.

If you are interested in learning more about TicoSan, contact us at *chair@globalwaterstewardship.org.*

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BOOTH TABLE WITH TWO CHAIRS	✓		✓	✓	✓
RECOGNITION IN GWS SOCIAL MEDIA		✓	✓	✓	✓
COMPANY LOGO IN CONFERENCE PROGRAM		✓	✓	✓	✓
COMPANY LOGO IN SPONSOR BANNER		✓	✓	✓	✓
RECOGNITION IN TICOSAN WEBSITE			✓	✓	✓
ADVERTISEMENT VIDEO IN EVENT SCREENS*			✓	✓	✓
COMPANY LOGO IN TICOSAN VOLUNTEERS T-SHIRTS			✓	✓	✓
OVERALL TECHNICAL SESSIONS SPONSOR**				✓	✓
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NETWORKING EVENT SPONSOR					✓
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*The video must be provided by the company (max. 1 min)
**Company name and logo on Technical Session signs
***Aquafest is a water festival intended to promote WASH education In the community.

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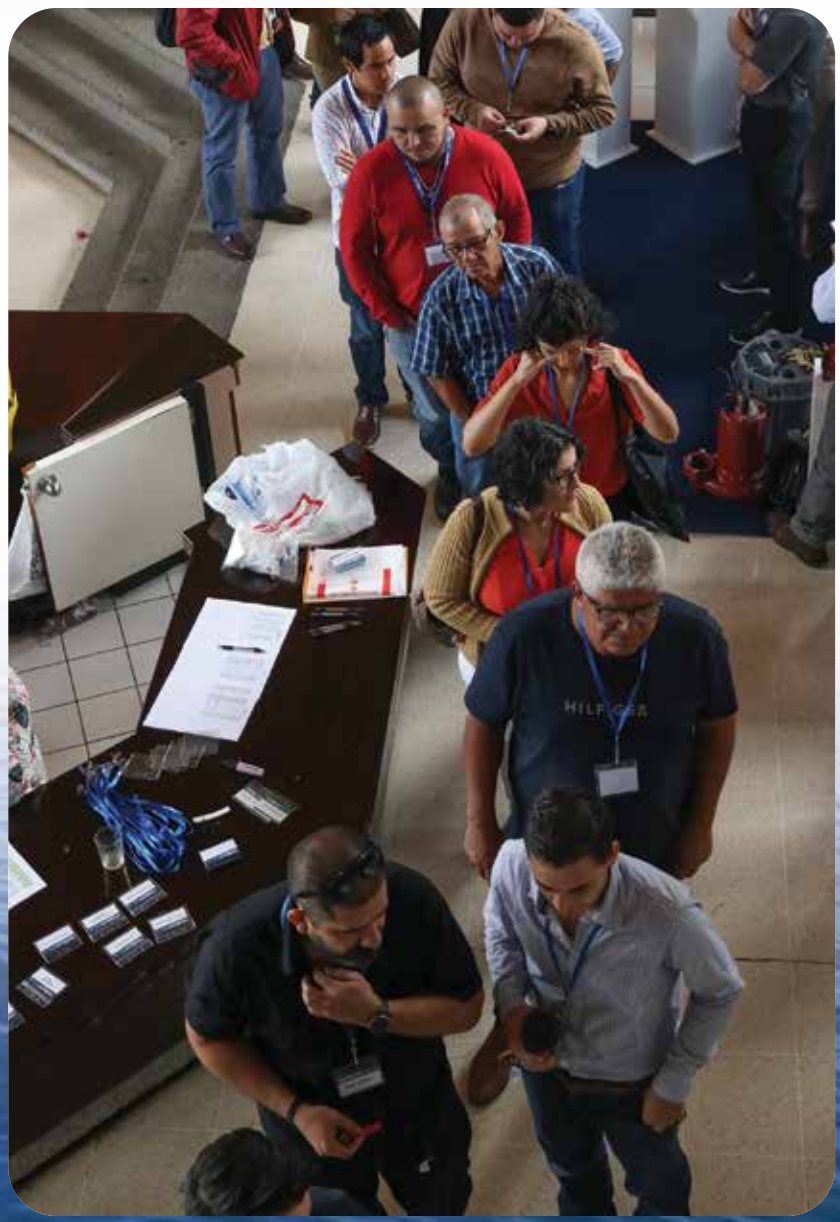


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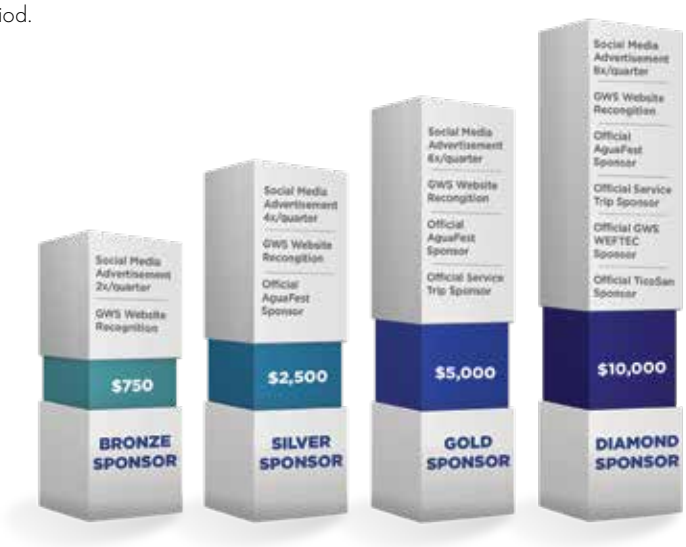

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