CENTRAL STATES WATER

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

PLANT PROFILE:

Urbana and Champaign Sanitary District

PLUS:

WEFTEC 2024 Recap

GWS 2024-2025 Problem Statement and Annual Service Trip Recap

MSDC Winner: Marquette University

Young Professionals' 2024 Wrapped

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Thank You to Our CSWEA Spark Plugs

By Troy Larson

Thank you to the spark plugs, doers, and energy sources that power this organization. From my current view of the organization, I am even more certain that we are built from simple fundamentals, with none being more important than the fact that we are a volunteer-based group. In any subset of humanity, there are those who drain energy from the room and others who provide it. Somehow, we have been blessed with a disproportionate number of energy providers who prioritize positive and productive behaviors and who stimulate others around them. Please do not underestimate the value of these energy providers – not only do they complete work with their energy, but they also create momentum for others. I am refraining from naming names because there are many more than I could name in just one article, but please know that they are there. ALSO: Know that they can use help, so please keep that in mind as you consider your personal interest in getting involved. In our committee work, we occasionally conclude that an initiative is maxed out due to the capacity of the key volunteers that are involved. This illustrates that there can be a basic vulnerability that the great things that we do are dependent on free will volunteers who could run out of capacity. I believe that these spark plugs would tell you that they have gotten more than they have given, so I can say that your additional involvement would be a valuable endeavor for you as well.

One incredibly simple and certainly valuable way that you can support the Association is to participate in the many webinars that are offered. These are low cost and low effort ways to get information and support the programming that is being provided. Webinars have the ability to distribute content that is niche, such as PFOS-related webinars, and also broadcast fundamentals such as the Operations series of information. Please take a moment and consider how you and your organization might benefit from taking more advantage of these opportunities. Participation in these events helps validate the efforts of the contributors and sponsors, so please join us as often as you can.

As many of you know, my initial attachment to the Association is through the operations portion of our water professionals and, therefore, I was thrilled for the operations teams that represented our member association so well at WEFTEC in New Orleans. As much as the technical and professional excellence on display, so was the connectivity. Both teams were sincerely supporting each other in competition as they did during training and team formation. The value to the Association is extraordinary and thanks not only to their efforts but to the sponsors, the Association and the State sections that all provide financial assistance.

Time moves quickly – I am already contemplating how soon my year as president will pass. We will be at the 98th annual CSWEA conference in Madison before you know it. **Please save the date: May 28-30, 2025.** The local arrangement committee is currently working diligently to get the meeting organized, and it will be another great event. Thank you to Cathy Wunderlich and her team of spark plugs for their contributions that will help make the annual meeting a success from the perspective of technical excellence and connectivity, while we all collaborate to build our water workforce! CS

> "In any subset of humanity, there are those who drain energy from the room and others who provide it. Somehow, we have been blessed with a disproportionate number of energy providers."

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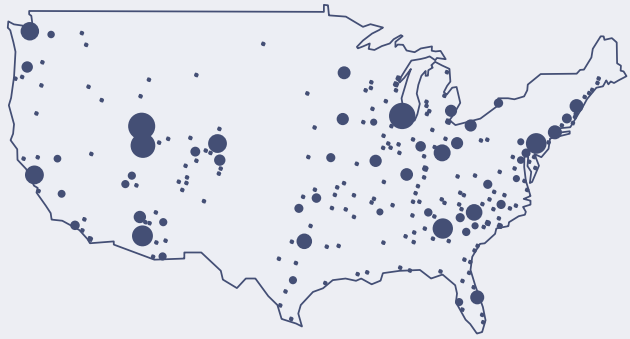

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Wonderful WEFTEC

Written by Anna Munson

Anna Munson

Liz Heise

In early October, Rich Hussey, Liz Heise, and I traveled to New Orleans as part of the House of Delegates (HOD) to convene the annual meeting and workshops at WEFTEC. This was Rich's final WEFTEC as a delegate for CSWEA. He has officially rolled off the HOD a few months ahead of schedule to dive into his new role as the 2nd Vice Chair for CSWEA. While we will certainly miss his leadership and contributions to the HOD, we're excited for him to continue working for our members in this new role. In the meantime, Liz Heise will be stepping in for the remainder of Rich's term. Liz has already brought her unique perspective and energy to the delegate role.

The HOD meetings and workshops at WEFTEC bring delegates from each member association (MA) and the delegates-at-large (DAL) together to reflect on work accomplished in the previous year, assess the successes and challenges, plan for the upcoming year, build relationships, and share ideas that could benefit our constituencies. Highlights of the work accomplished by the work groups and HOD committees since the 2023 WEFTEC include:

- Drafting a mission, vision, and values that align with the Federation's mission statement.
- Adjusting the number of delegates at large (DAL) positions for enhanced support and impact.
- Educating the HOD on WEF Unity communication tools.
- Hosting three in-person and one virtual WEFMAX event to promote cross-MA collaboration and learning.
- Awarding 15 grants to MAs to support initiatives such as developing a water-stories video series and a member training program.

"As your WEF delegates, we encourage you to get involved in a CSWEA committee, WEF Community, or attend an advocacy event like the WEF Fly-in."

New work groups were formed during the meeting to keep the HOD moving toward accomplishing our goals and to continuously work to improve the service of the HOD to the MAs and WEF. The 2024/2025 workgroups are:

- MA Spotlight and Engagement WG (October 2024-March 2025).
- HOD Document Management and Historical Records Project October 2024-March 2025).
- HOD Promoting the Circular Water Economy WG (October 2024-March 2025).
- HOD Workforce Development Recruitment Tools for Operators WG (April 2025-September 2025).
- HOD Delegate-at-Large Strategy & Implementation WG (April 2025-September 2025).

As in previous years, WEFTEC proved to be an exciting place to connect with CSWEA members. Several student design teams competed on Sunday afternoon. The Sunday evening social hosted by CSWEA and Illinois WEA at The Chicory was very well attended. The venue was elegant. As the evening air cooled, many of us wandered up to the rooftop space to enjoy a drink outside. The Ops Challenge teams gave it their all on the following days. CSWEA members could be found networking, teaching, and learning throughout the conference.

As we look beyond WEFTEC, there are several WEF conferences that promise to deliver new insights, networking opportunities, and discussions aimed at supporting and improving the way we approach water treatment and utility management.

The AWWA/WEF Utility Management Conference will take place in the vibrant city of Dallas, Texas from February 11-14, 2025. Registration is already open for this conference that brings together utility leaders in both the water and wastewater sectors.

From May 6-9, 2025, WEF will host the first joint Residuals and Biosolids and Innovations in Treatment Technology Conference in the historic city of Baltimore, MD.

The Collection Systems and Stormwater Conference will be hosted by WEF and Texas WEA (WEAT) in Houston, Texas from July 14-17. This conference will be the first WEF conference that is co-hosted by an MA. Attendees can expect to experience more local influence and culture than at previous WEF-hosted conferences. We are excited to see what WEAT has planned.

Beyond attending or presenting at these WEF conferences, there are many ways to make your CSWEA membership work for you. As your WEF delegates, we encourage you to get involved in a CSWEA committee, WEF Community, or attend an advocacy event like the WEF Fly-in. Please reach out to Liz or me if you want ideas or resources to find the right fit. CS

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The Future is Bright

By Patrick McNamara

It's an exciting time in Wisconsin! That's right, with dark days, cold weather, this is the season of anticipation. It's a great time both in the here-and-now as well as with what's to come. I, for one, love the four seasons. Winter brings a plethora of outdoor fresh air activities. Sledding, skating, ice(?) fishing, hot chocolate, and more. And, on those days when you might start to feel like it's a bit too cold or too dark, we are reminded that the best is yet to come for our state section.

We have two major hallmark activities to mark on your 2025 calendars in Wisconsin. First is the always exciting Education Seminar in Madison on April 22. While it is listed as a one-day event, come for two and spend the night! We have a great networking opportunity that brings together student Senior Design teams, presenters from the seminar, and all of us the evening before the seminar. Tuesday will be full of excellent talks focusing on the theme of grit removal and primary treatment for resource recovery opportunities.

Our annual conference will be held in Madison the week after Memorial Day on May 28-30. Mark it down – the conference offers many opportunities for fun and professional networking and development. Remember to submit a nomination to recognize a fellow water professional at the Awards Banquet – we have way too many hardworking people for there to be any awards not handed out. You can see the list of awards and make a nomination at *www.cswea.org/awards*.

Now that you have those spring events on your calendar, let's come back to the Winter season. February 20 will be the 2025 WI Section Government Affairs Seminar in Fond du Lac, WI. As well, look for our WI State Section Winter meeting, which will be planned around the event in Fond du Lac. We are always looking for members to join our committees. You are welcome anytime!

Stay warm, enjoy the seasons, and hope to see you soon! CS

Act Local

By Mark Enochs

Many years ago, I bought a used pick-up truck. It had a bumper sticker on it that said "Think Global. Act Local." I'm not a bumper sticker kind of guy, but I decided to leave it on. I didn't disagree with it – but what did it really mean? In our world of water and wastewater treatment and management can mean making a difference for the better right where we are. It takes a lot of people doing the right things to create success. Whether you're a wastewater design engineer or a treatment plant operator or superintendent, understanding the science of such systems is only part of it. It's actually doing something that makes a difference. Knowing your job and doing it well means drinking water and wastewater is going to be treated properly, thus making your local surrounding a better place.

Some of us got into the water/wastewater industry to save the world. Others because it's interesting. Some saw the value of job security – after all, everyone poops. With some, it kind of just worked out that way. Regardless, we're each in some type of position of responsibility. We're stewards – that is, we're tasked with taking care of something that's not ours – in this case, the environment.

By being involved in CSWEA, you're helping yourself be an even better steward. CSWEA exists to enable exchange of water quality knowledge and experiences, and to foster a greater awareness of water quality achievements and challenges. This is to benefit each CSWEA member as well as the public. This helps educate and encourage water professionals to continue learning and sharing for the benefit of ourselves, each other, and the world around us.

Professional Engineers are called to a high standard. We're to "hold paramount the safety, health, and welfare of the public." Again, being a good steward means knowing what we're doing and doing our part where we are. Or you could say "Think Global. Act Local".

In late Summer/early Fall the CSWEA Minnesota Section Industrial Wastes Committee hosted an Industrial pre-treatment seminar in Rosemount, Minnesota. The Storm Water Committee hosted a tour of the Twins Stadium. The Students & Young Professionals gathered at Rahr Malting in Shakopee for a tour. In November the Minnesota Section hosted the Conference on the Environment at the Minneapolis Convention Center. Conference attendance was near record high levels; the place was full of enthusiasm and high-quality presentations.

Now's the time to step-up. Get involved with the MN Section's Committees. Check out the CSWEA website and contact a Committee Chairperson. This is a great way to be an even better steward of the environment. CS

"CSWEA exists to enable exchange of water quality knowledge and experiences, and to foster a greater awareness of water quality achievements and challenges."

Bring on the Challenges

By Christopher Buckley

As fall transitions into winter in the Midwest, things slow down outside. Yet in our industry, they often speed up inside! Engineers and vendors are busy preparing improvement contracts for bidding in the late winter/early spring, and public works staff and operators are busy planning, budgeting, and maintaining equipment.

As freezing weather sets in, please remember our water and wastewater operator professionals, who often must brave the cold rain, ice, and snow to do their jobs and keep our industry running. Digging hard ground to fix water mains and sewers, working on frozen lift stations, and keeping our WWTPs working well during frigid temperatures takes dedicated individuals and organizations.

Shout out to the Illinois Young Professionals committee, which hosted a webinar on November 20, 2024, to help new members connect with the Illinois Section Committees. CSWEA operates 100% on a volunteer basis, and there is no better way to learn the industry, make networking connections, and have some fun than being actively involved in the IL CSWEA Section and its Committees. If you have an interest, there is a committee for you! Public education, collections systems, stormwater, nutrient removal, laboratory, biosolids and energy, operations, government affairs, and membership. Start with one, get involved, and make a difference.

I look forward to the end of this year and the start of 2025 as CSWEA has so many activities and conferences. First up is the plethora of webinars scheduled, which started with "Why Are My PAOs Misbehaving" on December 18 and continues with "Optimizing of Biological Phosphorus Facilities" on January 8, 2025, with more to follow. These one-hour webinars are an easy way to take time out of a busy day and stay abreast of new industry technologies and projects.

Spring brings a plethora of education and networking opportunities from the Government Affairs Seminar in March, the Education Seminar in April, as well as the "One Water For All" Annual Meeting in May.

Remember, our challenges create opportunities to showcase our abilities and what we are made of. Bring on the challenges! "New beginnings provide opportunities to succeed, learn, and mentor."

Stay safe, joyful, and warm this winter! CS

> "Remember, our challenges create opportunities to showcase our abilities and what we are made of. Bring on the challenges!"

CSWEA Wrapped





By Rahim Ansari, WI Section YP Chair; Nicholas Domalewski, IL Section YP Chair;
Kaitlyn Hague and Al Robertson, MN Section YP Co-Chairs; and Elizabeth Kramer, CSWEA YP Chair

2024 is coming to an end, so it's time for the Young Professional and Student Committees to give you a **CSWEA Wrapped** of the past year.

YP Summit

Each year CSWEA sponsors a group of YPs and Students to attend the YP Summit for Water Industry Professionals. This year, five YPs/Students from across the State Sections flew out to Portland and learned how they can shape the future of the industry. Check out this past year's *Central States Water* summer issue for details on the trip and reach out to your respective Section leadership to find out how to apply for next year's YP Summit in Dallas, TX!

CSWEA Annual Meeting

The Annual Meeting was in Schaumburg, IL this year and was filled with exciting conversations, fascinating technical presentations, and fun events! Attending YPs helped clean up invasive plant species at the beautiful Carl R. Hansen Woods, toured the Pagorski Water Reclamation Facility, and then finished the night with bowling and pizza at the Woodfield Mall! Shoutout to IL Section YP Chair Nicholas Domalewski for all his hard work organizing YP events at the Annual Meeting!

Centrisys and Kenosha Tour

Our WI Section YP group organized a tour of Centrisys/CNP Global Headquarters in Kenosha, WI. After listening to some great presentations on biosolids processing, touring the shop floor, and eating lunch, the group of engineers and operators headed over to the Kenosha WWTF and got to see Centrisys/CNP equipment in action at the plant! Huge thanks to Cory Melancon and Gerhard Forstner of Centrisys/CNP and Katie Karow of the City of Kenosha for hosting us.

CSWEA YP, AWWA YP, ASCE YP, and APWA YP Joint Picnic

A joint effort by four YP committees of CSWEA, AWWA, ASCE, and APWA, approximately 100 people joined to network and enjoy a meal together! Look out for next year's invite.

Vessco Tour and Cornell Pump Presentation

Our MN Section YP group organized a tour of Vessco's shop in Minneapolis, with a focus on pumps. A presentation from a factory representative for Cornell with a cutaway pump and a happy hour followed. Thank you, Vessco and Cornell, for hosting and spending time with our group.

MMSD Nine Springs Tour

WI Section Students and Young Professionals got to tour the Nine Springs Wastewater Treatment Plant and learn how the Madison Metropolitan Sewerage District has upgraded and optimized the facility over the years. Huge shoutout to Mike Zelinsky of Xylem for giving a pumping presentation and Matt Seib of MMSD (and our very own WI Section Trustee) for hosting us.

Rahr Malting Tour

The MN Section got a tour of Rahr Malting's MBR facility in Shakopee, MN. The tour focused more on the industrial side of wastewater treatment than municipal wastewater treatment. Shoutout to Rahr Malting for hosting us.

Brewer's Outing

The annual Brewer's outing hosted by Mulcahy-Shaw was a blast as always! WI Section YPs got to help the Mulcahy crew organize and setup the event with raffle prizes, cornhole, and lots of brats and drinks 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 YPs.

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Otsego, MN WWTP Tour

The MN Section got to tour the Ostego WWTP to see their new biosolids building. The City is now producing Class A exceptional quality biosolids with the use of centrifuges and lime stabilization. Huge thanks to the City of Ostego for hosting our group.

Socials and Happy Hours

Through the year, Students and Young Professionals got together in Madison, Milwaukee, Chicago, and Minneapolis for pizza, ice cream, board games, bowling, bocce ball, refreshments, and more! Reach out to your Section YP Chair to help schedule the next one. We've done breweries, bowling alleys, restaurants, lakeside locations, and campus hotspots.

Many more events including service projects, 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 2025 and reach out to get involved!

Sincerely,
Your CSWEA YP and Student Chairs CS

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The company's President, Karen Wolk, has been with the Illinois-based firm for 39 years, but top of the tree for long service at Lakeside is Draftsman Supervisor James Snyder, who has worked for the business for 42 years.

Pete Kasch (Shipping and Receiving) has served with Lakeside for 31 years, while Linda Zimmerman (Engineering Assistant) has recorded a full three decades. The long-serving team also includes National Sales Manager, Jim McKee (25 years), Regional Sales Manager, Jim Aitkenhead (11 years), Inside Sales Manager, Keith Humphrey (17 years) and Tim Lim, Project Engineer, 20 years.

Vice President of employee-owned Lakeside Equipment Corporation, Dan Widdel, has 24 years of service, as does Mary Ann Bell (Receptionist) and Severo Sosa (Senior Draftsman); closely followed by George Fridrich (Draftsman/Parts Associate) with 23 years.

Back row: left to right: Mary Ann Bell, Jim McKee, Keith Humphrey, Dan Widdel, Jim Aitkenhead, Severo Sosa. **Front row:** left to right: Pete Kasch, Karen Wolk, Jim Snyder, Linda Zimmerman.

Completing the mammoth 310-year milestone presents an average of 22.8 years for each of the 12 long-serving members of the team.

Lakeside's Contract Administrator, Marian Widdel, commented: "Time flies by here, which is always a good sign. It was only just recently when we noticed that a combined figure for such a small number might be in the region of 200 or 250 years' service, but to see that is actually a total of 310 years clocked up by just 12 people is a truly great achievement. We very much back any move to attract new people to our industry, but you have to say that for our customers, there are many times when you simply can't beat calling upon all that experience from such very knowledgeable, hard-working and enthusiastic professionals."

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Jonathan Kolweier

Wastewater Engineer, Baxter & Woodman, Naperville, IL

While attending CSWEA's Annual Meeting this past May, you might have noticed (or even been part of) a lively crowd gathered around the CSWEA booth. Chances are, this bustling energy was thanks to the hard work of Jonathan Kolweier. After stepping into the role of Co-Chair for the CSWEA Illinois Section Membership Committee earlier in 2024, Jonathan was quickly tapped by the Local Arrangements Committee to organize the booth – one of the goals set during the 2023 Central States Exchange.

With valuable advice and guidance from former Illinois Membership Chair Aaron Berry, Jonathan took the lead in organizing the CSWEA booth. He coordinated booth volunteers, launched the scavenger hunt with a YETI cooler as the grand prize, managed the distribution of membership gifts at registration, and played a key role in developing the New Member Meeting. Additionally, he ensured the booth offered resources for both current and prospective members to connect with committees and get involved with the Association. Thanks to Jonathan's leadership and dedication, the booth was a networking success, and CSWEA is excited to introduce you to him through this short article.

Jonathan's passion for wastewater started early, sparked by an annual event at his childhood church called the Celebration of Hope. This event, which focuses on partnerships with developing countries – including sanitation work – introduced Jonathan to organizations bringing small-scale wastewater treatment to communities in Africa and Latin America. His interest grew even further in high school, especially during a visit to the Stickney Water Reclamation Plant in Chicago as part of his AP Environmental Science class.

At the University of Illinois at Urbana-Champaign (UIUC), Jonathan became part of both the WEF and CSWEA communities through the UIUC WEF/AWWA Student Chapter. He joined as a freshman and, by senior year, was serving as the chapter's president. During this time, he had the opportunity to learn from CSWEA members like Liz Heise and Nick Domalewski, who shared their professional insights and introduced him to the CSWEA community at large. Jonathan also competed in CSWEA's Midwest Student Design Competition (MSDC) during his freshman year, further cementing his interest in the industry.

Jonathan's professional journey began to take shape with two internships at Baxter & Woodman (B&W) during the summers before his junior and senior years. The experience solidified his career path in the wastewater industry, and by the start of his senior year, Jonathan already had a job offer from B&W. Between his two internships at B&W and two years of full-time work, Jonathan has developed a strong passion for wastewater treatment design, with a particular focus on projects related to solids handling improvements, anaerobic digestion, combined heat and power, and biogas conditioning.

Alongside his professional accomplishments, Jonathan's personal life flourished during his time at UIUC, where he met his wife, Faith. Both were civil engineering students and active members of Cru, a Christian campus organization. The couple married in 2023 and now share a strong bond both personally and professionally. Faith, who currently works as an engineer at Clark Dietz, and Jonathan are united by their shared passion for serving others within the clean water industry.

One of the key strategic focus areas for CSWEA is Connection – something Jonathan

is deeply committed to. His experiences through his church, the UIUC WEF/AWWA Student Chapter, and the short time involved with the Illinois Section have fueled his desire to build and strengthen relationships within the clean water industry and the CSWEA community. Alongside Natalie Cook, his fellow Co-Chair of the Illinois Section Membership Committee, Jonathan has set ambitious goals to boost recruitment, improve retention by helping members find committee placements, and re-engage seasoned professionals who have become less active. Every CSWEA member has the opportunity to contribute their unique skills, personality, and passion, and Jonathan is committed to being a source of encouragement and guidance for those seeking a way to make a meaningful impact.

Jonathan's short journey thus far reflects his dedication to both clean water and fostering connections, and we are grateful for his hard work and leadership in the CSWEA community. We hope you get the chance to meet him and experience his passion firsthand. CS

CSWEA ATTENDS 2024 weftec®

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WEFTEC, the Water Environment Federation's Technical Exhibition and Conference, is the largest annual water quality exhibition in North America and offers water quality professionals the best water quality education and training available. This year, WEFTEC was held at the Ernest N. Morial Convention Center in New Orleans from October 5 to 9, 2024.

The CSWEA/IWEA WEFTEC Welcome Reception

By Mike Holland

The 2024 CSWEA/IWEA WEFTEC Welcome Reception in New Orleans was held at The Chicory on Sunday, October 6, from 5:30 pm to 8:00 pm. Attendees who did not pre-register were asked to sign in at the door and the event included appetizers, hors d'oeuvres and bar service with drink tickets. More than 300 people pre-registered and many other procrastinators dropped on the day of the event. Thanks to the generous donations from the 43 sponsors, we were able to raise nearly $19,500 for this year's event.

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WEFTEC 2024 Operations Challenge
Pumpers Place 1st in Division III

By Jeremy Cramer, PWO Representative

Each year at WEFTEC, the Operations (Ops) Challenge showcases the skills and expertise of wastewater professionals from around the world. The Ops 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, exciting, and promotes teamwork between wastewater professionals.

This year was the 37th annual competition at WEFTEC in New Orleans. Each team represented a WEF Member Association or comparable operator organization, competing in one of three divisions based on competition experience. The 2024 Ops Challenge competition featured a record-shattering 57 teams, including more international teams than ever before.

During the Ops Challenge, each team competes for the highest score in collections systems, laboratory, process control, maintenance, and safety events.

- The **process control** event tests mathematical skills and understanding of wastewater treatment processes. The event consists of both written and electronic portions. Teams use a wastewater treatment process simulator to visualize real-world problem scenarios, making real-time decisions to fix them.
- The **laboratory** event has teams analyze a range of wastewater parameters, and requires competitors to demonstrate their competence in lab-based tasks such as sampling, sample preparation, data collection, data interpretation, and familiarity with common laboratory equipment.
- The **safety** event requires teams to respond to a hypothetical emergency where a co-worker has 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.
- In the **collection systems** event, teams vigorously cut an 8-inch PVC pipe to fix a leak and then connect a 4-inch lateral and assembled a Victaulic tower.
- Finally, in the **maintenance** event, teams complete normal maintenance tasks to diagnose problems at a lift station wet well, readjust a conditioning pump, and replace a damaged impeller and pump nozzle.

CSWEA had two teams compete at the national competition, the Pumpers and Shovelers, both competing in Division III. Overall, there were teams in 11 Division I, 19 in Division II, and 27 in Division III. This was a very historic year for CSWEA as it brought home its first ever, **overall** 1st place trophy. The Pumpers not only won Division III, the team likely would have placed in the top three in either

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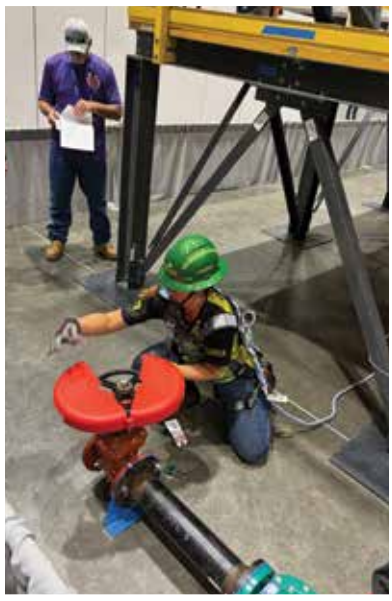

Division I or Division II as well. The Pumpers had an outstanding process control score of 2,295, giving them 1st place in this event (the score was higher than any Division II team and would have been third in Division I). The Pumpers also had an excellent lab event with a time of 489.30, earning 2nd place in the lab event (the time would have placed the team in the top three in either Division I or II) and had very solid runs in the safety (8th), maintenance (8th), and collections (5th) events, which allowed them to earn the 1st place overall in Division III. The Shovelers also did very well, placing 11th overall in Division III and achieving in the top 10 finishes for both the lab and process control events.

The teams were coached by Marc Zimmerman from the Janesville WWTP and Pat Heineck from the Sun Prairie WWTP. Marc and Pat put in a great deal of time and effort and did an excellent job coaching. The winning Pumpers team consisted of team captain Chris Lefebvre from Stevens Point, Kelsey Van Deusen from Red Wing, Alex Krause from Fond du Lac, and Justin Profancik from Urban & Champaign Sanitary District. The Shovelers team consisted of captain Jason Neighbors from the City of Lockport, Ben Edwards from the City of Stevens Point, Rylee Schoo from the Glenbard Wastewater Authority, and Casey Kleven from the City of Janesville.

Both teams performed well during the competition, which 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. The team members must practice alone and communicate long distance with their team-members and coach with questions or solutions most of the time. The teams practiced in Janesville during two 2.5 day training events and a single one day event.

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 Pumpers captain, Chris Lefebvre put in a tremendous amount of time analyzing the events ahead of time and his mentoring and guidance was a huge part in both team's success. Also, a huge thank you to Brent Perz from Baxter & Woodman for spending time coaching an assisting with the process control event.

The two teams would not have been able to compete at this amazing event if it were not for the generosity of sponsors. CSWEA is fortunate to have such great supporters in the organization. With CSWEA being made up of members from WI, MN, and IL 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.

Thank you to all that made it possible for CSWEA to send two teams to the 2024 Operations Challenge and also for your support! CS

CSWEA Well-Represented at WEFTEC Student Design Competition

By Joe Lapastora

CSWEA and Global Water Stewardship (GWS) had great representation at this year's WEFTEC Student Design Competition (SDC). Overall, 30 teams from many states across the US, as well as teams from Costa Rica and Canada, 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. Marquette University competed in the Wastewater Category, and their design was presented by Jessica Calteux, Zachary Molczyk, Keagan Morgan, and David Zeller. The Marquette team presented on novel pyrolysis of municipal wastewater solids for energy and biochar to combat the scrutiny of land application of biosolids for perpetuating the pretense of unregulated contaminants of emerging concern. The Illinois Institute of Technology (IIT) competed in the Water Environment Category, and their design was presented by Constantine Giatta, Francis Gilleece, Ryan Griepentrog, Mathis Lucet, and Judith Rackow. The IIT team presented on Chatham area Stormwater Management where they focused on best practices for highly urbanized areas and honed in on basement flooding mitigation via a combination of green and gray infrastructure.

Similar to past years, WEF was gracious enough to allow Costa Rican universities to compete at the international competition as extra representation of CSWEA. This year, both the Instituto Tecnologico de Costa Rica (TEC) and the Universidad de Costa Rica (UCR) were both invited to compete in the Wastewater Category. This marks the first year that two Costa Rican Universities have competed at the WEFTEC Student Design Competition. The TEC team included Marianela Leiva Camacho, Luis Eduardo Munoz Solorzano, Juan Andres Trejos Calvo, and Jeikell Vargas Maroto. The UCR team included Monica Aguero Sanchez, Priscilla Gallo Gutierrez, and Ariel Mesen Cabezas. Both teams presented their design on the centralized wastewater treatment system and collection system for the community of Horquetas, Costa Rica, as part of the GWS Problem Statement.

Furthermore, we were happy to see two additional teams who competed at the MSDC who were also invited to compete at WEFTEC SDC. The Notre Dame University team competed in the Water Environment Category, and their design was presented by Andrea Reisinger, Patrick Murray, and Brooke Wilkinson. The Washington University in St. Louis team competed in the Wastewater Category, and their design was presented by Sean Hwang, Yue (April) Rao, Ariel Richards, and Jiasi Sun.

In total, of the 30 teams to compete at the WEFTEC SDC, six teams came from the Midwest Student Design Competition! CSWEA and GWS could not be more proud and grateful to have such awesome teams and incredible representation. We look forward to next year's competition! CS

The Notre Dame University team presenting in the Water Environment Category,

Monica Aguero Sanchez from the Universidad de Costa Rica in front of the WEFTEC SDC sign.

The Instituto Tecnologico de Costa Rica Team in front of the Ernest N. Morial Convention Center.

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MONONA TERRACE

98th Annual Meeting Technical Topic Preview

The 98th Annual Meeting of the Central States Water Environment Association will be held May 28-30, 2025 at Monona Terrace on Madison, WI. Monona Terrace 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

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Urbana and Champaign Sanitary District

By Wade Lagle, Director of Operations

The mission of the Urbana and Champaign Sanitary District (UCSD) is to protect public health and safety, preserve the public trust, and protect the natural environment. This is accomplished by meeting present and future community needs, efficiently collecting and treating wastewater, and retaining and developing qualified staff. The district was organized in 1922 and dedicated its first treatment plant known as the Northeast Wastewater Treatment Plant (NEP) in 1924. Growth of the service area which includes all the City of Urbana, the City of Champaign, the University of Illinois campus, the Village of Savoy and surrounding unincorporated areas resulted in the construction of the Southwest Wastewater Treatment Plant (SWP) in 1968. UCSD also operates and maintains 27 pump stations, 40 miles of interceptors, and collectors in the unincorporated areas of the district.

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"The mission of the Urbana and Champaign Sanitary District (UCSD) is to protect public health and safety, preserve the public trust, and protect the natural environment."

The NEP is designed to provide preliminary, primary, secondary, ammonia, tertiary treatment, and seasonal chemical disinfection prior to discharge into the Saline Branch Drainage Ditch. Excess flow receives preliminary treatment, disinfection and clarification, de-chlorination and discharges separately from the main treatment plant. The wastewater sludge generated at the NEP and SWP are treated and dewatered at the NEP facility. A SCADA (supervisory control and data acquisition) system is utilized to aid the operations and maintenance staff in controlling the treatment plant's processes. The current design average flow (DAF) is 17.3 MGD and design maximum flow (DMF) is 34.6 MGD. Excess flow facilities provide another 22.75 MGD of treatment above the DMF.

Several expansions have occurred throughout the last 100 years of operation to today's facility. The fixed nozzle trickling filter beds have been in service since the late 1920s. During the 1950s several projects were completed including activated sludge basins, secondary clarifiers, and anaerobic digesters. The 1960s and 1970s saw the installation of additional digesters and methane gas reuse systems. The late 1970s early 1980s saw the addition of attached growth nitrification towers, tertiary sand filtration, thickening and dewatering equipment installations, and an excess flow clarifier. Early 2000s saw modifications to the digester complex with the addition of combined heat and power (CHP) units, thickening and dewatering upgrades as well as an offloading station for sludge and high strength waste loads. Also, several SCADA upgrades were made to accommodate new processes, pump station monitoring, SWP operational control, and disinfection improvements. The 2010 project, which takes us to today's facility, saw employee facility improvements, conversion from tertiary sand filtration to disk cloths, new screening and grit removal facilities, the addition of a dewatering storage tank, and a second excess flow clarifier. Currently all dewatered biosolids are stored and land applied throughout the year.

Looking into the future at what the next 20 years of potential permit changes and growth will bring, the district currently has three phases of improvements planned. New CHPs, a biogas conditioning system, new methane gas flare, digester mixing improvements, and replacement of the biogas piping are included in the Phase 1 Improvements that are anticipated to be completed in 2027. The new CHPs are anticipated to generate 65% to 75% of the electricity consumed by the NEP. Phase 2 Improvements include thickening and dewatering equipment replacement, ammonia and phosphorus side stream treatment, and UV disinfection with a projected completion of 2029. Phase 3 Improvement includes demolition of the rock trickling filter, demolition of the nitrification towers, new activated sludge basins that utilize biological phosphorous removal, and a new secondary clarifier with a projected completion of 2033.

The SWP is designed to provide preliminary treatment, secondary treatment, tertiary treatments, and seasonal ultraviolet (UV) disinfection prior to discharge. During excess flow, a portion of the flow receiving preliminary treatment is disinfected, clarified, dechlorinated and combined with the treatment plant effluent receiving secondary and advanced treatment in the rest of the plant prior to discharge to the Copper Slough, a tributary of the Kaskaskia River. The current design average flow (DAF) is 7.98 MGD and design maximum flow (DMF) is 17.25 MGD. Excess flow facilities provide another 26.83 MGD of treatment above the DMF.

Originally built in 1968 to accommodate the westerly growth of Champaign, the SWP now treats wastewater from the Villages of Savoy, Bondville, and southern areas of the University of Illinois. In 2016, the Second Street Pump Station was built to allow for flows from three interceptors from the Campustown and Downtown areas to be diverted from the NEP to the SWP. This unique pump station provides flow diversion options for the district to utilize for both wet and dry weather scenarios.

As with most facilities, the SWP has seen its share of upgrades and expansions over the last six decades. In the late 1970s and early 1980s, it was evident the growth westward in the district was occurring faster than originally planned. Due to this, two additional aeration basins were added along two secondary clarifiers. Also, the nitrification towers, tertiary sand filtration, and chemical phosphorus removal were added along with an excess flow clarifier. Aerobic digesters, thickening, and dewatering were included in this project as well. These improvements served the district very well through the early 2000s. In 2005, with excess treatment capacity in the NEP digester, complex solids processing was consolidated at the NEP. The SWP was converted to a full biological phosphorus removal (BPR) facility (the first in state of Illinois) as part of the

2005 Improvements Project. This was done by converting all activated sludge tanks (AST) to an anaerobic/oxic BPR mode of treatment. By doing this and adding an additional AST, the aerobic digesters were eliminated, and waste activate sludge was to be thickened and trucked to the NEP. A new headworks building was constructed which included fine screens and grit removal. A secondary clarifier was added to accommodate the addition solids inventory along with a second excess flow clarifier, thickened waste storage tank, and converting the sand filters to disk cloth filters.

Around 2017, it was evident the annual effluent disinfection exemption would be eliminated. UV disinfection was selected to address the District's future disinfection needs. Fast forward to today, future loading and planning efforts supported another phase of improvements to increase the DAF to 9.2 MGD. Phase 1 Improvements at the SWP anticipated to be completed by 2027 include two new primary clarifiers and the demolition of the nitrification towers along with replacing various equipment and upgrades within treatment processes will serve the District for the next 20 years. The District entered into a Solar Power Purchase Agreement in 2023 for construction of a 2.2 Megawatt solar field at the SWP that will generate 85% of the electrical consumption needs for that facility. CS

Northeast Plant

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SEWER THERMAL:

Can Sewage Be Used to HEAT AND COOL My Building?

BY PETE MULVANEY, CONSOR

The use of thermal energy from our sewer systems to heat and cool our buildings is on the rise. In places as diverse as Denver, CO; Washington DC; King County, WA; and Toronto, Canada; clever building managers are tapping the sewer system as a heat sink and a heat source to meet facility heating and cooling demands. This is done by leveraging mature technologies (heat exchangers and heat pumps) and applying them in somewhat novel ways. This approach is opening up new value streams. For example, sewer utilities can generate additional revenue streams, municipalities can reduce their carbon footprint, developers can market a greener building, and energy providers can create new district-energy opportunities.

The consistent temperature associated with modern sewer systems is what makes sewer thermal exchange so attractive. Think geothermal, where hydraulic fluids transfer thermal energy from a facility to the earth through pipe loops placed below ground – but in lieu of using the earth, we exchange thermal energy with the sewage flow.

The use of the sewer for energy is often referred to as "sewer energy" or "sewer heat extraction." This article uses the term "sewer thermal exchange" (STX) because energy can be transferred to heat and cool a building depending on the temperature conditions and thermal demands.

How Does STX Work?

Sewers maintain an average temperature range of 50°F and 70°F year-round. This consistent and reliable temperature is a boon for energy transfer, as the sewers are generally warmer than ambient in the winter and cooler than ambient in the summer.

To leverage this temperature delta between the indoor ambient temperature and the warm sewer, we need to transfer thermal mass between the building and the sewage, and that requires some equipment. The equipment will be familiar to most building operators: a heat pump, heat exchanger, and screening/filtering. Then to make it work, engineers include civil works, such as a wet well and piping, and electrical engineers plug in the control the system.

When in the "heating mode," the flow of thermal energy is from the sewer to the building, which can be described in five steps:

- A tap in the mainline sewer provides a sewage flow to a wet well.
- A pump moves the flow from the wet well through a screen or macerator to a heat exchanger.
- At the heat exchanger, thermal energy is transferred to a clean thermal fluid.
- The thermal fluid is conveyed to a heat pump.
- The heat pump elevates (or reduces) the temperatures for use in the facility heating, ventilation, and air conditioning (HVAC) system.

The same series of steps are followed for cooling, it is just that the heat pump is cooling rather than heating the hydraulic fluid.

In describing the benefits of STX, I like to start with the wastewater utilities. The owner of a public sewer can (and likely should) be promoting the use of STX because it opens possibilities for new revenue and attracts low carbon development.

At a minimum, tapping fees should be based on the size of the connection between the main sewer and the wet-well associated with the STX. These tapping fees would be levied on the building developer or owner, and can vary by size, so that larger taps, which convey more flow, are more costly than small taps. With an annual renewal fee, STX offers utilities new revenue streams for providing new services. These fees need to be thoughtful so they are meaningful to the utility without discouraging investment or raising the cost of STX delivered services.

> **"A successful STX project requires a match between the source of energy - temperature and flow of sewage - and the building demands for heating and cooling.**

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With low energy inputs and real-world energy heat pump efficiency coefficients between 5 and 7, STX is extremely efficient and thus a low carbon means to heat and cool. Compared to traditional evaporative cooling, STX is also a water winner – just think of all that condensation coming of the rooftop chillers in the summertime. STX simply does not use any potable water in its cooling or heating processes, and thus, when displacing the use of traditional cooling systems, it also saves water and concomitant costs.

Creating incentives or processes to ease the implementation of STX can position the wastewater utility as a leader in climate change mitigation and promote a very resilient climate adaptation. Smart utilities are aligning themselves with the climate and sustainability goals of their municipalities and the corporate operations within their service areas. Offering this low carbon, high-efficiency energy is a great way to attract and retain customers and make City Hall happy with your innovation and positive press – all while being compensated for new services.

The value to the end user is similar to that of the wastewater utility, but with a few additional perks. For example, the size of the HVAC equipment is reduced; sewer thermal systems are typically smaller than traditional HVAC. Even better, because no rooftop equipment is needed, chillers (which exchange heat with the atmosphere) can be eliminated, freeing up high-value real estate; allowing architects to create additional "rentable" space on the roof tops – another value created.

Putting STX in the mix provides end users with more options in the procurement of HVAC services. Many of the STX providers offer heating and cooling as a service through a performance contract, or they can sell the equipment and have a hands-off approach. Further, vendors like Noventa (Toronto, Canada) will bring the capital needed to make the project successful, and a variety of contract types are available to share risks and moderate costs. Fortunately, there is enough competition in the market now to make STX a very competitive alternative to traditional heating and cooling.

> **"As industry professionals and leaders, let's bring this low-carbon solution to our local utility and economy to create new opportunities to live more sustainably.**

Original Equipment Manufacturers (OEMs) that are familiar to the wastewater industry also capture value in the equipment manufacture. The three primary OEMs of STX include:

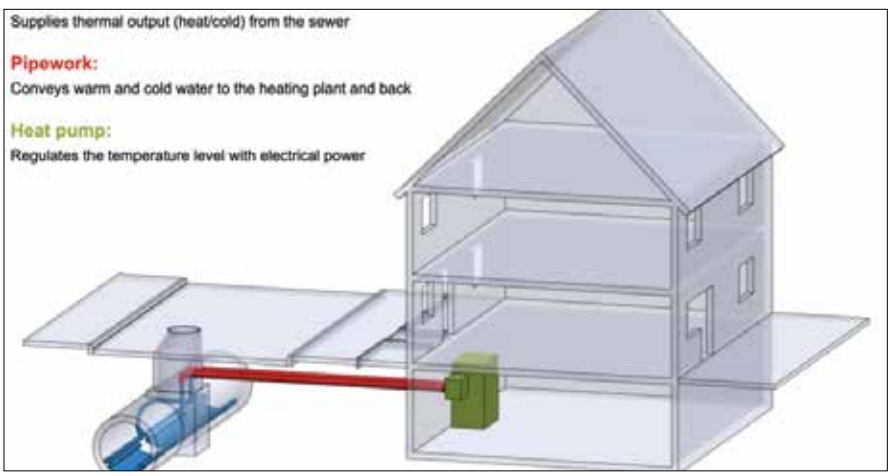
1. **Huber –** a name familiar to most in the wastewater facility world, as leading experts in screening and managing wastewater flows. An OEM out of Germany, Huber has tube sewer thermal heat exchangers with a self-cleaning brush and screw system that keeps the exchange at a consistently high performance. This system is typically paired with their screen as it pulls sewer flows from the wet well.
2. **International Waste Water (IWW) –** manufacturers of a range of modular STX equipment out of Canada. Their Piranha unit is small enough to work on a drain line (i.e., laundry facility), whereas the Shark system is in use keeping the National Western Center comfortable throughout the year. IWW uses a macerator to grind particles small enough to be effective in a plate head exchanger, offering higher efficiency, but more maintenance, to keep at optimal conditions.
3. **UHRIG** – manufactured in Switzerland and very popular across Europe. By placing the heat exchange inside the mainline sewer, they eliminate the need for screenings and a wet well, and the thermal fluid can have a direct exchange between a heat pump and the sewage. This is a simpler system but requires more access to the sewer and poses potential cleaning and hydraulic limitations.

STX is an efficient way to heat and cool building spaces in a low carbon, sustainable manner, and to gain additional value from our sewage... it is, after all, a form of resource recovery. But it cannot be applied everywhere.

Success Factors

A successful STX project requires a match between the source of energy – temperature and flow of sewage – and the building demands for heating and cooling. The source of thermal energy is the incoming sewage flow. In most cases, a continuous wastewater flow of at least 1.3 gallons per second is sufficient for efficient heat recovery, and the wastewater temperature should not fall below 50°F (10°C). The demand comes from the operations of a building, and for most STX projects, we are looking to meet at least 20kW of energy capacity. Typically, the demands are associated with comfort heating and cooling but can also be demand for hot water. When considering the thermal demands for a building, the typical peaks and timing of energy use is evaluated.

If the source and demands align, then the equipment needs to identify the right unit sizes and building footprint. On a technical front, STX success is limited to the potential of heat pumps to raise and lower the temperatures of the thermal fluid, which is limited to the temperature of the sewer. The delta between the sewer temperature and the desired temperature is what determines the efficiency of the system. The technical combinations for



The technology behind a Sewer Heat Exchanger, by UHRIG.

success are varied, and it is likely that most buildings can partially meet their energy needs with the installation of STX, but the final evaluation is financial.

The ultimate drivers of STX adoption are local energy costs and how low carbon solutions are valued. For most decision makers, investing in STX must make financial sense, so in markets where carbon is accounted for and/or energy costs are high, projects can more easily overcome the financial hurdle.

The STX market includes firms like Noventa which provide both capital and expertise to STX projects. Other ways to reduce capital costs include lease agreements and performance contracts rather than capital purchases. Maintenance is another hurdle that is often mitigated in the contract with options to train or operate the system - the equipment itself is not extensive, complex, or novel.

Case Studies in STX Success

The Toronto Hospital

The Toronto Hospital is the largest STX project in North America being installed today. Thermal energy from wastewater flowing through City of Toronto's municipal sewer will supply up to 90% of the hospital's heating and cooling needs, reducing the site's direct greenhouse gas emissions by about 8,400 metric tons each year.

This project is in a dense urban environment retrofitting the hospital without disrupting operations. To access the midtown interceptor sewer, Noventa constructed a 165-ft deep and 35-ft wide wet well, which houses the HUBER Rok4® pumping station. While not required, the STX infrastructure is being built below-ground to avoid occupying any valuable real estate on the hospital grounds.

This project had to navigate utilities, transportation infrastructure, and landlocked facilities, but ultimately found solutions to decarbonize Toronto Western Hospital's campus. While not yet operational, a few of the key energy expectations include:

- 1.8 billion kilowatt-hours of energy supplied over the life of the project.
- 19 megawatts of thermal energy capacity supplied.
- Over 2,400 tons of cooling capacity supplied.
- Over 33,000 MBTU of heating capacity supplied.

This project demonstrates that if STX can be implemented under these conditions, it can likely be implemented in buildings across many geographies and conditions.

The Toronto Western Hospital.

The American Geophysical Union Building (AGU).

The Huber system in AGU.

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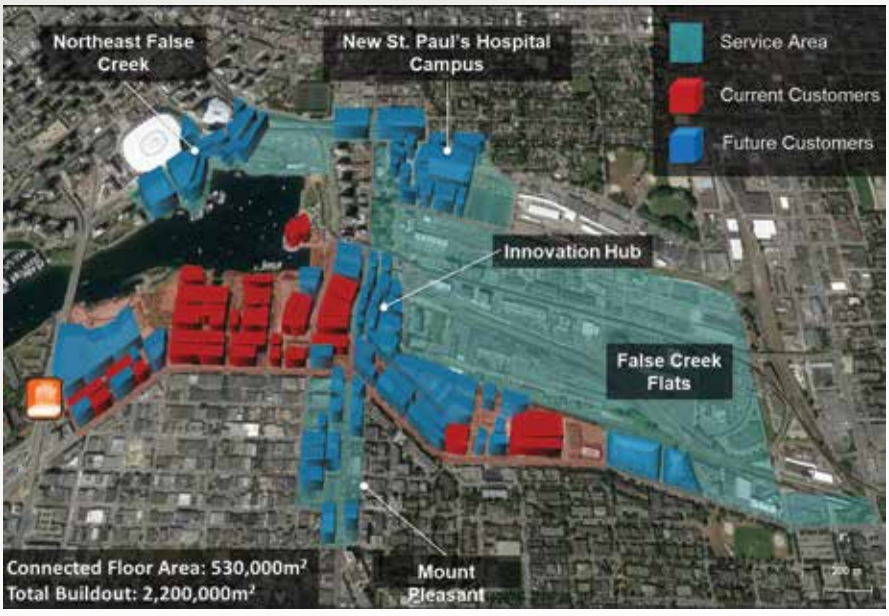

False Creek NEU: Red building are on the 3.2 <W system. Blue are to be added with the expansion.

The American Geophysical Union (AGU) Building

The American Geophysical Union Building (AGU) near DuPont Circle in Washington, DC was the city's first "net-zero" office building. The AGU headquarters uses a Huber Thermwin system, which taps into DC's municipal wastewater system as the heart of its heating and cooling plant. The use of STX at their headquarters reflects their mission of advancing earth and space science by providing technologies that foster a healthy and productive work environment, as well as demonstrate the role buildings can play in reducing carbon emissions that drive climate change.

The engineering team reviewed over 40 alternatives, ultimately selecting Huber as the most appropriate to serve 100% of space comfort heating and cooling.

The Huber system diverts local wastewater to an outside wet well before circulating it inside AGU headquarters. The wastewater is ultimately directed to an exchange system for heating and cooling. When sewer temperatures are cool, the building's radiant cooling system uses water from the sewer heat exchange system to operate in "free cooling" mode, allowing the building's water-to-water heat pump to be turned off. This capability eliminates the need for a cooling tower on the roof of AGU's headquarters and saves a substantial quantity of fresh potable water.

Data on this building and system performance are available through the American Geophysical Union Building website.

False Creek Neighborhood Energy Utility

The False Creek Neighborhood Utility (NEU) in Vancouver, Canada, is a STX utility and demonstrates the scale to which STX can be leveraged when planning beyond a single building or campus to consider larger districts. The NEU currently operates 3.2 megawatts of sewage heat recovery capacity. The sewage heat recovery expansion project is underway to install an additional 6.6 megawatts of sewage heat recovery equipment.

Originally built to provide all the heating for the Olympic Village at the 2010 Winter Olympics in Vancouver, it now provides space heating and hot water to buildings in Southeast False Creek, parts of Mount Pleasant, False Creek Flats, and Northeast False Creek.

The utility has rapidly expanded to serve over 6.4 million square feet of residential, commercial, and institutional space, as of 2021. In accordance with the 2018 NEU expansion plan, new developments located in the False Creek Neighborhood Energy Utility (NEU) service area are required to connect to the City-owned system for space heating and domestic hot water. Developers of new buildings in the service area are responsible for applying to the City for thermal energy service and ensuring the building is designed to connect to the utility. Detailed technical and legal agreements are available to developers, and open for downloading from the False Creek NEU website.

> **The SHARC can be used for both heating and cooling purposes, and it is expected to reduce carbon emissions by 99% compared to a typical laboratory building in Seattle.**

New developments seeking a building permit after September 1, 2019, are required to pay an initial connection levy. This levy is similar to connection fees used for water and sewer utilities and was developed after extensive consultation with industry. As district systems negate the need for buildings to install their own HVAC equipment, the fee is a cost savings for the connected building owner and residents. A few statistics from 2017 show the success of this municipally owned sewer thermal energy system:

- 3,500 tones of CO2 saved in 2017, the equivalent of taking 928 cars off the road
- 46,008 megawatt hours (mwh) energy produced by the utility in 2017
- 32 buildings with 4,686 residential suites Connected to the utility in 2017

South Lake Union Campus

In Washington, King County's Wastewater Treatment Division and Alexandria Real Estate Equities, Inc. have formed a public-private partnership to provide a large STX system that will heat a 1.6 million-ft^2 mixed-use life science mega campus in South Lake Union. The system is expected to come online in 2025.

The project is a significant step forward in King County's plans to develop commercial interest in STX (aka sewer heat recovery). It is also a great example of how utilities can partner with the private sector on innovative solutions to save energy costs and reduce greenhouse gas emissions. In this case, the partnership decided that the IWWS SHARC System is the best fit. The SHARC can be used for both heating and cooling purposes, and it is expected to reduce carbon emissions by 99% compared to a typical laboratory building in Seattle.

Recognizing the untapped benefits of sewer heat recovery, the King County Council authorized the Wastewater Treatment Division to launch a pilot program. In 2020, the Division began accepting applications for three spots in the program for commercial users. Alexandria is the first project to move forward with installation. There are two spots remaining in the pilot program.

Strong Finish

These examples illustrate what is possible through this STX technology, and new possibilities in small-scale applications are opening regularly.

Organizations are catching on. For example, the Minnesota Pollution Control Agency has established policies to evaluate STX proposals and the Washington Suburban Sanitary Commission (WSSC) has completed evaluations of its system for the development of STX and many others. As industry professionals and leaders, let's bring this low-carbon solution to our local utility and economy to create new opportunities to live more sustainably.

I encourage you to commit to talking with a client, supervisor, or policy maker about the opportunities for STX in your community. And to any sewer professional, let's make a point to think about how this can affect the design and construction of our sewer and wastewater systems.

King County is actively soliciting two additional STX projects... that is two more solicitations than we have in the Central States – Let's change that! CS

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MIDWEST STUDENT DESIGN COMPETITION WINNER

WEF Wastewater Category: Marquette University

Monday, April 8, 2024, marked CSWEA's 5th annual Midwest Student Design Competition (MSDC). Teams from across the region came together at the Monona Terrace Convention Center in Madison, WI to present their project designs in three categories: Water Environment Federation (WEF) Wastewater, WEF Water Environment, and Global Water Stewardship. Travelling from Milwaukee, WI, a four-person team represented Marquette University in the WEF Wastewater category, consisting of David Zeller, Jess Calteux, Keagan Morgan, and Zach Molczyk. The project they presented served as the capstone to their civil engineering education at Marquette and allowed them to combine their diverse academic focuses within their field of study. Their task was to integrate the novel wastewater biosolids handling technique of pyrolysis into an existing water reclamation facility in Milwaukee County. While Jess determined the ins and outs of the environmental considerations and capacity demands of the proposed facility, David and Keagan used geotechnical data to develop the structural and transportation aspects of the project, and Zach tied it all together with a construction summary and cost analysis. Over the course of three months, the team benefitted from leveraging each other's expertise, which was eventually recognized at the CSWEA MSDC as they took home first place in their Member Association for the WEF Wastewater category.

THE PROJECT

Milwaukee Metropolitan Sewerage District (MMSD) is the agency responsible for the wastewater treatment of most municipalities within Milwaukee County, and, as such, utilizes two facilities to achieve capacity requirements. One of these is in Oak Creek, WI (referred to as South Shore Water Reclamation Facility [SSWRF]) and the other is in downtown Milwaukee (referred to as Jones Island Water Reclamation Facility [JIWRF]). Between these two facilities are a series of pipes that enable the inter-plant pumping of sludge and wastewater. Currently, the JIWRF manufactures a product from wastewater biosolids known as Milorganite, which is marketed as a fertilizer and sold in stores around the country (as well as in Puerto Rico).[i] The production of Milorganite exemplifies land application as a biosolids handling method, which is a traditional and common practice across the world. This system helps MMSD achieve their current sustainability goals, which are set to evolve in accordance with their 2035 Vision and 2050 Facility Plan documents.[ii, iii]

DEFINING THE ISSUE

Contaminants of Emerging Concern (CECs) are classified as contaminants that are currently unregulated but pose health risks to human beings as well as the environment.[iv] CECs may include pharmaceuticals, microplastics, or other forms of chemical or biological contamination. One type of CEC is per and poly-fluoroalkyl substances (PFAS), a family of forever chemicals commonly found in nonstick cookware, waterproof materials, fire retardants, and a plethora of other materials and substances.[v] As a result of their pervasiveness throughout society, many species of PFAS end up in wastewater, and, by extension, in the biosolids generated through wastewater treatment. Due to their contamination with PFAS and other CECs, there are some regulations that currently prohibit the land application of biosolids.[vi] As research on the health effects of PFAS on human beings continues to evolve, it is likely that these regulations will become not only more stringent but also more common.

Pyrolysis is an emerging technology whereby substances, like wastewater biosolids, undergo anaerobic heating between 400°C to 900°C to reduce contamination.[vii] Research supports the claim that pyrolysis is capable of reducing or eliminating many forms of contamination, ranging from biological to chemical, including many CECs, like microplastics and PFAS.[viii] For this reason, it is a very promising method for biosolids handling.

The pyrolysis process generates products in three phases.[ix] The first of these is the solid phase, otherwise known as biochar. Through the research conducted by the team, it was found that due to biochar's high nutrient content, it can be utilized as a soil amendment in land application, but it can also be used for a variety of other purposes.[x] For example, it can undergo further processing and be utilized as a sorbent for water pollutants.[xi] Additionally, it can be leveraged as a mechanism for carbon sequestration due to its high carbon content.[xii] Biochar can serve as a substitute in traditional uses of charcoal, and it can also replace concrete aggregate in some contexts.[xiii] Both of these applications reduce the need to source less sustainable materials for these uses, which reduces the carbon cost associated with charcoal or concrete aggregate production.

The liquid phase of pyrolysis products is bio-oil, which is more or less a nuisance product, but which can be eliminated via thermal oxidation conversion to the gaseous phase.[xiv] The gaseous phase product is referred

to generally as "syngas" and is produced through the non-incineration combustion that takes place in a pyrolysis machine's anaerobic environment.[xv] Syngas is an extremely useful resource, as it serves as a source of renewable energy.[xvi] In fact, many pyrolysis technology manufacturers design their systems to capture enough syngas to completely offset the energy costs of their equipment and to even capture excess energy, which can be redirected to help power other machinery in the treatment train, such as the dryers.[xvii]

PROBLEM STATEMENT

Bearing in mind the existing biosolids handling method utilized by MMSD, and with an eye on the impending regulatory changes that may disrupt the field over time, the Marquette team sought to augment the treatment train at SSWRF to increase the plant's capacity while remaining aligned with future sustainability goals. Ultimately, the team asked, "How can MMSD incorporate alternative biosolids handling processes into the wastewater treatment train at the SSWRF to meet capacity needs while capitalizing on the resources generated by wastewater treatment to achieve future sustainability goals?" In addition to choosing pyrolysis of biosolids as the ideal biosolids handling method, it was necessary to determine the facility layout, which considered design alternatives for the proposed treatment train, the facility's structure, and the facility's transportation plan.

PROPOSED SOLUTION

Treatment Train

To design the proposed pyrolysis treatment train, first it was necessary for the team to understand the existing system. Jess Calteux headed this aspect of the project's research and developed a nuanced understanding of MMSD's facilities in the process. As it runs today, SSWRF ships the Waste Activated Sludge (WAS) generated on-site to JIWRF, in downtown Milwaukee, to undergo further processing before it is used to manufacture Milorganite. Meanwhile, the primary sludge generated at SSWRF is kept on-site, where it undergoes digestion, dewatering, and drying – after these steps, the biosolids produced may serve as a lower-class soil amendment or may simply be landfilled.

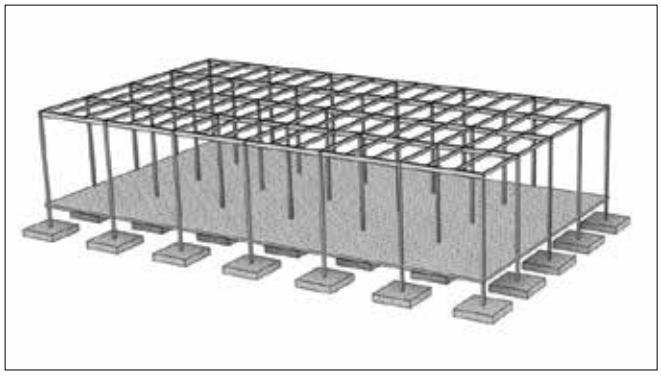
A couple of potential areas for improvement within this existing system are the contamination levels of the biosolids as well as the final application of these biosolids at the end of the treatment train. The biosolids produced from the sludge at SSWRF may still contain unregulated CECs, like PFAS. As regulations on these types of CECs continue to tighten, it may be necessary for MMSD to reinvent their current system to meet the new requirements. The alternative to increasing decontamination efforts would likely be landfilling the biosolids instead of land applying them. This is an unsatisfactory approach to handling a resource which is rich in nutrients and carbon, and which could be recovered and repurposed to a wide variety of beneficial contexts. Finding a way to leverage the nutrient potential contained within the biosolids generated at SSWRF would enable MMSD to capitalize on this very valuable resource.

In order to meet both the team's goals as well as MMSD's sustainability goals, the team designed a pilot-scale pyrolysis treatment train that would be capable of handling 25 dry tons of biosolids a day. The proposed treatment train would begin with combining the digested primary sludge and raw WAS generated at SSWRF in an equalization tank (the tank was suggested to be a repurposed anaerobic digester that already exists on site). This would reserve the WAS at SSWRF, which would help to reduce the capacity demands at JIWRF. Next, the mixed sludge would undergo thickening, both via gravity belt thickeners and belt filter presses, then drying. These steps would prepare the biosolids for pyrolysis, which would convert them into biochar – a nutrient and carbon rich substance that retains many of the resources generated in the wastewater treatment process.

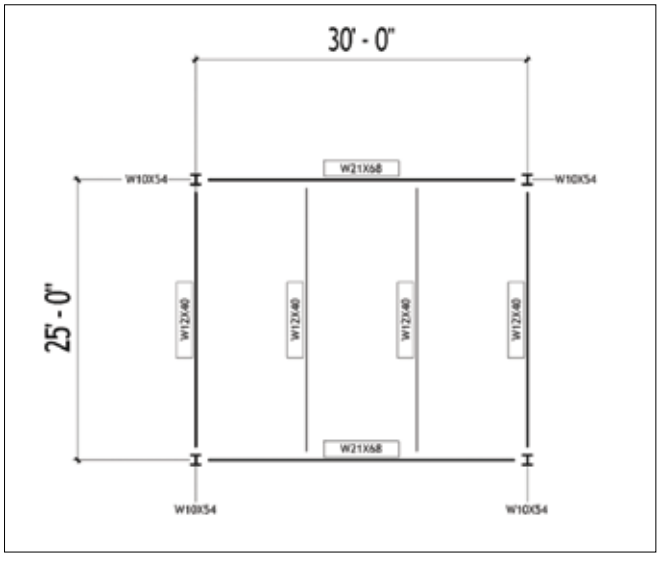
In order to design this treatment train, it was necessary to consider the existing data on the moisture content of wastewater sludge and biosolids at each treatment step, as well as general capacity specifications of the required equipment. Determining the quantity and approximate size of the machines needed for each phase of treatment enabled the design of the structure housing the proposed pyrolysis treatment train.

Structural

Staying on suit with the project's environmental goals, the structural team of David Zeller and Keagan Morgan wanted to emphasize sustainability in the building designed to house the treatment train. To do this, a typical bay was designed assuming simply supported beams for the building based off ASCE minimum design loads and Wisconsin Building Code deflection limits. The bay was then outfitted with three different material alternatives, which were analyzed based on their amounts of upfront carbon (carbon produced during the material fabrication process), measured in terms of CO_2 equivalents found via the most recent Carbon Leadership Forum Material Baseline Report.[xviii] Alternatives that were considered were a complete



The structural framework of the facility.

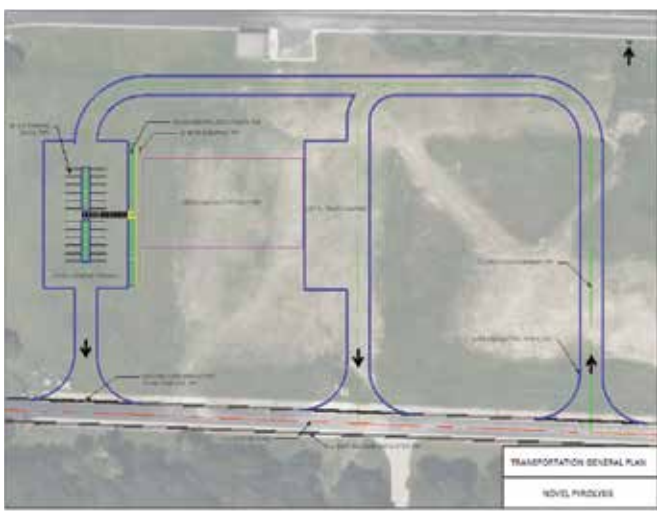


A typical bay.

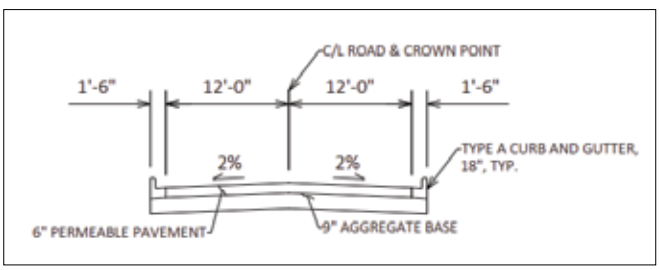
reinforced concrete building, a steel framework with concrete tilt-up wall panels, and a steel framework swapping the concrete tilt-ups for cross-laminated timber walls.

Upon calculating material quantities of CO_2e for each of the three alternatives, it was found that the third alternative with the structural steel framework and cross-laminated timber walls had the lowest amount of upfront carbon. Although the price was higher than the other alternatives, the team believed that selecting the material with the lowest upfront carbon was important to the scope and the goal of a sustainable project. A cross-laminated timber wall manufacturer was contacted to ensure that the material would be able to withstand the demands associated with housing a pyrolysis facility, and the team was reassured through their research that the ambient temperature of the pyrolysis equipment would not exceed the threshold of the cross-laminated timber walls.

Upon selecting the material and in coordination with the treatment train design, the building size and footing plan to hold and support the entire treatment train was determined and the typical bay was duplicated to create the framing plan. The preliminary steel W-shapes were further analyzed with the final geometry utilizing MASTAN2, a MATLAB structural analysis application. As horizontal wind loads were applied, the team had to consider P-Δ effects in the analysis via second order analysis. Second order analysis considers stability of a structure under deflection, and the team had to ensure that the members were able to sustain the loads applied. Analysis of the fixed beam connections was also achieved using this software. After analysis, some members were increased in size to account for the higher loads found under second order analysis.



The site layout for the facility.



Proposed Typical Section of Roadway

The final portion of structural design was designing the connections between floor beams, girders, and columns. Many of the floor beams were connected to girders via simple bolted/welded shear plate connections to continue along with the simply supported assumption. For stability, floor beams connected to columns were required to be fixed connections, in which a plate was bolted to each flange and welded to the column. All of the girders had to be designed as fixed connections for the stability of the structure, and a similar but stronger flange plate connection was designed to accommodate this need.

Transportation

Moving toward the transportation aspects of design, the team's priorities when designing the trucking/parking plan were maximizing pedestrian safety and further improving the site's overall sustainability. The first alternative in this design process was the continued usage of existing lots on MMSD's South Shore Campus. While this alternative was the most cost-effective, it was quickly decided against as it contained the longest walking distance for pedestrians. Another alternative consisted of designing a new lot surrounding the structure's footprint. The parking plan and trucking area were placed on opposite sides of the facility to minimize contact between building employees and the estimated 20 trucks that would be entering the site each day. Finally, to emphasize the project's environmental goals, a third alternative of an updated parking/trucking lot was designed with permeable pavement and green space.

When comparing all three alternatives, the third alternative containing green space and permeable pavement was found to be the safest and most sustainable overall. Including permeable pavement allows for reduced stormwater runoff while providing the same strength as a non-permeable paved surface. Incorporating green spaces within the parking lot helps further diminish water runoff and assists with drainage in the area. These green spaces are filled with native plants to collect stormwater, improve the overall aesthetics of the lot, and create a welcoming area for visitors and employees.

To maximize pedestrian safety, the team followed the WisDOT standards for both roadways and parking lot design. For example, a 6' wide typical sidewalk was positioned in front of the facility footprint with an 8' wide crosswalk leading up to it, which is wider than the Wisconsin standard (5' and 6' respectively). These dimensions were selected so that visitors would feel more comfortable entering the facility. 20 90° parking spaces (18' x 9') were additionally incorporated into the lot to provide the maximum amount of space per vehicle. The trucking lot on the east side of the facility contained a design width of 72', allowing several trucks to navigate the area at the same time.

The final portion of the transportation design was to determine the type of pavement to be used for each lot, as well as the entry and exit routes. As previously mentioned, the selected alternative was to be designed with a permeable pavement. When analyzing possible loadings from the large tanker trucks that would be using these roads, a pavement thickness of 6" with an aggregate base of 9" was decided upon. Along the entry/exit routes a standard 2% grade, as well as a typical 18" curb and gutter, were utilized throughout. With the transportation plan, it is important to note that construction on the existing roads on MMSD's South Shore location is not required.

Construction

In order to bridge the gap between theory and practice, it was necessary for the team to plan out the construction of the facility. Zach Molczyk was responsible for this phase of the project and took on the tasks of assembling a Gantt chart to map the phases of construction as well as building a cost estimate for the facility. When assembling the Gantt chart, items such as the site logistics, design of the building, and size of scope were all kept in mind. The

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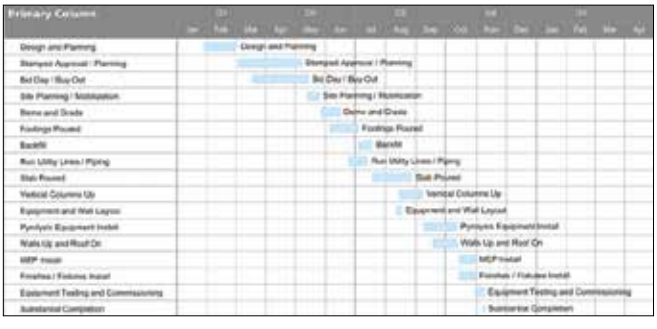
hypothetical start date of construction was January 29, 2024 – the day the team received the project. Using a relatively conservative estimate to predict the time that design, permitting, and buy out would take, it was determined that site planning and mobilization would occur by May 13, 2024. Again, being conservative with the timeline, the project was estimated to be substantially completed by November 8, 2024.

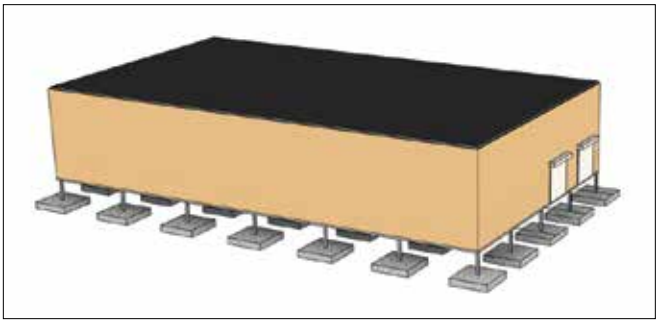
With the project being slab on grade, the only foundation work that needed to be considered into the timeline were the footings. One of the biggest hurdles within the timeline was the installation of the pyrolysis equipment, due to the complexity and rarity of the equipment. As of March of 2022, only three fully operational pyrolysis facilities were running in the US. The specificity of the labor required to properly install this equipment was one aspect that increased the length of the project's implementation, as well as the long lead times for these one-of-one machines.

Another important aspect to consider was the need to maintain full functionality of the MMSD South Shore plant. An example of this was found in the reconversion of an existing aeration basin into an equalization tank to combine the flows of the digested primary sludge and the WAS. Once combined, this sludge will go through the new facility to be digested, dewatered, dried, and pyrolyzed. With the amount of back and forth required for this conversion, it will be necessary to run lines from the pyrolysis facility to the existing aeration basin, across one of the facility roads. Doing so cannot inhibit the operation of the existing treatment train, as MMSD's SSWRF services a large area in Milwaukee County that includes hundreds of thousands of people. Any obstruction or inhibition of the current treatment train could have devastating consequences for the MMSD processes.

In terms of the estimated cost for this project, various research was done on the price points for the existing equipment at MMSD's SSWRF, such as the gravity belt thickeners, belt filter presses, and dryers. Combined with generally specified data retrieved from various pyrolysis equipment manufacturers' websites such as Bioforcetech, KORE Systems, and PYREG, it was estimated that the costs for the pyrolysis process equipment would be about $46,000,000.[xix,xx,xxi] Using 2023 Wisconsin labor rates found on the US Bureau of Labor Statistics website, it was estimated labor would cost $583,400 given an average construction crew of 15 people.[xxii] In addition to demolition, construction, and paving cost considerations, the overall price on the project was estimated to be about $47,700,000, with the majority coming from the price of equipment.



Project Gannt Chart.



The final rendering of the facility.

KEY TAKEAWAYS

It is due to the sustainability of the pyrolysis process that it is such an attractive biosolids handling method for achieving the team's design goals as well as MMSD's future sustainability initiatives. Generating marketable biochar aligns with MMSD's current practice and maintains a forward-thinking perspective on the future viability of the existing biosolids handling method. By incorporating other aspects of sustainable design into the structural, transportation, and site layout plans, the team was able to create a project solution that would increase capacity at the MMSD treatment facilities while reducing upfront carbon costs for the structure, enhancing pedestrian safety, and contributing to the management of stormwater runoff on site. Furthermore, the team's construction considerations sought to address the unique challenges that implementing a novel wastewater treatment train would create. By incorporating the long lead times required to order the equipment and ensuring conservative time estimates for the construction of the facility, the construction schedule outlined a realistic approach to implementing this project's design. CS

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GLOBAL WATER STEWARDSHIP

GWS Update

Annual Service Trip

By Sarah Guzman, GWS Co-Chair

Another August gone, another GWS trip on the books. This year, the 2024 Central States MSDC winners from the University of Marquette, along with nine amazing volunteers, ventured on the annual GWS service trip.

We started our amazing annual trip to Costa Rica on August 21, 2024, when all the volunteers met at the San Jose airport and traveled for 6+ hours to the community of Santa Teresa. There, we met with our partners, the Nicoya Waterkeepers, who are an international non-profit organization that promotes water conservation in Santa Teresa. On Thursday, we visited several possible locations for the PTAR design for the 2025 MSDC. On Friday, GWS had the amazing opportunity to present our mission, vision, and past experience to the Santa Teresa community leaders. The Marquette students also had the opportunity to present their design to community leaders to give them an overview of what they can expect for their community.

Saturday was a free day. Where different volunteers enjoyed the beach, others went to Tortuga Island and had the amazing experience to swim in a bioluminescent coast, and another group hung out in the community. This break was very much needed ahead of our Sunday trip.

On Sunday, we traveled from Santa Teresa to La Fortuna, which was approximately 5 hours of travel. In La Fortuna, we met with Doña Nidia Vasquez, Executive Director of La Fortuna Asada. During our visit,

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"There is so much more that we want to do, and we are hoping to keep expanding GWS's footprint in order to keep educating and sharing with others the importance of sanitation and clean water."

GWS awarded her US$1,500 for her support and previous donations to AguaFest. Doña Nidia has been one of GWS strongest supporters since day one and we were extremely proud to give back a bit.

After La Fortuna, we drove to Santa Teresa. On Monday, we had the busiest day of the trip. On this day, GWS split into two teams, one for the biogarden and one for the educational activities with the students. The biogarden construction went very smooth and it was finalized within five hours. We had more 350 students participate in the student activities and everyone had a blast. To finalize an amazing and busy day, the Marquette students presented their project to the Horquetas community. This ended with a great discussion. Following the presentation, GWS and the Horquetas ASADA group went to have a farewell dinner, and everyone had a good camaraderie time.

On Tuesday morning, everyone was tired and packed to head back to San Jose. It was a three-hour drive full of chatting and reminiscing about a time that will always be in our hearts. In 2025, we will be back to Santa Teresa and we will be visiting the next Community of Choice winner. Until then, stay tuned on our next adventures.

It is amazing how months of planning go into making this a successful week. There is so much more that we want to do, and we are hoping to keep expanding GWS's footprint in order to keep educating and sharing with others the importance of sanitation and clean water. If you or someone you know might be interested in supporting GWS cause, do not hesitate in reaching out.

If you want to learn how it went or get involved in any of the GWS initiatives, please reach out to Sarah Guzman and Joe Lapastora at *chair@globalwaterstewardship.org*.
Pura Vida! CS

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GLOBAL WATER STEWARDSHIP

GWS 2024-2025 Problem Statement

Santa Teresa, Costa Rica

Santa Teresa Beach, Santa Teresa, Costa Rica.

Project Understanding

- **Location:** Santa Teresa, Costa Rica.
- **Population Estimate:** 4,537 (Year 2024) ***Source – (AYA, 2024)***
- **Number of Water Services:** ***Source – (AYA, 2024)***
  - Residential – 1,225 services
  - Rental Houses – 59 services
  - Hotels – 49 services
  - Restaurants – 42 services

- **Water Usage:** ***Source – (AYA, 2024)***
  - Average Monthly Consumption – 62,075 m^3
  - Estimated Average Monthly Consumption Per Commercial Property – 50 m^3
- **Annual Average Precipitation**: 3,500 mm *[Source – Climate-Data.org]*
- **Average Temperature:** 24.4 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:** 0.25 Liters/sec/km
- **Typical Influent Characteristics:** ***Source – (AYA, 2024)***
  - 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
- **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 a collection of small coastal villages, with Santa Teresa, Costa Rica being the most prominent and centralized. Santa Teresa and its neighboring villages are in the province of Puntarenas, or Western Costa Rica, and are about 100 miles west of the capital city, San Jose. The community extents include the coastal strip between Cabo Blanco Absolute Nature Reserve and the Caletas-Ario Wildlife Refuge, which includes the villages of Malpaís, Carmen, Santa Teresa, Hermosa, and Manzanillo.

This community was originally comprised of small fishing villages, which relied on fishing, agriculture, and cattle ranching for income. Today, they largely rely on tourism, with an estimated 200,000-300,000 visitors per year. Population data can be found on Costa Rica's social security agency website, Caja Costarricense De Seguro Social. Use your best engineering judgment regarding projections.

Almost every home and business located within Santa Teresa is connected to a private septic tank. Recent studies suggest 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 Nicoya Waterkeepers, AyA, and the local utility, 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 include one (1) collection system design and also specify outfall/discharge location of the treatment plant's effluent.** 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.

Figure 1: General community extents of Santa Teresa and surrounding villages.

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.

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 US 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.

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 may not be.
9. Consider simplicity (less O&M the better) in design whenever possible.
10. It is recommended that the teams design for the year 2045 (20 years). Provide justification with any variances. Consideration should be given to future plant process expansions beyond 2045 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. Three (3) alternate treatment processes.
    c. Designate one (1) of those three (3) proposed treatment processes as the recommended treatment process.
    d. Clearly state the capital cost estimate for full construction of the WWTF and accompanying collection system.
    e. 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. CS

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