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2016 Superior Achievement in Environmental Engineering and Science Winner,

Dr. Daniel B. Oerther, P.E., BCEE

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FEATURES

DEPARTMENTS

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PRESIDENT'S PAGE

Howard B. LaFever, P.E., BCEE

JUST DO IT: MENTORING YOUNGER GENERATIONS

Once again, I find myself looking out of my office window at a partial blue sky with no snow wondering what happened to winter and if spring is just around the corner. (This is the least amount of snow that I've ever seen in Upstate New York). With temperatures predicted to be above normal (for mid-March) for the next few days, this is not good for maple syrup making! While it continues to be spring-like, I will know that spring is truly here when the wild leeks pop up from the sugar maple forest. Despite abnormal weather, I have made 30 gallons of the delicious liquid gold we call maple syrup, most of which I plan to share with others, including bringing some to the Board Meeting following the 27th Annual 2016 Excellence in Environmental Engineering and Science Awards, Luncheon and Conference (E3S), which will be held at the prestigious National Press Club in Washington, DC on April 14th.

Before moving on to the main theme of the President's Page, I would like to thank all the organizations that submitted an entry and all the volunteer judges, and I offer a hearty congratulations to the winners of the Grand Prize, the Honor Award, and the Superior Achievement Award!

In addition to the project awards and the technical presentation by the Superior and Grand Prize winners, the E3S provides a forum to recognize the contribution of members to the Academy in the field of Environmental Engineering & Science. Descriptions of the awards and background are provided later in this journal, so I won't go into detail here. Congratulations to all recipients.

Now on to my main theme – *Just Do It: Mentoring Younger Generations*. As part of my write up for the election in 2014 for Vice President of the Academy, I pledged to help strengthen the growth in membership with an emphasis on younger members and students. To my surprise, I found from the Academy's website that we have in place a Young Professional Program and material on "How to Start a Student Chapter."

I reread Burk's article in the winter 2014 edition of *Environmental Engineers & Scientists* entitled, "Do You Know Who These People Are?" The article is about a call Burk received, and future conversations, from a group of college students from Johns Hopkins University interested in forming a student chapter. Some of his comments from these conversations were:

- "They were interested in pursuing a career that enables them to do something that would have a positive impact on the environment." (Sounds familiar to when I was on the "soap box" in the early 1970s talking about upgrading and protecting our water resources and the need to recycle – Earth Day!)

> "Take positive action to tell the young professionals and college students about the Academy, explain why you are Board Certified and why it is important to you.

- "A desire to be a change agent for the environment and the need to better manage our impact on the environment as the world's population continues to grow."
- "It's all about passion, commitment, and determination."
- "They are looking to stand on the shoulders of the current generation of environmental engineers and scientists as they go forward in their careers. They want to be able to combine education and passion with a solid foundation in which to build."

Burk's final paragraph was a challenge to all of us members: "We are the ones with the obligation to create an environment that enables the next generation to succeed. That is a consistent endeavor and considerable responsibility because the issues the next generation will address are arguably more difficult than those of the past 50 years."

So with that challenge, I ask all of our members to "Just Do It." Take positive action to tell the young professionals and college students about the Academy, explain why you are Board Certified and why it is important to you. I encourage you to make presentations at a student chapter, or better yet, help start one. On the following page is a list of existing student chapters and others that are in the works of being formed. As an example, members of our firm recently reached out to the group at Cornell University to help with networking, speaking, and

Existing Student Chapters
California Polytechnic State University
California State University, Fullerton
Columbia University
Cornell University
Florida International University
John Hopkins University
King Abdullah University of Science & Technology
Lehigh University
Northwestern University
Ohio State University
Stevens Institute of Technology
Texas A&M University
University of California, Irvine
University of Colorado, Boulder

In the Process of Forming Chapters
Georgia Tech
University of Miami
University of Wisconsin
Vanderbilt University

mentoring. As part of a technical Symposium I am organizing here in Cazenovia, New York (the day before our Board of Trustees Meeting on October 21, 2016), I am encouraging students from Cornell University, SUNY-Environmental Science & Forestry, Syracuse University, and Colgate University to attend in order to network with and mentoring the next generation of environmental engineers and scientists.

As another example of "Just Doing It", when I talk to our state representatives, I encourage them to become active in local student chapters, help start a chapter, and to encourage other local Academy members to continue to be the shoulders for the next generation to stand on and learn from.

Much like the maple syrup that I make and mostly share, we as members of the Academy need to share our knowledge, expertise, professionalism, and enthusiasm with the next generation. We can do this in a variety of ways, including but not limited to, networking, mentoring, encouraging, and teaching others about the creative ways that environmental engineering and science positively impact our lives now and in the future.

In closing, if we all "Just Do It" and do our part with the younger generation so the "Best of the Best" will rise to the top (and become Board Certified), then I can continue to make and share the sweetest syrup in the world with generations to come. In addition, I will sleep better at night knowing the "Best of the Best" will be working on the pressing problems of our times, including climate change, thus ensuring that my beloved sugar maple will survive! A

ACADEMY NEWS

2016 WHO'S WHO AND RESOURCE GUIDEBOOK

BCEEs, BCEEMs, BCESs, and AAEES Members: The 2016 editions of *Who's Who in Environmental Engineering and Science* and the *Environmental Engineering and Science Resource Guidebook* are currently in production and will be available mid-June. Digital versions are automatically sent via email to all members, but you must opt in to receive hard copies. If you received hard copies of these publications last year, then you are already opted-in and will automatically be mailed the print editions. If you only received the digital versions and would like to opt in for the hard copies, please email YMoulden@aaees.org by May 31st with your request.

3,2,1 ACTION!

In the coming months, we will be updating our current "Value of Certification" video. Since we highly value the opinions of our Academy members, we are asking that you take a moment to email us any ideas or suggestions you may have regarding the contents of a new video. This type of marketing piece is an extremely effective tool in getting our story out there and communicating the impact certification has on one's career. Please send any feedback to Marisa at MWaterman@aaees.org.

SHINING THE SPOTLIGHT ON YOU

The Academy has special features on its website and in electronic and print publications in recognition of you, **the Academy's honored professionals**. If you want to toot your own horn, or someone else's, here are two ways to do it:

Volunteer of the Month

Part of the Academy's success lies with the selfless work of its members. Do you know of a member that always goes above and beyond? Then send a nomination for **Volunteer of the Month**. Email the 350-word nomination to YMoulden@aaees.org.

Side Tracks

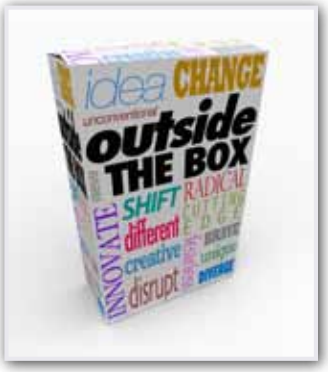
Interested in knowing about the extracurricular activities of your fellow Academy members? Or do you have fun (or possibly funny) stories you'd like to share? Side Tracks is intended to provide a vehicle for learning about the outside interests of your colleagues. Email your submissions to YMoulden@aaees.org for a chance to be featured in a future issue of *Environmental Engineer and Scientist.*

EXECUTIVE DIRECTOR'S PAGE

Burk Kalweit

THE IoT AND THE ENVIRONMENT

NEW WAYS OF THINKING AND NEW WAYS OF DOING



I look forward to doing the spring edition of my comments for the "*Environmental Engineer and Scientist* Magazine" because of the variety of remarkable technologies and solutions to thorny problems that we have had entered into our annual competition, the results of which we publish in this issue of the magazine. I'm always amazed by the ingenuity and creativity of the people who end up being our award winners. From what I've seen and heard, our labeling the winners with the title 'best of the best' is not an overstatement. A part of the Academy's task in this endeavor is to make sure we are publicizing the event and spreading the word about the awards to our community of sponsoring organizations, as well as to the organizations our members work for. There are some great stories being told here and we want to make sure the word gets out to a national, and in some cases, global audience. Thankfully, I have no role to play in making the determination of which project wins and which are the first runners-up.

At the first E3S Conference I attended, I had an interesting conversation with one of the Academy's Trustees about the awards and the nature of the technology that was being selected for top prize-winners. It made me think of one of the seminal works on technology and innovation of the past 30 years or so. It was written by Harvard business school professor Clayton Christensen and entitled, "The Innovator's Dilemma."

The book tracks the path of innovation in a handful of different industries, focusing on what Christensen called the innovator's dilemma when faced with 'disruptive technologies.' This dilemma had to deal with the fact that new technologies were constantly being introduced across the industries studied and the new technologies were responsible for a sea change in the economics of the sector under analysis. Rapid technological change made it possible to increase the functionality of a desired product at a fraction of the cost of what was available in the existing market.

One example provided was of the disk drive industry in the United States. The dilemma being faced by disk drive manufacturers was that in a rapidly changing technical environment, existing producers had to introduce new products that effectively cannibalized their existing product lines. The choice they had was one of staying at the leading edge of technology and undercutting their existing products, or sticking with their existing product lines, even as competitors were beginning to nibble away at their customer base. This is where the term *disruptive technologies* came from. In the disk drive industry, it was not unusual to have the next generation product deliver something like 10 times the storage space for the same price as the existing product lines.

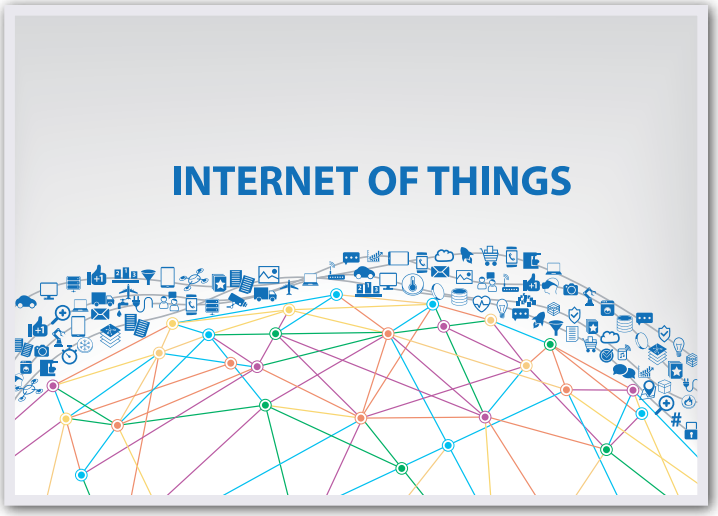
Getting back to the conversation I had with the Board of Trustees member, the question I had for him was, "are there any potentials for disruptive technologies in the environmental sector as the Academy understands it?" Part of this discussion emanated from the fact that the Academy had just put out a special edition of its magazine celebrating the one hundred year anniversary of the activated sludge process. The obvious question here is '*is that the best we can do*'? I personally can't think of any other industry where the core technology being employed is 100 years old.

Well, part of that has to do with the fact that I really can't say I'm qualified to judge the situation. In fact, I think it's pretty obvious that anything that has been around for 100 years and is still a core technology must be pretty darn good. I also know that people working in this area are continually pushing the boundaries of the existing science and engineering technology, and also developing solutions that are both creative and effective.

So, coming full circle, I am left to conclude that the environmental sector is not a place where we are likely to find the application of disruptive technologies that are driving new and game changing approaches to dealing with the processes and issues that today's environmental engineers and scientists deal with. Rather than thinking well outside the box and coming up with new-to-the-world approaches, I have to understand the constraints of the situation and the fact that incremental change over the course of many, many years may well have the same impact that would result from some truly disruptive technologies in a much shorter time span. That's just the way it is.

But, hold on a minute. I can't let this go that easily. How about we introduce a new element to the equation and see what that might do to the environmental world as we know it? I don't know for sure, but I imagine that many of you have heard of the Internet of Things, or IoT, as it is sometimes abbreviated. I personally have been on the trail of the IoT for the better part of 10 years now, following its rapid deployment in certain areas, and the development of significant potential applications in many others. Before we dive too deeply, let's slow down and absorb the following definition which comes directly from Wikipedia.

The Internet of Things (IoT) is the network of physical objects—devices, vehicles, buildings and other items—embedded with electronics,



software, sensors, and network connectivity that enables these objects to collect and exchange data. The IoT allows objects to be sensed and controlled remotely across existing network infrastructure, creating opportunities for more direct integration of the physical world into computer-based systems, and resulting in improved efficiency, accuracy and economic benefit. When the IoT is augmented with sensors and actuators, the technology becomes an instance of the more general class of cyber-physical systems, which also encompasses technologies such as smart grids, smart homes, intelligent transportation and smart cities. Each thing is uniquely identifiable through its embedded computing system, but is able to interoperate within the existing Internet infrastructure. Experts estimate that the IoT will consist of almost 50 billion objects by 2020.

I did a little research over the course of the last couple of weeks to see what was happening in the environmental sector as it related to the Internet of Things. I didn't get very far into the research, but that's probably because I didn't find very much. In addition to not finding very much, what I did find had a different spin on things than what I expected. There was a reasonably good piece in Wired Magazine that talked about the impact of the IoT on the environment. But its environmental impacts consisted of substituting the ability to connect with remote sensors for having to travel to a site to gather data. Hardly an exciting application.

What was missing was a perspective on the opportunities to manage environmental systems through the use of the IoT. When we say manage systems, we are talking about both natural systems and man-made systems. Being able to tap into system operations and activities in real time will make us so much smarter about what's going on that it absolutely boggles the mind. The potential is there to do things that we only dreamed of 10 or 15 years ago. And harkening back to where this article began, let's think about disruptive innovation for disruptive technologies in the application of such systems to the existing environmental infrastructure. Where the disruptive comes in is that we suddenly have capabilities that enable new business models and open up the entire world to connectivity and the ability to respond to inputs and outputs from untold thousands or untold millions of devices .

That sounds a bit nebulous and pie-in-the-sky, I have to admit. So let me give you a simple example of what the Internet of Things can do, and has done. How many people are aware that the IoT has enabled General Electric to get out of the business of selling jet aircraft engines? If you're familiar with that industry, or at least familiar with major players, you probably are aware that they have significantly reworked their business

> "The Internet of Things (IoT) is the network of physical objects - devices, vehicles, buildings and other items - embedded with electronics, software, sensors, and network connectivity that enables these objects to collect and exchange data.

model to one in which they lease engines to the party buying an airplane. They do not want to sell aircraft buyers the engines that go with the airframe. Instead, through a very clever use of the IoT, GE offers its aircraft engine customers a cradle-to-grave package of services that its engines provide. This includes a complete package of maintenance and repair under what is effectively a universal warranty that customers cannot avoid.

You want an engine? The way you get it is lease it from GE. They will take care of that engine for its entire lifespan and the only requirement on the leasing party is that when asked to bring it in for service you will do so under the terms and conditions of the lease agreement. GE makes this line of business work because, through its own IoT applications, it tracks every engine across its daily activities, monitoring dozens of parameters that have an impact on the life of the engine and its need for service. But what makes this such a compelling business case is that the customers are never left without an engine.

GE knows, through its monitoring, if there is the likelihood of problem or potential failure with a component. If so, the next time the aircraft lands, arrangements are made to swap out the defective engine with another one, thereby minimizing downtime to the aircraft owner and also minimizing potential repair costs that GE, as the owner of the engine, would incur in the event of catastrophic failure. In the context of the business being conducted here, the IoT solution is optimal for GE because it stays on top of its business line and its products and keeps tight control of the customer for the duration of the life of the aircraft or the engine. From the customer's perspective, it saves money in so many ways, by virtue of all the things that they, as aircraft owners, no longer have to worry about. If something begins to go wrong, processes automatically kick in to take care of the problem before it even becomes one.

Airplanes? Aircraft engines? I thought we were supposed to be talking environmental applications of the IoT. Yes, we are. And yes, let's take a look at how this might work in the environmental market. Well, as is frequently the case with new ideas, things here might get a little complicated. We really need to take a look at what we define as the environmental sector. We also need to take a look at where the maximum amounts of impact might be generated in the future. And finally, we need to take a look at the broad impacts that the application of the IoT and these technologies will have on the environment, both the natural and the man-made environment.

Clearly, there is way too much going on here for us to be able to discuss in this brief overview. What we can do is think about how the application of the Internet of Things enables us to do a much better job of understanding what's going on in the environment. We all know that

Executive Director's Page, continued on page 18

MEMBER NEWS

IN MEMORIAM

J. Darrell Bakken, 85, of Bloomington, died Saturday, November 28, 2015, at Meadowood Health Pavilion. He was born on September 29, 1930, in Wahpeton, North Dakota. He was the son of John Bakken and Marie Folstad Bakken.

Darrell graduated from North Dakota State University in 1952 with a B.S. in Civil Engineering. He served as a lieutenant in the Medical Service Corps of the U. S. Army from 1954 to 1956, working as a sanitary engineer in Germany and France. He returned to the United States in 1956 and married Ruth Partridge of Ayer, Massachusetts, on April 21 of that year. They moved to South Dakota, where he worked for the State Department of Health as a sanitary engineer. Their daughter Dawn was born in Pierre, South Dakota, in March 1959. In 1960, Darrell earned an M.S. in Civil Engineering from the University of Minnesota. In 1965, Darrell accepted a job as a development engineer for the Indianapolis Water Company. He worked for the IWC until his retirement in 1994, serving as the Vice President and Director of Engineering from 1983 to 1994.

Darrell was a life member of the American Water Works Association, a diplomate of the American Academy of Environmental Engineers, and a member of the American Society of Civil Engineers, the Water Environment Federation, and the Indiana Water Pollution Control Association. He was also a member of the Indianapolis Scientech Club.

He was a Life Member and had been a Board Certified Environmental Engineer in Water Supply and Wastewater Engineering since 1980.

Steven W. Highter died unexpectedly, Thursday, March 10, 2016 at the St. Jude Medical Center in Fullerton.

Born on September 22, 1967 in South Bend, Indiana to William H. Highter of Amherst, MA and Carolyn C. Leach of Gales Ferry, CT, Steve graduated from Bearden High School in Knoxville, TN in 1985.

In 1989 he received a Bachelor of Arts and Letters degree from the University of Notre Dame, a Bachelor of Science degree in Civil Engineering from the University of Massachusetts Amherst in 1994, and a Master's degree in Environmental Engineering from Stanford University in 1995. Steve was a Licensed Professional Engineer in California.

Following graduation from Stanford, Steve worked in the Planning Division of the Sanitation Districts of Los Angeles County in Whittier. He became the Head of the District's Public Information Section in 2014 which was his responsibility until his death. Steve loved working at the Districts, respected his colleagues, and held upper management in high esteem.

Steven loved food and drink and was an accomplished chef, a skill learned from his mother and perhaps an inherited trait from his Nana Highter. Steve's demeanor and his tranquil outlook on life and acceptance of others were definitely passed to him by his Pepe Couture. He had a well-developed sense of humor and always made people feel at ease. Steve's love of Notre Dame, particularly anything or anyone associated with Notre Dame football, became imbedded in him when he matriculated in 1985 at ND. He could even make his Dad (ND '66) blush with his unabated zeal for ND football. He will be sadly missed at the next Peachtree Association gathering in South Bend next September.

Steve leaves the loves of his life: his daughters, Sydney and Sheridan. Steve enjoyed nothing more than time spent with his daughters at Angles games, Knott's Berry Farm Park, RVing, reviewing homework or just hanging out. His involvement, along with their mothers, is evident in their character today and will be throughout their lives. His love for them was truly unconditional.

Steve also leaves his mother, Carolyn Leach and her husband Chris of Gales Ferry, CT, his dad Bill of Amherst, MA, and his sister Beth of Gales Ferry.

Steve leaves his love Johnine Shoemaker who made his life so happy sharing the last four years of his life. He also leaves his roommate at Notre Dame Kevin Boughal of Camarillo, CA who over the years has truly become his brother. He leaves many aunts, uncles, and cousins in New England, New York, Virginia, Delaware, Texas, New Jersey, Arizona, and Florida, all of whom he loved.

Steve was a member of the Elks and was particularly involved in the process of awarding college scholarships to deserving and needful high school students.

Mr. Highter had been a Board Certified Environmental Engineer in Water Supply and Wastewater Engineering since 2012.

2017 NOTICE OF NOMINEES FOR BOARD OF TRUSTEES

The Academy's Nominating Committee is chaired by Past President Christian Davies-Venn. Its members include Lilia A. Abron, Pasquale S. Canzano, Jeffrey H. Greenfield, James Mihelcic, and Michael W. Selna. The following candidates have been recommended for 2017.

PRESIDENT-ELECT

C. Hunter Nolen, P.E., BCEE

VICE PRESIDENT CANDIDATES

Kristin Morico, P.E., BCEE, CSP, F.ASCE
James W. Patterson, Ph.D., BCEEM

TRUSTEE-AT-LARGE CANDIDATES

James Clarke, Ph.D., BCES
David M. Gaddis, P.E., BCEE
Jeffrey H. Greenfield, Ph.D., P.E., BCEE
Wendy Wert, P.E., BCEE

PRESIDENT-ELECT

C. Hunter Nolen, P.E., BCEE, is a Senior Vice President with AMEC a global consulting and engineering firm. He is in charge of its West US Environment & Infrastructure Group, providing environmental, geotechnical, and materials testing services to industrial and public clients throughout the Western US. Mr. Nolen's technical specialties include development and execution of large-scale environmental programs, as well as design and construction projects requiring the integration and coordination of management, technical, community, and financial issues. He has a master's in environmental engineering from Montana State University, a bachelor's in aquatic biology from the University of Texas at Austin, and completed the Executive Education Program at the University of Texas McCombs School of Business.

Mr. Nolen's experience includes analysis, design, and construction of solutions in water and wastewater treatment, storm water management, air pollution control, and groundwater and soils treatment. He has provided these services to a wide range of clients including industry, municipalities, state regulators, and federal agencies.

Mr. Nolen engages in numerous special assignments, committee memberships, consultancy, and responsibilities on behalf of AMEC, clients, and for the American Academy of Environmental Engineers and Scientists. For the Academy, Mr. Nolen is a Trustee-at-Large on the Board of Trustees and Chairman of the Planning Committee. He supported the development of the Academy's Strategic Plan, facilitated the Academy's pre-conference workshops at joint New Jersey Water Environment Association/WEF Industrial Wastewater conferences, and facilitated the Academy's webinar on Environmental Management Challenges in Shale Oil & Gas Development.

If elected to the AAEES Vice President position, Mr. Nolen will continue to bring value to the Academy's successful pursuit of its Vision and Mission, with particular emphasis on furthering the goals defined in the Strategic Plan.

VICE PRESIDENT

Kristin (Kris) Morico, P.E., BCEE, CSP, D. WRE, ENV SP, F.ASCE, is currently the leader of environmental programs for GE's Global Operations EHS group. Previously, she was the global leader of GE Water Programs and other adjacent activities. In this new role, Kris is responsible for the development and implementation of associated environmental programs globally working closely with GE's regions and business segments. She has been with GE for 8 years.

Kris began her career working in the municipal water sector as a process engineer for the Regional Water Authority in New Haven, CT, and over the past 30 years (the past 11 of which have been in an executive capacity), she has assumed leadership positions of increasing responsibility. Kris has assumed a variety of positions across several Fortune 500 companies including Clairol, Inc., Malcolm Pirnie, Inc., environmental consultants, Environmental Compliance Officer for ABB/Combustion Engineering, Director of Global Environmental Programs and EHS Governance at Pratt and Whitney (Division of UTC), and most recently (prior to her present role with GE), she was the Director of Environmental Programs at Tyco International located in Princeton, NJ.

Kris possesses a BS in Biology from Fairfield University, MS Civil Engineering from the University of Connecticut, MEM Environmental Management from Yale University, and an EMBA from the University of Connecticut. She is a licensed Professional Engineer in 8 states, Board Certified Environmental Engineer in the American Academy of Environmental Engineers, Certified Safety Professional, and a Certified Sustainability Professional. She also possesses a Class IV Water Treatment Plant Operators License issued by the State of Connecticut Department of Public Health and is an Environmental Laboratory Director through the same agency. She is an active mem-

ber in several professional EHS organizations and was elected to the status of Fellow in the American Society of Civil Engineers and Vice President Elect for the National Association of Environmental Managers (NAEM) and serves on the advisory board for the University of Connecticut School of Civil and Environmental Engineering as well as a Board of Trustee of the American Academy of Environmental Engineers. Kris is a visiting lecturer at Yale School of Forestry and Environmental Studies and was inducted into the Academy of Distinguished Engineers at the University of Connecticut School of Engineering in 2011.

James W. Patterson, Ph.D., BCEEM, is an internationally-recognized expert on industrial pollution control. Dr. Patterson is completing his first term on the Board of Trustees. Dr. Patterson is completing his first term on the Board of Trustees, and has been re-elected to a second term, to begin in 2016. He was the 2011 AAEES Kappe Lecturer, has served on the AAEES Membership Committee, and since 2010, as Vice-Chair of the AAEES Certification by Eminence Committee. He also serves as Vice-Chair of the AAEES Environmental Scientist Certification Board.

He is Principal of Patterson Environmental Consultants, Inc., which specializes in industrial waste management. Dr. Patterson previously served as Professor and Chairman of the Pritzker Department of Environmental Engineering at the Illinois Institute of Technology (IIT) in Chicago for 20 years, and as Director of the EPA-sponsored Industrial Waste Elimination Research Center of Excellence at IIT for 8 years. He received his Ph.D. in Environmental Engineering in 1970 from the University of Florida, and his B.S. and M.S. degrees in 1964 and 1967 respectively, from Auburn University.

Dr. Patterson is the author of two books on industrial wastewater treatment, editor of a three-volume series on industrial pollution prevention, co-editor of a nine-volume series on water quality management, and has authored more than 100 other book chapters and technical papers. He was Chair of the WEF Journal Water Environment Research Board of Editors. He has served as an international consultant and advisor to numerous industries and government agencies, including the U. S. Congressional Office of Technology Assessment, the US EPA, Department of Defense, and Department of Justice, the Illinois Pollution Control Board and Illinois EPA, the Kentucky Department of Natural Resources, the New York State Hazardous Waste Center, and the Ohio EPA.

During 1983-84, Dr. Patterson served as Executive Director of the State of Illinois Hazardous Wastes Task Force. He has served as Chair of the International Joint Commission Expert Committee on Engineering and Technological Aspects of Great Lakes Water Quality, and as Chair of the State of Illinois Effluent Standards Advisory Panel. Dr. Patterson was appointed a Charter Member of the US EPA National Advisory Council for Environmental Technology and Policy.

TRUSTEE-AT-LARGE

James H. Clarke, Ph.D., BCES, F.AAFS, is Professor of the Practice of Civil and Environmental Engineering and Professor of Earth and Environmental Sciences at Vanderbilt University. He also serves as Director of Graduate Studies for the graduate program in Environmental Engineering. Jim's research interests are in the areas of sustainable environmental protection, nuclear environmental engineering, environmental risk analysis and performance assessment, the investigation, remediation and long-term management of contaminated sites, and the environmental consequences of energy choices.

Jim was a member of the Nuclear Regulatory Commission (NRC) former Advisory Committee on Nuclear Waste and Materials and was its lead member for decommissioning and risk-informed regulation. He currently serves as a consultant to the NRC Advisory Committee on Reactor Safeguards and its subcommittee on Radiation Protection and Nuclear Materials. Jim also served on the National Academy of Science Committees on Remediation of Buried and Tank Waste and Tritium Releases from Nuclear Power Plants.. He is a peer reviewer for the Department of Energy, the Nuclear Regulatory Commission, the National Academies, the U.S. Environmental Protection Agency and several journals and book publishers. Professor Clarke has over 35 years of professional experience with approximately 200 publications and presentations. He received a Ph.D. in theoretical chemical physics from The Johns Hopkins University and a B.A. in chemistry with honors from Rockford College (now Rockford University).

David M. Gaddis, P.E., BCEE, is a Corporate Quality Manager at CDM Smith Inc., an employee-owned full service engineering and construction firm founded in 1947. The Firm's focus is on providing solutions in water, environment, transportation, energy and facilities fields. Mr. Gaddis has spent his entire 34-year career with CDM Smith.

David Gaddis works with a core team to monitor the implementation and function of the Firm's ISO 9001:2008-compliant Quality Management System (QMS) and spearheads firm-wide quality initiatives. David ensures QMS process execution and client requirement awareness throughout the organization. This is accomplished through a multi-faceted auditing program, coordination with a nationwide team of quality managers and various data gathering and metric reporting mechanisms. David is also a key member of the core team that drives the firm's QMS and global business best practice improvements.

Mr. Gaddis is a practicing environmental engineer whose experience includes study, design, construction coordination, resident engineering, and start-up of facilities across the spectrum of CDM Smith's practice. He is licensed to practice engineering in 4 states. Among his accomplishments, Mr. Gaddis was a member of the firm's project management training committee.

Mr. Gaddis received his DEE certification in 2001 and became an active member of the AAEES Engineering Excellence Committee in 2009. He accepted the Chair position in 2012. He has been the New Jersey State Representative for AAEES since 2009.

Under his direction, several projects have received peer recognition, including The Somerset Hills Interceptor Rehabilitation, Somerset, NJ (CEC of New Jersey Grand Award 1999); Franklin Township Sewerage Authority Sewer Map Automation Project (CEC Honor Award 1999); Montclair Radium Contamination Cleanup, Montclair, New Jersey (CEC of New Jersey Excellence Award 1992); NJDEP, Camden Metropolitan Area Water Supply Feasibility Study, New Jersey (National ACEC Honor Award).

Mr. Gaddis is an FAA-licensed airplane pilot, holds a commercial deep sea diver certificate, and serves his community as a trustee of the 1,000-member homeowner association where he lives. He has a daughter, Sarah who is enjoying college at Loyola University Chicago.

Jeffrey H. Greenfield, Ph.D., P.E., BCEE, is currently a Senior Project Engineer in the Public Works Department with the City of West Palm Beach, Florida. He has 20 years of consulting experience and 15 years of Civil and Environmental teaching experience both full-time and part-time at Florida International University and 3 years of part-time teaching experience at the University of Miami.

Dr. Greenfield earned a B.S. in Biology, as well as a M.S. and Ph.D. in Civil Engineering (Environmental Engineering Program), all from the University of Pittsburgh. He became a Board Certified Environmental Engineer in 1999 and holds two specialty certifications in Water Supply/Wastewater and Environmental Sustainability.

Dr. Greenfield became an active member of the AAEES Water Supply and Wastewater Committee in 2000 and by 2005 was appointed as chair, a position he still holds to date. He continues to serve on the Academy's Awards and Nominating Committees as well as the Education Committee. In addition to volunteering as an ABET program evaluator for both engineering and engineering technology since 2007, Dr. Greenfield currently serves as an ABET engineering technology accreditation commissioner. His most recent Academy activities include participation in the activated sludge anniversary workgroup, helping to prepare the water supply and wastewater exam preparation course, chair of the BCES Surface Water Resources exam workgroup and member of the Tau Chi Alpha committee. Dr. Greenfield is also an active recruiter of new members to become board certified and an avid promoter of the engineering profession.

Dr. Greenfield has focused a considerable amount of time contributing to the advancement of the future of engineering by serving on committees with NSPE, ASCE, and NCEES as well as on both county and state committees with the Florida Engineering Society. He received the 2013 Government Engineer of the Year Award from the Florida Engineering Society's Florida Professional Engineers in Government, and the 2013-2014 Government Engineer of the Year Award from the Florida Section of ASCE.

Wendy Wert, P.E., BCEE, is a registered civil engineer with the State of California. She has a BS degree in Environmental Engineering and an MS degree in Water Resources Engineering from the University of Central Florida. Ms. Wert has over 17 years of experience in the areas of environmental and civil engineering. She contributes process treatment expertise to facilities advance planning. Ms. Wert occupies a key role on award-winning programs that rely on public participation to integrate water supply, water reuse, water conservation and stormwater management with wastewater facilities planning. She also has extensive experience in system design, modeling, and upgrading. At the Sanitation Districts of Los Angeles County (Sanitation Districts) she evaluates long term costs in three areas of practice: wastewater management, energy recovery, and solid waste management. Ms. Wert has published numerous technical papers, received many local, state and international awards. Ms. Wert represented the Sanitation Districts at the 4th Annual International Congress of Environment 2014 in Qingdao, China where she discussed the major elements of Planning for Sustainability. She currently serves as a Trustee for the American Academy of Environmental Engineers and Scientists (AAEES), as a Director for the California Water Environment Association (CWEA) and as the Chairperson for CWEA's southern regional committee. Her passion for scientific education has led Ms. Wert to successfully author grants that support the Sanitation Districts in class sewer science outreach program. An avid mentor, she participated in the development of the Environmental Engineering and Science Foundation, a collaborative partnership to sponsor research.

Ballots will be mailed in April.
To be valid, ballots must be received on or before June 15, 2016.

The AAEES *Honorees*

The AAEES Awards were established to honor and recognize distinguished environmental engineers, environmental scientists, educators, students, and professionals. Below is the criteria for each award. Profiles of this year's honorees are presented on the following pages.

Gordon Maskew Fair Award

The Gordon Maskew Fair Award honors one of the pioneers of environmental engineering. Dean Fair, in addition to his own exemplary career, spawned a living legacy during his lifetime -- those that he taught are now teaching us.

Through the Fair Award, the Academy seeks to identify Board Certified Environmental Engineers, Board Certified Environmental Engineering Members, and Board Certified Environmental Scientists who have contributed to the status of the environmental engineering or science professions by:

- Exemplary professional conduct
- Recognized achievements in the practice of environmental engineering and science
- Significant contributions to the control of the quality of the world's environment.

The Gordon Maskew Fair Award was established in 1971.

Edward J. Cleary Award

The Cleary Award is given to an individual who is an outstanding performer in the management of environmental protection enterprises conducted under either public of private auspices who have demonstrated exemplary professional conduct, personal leadership, originality in devising new environmental protection techniques and sensitivity and responsiveness to social, economic, and political factors in environmental protection.

The Edward J. Cleary Award was established in 1973.

Stanley E. Kappe Award

The Stanley E. Kappe Award honors the man whose dedicated leadership, strong devotion, and tireless efforts contributed so much to the growth and advancement of AAEES during the period he served as its Executive Director, 1971 to 1981.

This award is presented to the Board Certified Environmental Engineer or Board Certification Environmental Scientist who has performed extraordinary and outstanding service contributory to significant advancement of public awareness to the betterment of the total environment and other objectives to the Academy.

The Stanley E. Kappe Award was established in 1983.

Honorary Member

One or more Honorary Member may be selected each year by the Academy's Board of Trustees by affirmative vote of at least two-thirds of its members. The individual so honored possesses one or more of the following characteristics:

- has attained a position of eminence in the environmental engineering profession;
- has made a singular noteworthy contribution, or a sustained contribution, to the advancement of environmental engineering; and
- has performed outstanding service over a relatively long period of time in the advancement of the affairs of the Academy.

Honorary Members were established in 1982.

International Honorary Member

One International Honorary Member may be selected each year by the Academy's Board of Trustees by affirmative vote of at least two-thirds of its members. The individual so honored possesses one or more of the following characteristics:

- has attained a position of eminence in the field of environmental and/or human health protection internationally or in his or her country;
- has made a single noteworthy contribution or sustained contribution to the advancement of environmental and/or human health protection in a specific area internationally or in his or her country; or
- has rendered outstanding service over a long period of time resulting in the advancement of environmental and/or human health protection internationally or in his or her country.

International Honorary Members were established in 2014.

W. Brewster Snow Award

This honor is awarded to an outstanding engineering student currently pursuing or recently completing a Masters degree in Environmental Engineering or closely related degree program.

The W. Brewster Snow Award was established in 2011 in association with the Environmental Engineering and Science Foundation and co-sponsored by the Association of Environmental Engineering and Science Professors.

W. Wesley Eckenfelder Graduate Research Award

This award is given annually to recognize a student whose research contributes to the knowledge pool of wastewater management. The award selection is based on original and innovative research of publishable quality.

The W. Wesley Eckenfelder Graduate Research Award was established in 2012 in association with the Environmental Engineering and Science Foundation and co-sponsored by the Association of Environmental Engineering and Science Professors.

Innovyze Excellence in Computational Hydraulics/ Hydrology Award

This award is given annually to recognize a student whose research contributes to the knowledge pool in the area of Computational Hydraulics & Hydrology. The award selection is based on original, innovative research of publishable quality. Both Master's and Ph.D. students are eligible.

The Innovyze Excellence in Computational Hydraulics/Hydrology Award Award was established in 2015 in association with the Environmental Engineering and Science Foundation and sponsored by Innovyze.

Congratulations to our 2016 Honorees!

Gordon Maskew Fair Award

Dr. Bruce E. Rittmann

Dr. Bruce E. Rittmann is Regents' Professor of Environmental Engineering and Director of the Swette Center for Environmental Biotechnology in the Biodesign Institute at Arizona State University. His research focuses on the scientific and engineering fundamentals needed to "manage microbial communities to provide services to society." Services include generating renewable energy, cleaning water and soil, and improving human health.

Dr. Rittmann is a member of the National Academy of Engineering; a Fellow of the American Association for the Advancement of Sciences, the Water Environment Federation, and the International Water Association; and a Distinguished Member of ASCE. Dr. Rittmann was awarded the first Clarke Prize for Outstanding Achievements in Water Science and Technology from the National Water Research Institute and the Walter Huber Research Prize and the Simon Freese Award from ASCE. Dr. Rittmann is on the List of Most Highly Cited Researchers of the Institute for Scientific Information and has published over 550 journal articles, books, and book chapters. Together with Dr. Perry McCarty, Dr. Rittmann authored the textbook *Environmental Biotechnology: Principles and Applications* (McGraw-Hill Book Co.).

Edward J. Cleary Award

Kira Lynch

Ms. Kira Lynch is an environmental scientist with twenty five years' experience in environmental characterization and remediation. She is currently the Office of Research and Development (ORD) Superfund and Technology Liaison (STL) for Region 10. The STLs are ORD employees, who reside in each regional office. Ms. Lynch's responsibilities include assisting the Region 10 Superfund program with integrating the most current science and technology into decision making and facilitating access to the expertise and information needed to solve challenging waste cleanup problems.

Ms. Lynch is a member of the EPA Engineering Forum and provides direct technical support on a range of projects nationally for EPA. Prior to working for EPA Region 10, she served as one of the Army Corps Innovative Technology Advocates (ITAs) for ten years, and worked in the Quality Assurance Management Section (QAMS) for EPA Region 9. She has been involved in the design and evaluation of several Department of Defense Environmental Security Technology Certification Program (ESTCP) research projects. She has been involved in the development of numerous EPA and US Army Corps guidance documents on environmental remediation and characterization. Ms. Lynch has also been the author on several journal articles on cleanup approaches and the use of adaptive site management (Triad approach) to site characterization and cleanup.

Stanley E. Kappe Award

Dr. Cecil-Lue Hing, P.E., BCEE

Dr. Cecil Lue-Hing is the retired Director of Research and Development for the Metropolitan Water Reclamation District of Greater Chicago, and is currently Principal of the Environmental Engineering Consulting firm of Cecil Lue-Hing and Associates Inc., in Chicago, Illinois. He was certified DEE (now BCEE) in 1982, and has served and continues to serve the Academy in many capacities including, as Committee Member, Committee Chair, Member of the BOT, Vice-President, President Elect, and President. He has served as a Member, of the Excellence in Environmental Engineering Award, Diversity Work Group, International Relations, Membership, and Recertification Committees, and as Chair of Certification by Eminence, Awards, and Strategic Planning Committees. He currently serves as Board Chair, Environmental Engineering & Science Foundation. He is a Past-President, of the Academy; Past-President, of EWRI of The American Society of Civil Engineers; Past President of NACWA; a Founding Member, of the Research Council and former Board Member, the Water Environment Research Foundation; and former Chairman, Board of Editorial Review of Water Environment Research.

He has received many prestigious awards including ASCE's National Government Civil Engineer of the Year, the Simon W. Freese Environmental Engineering Award and Lecturer; the Water Environment Federation's Charles Alvin Emerson Medal, the American Academy of Environmental Engineers Gordon Maskew Fair Award, WEF Fellow, Member NACWA's Hall of Fame, and was the Academy's Kappe Lecturer for 2003. He has co-authored and co-edited eight books in different areas of wastewater treatment technology including, *Biosolids Management*, *VOC Quantification & Control at Wastewater Treatment Facilities*, and *Sewage Microbiology*, and is a co-holder of two U.S. Patents regarding analytical procedures for certain cyanide species in water and wastewater.

Dr. Lue-Hing is a graduate of Marquette, Case Western Reserve, and Washington University in St. Louis MO., a Registered Professional Engineer, a Board Certified Environmental Engineer (Diplomate) of the American Academy of Environmental Engineers and Scientists, Honorary Diplomate Academy of Water Resources Engineers, a Distinguished Member of ASCE, a WEF Fellow, and in 2000 was elected a Member of the National Academy of Engineering.

Honorary Member

Kenneth Kirk

Ken Kirk was the Executive Director of the National Association of Clean Water Agencies (NACWA), formerly known as the Association of Metropolitan Sewerage Agencies (AMSA) from 1989 - 2015. Prior to joining NACWA, he worked with a Washington, DC-based private consulting firm, where he had responsibility for the management of several associations, including AMSA; worked in the Environmental Protection Agency's Office of Legislation; and served as Public Affairs Manager at the Water Environment Federation.

Mr. Kirk has degrees from New York University, the Georgetown University Law Center and the George Washington University Law Center, where his specialty was environmental law. Mr. Kirk also serves as co-chair of the Water Infrastructure Network, a broad-based coalition dedicated to preserving and protecting the health, environmental and economic gains that America's drinking water and wastewater infrastructure provide. He is the founder and first president of the U.S. Water Alliance formerly Clean Water America Alliance, a 501(c)(3) nonprofit organization established to explore the complex issue of water sustainability and plan for the future by improving public awareness that advances holistic, watershed-based approaches to water quality and quantity challenges.

International Honorary Member

Professor Ruey-An Doong

Ruey-an Doong is a Distinguished Professor of Environmental Engineering at National Chiao Tung University, Taiwan. He holds his B.S. and Ph.D. in Environmental Engineering from National Chung Hsin University and National Taiwan University, Taiwan, respectively. He joined the Department of Biomedical Engineering and Environmental Sciences, National Tsing Hua University from 1994 to 2014 and served as Chair of the Department and Dean of the College of Nuclear Science. During this period, he has established a research collaboration and student exchange network in his Department/College and promoted graduate research initiatives involving the top professional societies and universities worldwide. He has joined the Institute of Environmental Engineering at National Chiao Tung University since August 2015.

Professor Doong is known for his achievements and contributions in environmental chemistry and environmental nanotechnology. His work on the synthesis and characterization of nanomaterials for environmental applications has been recognized internationally. Professor Doong has received many research awards and honors including the Outstanding Research Award from the Ministry of Science and Technology, Taiwan and an invited speaker at the 2013 Gordon Research Conference on Environmental Nanotechnology. Professor Doong also has served actively on many professional committees, including the Division of Environmental Chemistry of American Chemical Society (ACS) of which he is a long-term committee member and has organized many symposia for the division during its national meetings. In addition, he has devoted much effort on developing international collaboration research and education programs, especially in helping scholars and graduate researchers with increasing their academic research capability in Southeast and South Asian regions including Philippine, Indonesia, Vietnam, Laos, Malaysia, Thailand, India, Sri Lanka, Bangladesh and Cambodia.

W. Brewster Snow Award

Gregory Hinds; Advisor: Dr. Sarina Ergas

Mr. Gregory Hinds graduated with a BS in Civil & Environmental Engineering from California State University, Chico (GPA = 3.77) and was awarded an MS degree in Environmental Engineering from the University of South Florida (GPA = 3.95). His graduate GPA was 3.95 (out of 4.0) and his graduate advisor was Dr. Sarina Ergas. His MS thesis research examined the use of high solids anaerobic digestion for bioenergy production from the organic fraction of municipal solid waste. His platform presentation at the 2016 Global Waste Management Symposium won 1st prize for Best Student Presentation. He is lead author of a book chapter on high solids anaerobic digestion and also a manuscript submitted to *Environmental Engineering Science*. Greg also wrote articles about his research for the Florida SWANA newsletter and an IWA specialist group newsletter.

His senior design project developed a wastewater export and treatment system for Lake Atitlán, Guatemala. He traveled to Guatemala to present his capstone design report to engineering professionals at the Regional School of Sanitary Engineering at the University of San Carlos and has coauthored a paper in review about this project with the Journal of Ecological Engineering.

Greg is a member of SWANA, AWWA, and ASCE. While an undergraduate, Greg received an Academic Achievement Award from ASCE and was also an active member of the Sustainable Engineering and Health for Development student chapter. He is currently working as a stormwater and restoration engineer with Wildscape Engineering, a consulting firm in the Tahoe area of Northern California.

W. Wesley Eckenfelder Graduate Research Award

Dr. Matthew Verbyla

Originally from Unionville, CT, Matthew Verbyla is currently a postdoctoral research associate at the University of South Florida (Tampa, FL). His research addresses sustainable development challenges at the intersection of food-energy-water systems and public health; specifically he studies pathogen removal in natural and non-mechanized wastewater treatment systems to assess the microbial risk of wastewater reuse in agriculture. Matthew has a Bachelor of Science in Civil Engineering from Lafayette College (2006), as well as a Master of Science in Environmental Engineering (2012) and a Ph.D. in Environmental Engineering (2015), both from the University of South Florida. He has several years of professional experience in Honduras, first with a Fulbright Fellowship (2007) to study the sustainability of rural water service under decentralization policies, and later as the engineering project director for a non-profit organization, where he led the development of water, wastewater, and infrastructure projects for small cities and periurban communities.

Matthew received a National Science Foundation Graduate Research Fellowship in 2012 to support his doctoral research. In 2015, he received a USAID Research and Innovations Fellowship in Engineering to spend six months working with a non-profit organization in Minas Gerais, Brazil to develop a novel solar-powered sludge-drying system. Matthew is an editor for the Sanitation Technologies group of the Global Water Pathogens Project (www.waterpathogens.org), which is led by UNESCO and Michigan State University. He has LEED Green Associate credentials from the U.S. Green Building Council and several years of civil engineering consulting experience in the United States.

Innovyze Excellence in Computational Hydraulics / Hydrology

Jennifer Jefferson; Advisor: Dr. Reed Maxwell

Ms. Jennifer Jefferson is a PhD student majoring in Hydrology at the Colorado School of Mines, working under the supervision of Dr. Reed Maxwell. She expects to graduate in 2016. She has BS and MS degrees in Civil Engineering from Iowa State University. Her research interests are modeling the impact of land surface disturbances on hydrological processes. Her research has focused on ParFlow.CLM, a parallel coupled terrestrial hydrology simulation platform; she is studying the sensitivity of these types of models using high resolution simulations running on supercomputing platforms. Jennifer is author of several high impact peer reviewed journal articles. Her nomination package included a manuscript titled "Active Subspaces for Sensitivity Analysis and Dimension Reduction of an Integrated Hydrologic Model" that was published in Computers & Geosciences. That paper has advanced efforts to utilize integrated hydrologic models that are coupled to land surface models. Her research contributions are important because energy transfer into and out of the land surface is a primary driver of climate and weather patterns.

Jennifer is a professionally registered engineer in Wisconsin and has served as president of the Colorado School of Mines's Hydrologic Science and Engineering Club and is a member of the American Geophysical Union, Society of Women Engineers, and American Society of Civil Engineers. In her nomination package, Jennifer stated that her research has demonstrated that advancing science in her area requires effective collaboration and communication between modelers, mathematicians, engineers and hydrologists.

Executive Director's Page, continued from page 8

understanding breeds knowledge and that knowledge breeds wisdom. In the case of the environment , what we need is a lot more information that will enable us to generate the knowledge that we require to do a better job of allocating the resources we have available to creating the environment that we want.

Two of the primary issues that face the environmental professionals are water and global warming. The California drought is proving the importance of the need to develop a better understanding of the water resources we have available. One way of doing that is the application of IoT technologies so that we are able to monitor, in real-time, the status of our water resources so that, armed with information, we can make allocation decisions that are effective and appropriate for the longer term. Monitoring our man-made water infrastructure as well as the natural infrastructure that surrounds it would seem to be one of the most important steps we can take in determining our water future.

Global warming is the other major issue the environmental profession faces at present. The application of monitoring all aspects of our creation of CO2 is a critical link in defining how we are going to get to a carbon neutral our carbon negative economy over the course of the next 20 or 30 years. We know what some of the solutions look like, but we don't know how best to apply the multiple options we have available. There has been much work done on this topic in the state of California, where the University of California system recently released a report called "Bending the Curve," a reference to the need to curtail carbon emissions to change the slope of the projected increase in CO2 concentration by the year 2050. The report offers up scalable solutions for addressing the need to apply policy and technology solutions that will begin to work immediately at mitigating the projected increases in CO2.

Critical to the solutions is the ability to do a better job of tracking sources of emissions and developing alternate approaches to achieving the desired emissions reduction. A simple example that is offered up from the folks in the transportation sector has to do with the replacement of intersections with traffic circles. Research has been done that shows that the application of traffic circles rather than traditional 90 degree intersections has two related positive effects. First, because vehicles don't spend a minute or so idling while waiting for the lights to change, there is a documentable 20 to 25% decrease in carbon emissions at that location due to the fact that vehicles can keep moving rather than waiting for the light. What's even more interesting is that there is a significant safety benefit in making this change as well. Statistics indicate that those locales where intersections have been replaced by traffic circles, see a roughly 30% decline in overall accidents at the intersection, and more importantly, the severity of the accidents that do occur is greatly reduced. Rather than having accidents involving perpendicular or head on vehicular contact, accidents at traffic circles tend to be predominantly relatively minor fender benders.

This is not exactly what Academy members would think of as environmental engineering or environmental science, but if we take the broad expansive view that everything is in the environment, and everything is connected to everything else at some level, then doing what we can to replace intersections with traffic circles is an environmental solution of sorts. To the extent that we have the technology available to monitor traffic flows, and to monitor the emissions of CO2 from those traffic flows as they are impacted by new approaches, we began to see how the practice of environmental engineering and environmental science is moving incrementally into areas that are non-traditional. This takes us right back to the issue of disruptive technologies and the impact of the IoT on the environment going forward.

Part of the challenge to us all and coming up with scalable solutions or approaches to issues that bring a different perspective is the need for us all to think differently. One of my favorite examples of thinking differently was provided by a colleague who works in the IoT area for IBM. Included in his portfolio of interest areas is the topic of traffic and the need to monitor traffic in real-time in order to optimize the entire set of externalities that are produced by urban traffic. I asked him about the need to monitor flows in real-time, thinking that data captured on a minute-by-minute basis is good enough to understand what's going on. His simple response to me was, 'would you be willing to step off the curb to cross the street using data from a minute ago?' Well, maybe we need to think about that – and then say no.

As is usually the case, the more one looks into these things, the more complicated they get. Trying to wrap up the inputs from above into a coherent conclusion is a bit daunting. There's so much on the table that it is very difficult to know where to begin. The only conclusion I can recommend from this is the fact that the IoT is real and expanding on a daily basis into areas that range from environmental monitoring to uses in the smart home all the way to monitoring and responding to peoples' individual health vital signs with instructions on what to do in case of unexpected changes in status.

So we can't put it in a box and wrap it up with a bow and say this is the environmental side of the IoT. Nor can we say that technology X is the game changer for the environmental sector to the exclusion of all others. What we can say is that the pace of progress is quickening. What that means to us becomes a function of how creative and flexible we can be. Our disruptive technology is one that is a combination of dozens of new discoveries that are taking place every day. Our challenge is to absorb them and apply them in the work we do to meet the mission statement of the Academy in ensuring the long-term health and viability of mankind and the natural systems that we coexist with.

2016 Excellence in Environmental Engineering & Science™

The Excellence in Environmental Engineering & Science Awards Competition was launched in 1989 to recognize and promote quality projects in environmental engineering and science. Entries and awards are made in each of the following categories.

- Design
- Environmental Sustainability
- Operations/Management
- Planning
- Research
- Small Firms
- Small Projects
- University Research

Each entry is judged based onthe following criteria:

1. Demonstration of a comprehensive, integrated approach that considers all environmental media, i.e., air, water, and land.
2. Quality as evidenced by the degree of user satisfaction and proven performance.
3. Originality and innovation, representing the application of new knowledge, a new application of existing knowledge, or an innovative mix of existing knowledge.
4. The complexity of the problem or situation addressed.
5. The extent to which the project contributes to, or offers the prospect of, contributing to social and economic advancement.

One Grand Prize is awarded in each category. Honor Awards are presented to other deserving entries, as determined by competition rules, in each category. The Superior Achievement for Excellence in Environmental Engineering and Science is awarded to the overall best entry in each year's competition.

This year's Superior Achievement award went to Daniel B. Oerther, Ph.D., P.E., BCEE, for Improved Water Quality for Ixcan Guatemala. This marks only the second time in E3S's history that a project entered in University Research won the competition's biggest prize. Congratulations to all of our winners!

Sixteen projects were awarded prizes in the 2016 competition: 1 Superior Achievement, 9 Grand Prize, and 6 Honor Awards. Summaries of the winning entries are on the following pages.

AAEES would like to thank the 2016 panel of judges for offering their time and expertise for the 2016 E3S Competition:

- Timothy Berry
- Mary Clyburn
- Yang Deng
- Venkata Gadhamshetty
- Jerome Gilbert
- Georgine Grissop
- C.P. Huang
- Robert Hurdle
- Michael C. Kavanaugh
- Jose Marti
- Kevin Morris
- James Newton
- Gbekeloluwa Oguntimein
- Webster Owen
- Rafael Rios
- Mike Sarullo
- Michael Stanforth
- Vel Subramanian
- Rocky Welborn
- David Wunder

ENTRANT: Daniel B. Oerther, Ph.D., P.E., BCEE
ENGINEER-IN-CHARGE: Daniel B. Oerther, Ph.D., P.E., BCEE
LOCATION: La Antigua, Guatemala

Improved Water Quality for Ixcan Guatemala

In 2005, Guatemalan pastor Rodel Perez recognized the need to expand his ministry to include a more holistic approach to meet not only the spiritual, but the educational and physical needs of the villagers he served. The local Guatemalan health department informed Rodel that diarrhea morbidity and mortality was higher in the Ixcan region of Guatemala compared to the rest of the country. Initially, Rodel focused exclusively on the use of dry composting latrines.

In 2007, Dr. Daniel Oerther began working with Rodel Perez, and his son, Gerber Perez, a Christian missionary operating the Healthy Communities organization in partnership with Hecos 2:8 and Mission Impact, to assist the complex challenge of providing sanitary and potable water to the region. Dr. Oerther had been heavily involved with partners to address both source water protection and potable water production for villages in Sub-Saharan East Africa. Dr. Oerther recruited graduate student Dan Divelbiss to conduct an extensive sanitary survey in Ixcan. Using a field lab and collaborating with the local health department, Divelbiss performed measurements of water quality and quantity, and evaluated the feasibility of using a mixture of technologies to protect water sources (i.e., dry composting latrines) and to produce potable water (i.e., filtration, coagulation, and disinfection). The survey confirmed that many villagers consumed untreated, contaminated water. Interviews revealed that the villagers were aware of the risks of acquiring illnesses from water, but lacked the technical knowledge to solve their problem.

TOP Guatemala girl enjoying water
BOTTOM Guatemala family enjoying water with Gerber Perez holding glass

Guatemala filter construction with community and volunteers.

Guatemala filter construction with Dan Oerther.

The villagers specified a need for a long-term solution that was effective, inexpensive, required little outside capital, and utilized local materials and labor. The technology would require a heavy investment of capital and sweat equity on the part of the villagers and could be easily integrated into their existing daily routines. The biosand filter originally described by the Centre for Affordable Water and Sanitation Technology (CAWST) appeared to be the most applicable to the specific conditions in Ixcan.

Based on a successful 2008 pilot project in the community of Santa Catarina El Rosario, the biosand filter was deemed the technology of choice. Filter molds and construction oversight was provided by the University. In turn, each participating household would provide sweat equity and one bag of cement. They were also required to attend a day-long training workshop on filter operation and maintenance. Additional filters were constructed in the local village elementary school, and science lessons were presented in classrooms to explain germ theory and the importance of potable drinking. The pilot program was met with much enthusiasm and neighboring villages made requests for similar projects. Since 2009, more than 3,500 point of use CAWST slow sand biofilters have been constructed without any further capital investment from the USA. It is estimated that nearly half of the more than 70,000 villagers in the region now consume treated water.

A water quality monitoring laboratory was established in facilities belonging to the Perez family with financial support of the National Science Foundation to document the effectiveness of the technology intervention. Throughout 2009, coliform counts and health survey information were collected. The results were used to develop a comprehensive Structural Equation Model (SEM) as an innovative tool to evaluate the effectiveness of the project. Local health personnel performed surveys of more than 500 homes, and the results were integrated into the SEM. The research studies performed as part of this project were the first applications of SEM in the field of environmental engineering to evaluate interventions to improve water quality.

To continue this work after his relocation from Cincinnati to Missouri, Dr. Oerther recruited graduate student Lee Voth-Gaeddert to continue the SEM evaluation. In the summer of 2015, the work to place filters in homes in the Ixcan region of Guatemala was considered 'complete,' and the team has transitioned to expand the utility of SEM as a tool to evaluate the effectiveness of additional interventions to reduce more complex diseases.

LEFT Tanzania filter construction.
RIGHT Dan Oerther and two students pictured with Tanzanian kids enjoying water.

ENTRANT: CH2M

ENGINEER-IN-CHARGE: Richard Voigt, P.E.

LOCATION: Alexandria, Virginia

State-of-the-Art Nitrogen Upgrade

The State-of-the-Art Nitrogen Upgrade Program involved long-range planning, design and construction of $131 million in improvements to a 54-million-gallon-per-day water resources recovery facility that serves 320,000 customers and is located in an urban setting. AlexRenew uses cutting-edge deammonification technology in sidestream and mainstream processes to provide reliable treatment while optimizing operational costs. AlexRenew is the first water utility in the United States to implement a full-scale mainstream deammonification system and the first water utility in the world to use this technology to meet very low nitrogen limits.

Utilization of a public-private partnership with adjacent stakeholders provided the opportunity to transform a historic landfill into a vibrant urban development that includes AlexRenew's Nutrient Management Facility, an 18-million-gallon facility that balances ammonia-nitrogen loading to the facility's biological reactor basins, improves the reliability of nitrogen removal to required very low levels, and provides efficient use of limited space.

As a benefit to the community, AlexRenew's improvements included building a full-size multipurpose athletic playing field directly on top of process tankage. The Limerick Athletic Field opened to the public in October 2015. Planned commercial, residential and green spaces are connected together, in keeping with the City of Alexandria's revitalization of the Eisenhower Corridor.

TOP The Limerick Athletic Field is a full-size athletic field located directly on top of the Nutrient Management Facility. *BOTTOM* The State-of-the-Art Nitrogen Upgrade Program (SANUP) for Alexandria Renew Enterprises (AlexRenew) was designed and constructed in a phased approach.

Grand Prize - Environmental Sustainability

ENTRANT: Carollo Engineers, Inc.
ENGINEER-IN-CHARGE: Christopher T. Cleveland, P.E.
LOCATION: Delano, California

Delano biottta™ Wellhead Nitrate Treatment

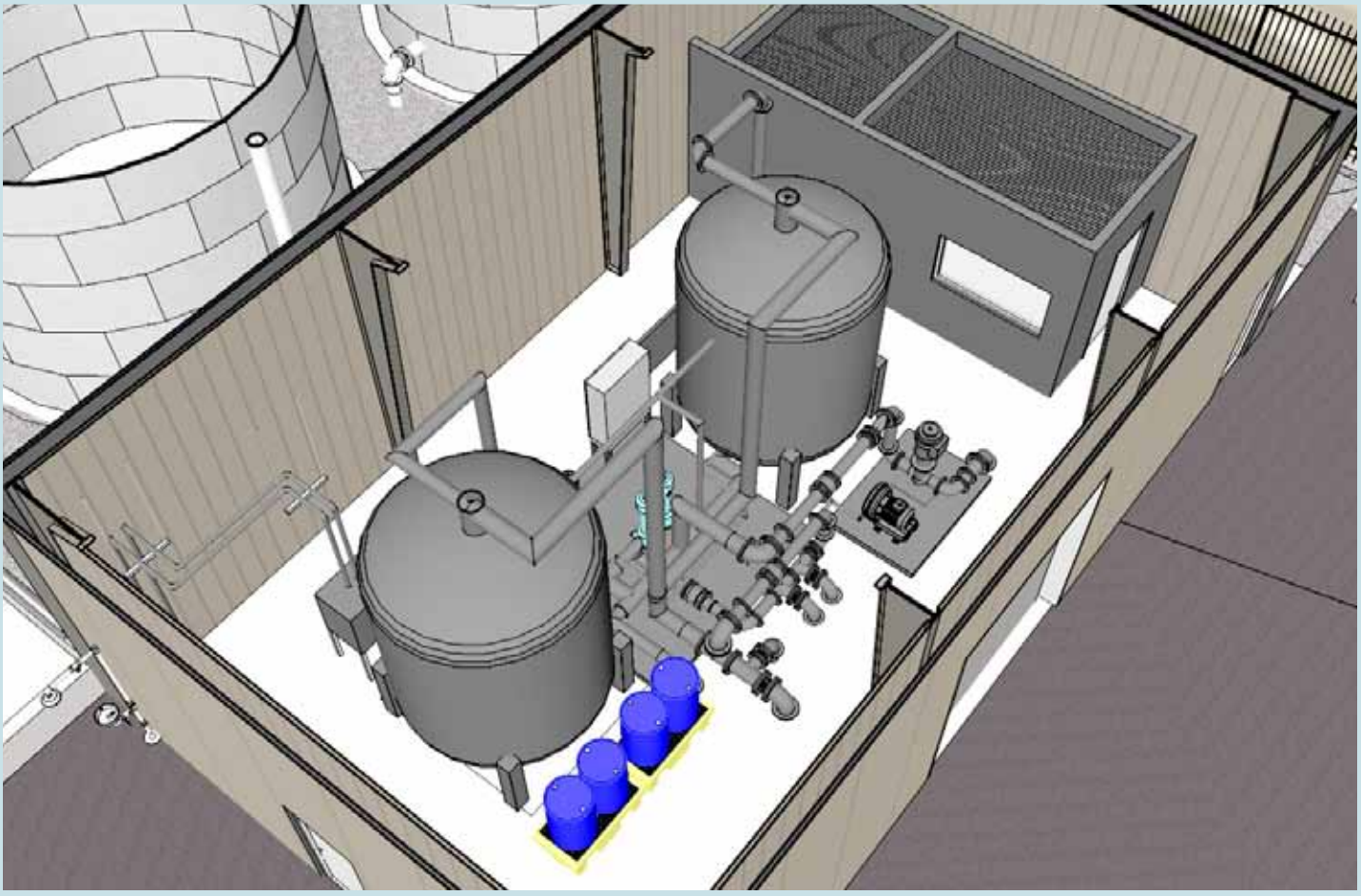
On April 30, 2014, the state of California approved a grant-funded project that will help provide the City of Delano with safe drinking water. The $5 million grant will allow the City to remove one of California's most widespread groundwater contaminants: nitrates. Nitrates can cause significant health problems when consumed in drinking water. The grant funded a three-year project to demonstrate the *biottta*™ (**b**iologically-**t**ailored, **t**wo-stage **t**reatment **a**pproach) nitrate treatment system. Designed and constructed by Carollo Engineers, Inc., this system will be used on a critical municipal supply well that produced water exceeding the State's maximum contaminant level (MCL) for nitrate.

The City currently has sufficient water supply to meet demands, but the supply well requiring treatment is needed to ensure sufficient supply. This project will ensure that the well is an integral part of Delano's future potable water supply. The *biottta*™ uses bacteria native to the local groundwater to convert nitrate to harmless nitrogen gas, thereby avoiding the generation of the high-strength, contaminant-laden waste stream typically associated with nitrate treatment.

This results in a low-energy, cost-effective, and sustainable solution for removing nitrate from groundwater in rural communities – making it an ideal fit for the City of Delano.

Delano's *biottta*™ facility is the first full-scale drinking water facility of its kind in the United States. The three-year project consists of a ten-month pilot study; design, construction, and permitting of a full-scale demonstration facility; operation of the demonstration facility for twelve months; and dissemination of project results. It will provide twelve months of actual full-scale operational data to refine and confirm the long-term economic benefits that can be realized by the City and other water utilities.

TOP The City of Delano is an incorporated city located in Kern County, California, in the heart of the Central Valley, one of the world's most productive agricultural regions.
BOTTOM 3-D model depicting the full-scale biottta™ treatment system and building. The use of 3-D modeling enabled Carollo to work closely with the City and State regulators during design to incorporate operational flexibility features while fitting the equipment within the contraints of the skid-mounted system.



Grand Prize - Environmental Sustainability

ENTRANT: Dewberry

ENGINEER-IN-CHARGE: Alan Pratt, P.E.

LOCATION: Parker, Colorado

Rueter-Hess Water Purification Facility

Parker Water & Sanitation District (PWSD) in Parker, Colorado, recently opened the 10-MGD Rueter-Hess Water Purification Facility (RHWPF), a major component in a 30-year infrastructure development program designed to transition to a renewable water supply. The new water treatment plant serves approximately 50,000 customers within the district, located approximately 20 miles southeast of Denver.

The RHWPF uses new technologies that have enabled PWSD to convert from rapidly declining groundwater sources to a renewable water supply drawn from surface water, groundwater, alluvial well water, and reclaimed wastewater. The project showcases the potential for communities facing critical water shortages across the U.S. to transition to sustainable water supplies.

Designed by Dewberry, the RHWPF is the first plant in the world to incorporate a trio of cutting- edge treatment technologies to meet and exceed EPA drinking water standards.

In the first such application in a drinking water system in the U.S., the 560 ceramic membrane modules were specified because of their ability to withstand impacts from the abrasive sand and PAC particles used in upstream processes and then be cleaned back to like-new condition. The ceramic membrane filtration system is anticipated to last much longer than conventional polymeric membranes.

The completion of the RHWPF, which is expandable to 40 MGD, is part of a visionary, multi-phase plan for PWSD, where district leaders had long recognized groundwater as a diminishing resource within the rapidly developing area. The new network features a 50-cfs pump station that brings surface water from nearby Cherry Creek and Cherry Creek alluvial wells into the 72,000-acre-foot Rueter-Hess Reservoir, completed in 2012. Water stored in the reservoir flows by gravity into the RHWPF. After moving through the two ballasted sedimentation chambers and the ceramic membrane filters, the disinfected water is pumped into the PWSD's distribution piping network for use by customers. Wastewater is returned to nearby reclamation facilities and then to Cherry Creek for reuse.

RIGHT The Colorado Department of Public Health and Environment provided regulatory approval for the first-time use of ceramic membrane filters for a drinking water system in the United States.
BOTTOM The 10 MGD WPF is designed for expansion up to 40 MGD.

Grand Prize - Industrial Waste Practice

ENTRANT: Navy Region Southwest
ENGINEER-IN-CHARGE: Angela Lind, P.E.
LOCATION: San Diego, California

Design/Build of Remediation Systems for VOC-Contaminated Groundwater, Soil Gas, and Indoor Air at Naval Base Point Loma

The Navy and its contractors developed an innovative and expedited approach to clean up contamination detected in the groundwater, soil gas, and indoor air at Naval Base Point Loma, located in San Diego, California. The site has historically been used as an aircraft manufacturing facility. Solvents stored at the site were identified as the source of volatile organic compound (VOC) contamination—primarily trichloroethene (TCE).

Since the remediation systems began operations in April 2015, levels of TCE in indoor air have reduced to below the U.S. Environmental Protection Agency's action levels. Offices that were vacated due to health concerns are reoccupied. Further, groundwater VOC concentrations have been substantially reduced more than 100 fold. The improvement in groundwater quality will support future beneficial uses as the demand for water continues to increase.

Naval Facilities Engineering Command Southwest provided project management and contract administration services for the project. Four contractors worked seamlessly to address the contamination concerns: CH2M HILL-Kleinfelder Joint Venture; CB&I; Tetra Tech EC, Inc.; and NOREAS, Inc. The remediation system included three major components to address contamination in groundwater, soil gas, and indoor air. Separate systems were installed to treat soil gas and groundwater. The soil gas was treated by installing four vertical wells and one horizontal well to directly extract VOCs. The groundwater system included injecting microbial cultures and emulsified vegetable oil to break down the VOCs. To prevent soil gas from migrating to indoor air, the team sealed cracks and entry points. As an added measure of protection, the team installed a ventilation system under the building floor.

The Navy and its contractors addressed several challenges while designing and implementing the remediation system. The system needed to reduce contamination rapidly to minimize disruption to Navy operations, be installed in areas with extensive utilities and constrained spaces, and ensure all potential migration pathways were addressed and sealed off.

Leveraging the expertise of several of the region's leading remediation contractors, the team provided the best custom solution to ensure the system efficiently and rapidly reduced contamination. Several tests were conducted to determine the best locations for the wells and injection sites. The team used a depressurization test to identify vapor entry points and migration pathways.

RIGHT The primary VI entry point, a 10-inch x 20-inch saw cut opening in the concrete floor, was hidden within a wall. The area was sealed and modified for use as the extration point for the sub-floor ventilation system.
BOTTOM Offices vacated as a result of vapor intrusion are now reoccupied due to successful SVE/EAB and VI mitigation performance.

Grand Prize - Operations/Management

ENTRANT: Sanitation Districts of Los Angeles County
ENGINEER-IN-CHARGE: Grace Robinson Hyde, P.E., BCEE
LOCATION: Whittier, California

Waste Not, Want Not — Recycling Food Waste at a Wastewater Treatment Plant

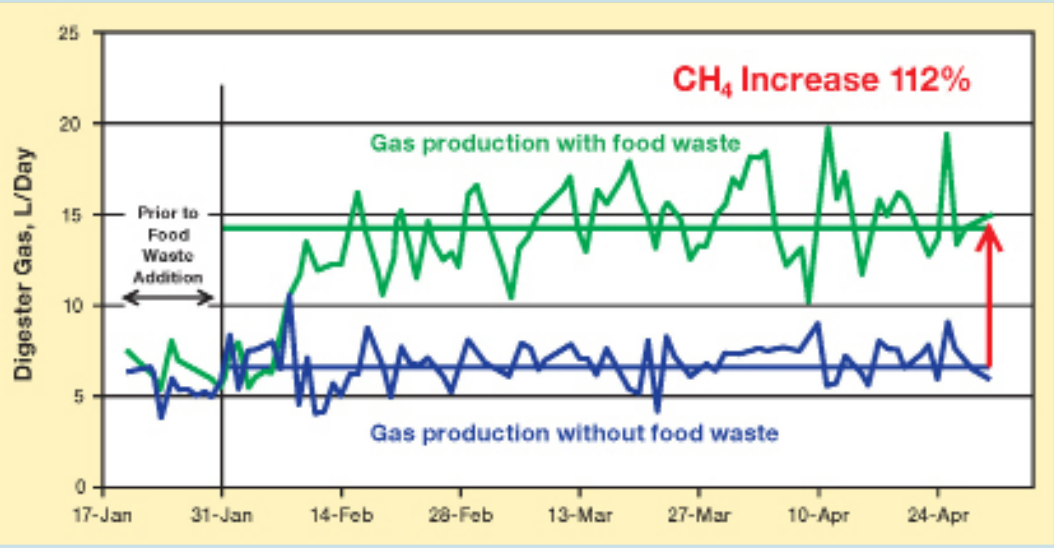
The Sanitation Districts, in partnership with USA Waste of California, Inc., have developed a project in which source separated food waste is collected, processed, and delivered to an anaerobic digester at a large wastewater treatment plant. This project utilizes existing wastewater treatment infrastructure to recycle up to 84 tons per day of source separated food waste. Food waste is diverted from landfill disposal and converted into renewable energy and soil amendments. Diverting organic waste away from sanitary landfills is a key part of California's strategy to reach 75 percent recycling by 2020.

US Waste obtains the food waste via customer agreements that prohibit disposal of food waste containing glass, metals, plastics, wood, fiber products, and hazardous materials and cleaning solvents. Remaining non-food waste contaminants are removed using a system that refines the food waste to a clean feedstock. The raw feedstock is reduced to particle size followed by screening and mixing with water to create slurry that meets Engineered Bio-Slurry specifications.

Bench scale testing of various blends of wastewater treatment infrastructure sludge and food waste slurry was performed. The tests showed that methane production was more than doubled in the digester with food waste slurry addition, and that food waste slurry co-digestion at the feed rate tested had no deleterious impact on digester operation or stability. Since the Joint Water Pollution Control Plant (JWPCP) facility operates a combined cycle combustion turbine facility that typically generates 20 MW for onsite use. This facility has spare capacity that is able to use most of the additional digester gas produced by the project to generate an additional 250 kW of electricity.

The Sanitation Districts and US Waste have successfully initiated a pioneering project to recycle food waste through anaerobic digestion at an existing wastewater treatment plant and, to date, have processed more than 19,000 tons of food waste slurry. This project has lead the way in helping to meet California's organic recycling goals and to provide operational details and lessons to other wastewater treatment facilities around the country as they adopt the approach.

TOP Bench scale test results showed that methane production is doubled at the optimum food waste feed rate.
BOTTOM Methane gas generated in the anaerobic digestion process is used to produce power and digester heating steam in a Total Energy Facility that utilizes gas turbines and waste-heat recovery steam generators. The on-site generation of electricity permits the JWPCP to produce most of its own electricity.



ENTRANT: Los Angeles Department of Water and Power
ENGINEER-IN-CHARGE: Penny Falcon
LOCATION: Los Angeles, California

Water Loss Task Force Action Plan

In 2013, the Los Angeles Department of Water and Power (LADWP) completed a Water Loss Audit and Component Analysis (Audit) to comply with the requirements of California Assembly Bill 1420 (2009) and the California Urban Water Conservation Council's (CUWCC) Best Management Practice 1.2. The goal of the Audit was to identify water system losses, determine the economic optimum level of water losses, and provide recommendations for loss intervention strategies.

Although the Audit confirmed that the City's water system experiences relatively low levels of water loss, LADWP determined that the high cost of water production justifies the examination of cost-effective options to further reduce losses. Water loss control measures also help the City comply with emergency water conservation measures enacted by the State of California to address on-going drought conditions.

LADWP decided to use the Audit results to create a new and innovative planning and management mechanism to proactively address water loss in a manner that exceeds current State and CUWCC requirements. The mechanism consists of the Water Loss Task Force (Task Force), a group of over 100 LADWP staff and managers focused on reducing water loss, and the Water Loss Task Force Action Plan (Action Plan), a "living" road map for the Task Force to follow to address the recommendations provided by the Audit and incorporate water loss control measures in ongoing operation and maintenance. It is estimated that Action Plan implementation will require over $4 million for capital projects and approximately $2 million for annual operations and maintenance.

The Action Plan also represents LADWP's strong commitment to addressing water loss problems rather than simply identifying and reporting them in a document. Its goal is to protect the City's equipment, infrastructure, and valuable water supplies by improving water loss detection, data collection, response, and prevention. Since the Action Plan was finalized in September 2015, LADWP has expedited implementation of key tasks.

TOP The Los Angeles Department of Water and Power staff are reading selected meters throughout the City of Los Angeles. The meters were discovered to be covered in dirt, asphalt, or concrete when the streets or sidewalk was repaired. Some meters were tampered or stolen and needed to be replaced. The meter database needed to be updated to reflect the current field conditions.
BOTTOM The Los Angeles Aqueduct provides water from the Eastern Sierras to the Los Angeles Aqueduct Filtration Plant where it will deliver water to Los Angeles residents through 7,000 miles of pipeline.

ENTRANT: DC Water

ENGINEER-IN-CHARGE: Sudhir Murthy, Ph.D., P.E., BCEE

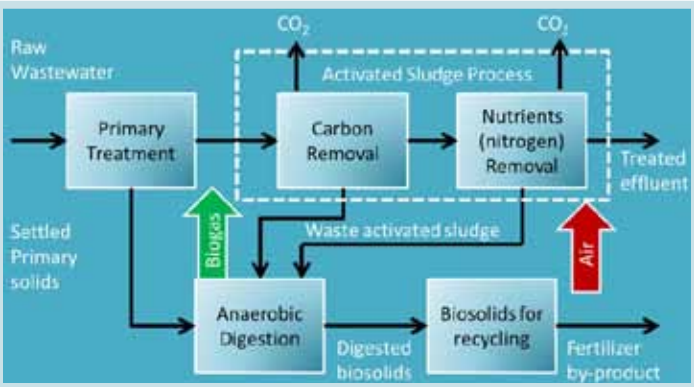
LOCATION: Washington, DC

Closing in on Energy Neutrality at a Water Resource Recovery Facility: Modifying Contact Stabilization for 21st Century Drivers

The District of Columbia Water and Sewer Authority (DC Water), George Washington and Ghent Universities, and AECOM are collaborating together on an extensive engineering and applied research program to allow Water Utilities to close in on energy neutrality at a wastewater treatment works.

Because of increasing stress on energy and nutrient resources, water utilities have to be innovative in how they treat wastewater by maximizing resource capture with minimum energy consumption. It is well known that aeration required to destroy organic carbon contaminants in wastewater is the largest energy consumer during treatment; fortunately energy can be recovered by anaerobic digestion of sludge which converts carbon in the wastewater sludge into a methane-rich biogas. The diversion of the organic carbon in wastewater away from aeration and towards anaerobic digestion for energy recovery rather than consumption plays a fundamental role in helping a wastewater treatment plant in becoming energy self-sufficient. Several approaches have been previously used to attempt this over the years, but have all suffered from a variety of limitations.

Previous work has shown that lower aerobic biosolids retention times can maximize carbon uptake into biomass but this comes at the expense of poor settleability which is required to enable settlement of the carbon for harvesting. When aeration is preceded by chemically enhanced primary treatment, as is the case with DC Water this becomes even more challenging. However, DC Water recognized that the Contact Stabilization Process, originally developed in the 1940s, but superseded in favor carbon oxidation processes, could be repurposed for modern drivers. DC Water developed a modified version of the technology and gained valuable insight into the fundamentals influencing adsorption of carbon and bio-flocculation. The work conducted by DC Water has demonstrated that, not only is it possible to maximize carbon adsorption and harvesting, itself a major breakthrough, but that it can be controlled and understood in real-time. The results found by the research team are also manifesting themselves at full-scale at DC Water's Blue Plains Advanced Wastewater treatment works.



TOP Simplified wastewater treatment configuration.
BOTTOM Primary treatment to redirect carbon to anaerobic digestion.

Grand Prize - Small Firms

ENTRANT: AquaWorks DBO, Inc.
ENGINEER-IN-CHARGE: Adam Sommers, P.E.
LOCATION: Conifer, Colorado

Mountain Water & Sanitation District Wastewater Treatment Improvement Project

The Mountain Water and Sanitation District, located 45 minutes west of Denver, Colorado, provides municipal water and wastewater service to approximately 400 homes. The district's wastewater treatment plant, designed in the early 1980s, was never intended to remove ammonia. The Colorado Department of Public Health and Environment, the agency responsible for regulating wastewater treatment, issued ammonia limits as low as 4.3 mg/L effective as of its 2016 discharge permit renewal. The existing plant was not capable of meeting these limits, and the district immediately began searching for the most cost-effective way to maintain compliance with the updated requirements.

AquaWorks DBO engineered a system that implements a wastewater treatment process where advanced treatment through denetrification occurs within the sequencing batch reactor units at no additional incremental cost, preparing the District for the possibility of additional nitrogen limits. The system improvements were also engineering to allow the district to maintain long-term compliance with newly-implemented effluent ammonia regulations. AquaWorks was also instrumental with the district being awarded a State Revolving Fund loan for the project at a 0% interest rate, and designing environmentally innovative components to qualify the project for the EPA funded Green Project Reserve Program.

TOP Completed wastewater treatment plant
BOTTOM Wastewater treatment plant interior - Treatment units below grating

ENTRANT: Geosyntec Consultants, Inc.
ENGINEER-IN-CHARGE: Rachel Klinger, P.E.
LOCATION: Tampa, Florida

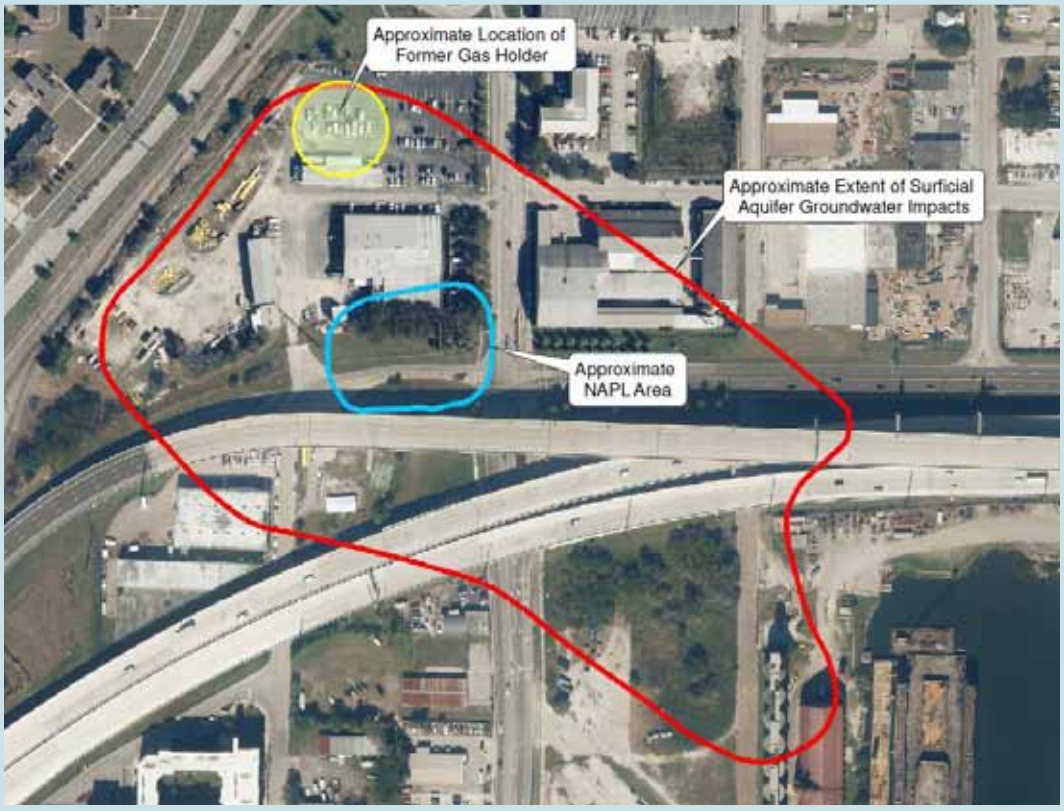
Remediation of a Former Manufactured Gas Plant Brownfield Property in Downtown Tampa Florida

In early 2015, a Brownfield Site Rehabilitation Agreement was executed with the Florida Department of Environmental Protection (FDEP) to position a former manufactured gas plant (MGP) property for redevelopment. Geosyntec Consultants, Inc. (Geosyntec) provided engineering services to TECO Peoples Gas System (TECO) to evaluate, select, and implement a fast-track, comprehensive Site cleanup approach to position the Site for redevelopment.

The cleanup of the former MGP Site was put into high gear and required a team of experienced professionals working in close coordination with FDEP, the City of Tampa, Hillsborough County, TECO and the developers. In under one year, Geosyntec completed a remedial feasibility study, selected multi-phase extraction (MPE) to cleanup MGP impacts, and designed, implemented, and operated the selected remedial alternative. The operating MPE system is effectively removing MGP impacts and treating extracted groundwater and vapor streams. During the first six months of operation the MPE system has removed over 10 tons of MGP impacts from the subsurface.

With the increased demand for urban property in downtown Tampa, the Former MGP Brownfield property is viewed as an attractive location for a mixed use development in the trendy Channelside District located blocks from the historic Ybor City neighborhood. The proposed real-estate development is expected to have two, 29-story towers with over 1,000 apartments or condominiums and more than 40,000 square feet of retail space in a third building.

The on-going remedial efforts led by Geosyntec to reduce the environmental impacts associated with the former MGP property will transform this property from a former MGP to a thriving urban oasis just blocks from Hillsborough Bay and the Florida Aquarium. According to the Mayor of Tampa, Bob Buckhorn, "the development will provide a great linkage between Ybor City and downtown".



RIGHT Circa 1900. A manufactured gas plant was established in Tampa, Florida, to support the increasing need for energy. Manufactured gas was used to light streets, heat homes, and cook food. *BOTTOM* Though MGP operations ceased in the 1960s, remnants of the operations were left behind. MGP coal tar non-aqueous phase liquids (NAPLS) encompass an area of approximately 1 acre and a dissolved groundwater plume encompasses an area of approximately 20 acres.

ENTRANTS: University of Nebraska-Lincoln and Texas A&M University
ENGINEER-IN-CHARGE: Tian C. Zhang, Ph.D., P.E., BCEE
LOCATION: College Station, Texas

Kinetics and Mechanistic Framework for Pollution Control Using Activated Iron Processes

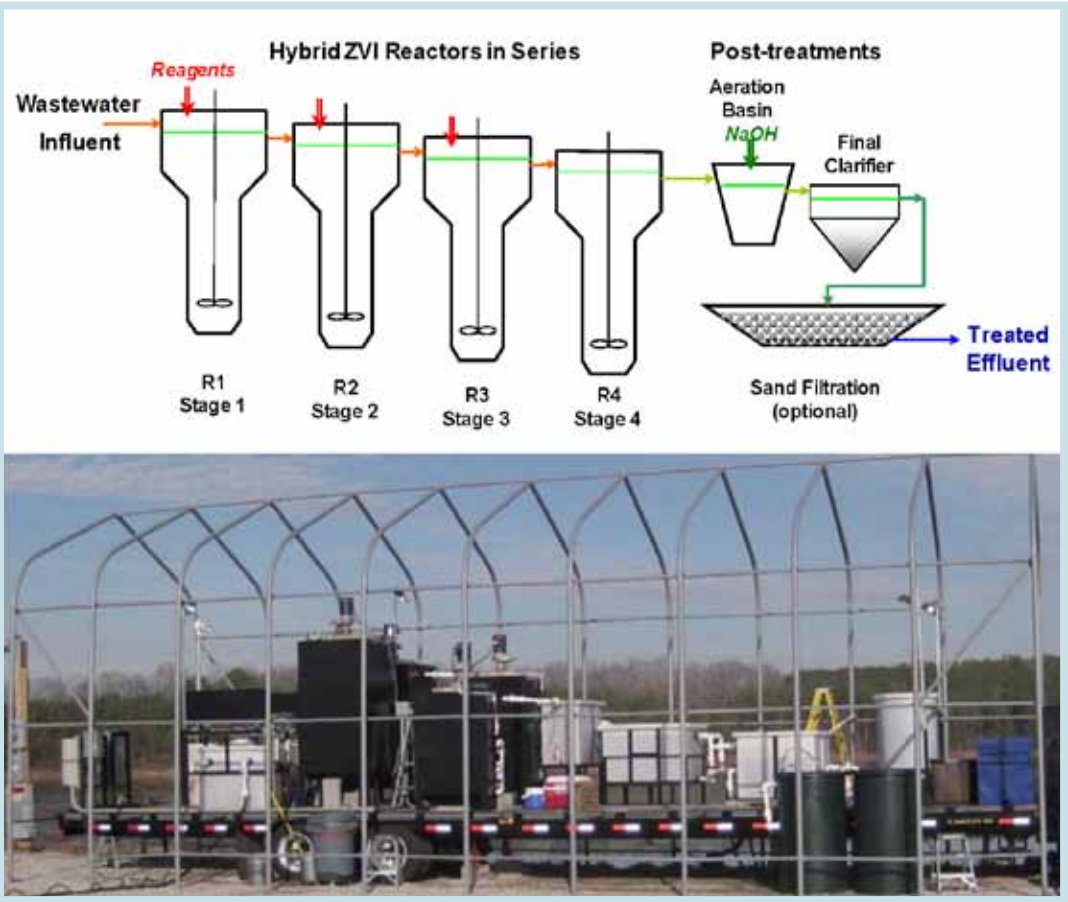
In 1994, the National Research Council estimated that the United States had 300,000 to 400,000 contaminated groundwater/soil sites with hazardous wastes posing a myriad of threats to human health and the environment. Up to $1 trillion would be required to clean up the sites over the span of the next 30 years. Zerovalent iron (Fe^0) technology emerged as a potential solution to various pollutants since 1990, but problems associated with passivation hampers its application. Elucidating the mechanisms that describe these relationships has been an ongoing critical challenge for researchers.

This project primarily focused on: 1) application of Fe^0 processes for remediation of different contaminants in multiple media; 2) elucidation of the functions of iron oxides and relationships among Fe^0, Fe^{2+} and iron oxides under different conditions; and 3) development of the activated iron technology and promotion of its applications. It was determined that a series of chemical reactions and mechanisms that in tandem could overcome Fe^0 passivation and invented a hybridized system of surface reactive Fe^0 + FeO_x + Fe(II)–the so-called *Activated Iron Technology* (AIT). The technology has been used for a) removing heavy metals from flue-gas desulfurization (FGD) wastewater, refinery stripped sour water, and acid mining drainage; b) removing dissolved silica for many industrial water supplies; c) remediation of groundwater contaminated with multi-pollutants; and d) air purification of different sources.

Remediation of pollutants from different media is very important but often costly. This study developed a new treatment platform that uses reactive power of the rapid iron corrosion process to remove various contaminants/impurities from all environmental media.

Little is known about how to rejuvenate passivated iron grains. This study investigated formation and effects of Iron corrosion coatings on performance of Fe^0 or AIT systems and found that the formation of magnetite on Fe^0 granules could significantly accelerate reduction of pollutants if Fe^{2+} or other are available in bulk solution. AIT has the advantages of simplicity, versatility/ robustness, high efficiency, low operation/maintenance cost, and limited sludge production as well as is effective for decreasing a broad spectrum of heavy metals and metalloids of different forms to near or below ppb level.

The project advanced fundamentals of how to rejuvenate passivated iron with improved understanding of mechanisms and kinetics related to the Fe^0 process. Results of this study have direct transferability for people to develop new activated iron processes. The invented AIT can be used as a platform for remediation and pollution control in all environmental media, which will contribute to reduction of public health risk, promotion of economic growth, and development of sustainability society.



Schematic representation *TOP* and a picture *BOTTOM* of the pilot-scale continuous-flow hybrid activated iron system to treat flue-gas-desulfurization (FGD) wastewater between Jan. 15 to June 22, 2011 for field demonstration. The system, mounted on a 40-ft flat-bed trailer, has a treatment capacity of 1-2 gal/min (5-10 m^3/d) and a total hydraulic retention time of 8-16 h. The four reactors have a total volume of 1,000 gal (250 gal/each reactor). Raw FGD wastewater strength: Hg^{2+} (50-195 µg/L), 1-3 ppm SO_4^{2-}-Se; 10-30 mg/L NO_3-N, high persulfate (~300 mg/L) and varied flow rate.

Honor Award - Design

ENTRANT: Black & Veatch
ENGINEER-IN-CHARGE: James H. Clark, P.E.
LOCATION: Fountain Valley, California

Orange County Groundwater Replenishment System Initial Expansion

The Initial Expansion of the Groundwater Replenishment System (GWRS) made the world's largest advanced water purification system for potable reuse even bigger. The 30 mgd expansion increased capacity of the GWRS to 100 mgd.

The expansion featured several key developments to optimize the performance of the existing advanced water purification facility. Completed in 2015, the Initial Expansion included enhancements to the post-treatment system and the RO system as well as a concept to equalize secondary effluent flow to maximize GWRS capacity.

The GWRS is a joint project of Orange County Water District and Orange County Sanitation District. By taking highly treated wastewater and purifying it through a three step process, it produces near-distilled quality water.

Black & Veatch provided preliminary and final design as the structural, civil, electrical and mechanical engineer. Parsons served as the construction manager for the project, and McCarthy Building Companies Inc. was the general contractor.

The Initial Expansion project increased the capacity of the GWRS from 70 mgd to 100 mgd.

Honor Award - Environmental Sustainability

ENTRANT: Orange County Sanitation District
ENGINEER-IN-CHARGE: Andrew M. Stanton
LOCATION: Fountain Valley, California

OCSD Central Generation Emissions Control (J-111)

Catalytic converter technology, similar to those used on automobiles, small engines, and large power stations, is helping the Orange County Sanitation District (OCSD) perform well below emissions control limits established by South Coast Air Quality Management District (AQMD).

OCSD's two wastewater treatment plants treats an average of 182 million gallons per day (mgd) of wastewater. OCSD burns digester gas, which helps to create heat and power for its facilities by fueling central generation units. OCSD's eight central generation units are capable of producing a combined 22.5 megawatts of energy.

The installation of catalytic converter technology on the central generation units helps OCSD to achieve emissions well below the limits required by comply AQMD's amendment to Rule 1110.2, which sets emissions limits for wastewater treatment facilities. The first of the engines to be retrofitted is achieving 83 percent reduction in oxides of nitrogen (NOx) and 98.6 percent reduction in carbon monoxide emissions.

The project required significant coordination between the work planning and OCSD's regular operations, including normal maintenance operations. Careful organization was necessary to ensure OCSD continued to operate without having to purchase more power to compensate for losses, or to flare off more digester gas as a waste product.

PLC display for the emissions control system showing system configuration.

Honor Award - Operations/Management

ENTRANT: CDM Smith

ENGINEERS-IN-CHARGE: Gerald B. Benson, P.E., BCEE/Brian Cully, P.E.

LOCATION: Columbia, South Carolina

Best-in-Class O&M and Organizational Improvements for the City of Columbia Utilities Department

The wastewater services of the City of Columbia, South Carolina, faced aging infrastructure, budgetary constraints, deferred maintenance, and outdated operations and maintenance systems. As a result, increased sanitary sewer overflows resulted in an EPA Consent Decree. In response and in collaboration with CDM Smith, the city developed the Clean Water 2020 program (CW2020).

CDM Smith is the program manager CW2020. An essential component of this program is the city's now-completed best-in-class $4.5 million Operations and Maintenance Systems and Organizational Improvements project.

This effort included a wide variety of activities: from assessing and cataloguing hundreds of assets throughout the city's wastewater system, to upgrading and interconnecting software and hardware, to performing organizational assessments and leading workshops to improve business practices. CDM Smith provided the business partnership, technical expertise, and consent decree response experience needed to help the city of Columbia respond to regulatory engagement with an effort that was truly exceptional.

The city has set a course to invest more than $800 million on wastewater infrastructure in the next several years. Columbia is now utilizing the technology and training it has implemented through the improvements to make that investment pay off.

When catastrophic flooding struck the city in October 2015, damaging many of the city's wastewater assets, the careful and complete cataloguing that had taken place through the improvements helped the city assess damage and plan for recovery far more quickly.

Honor Award - Research

ENTRANT: Orange County Sanitation District

ENGINEER-IN-CHARGE: Ted Vitko, P.E.

LOCATION: Fountain Valley, California

Critical Assessment of Process Odorants

The Orange County Sanitation District (OCSD) provides wastewater collection, treatment, and recycling for approximately 2.5 million people in central and northwest Orange County and treats nearly 200 million gallons of wastewater a day (MGD. The delivery and treatment of wastewater commonly generates odors.

Although the most odorous processes are equipped with foul air scrubbers, nuisance odors can occur. OCSD has conducted groundbreaking research that will transform the approach for odor control treatment by using methods that were adapted from the food and water industry to identify compounds that cause unwanted odors. To help determine the type of odors produced at the two plants, OCSD used a new approach with an odor panel method (OPM) providing sensory descriptors and simultaneous chemical analyses to determine the most odorous compounds. Using an intensity scale, panelist were asked to rate the intensity of the odor. Using the panel's responses, nine different types of odors were identified.

The most odorous compounds were then further evaluated to determine the concentration where the compound becomes a nuisance or an 'action level.' The previous science in this area had voids or wide ranges of values, which were difficult to use in design.

Obtaining a Foul Air Sample with a Flux Chamber on a Trickling Filter

Honor Award - Small Firms

ENTRANT: McCrone

ENGINEER-IN-CHARGE: Robert M. Sell, P.E.

LOCATION: Ijamsville, Maryland

Cultural Integration in Wastewater Treatment - SBA Temple

McCrone had the unique privilege to design a wastewater treatment and disposal system for Sri Bhaktha Anjaneya (SBA) Temple in Ijamsville, MD. McCrone was tasked with integrating wastewater flows from the Hindu temple into current wastewater system design guidelines.

There were several engineering challenges related to the project's cultural uniqueness. McCrone's engineering transcended the design parameters for an unconventional project, to integrate a different culture through the world of wastewater treatment. McCrone submitted their research report to MDE for inclusion in the newly-established wastewater flow parameter in MDE Guidance on Wastewater Flows for Use in Designing On-Site Systems.

Rob Sell, Project Manager, realized the challenges of the project and also appreciated the opportunities to contribute to Maryland's flowrates database and learn about new "wastewater culture". He worked closely on the project with Natalia Dunlap, the Project Engineer in Public Works who also played a key role in the SBAT project. Natalia was dedicated to the project and vested in its success as much as Rob; she even attended the Grand Opening of the Temple two weeks before delivering her first baby.

WWTP site and five Priest Houses in the background. The WWTP system includes two E300 ECOPAD systems designed to handle estimated wastewater flow rate of 4,775 GPD. ECOPAD is an aerobic fixed-film process consisting of three phases: media, biofilm and liquid. The BOD and ammonia removed from the liquid flowing past the biofilm is oxidized. Oxygen is supplied by diffused aeration in to the packing. No clarification is used with the aerobic submerged attached growth processes, and excess solids from biomass growth and influent suspended solids are trapped in the system and must be periodically removed. The major advantages of submerged attached growth processes are their relatively small space requirement, the ability to effectively treat diluted wastewaters, no sludge settling issues as in activated-sludge process, and aesthetics. The fence is installed to prevent holy cows from entering the WWTP site and rubbing against electrical and chemical equipment.

2016 Environmental Communications Award

Communicating with the public at large and other constituents can be a complex and challenging issue. Communication and marketing plans must be designed to address the objectives and strategies of the campaign to reach target audiences.

With this in mind, in cooperation with the International Water Association and the PIA Awards, AAEES offered a new area of competition for 2012, the Environmental Communications Award.

The criteria that an independent panel of judges uses to assess the entries include:

- **Future value** to the water engineering profession,
- **Creativity and clarity** in portraying and communicating the messages,
- **Effectiveness in delivery** and achieving desired outcome, and
- **Integrated Design Approach** – Narrative and visual elements work together to achieve the communication objectives.

Two winners were selected for the 2016 Environmental Communications Awards: one Grand Prize winner and three Honor Awards.

AAEES would like to thank the following individuals who served as judges for the 2016 Environmental Communications Awards:

Judy Berkun

Marlene Hobel, Vice President, Corporate Communications, CDM Smith

Marisa Waterman, Marketing Specialist, AAEES

Grand Prize

ENTRANT: Metropolitan Water District of Southern California

PERSON IN CHARGE: Susan Sims

Communicating the Value of Water Conservation During California's Historic Drought

OVERVIEW

In response to California's worst drought in more than a century, Governor Jerry Brown declared a state of emergency in 2015 and issued the first-ever mandated statewide urban water restrictions. The Metropolitan Water District of Southern California, the nation's largest municipal water provider, responded to this challenge with a series of innovative environmental and engineering strategies that were communicated with a multimedia, multilingual outreach program aimed at increasing public awareness and affecting behavioral change.

Metropolitan's approach successfully communicated the need, value and benefits of water conservation to a culturally diverse region of 19 million people, resulting in a 27% reduction in water use and corresponding benefits to the region's water supply, public health, economic conditions and environmental sustainability. In a recent public awareness survey of 1,000 Southern Californians as conducted by an independent research firm for Metropolitan, 88% of respondents had seen advertising encouraging people to conserve and nine of out ten gave high ratings to the television commercial used in Metropolitan's advertising campaign.

BACKGROUND

Metropolitan offers many water conservation programs for residents and businesses. Over the past 25 years, these programs have reduced per capita water use by about 30%.

But with a statewide call to reduce water use even more in 2015, the fourth year of drought, Metropolitan faced an even greater challenge. It responded with a focused effort to capitalize on the public's awareness and the need to conserve. Metropolitan expanded funding for its rebate programs for turf removal and water-saving products from $20 million to $450 million, making it the largest single investment in water conservation incentives in the nation's history.

Through this program, more than 190,000 people have received rebates to lock in permanent reductions by installing water-saving devices in their homes and businesses, and by replacing lawns to drought-tolerant landscapes that better fit the region's Mediterranean climate and promote environmental sustainability. Once fully implemented, the program will support the removal about 175 million square feet of turf in Southern California – the equivalent of about 3,000 football fields, and save 21 million gallons of water a day.

THE COMMUNICATION PLAN

To promote water conservation, Metropolitan created and managed a portfolio of high-profile communications activities including its "Let's All Take a Turn" advertising and outreach campaign, which was launched in July 2015. Key components and measures of success included:

- Multimedia: The research-based $5.5 million campaign featured television, radio, outdoor, and digital advertising targeting all demographics.
- Multilingual Integrated Design: All campaign materials were translated into Spanish, Chinese, Korean and Vietnamese and campaign featured an integrated design approach using in-language and stand-alone visuals to communicate an impactful message through imagery.
- Clear, Creative Concepts: Campaign materials used strong creative graphic elements that clearly communicated the water saving message according to focus groups. The message was direct: During these extreme conditions, we can all do our part.
- Digital and Social Outreach: Using social media and an innovative online strategy, Metropolitan reached digitally-savvy millennials and culturally diverse audiences with unique approaches including social media, digital content, and video banners that were continually optimized for greatest value.
- Innovative Use of Communication Tools: Metropolitan created two water lover music playlists -- one for Pandora Radio and one for Uforia, a Spanish language streaming station that featured water-themed songs timed for shorter showers. The move, which attracted substantial media attention, marked the first time a water agency has used Pandora and Uforia in this way to spread the water- saving message.
- High Visibility Events: To attract media and public attention, Metropolitan held several outreach events. For one, the iconic giant rooftop sign on Randy's Donuts in Inglewood was covered with the red knob of the Turn campaign and the community was invited to make pledges to use less water (and get a free donut!)
- Collaboration with Partner Agencies and Conservation Organizations: A Twitter-based #wateryoudoing hashtag campaign was conducted in a partnership with leading environmental organizations.
- News Media Coverage: The campaign and California's drought attracted worldwide media attention throughout North America and as far away as Europe and Asia. Metropolitan participated in more than 450 news media interviews in 2015.

> "Metropolitan is proud to have accelerated the movement by hundreds of thousands of Southern Californians to embrace a new outdoor aesthetic and lock in water savings permanently."
>
> *Jeffrey Kightlinger*
> *General Manager Metropolitan Water District July 2015*

- Measuring Reach to Target Audiences: With approximately 1 billion media impressions delivered, the campaign successfully reached its audience as demonstrated in a post-campaign public awareness survey conducted by an independent research firm.

Cost Effectiveness: With high public awareness and news media interest in the drought, Metropolitan added significant added value through its "Turn" campaign media buy and outreach.

- Secured at a cost of about $4 million, the media portion of the campaign leveraged an extra $2 million in added advertising placements for a total value of $6 million in advertising – a 59% increase at no additional cost to Metropolitan.
- The digital, social, and community events reached large audiences, making them an extremely good value. Across the board, measurements exceeded the baseline metrics and industry standards.
- The campaign generated enormous amounts of press coverage and earned media, ranging from stories in the LA Times to newspapers in China, Japan and Europe, and included media trade publications such as Ad Age, to university publications, magazines and blogs.

FUTURE VALUE

The cultural, ethnic and economic diversity of the region, overlaid with the historic drought, provided a remarkable opportunity to capitalize on the public's awareness of water issues and conservation opportunities with a strong and effective communication program, and positions Metropolitan as a leader in sustainability. Awareness of Metropolitan's "Take a Turn" ads is above average compared to similar campaigns, according to an independent survey of 1,000 Southern Californians. The campaign created the type of public awareness that will be essential as Metropolitan explores additional sustainability opportunities and sound investments in water storage, recycling and other regional projects, together with infrastructure improvements that improve system reliability to meet future challenges.

Honor Award

ENTRANT: Alexandria Renew Enterprises

PERSON IN CHARGE: Kristina Twigg

Rebranding AlexRenew

Alexandria Renew Enterprises (AlexRenew) is an advanced water resource recovery facility serving more than 300,000 customers in northern Virginia. In 2012, our services were a line item on customers' water bills. Now, after rebranding, AlexRenew is developing awareness among the community and water sector of our role as Alexandria's Water Transformers.

Each year, AlexRenew transforms more than 13 billion gallons of wastewater into clean water as well as renewable energy and Class A biosolids. AlexRenew also reuses 1.4 billion gallons onsite and will soon offer reclaimed water locally. Core to AlexRenew's mission is protecting public health and the environment. This is integral to the economy of Alexandria, which chartered itself an Eco-City. Additionally, AlexRenew creates local jobs through major construction projects, and we maintain an operator apprenticeship program.

Designed to transform 54 million gallons per day on a 33-acre campus, AlexRenew is the smallest gallon per acre facility in the nation. Being good neighbors in a space-constrained urban area within the ecologically sensitive Chesapeake Bay watershed requires ingenuity. AlexRenew meets these challenges with hard work and innovation, like our advanced odor control system.

In 2012, AlexRenew changed its name from Alexandria Sanitation Authority to one befitting its role in resource recovery and community development. We created a new logo and brand identity becoming "Alexandria's Water Transformers." The goal of the rebranding was to better convey AlexRenew's role as more than a passive treater of water to a bold, creative transformer that redefines the way our community solves problems. The brand also redefines the role of wastewater as a resource too useful to waste. As we began handling our own billing, we wanted our customers to recognize AlexRenew as an investment in clean water rather than just a bill.

Our brand now reflects who AlexRenew is, what we do, and value we add. It aligns with our 2040 vision, created by our citizen-led board, and defines the characteristics we embody, helping to create a positive collective identity for our AlexRenew team. The brand defines the image we project through both internal and external communications to our core audiences: residents, employees, and influencers, which includes decision makers and water sector leaders. It also provides a roadmap for communicating to these audiences.

BRAND DISCOVERY PROCESS

AlexRenew, together with our partner Siddall, executed a brand discovery process. We analyzed other water utilities' brand identities and expressions of them as well as three years of AlexRenew communications materials and messages. We interviewed AlexRenew team members, vendors, and board members, who are community mem-

bers with valuable customer insight. With the recent change in billing, we did not survey customers. Our name recognition was already low, and we knew from feedback that customers saw us only as a bill.

The Alexandria's Water Transformers brand developed out of the discovery process along withsupporting brand copy:

"The innovations at Alexandria Renew are all about creating a higher quality of life. Thanks to the progressive solutions and dedicated staff of Alexandria Renew, the water leaving the city's homes transforms into revived natural spaces, a stronger economy, cost-effective solutions for irrigation and more beautiful green spaces for families to share. And every person who touches Alexandria Renew can take pride in knowing they are supporting this transformation."

From there, we developed the brand strategy, promise, mantra, and personality.

- Strategy: Reframing the role of the water resource recovery facility from a passive treater of water to a bold, creative transformer, redefining the way our community solves problems
- Promise: The ingenuity to transform our water and our world
- Mantra: Transforming water to transform our world
- Personality: Innovative, resourceful, connected, public-minded, and customer-focused

During a brand immersion session with AlexRenew team members, we identified four brand roles that best reflect our work and support our brand. These roles include:

- Innovator – big problems call for real creativity, fresh approaches, and new technology
- Transformer – we do more than just treat water, we transform it
- Good neighbor – we put resources to work so the community and the environment can thrive
- Problem solver – working together, we're helping to reduce our impact, lower risk, and decrease costs

APPLYING THE BRAND

AlexRenew launched the brand in October 2015. Internally, the AlexRenew team received launch boxes with brand information and giveaways. Brand posters celebrating team members' hard work and ingenuity are hung throughout campus. As we elevate our brand, taking AlexRenew from a standard utility to a place of transformation, we also elevate the internal culture. The brand helps every associate realize the importance of their work.

During its external launch, the AlexRenew brand was experienced by hundreds of local residents at FieldFest, a day-long festival celebrating the opening of a new community athletic field constructed on top of our nutrient management facility. Since its launch, we have applied the brand creative to all of our existing communications vehicles, including our website, social media, internal newsletter, customer bills and bill stuffers, brochures, and educational materials. Additionally, we have applied the brand to business support materials including stationery, folders, business and note cards, name badges, and PowerPoint templates.

The brand creative also directed our content strategy and communications plan. The content strategy examines Alexandria demographics and recommends platforms, content, and key messages for AlexRenew staff, water sector leaders, and residents — including such target groups as parents, millennials, baby boomers, and educators. Our communication efforts focus on telling AlexRenew's story using words and visuals across a variety of platforms all through the lens of our brand. The communications plan outlines objectives, strategies, and activities that use online and traditional media.

AlexRenew's brand has received enthusiastic response from our board and water sector leaders. Incorporating the brand into all that we do has enhanced positive word of mouth in our community, helped the public better understand what we do, enhanced employee pride, and resulted in uniform messaging. To date, target audience responses to our brand have been wholly positive. While our results are qualitative, we view them as an encouraging indicator of the response to our future branded communications.

PROFESSIONAL SERVICES DIRECTORY

Ad Size	1 Time Rate (Color)	4 Time Rate (Color)/issue	4 Time Rate (B&W)/issue	Online/Digital Edition
Double Page Spread	$2,500	$2,000		FREE
Full Page Back Cover	$1,800	$1,600		FREE
Full Page Inside Cover	$1,500	$1,300		FREE
Full Page	$1,000	$900		FREE
2/3 Page	$725	$700		FREE
1/2 Page	$675	$600		FREE
1/3 Page	$500	$425		FREE
1/4 Page	$400	$350		FREE
Professional Services Directory 1 Height*		$160	$140	FREE
Professional Services Directory 2 Height*		$220	$200	FREE

*Professional Services Directory is a special section for employers of Board Certified Environmental Engineers, Board Certified Environmental Engineering Members, Board Certified Environmental Scientists, and AAEES Members only. Rates start at only $140. For other advertising opportunities in *Environmental Engineer and Scientist*, call Yolanda Moulden at 410.266.3311 or email YMoulden@aaees.org.

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