

Curriculum Vitae

**Glen T. Daigger, PhD, PE, BCEE, DMASCE, Distinguished Fellow IWA, Fellow WEF
NAE**

EDUCATION

PhD, Environmental Engineering, Purdue University, 1979

MSCE, Environmental Engineering, Purdue University, 1975

BSCE, Purdue University, 1973

PROFESSIONAL REGISTRATION

Registered Professional Engineer: State of Indiana, Number 870309; State of Arizona, Number 47312

Board Certified Environmental Engineer, American Academy of Environmental Engineers

PROFESSIONAL EXPERIENCE

University of Michigan: 2015-Present

Dr. Daigger is currently Professor of Engineering Practice in the Department of Civil and Environmental Engineering at the University of Michigan. In this role he identifies and develops significant initiatives within the Department, the College of Engineering, and across campus for increased contribution to solving regional, national, and global water issues. He also interacts broadly across campus with faculty and students to help bring “real world” experience into the classroom and the research program.

One Water Solutions LLC: 2014-Present

Dr. Daigger is currently President and Founder of One Water Solutions, a water management professional services company. One Water Solutions provides water management consulting services to a wide range of utilities, consulting firms, and technology providers. Specializing in innovative solutions, coupled with fundamental and practical knowledge of existing and emerging water management and treatment technologies and practices, One Water Solutions offers superior water management solutions to its clients. Dr. Daigger is responsible for all aspects of the firm’s operations and is the principal consultant employed by the firm.

CH2M HILL: 1997–2014

Dr. Daigger served as a senior vice president with CH2M HILL, an international consulting engineering firm. He served as chief wastewater process engineer and was responsible for wastewater process engineering on both municipal and industrial wastewater treatment projects on a firm-wide basis. He is the first Technical Fellow for the firm, an honor which recognizes the leadership that he provides for CH2M HILL and for the profession in the development and implementation of new wastewater treatment technology. He also served as the chief technology officer for the firm’s Water Business Group. From 1997 to 2006 he served as technology director of the firm’s Water Business Group.

Clemson University: 1994–1996

From August 1994 to July 1996, Dr. Daigger served as professor and chair of the Department of Environmental Systems Engineering (ESE) at Clemson University. In that position he was responsible for leadership and administration of the activities of the department, including its continuing development as an academic department. He also taught graduate and undergraduate courses in environmental engineering and water and wastewater process engineering. ESE is a mature academic department (nearly 30 years old) and is widely recognized as one of the premiere environmental engineering graduate schools in the nation. It offers a broad curriculum that covers the topics of environmental science and engineering. Seven areas of specialization are offered, consisting of process engineering, hazardous and radioactive waste treatment, contaminant characterization, contaminant fate and transport, analysis of natural systems, environmental restoration, and risk assessment and waste management. The student body averages approximately 100 graduate students pursuing masters or PhD degrees. During the 1995–1996 academic year, he also served as the director of the newly organized School of the Environment, which included the ESE Department and the Departments of Environmental Toxicology and Geological Sciences. In that position he was responsible for establishing the overall direction and program for the school.

CH2M HILL: 1979–1994

Between 1979 and 1994, Dr. Daigger was employed by CH2M HILL, an international consulting engineering firm, where he served as a senior vice president. CH2M HILL is the largest consulting engineering firm in the United States, and it also maintains the largest wastewater treatment practice of all firms within the United States. Dr. Daigger served as process engineer, project engineer, process consultant, and senior consultant on a wide variety of municipal and industrial wastewater treatment and reclamation projects. Between 1982 and 1991 he served as assistant director of CH2M HILL's Wastewater Reclamation Discipline Group, with firm-wide responsibility for wastewater process engineering. In this position he was responsible for establishing standards and overseeing the process engineering work on all of the firm's municipal wastewater treatment projects. He also served as acting director for the group during periods when the director was not available. Between 1991 and 1994, Dr. Daigger served as director of the Wastewater Reclamation Discipline Group and then as director, wastewater reclamation. In these positions he was responsible for technology and quality for all of the firm's municipal wastewater treatment projects. This practice area represented in excess of \$100 million in professional fees for the firm on an annual basis.

Between 1990 and 1992, Dr. Daigger also served as CH2M HILL's first director of the Office of Innovation. The Office of Innovation was organized to recognize and champion the innovation process within all of the firm's activities. As the first director of this activity, Dr. Daigger was responsible for taking the objectives formulated by the firm's Board of Directors and developing and implementing an integrated program to meet those objectives. The program was not to stand alone, but was to be integrated into the firm's existing activities. This objective was realized, and

the program was successfully transitioned to the next director (note: by charter the term of the director is limited to 2 years).

Purdue University: 1975–1979

During his career at Purdue University, Dr. Daigger served as a University Fellow, David Ross Research Fellow, and as a graduate teaching assistant.

Project Experience

Dr. Daigger has also been a practicing environmental engineer. He has been involved in the planning, development, design, construction, startup, and operation of wastewater treatment facilities for municipalities and industries. Included in these activities have been many process studies and bench-scale and pilot-scale evaluations of wastewater treatment alternatives. He has been involved in facilities ranging in size from the smallest to the largest. Appendix A lists the facilities he has been involved with.

Dr. Daigger has also been involved with a number of industrial wastewater treatment facilities. Examples include the Burley, Idaho; Ontario, Oregon; and Plover, Wisconsin facilities for Ore-Ida foods; the Marcus Hook Refinery in Philadelphia, Wisconsin; the Kwinana Refinery in Perth, western Australia; the Bahrain Petroleum Company Refinery; two wet corn milling plants in Lafayette, Indiana, for the Staley Corporation; the Hubinger wet corn milling plant in Keokuk, Iowa; Columbia Nitrogen in Augusta, Georgia; Pendleton Woolen Mills, Pendleton, Oregon; ARCO; EXXON; and numerous pulp and paper facilities such as the Proctor and Gamble facility in Mahopany, Pennsylvania; and the Georgia Pacific facilities in Pensacola and Jacksonville, Florida.

MEMBERSHIPS IN PROFESSIONAL SOCIETIES

American Academy of Environmental Engineers and Scientists

American Society of Civil Engineers

American Water Works Association

Association of Environmental Engineering and Science Professors

Chi Epsilon

International Water Association (IWA)

National Academy of Engineering

Sigma Xi

Tau Beta Pi

Water Environment Federation

PROFESSIONAL ACTIVITIES

Chair of the National Water Research Institute (NWRI) Panel on Hampton Roads Sanitation District (HRSD) Sustainable Water Infrastructure for the Future (SWIFT) Program, 2016-Present

Member of the Water Environment & Reuse Foundation (WE&RF) Board of Directors (2016-Present), Co-Vice Chair (2016-Present)

Chair of the International Advisory Committee (IAC) of the International Science & Technology Cooperation Center for Urban Alternative Water Resources Development (Int'l AWR Center), Xi'an, PRC, 2015-Present

Member, Expert Panel for the Integrated Validation and Demonstration Plan, Singapore PUB, 2015-Present.

Member of the Asian Development Bank Water Advisory Group, 2014-Present

Member of the National Academy of Engineering Nominating Committee, 2014.

International Co-Chair of the Science and Technology Commission for the 7th World Water Forum, 2013-2015.

Member of National Academy Committee on the On-Site Reuse of Graywater and Stormwater: An Assessment of Risks, Costs, and Benefits, 2013-2015.

Member of National Academy Committee on Science and Technology Capabilities at the Department of State, 2013-2015.

Member of the Water Environment Research Foundation (WERF) Board of Directors, 2013-Present (Vice Chair 2015-2016).

Member of The Water Council Board of Directors, 2013-Present.

Member of National Academy of Engineering Committee on Membership, 2012-2013.

Member of National Academy Panel Regional Approaches to Urban Sustainability: A Focus on Portland – A Workshop, 2012-2-13.

Member of National Academy Panel on the Review of the Draft 2013 National Climate Assessment (NCA) Report, 2012-2013.

Member of the National Academy of Engineering Center for Engineering, Ethics and Society Advisory Committee, 2012-2018.

Member of the National Academy Committee on Sustainability Linkages in the Federal Government, 2011 – 2013.

Member of the National Academy Committee on Economic Analysis of Final Water Quality Standards for Nutrients for Lakes and Flowing Waters in Florida, 2011-2012.

Member of the National Academy Committee on Regional Approaches to Urban Sustainability: A Focus on Metropolitan Houston, 2011-2012.

Member of the National Academy of Engineering Engineering Ethics Center Advisory Committee, 2011-2012.

Member of National Academy of Engineering Section 4 (Civil Engineering) Peer Committee, 2010-2013. Chair 2012-2013 and Vice Chair 2011-2012.

President, International Water Association (IWA), 2010–2014.

Member of the Board of Directors for the Environmental Engineering Foundation (Currently Vice-Chair and Previously Treasurer), 2009-Present.

Member of the National Academy Committee on Transitioning to Sustainability: The Challenge of Developing Sustainable Urban Systems. The National Academies Second Sustainability R&D Forum, 2009-2010.

Member of National Academy Roundtable on Science and Technology for Sustainability, 2007–2013.

Member of National Academy Committee on the Review of Water and Environmental Research Systems Network, 2007-2010

Senior Vice President, IWA, 2006–2010.

Member of the Environment and Water Industry Development Council (EWI), Singapore, International Advisory Panel, 2006-2009.

Member of National Academy of Engineering Committee on Engineering Education, 2005-2008.

Member of National Academy Committee on Energy Futures and air Pollution in Urban China and the United States, 2005-2007.

Member of the Water Environment Research Foundation (WERF) Research Council (2002–2008) and Chair (2004–2006).

Member of the Water Environment Research Foundation (WERF) Board of Directors, 2004-2006.

Chair of the Committee Leadership Council of the Water Environment Federation (WEF), 2004–2007.

Member (at-Large) of the WEF House of Delegates, 2004–2007.

Member of the WEF Board of Trustees, 2004–2006.

American Academy of Environmental Engineers (AAEE) trustee, 1998–2002.

Member of AAEE Long Range Planning Committee, 2002–2008.

Member of the USA National Committee (USANC) to IWA, 1996–2008.

Former Chair of the Water Environment Research Board of Editorial Review.

Former Chair of the WEF Technical Practice Committee.

Former Chair of WEF Manual of Practice No. 8 Task Force.

Member of the Scientific Committee for the IWA Leading Edge Drinking Water and Wastewater Treatment Technology Conferences in the Netherlands, Prague, Sapporo, Singapore (2), and Zurich, 2003–2009.

Member of the Organizing Committee for the 1994 ASCE Environmental Engineering Conference in Boulder, Colorado.

Member of the Panel on Source Control and POTW Technologies, Committee on Wastewater Management for Coastal Urban Areas, National Research Council, Water Science and Technology Board, 1990-1993.

Member of the Civil Engineering Research Foundation Implementation Task Force.

Member of WEF Committee on Manual of Practice (MOP) for Wastewater Treatment Plant Design (MOP 8). Contributing author to chapter 8, Activated Sludge, and Reviewer for chapter 11, Fixed Film Systems.

Member of WEF Committee on Clarifier Design. Co-author of Manual of Practice on Clarifier Design.

Member of the WEF Committee on Fixed Growth Reactors. Reviewer of Fixed Growth Reactor MOP.

Member of WEF Committee on Nutrient Control. Reviewer of Nutrient Control MOP.

Former member of WEF Awards Committee, and former chairman of the Gascoigne Medal Subcommittee.

Member of WEF Committee on Aeration.

Member of IWA Technical Group on the Design and Operation of Large Wastewater Treatment Plants.

Member of the IWA Technical Group on Biological Nutrient Removal.

Member of the IWA Technical Group on Population Dynamics.

Member of the IWA Technical Group on Biofilms.

Technical reviewer of papers submitted for publication in numerous professional Journals, such as *Water Environment Research*, *Water Science and Technology*, *Water Research*, and *Journal Environmental Engineering Division, American Society of Civil Engineers*. Also a frequent reviewer of manuals and reports. Examples include:

U.S. EPA, *Design Manual for Phosphorus Removal*, EPA/625/1-87/001, Water Engineering Research Laboratory (September, 1987).

U.S. EPA, *Handbook, Retrofitting POTWs*, EPA/625/6-89/020, Center for Environmental Research Information (July 1989).

WEF Manual of Practice, *Aerobic Fixed Film Reactors*, 2001

HONORS AND AWARDS

Presented the John McClanahan Henske Distinguished Lecture in Chemical and Environmental Engineering, Yale University, New Haven, CT, December 7, 2016.

Received Frederick George Pohland Medal, Association of Environmental Engineering and Science Professors, 2016.

Life Member, American Society of Civil Engineers, 2016.

Named Most Influential Individual in Water for 2015 by Water and Wastewater International.

Keynote Lecture at the Joint Chemical & Environmental Engineering Seminar
Sponsored by the Chancellor's Distinguished Visitors Program and the Frank H. Schulte, Jr.
Endowment for Chemical Engineering in Honor of Dean Henry E. Bent

Named Distinguished Fellow, International Water Association, 2014

Richart Lecture, University of Michigan, 2013.

McCarty Lecture, Stanford University, 2013.

Elected Distinguished Member of the American Society of Civil Engineering, 2012.

Named Water Environment Federation Fellow, 2012.

Named Distinguished Engineering Alumni, Purdue University, 2012.

Presented the Tsuan Hua Feng Distinguished Lecture at the University of Massachusetts at Amherst, October, 2011.

Received Purdue University Civil Engineering Alumni Achievement Award, 2010.

Named Fellow of the American Society of Civil Engineers, 2009.

Presented the 2008 Association of Environmental Engineering and Science Professors Lecture at the Research Symposium for the Water Environment Federation Technical Exhibition and Conference.

Received the 2008 Harrison Prescott Eddy Award from the Water Environment Federation.

Presented the 2006 Simon W. Freese Award & Lecture from ASCE.

With M. G. Noesen, D. Laffitte, T. Mc Allister, S. Clark, and B. Sprick, recognized by the Water Environment Federation for the best poster at the 2005 WEFTEC Conference, entitled "Peak Flow Treatment Alternatives Evaluated for the Eugene-Springfield Water Pollutions Control Facility, Oregon".

Elected to the National Academy of Engineers, 2003.

Received the 2002 Harrison Prescott Eddy Award from the Water Environment Federation.

Received the 2001 Harrison Prescott Eddy Award from the Water Environment Federation.

Presented the American Academy of Environmental Engineers (AAEE) Kappe Lecturer, 2001

Received the 1996 Phillip F. Morgan Award from the Water Environment Federation.

Named first Technical Fellow by CH2M HILL, 1996.

Presented the third annual James JC. Brown Design Lecture at the University of North Carolina at Chapel Hill, 1993.

Recognized by CH2M HILL for Outstanding Contribution to Innovation by the Firm.

Recognized specifically for development of the WQIG and for the development of phosphorus removal technology at the Rock Creek Advanced Wastewater Treatment Plant, 1992.

Recognized by the American Consulting Engineering Council with a Grand Award for contribution to the development of the VIP plant project, 1992.

Recognized by Engineering News Record (ENR) for Outstanding Contribution to the Construction Industry, February 17, 1988.

Received the 1987 Radebaugh Award from the Central States Water Pollution Control Association for Noteworthy Advancement of Knowledge.

Outstanding Paper Presented at the 1985 Annual Conference of the Illinois Water Pollution Control Association Meeting.

Received the 1982 Gascoigne Award from the Water Pollution Control Federation for Significant Contribution to Operations.

Named a David Ross Fellow, 1975–1977.

Named a Purdue University Fellow, 1973–1975.

Named Outstanding Civil Engineering Senior by Indiana Section of ASCE.

Named Outstanding Junior by Purdue Student Chapter of Chi Epsilon.

Honorary Professorships

Xi'an University of Architecture and Technology, 2016.

Tongji University, Advisory Professor, 2012.

Nanjing Institute of Environmental Sciences, Ministry of Environmental Protection, Honorary Professor, 2012.

Beijing University of Civil Engineering and Architecture, Visiting Professor, 2009.

PUBLICATIONS

Books, Monographs, and Book Chapters

Foundational

Sabba, F., J. Calhoun, B.R. Johnson, G.T. Daigger, R. Kovács, I. Takács, and J. Boltz, “Applications of Mobile Carrier Biofilm Modelling for Wastewater Treatment Processes,” In *Frontiers in Wastewater Treatment and Modelling*, Mannina, G. Ed., FICWTM 2017, Springer International Publishing AG, Cham, Switzerland, 2017.

Cavagnaro, P., C. Conn, C. Hill, B. Hannon, G. Daigger, K. McCormack, J. Zelski, N. Love, C. KOsmoski, D. Mack, J. Harte, *Michigan’s Water Resource Utility of the Future: A Vision for the Transformation of Michigan’s Wastewater Industry to Water Resource Recovery Facilities*, MWEA, Bath, MI, 2017.

Catley-Carlson, M., G. T. Daigger, and C. van Steendam, *A Better Water future for Flanders: “Not too much; not too little”*, Royal Flemish Academy 2016 Thinkers Programme, 2016.

Daigger, G. T., “What is Water Worth?”, In *The Value of Water: A Compendium of Essays by Smart CEO’s*, Roa, D. V., Vincent Roa Group, Rockville, MD, 2014.

Daigger, G. T., “Arden and Lockett Remembrance,” In *Activated Sludge – 100 Years and Counting*, Jenkins, D., and J. Wanner, Ed., IWA Publishing, London, 2014.

Grady, C. P. L., Jr., G. T. Daigger, N. G. Love, and Carlos, D. M. Filipe, *Biological Wastewater Treatment*, Third Edition, CRC Press, Boca Raton, FL, 2011.

Grady, C. P. L., Jr., G. T. Daigger, and H. C. Lim, *Biological Wastewater Treatment*, Second Edition, Marcel Dekker, New York, New York (1999).

Daigger, G. T. and J. A. Buttz, *Upgrading Wastewater Treatment Plants*, Second Edition, Technomic Publishers, Lancaster, PA (1998).

Daigger, G. T. and J. A. Buttz, *Upgrading Wastewater Treatment Plants*, Technomic Publishers, Lancaster, PA (1992).

Solids Separation

Jenkins, D., M. G. Richard, and G. T. Daigger, *Manual on the Causes and Control of Activated Sludge Bulking, Foaming, and Other Solids Separation Problems*, 3rd Edition, Lewis Publishers, Boca Raton, FL, 2004.

Jenkins, D., M.G. Richard, and G.T. Daigger, *Manual on the Causes and Control of Activated Sludge Bulking and Foaming*, 2nd Edition, Lewis Publishers, Ann Arbor, MI, 1993.

Jenkins, D., M. G. Richard, and G. T. Daigger, *Manual on the Causes and Control of Activated Sludge Bulking and Foaming*, 1st Edition, Water Research Commission, Republic of South Africa (December, 1984).

Nutrient Removal

Daigger, G. T. and S. R. Polson, “Design and Operation of Biological Nitrogen Removal Processes,” In *Principles and Practice of Phosphorus and Nitrogen Removal from Municipal Wastewater*, 2nd Ed., Sedlak, R. K., Ed. Lewis Publishers, Ann Arbor, MI (1992).

Daigger, G. T. and T. W. Sigmund, "Design and Operation of Chemical Phosphorus removal Facilities," In *Principles and Practice of Phosphorus and Nitrogen Removal from Municipal Wastewater*, 2nd Ed., Sedlak, R. K., Ed. Lewis Publishers, Ann Arbor, MI (1992).

Daigger, G. T. and S. R. Polson, "Design and Operation of Biological Phosphorus Removal Facilities," In *Principles and Practice of Phosphorus and Nitrogen Removal from Municipal Wastewater*, 2nd Ed., Sedlak, R. K., Ed. Lewis Publishers, Ann Arbor, MI (1992).

Resource Recovery

Daigger, G. T., "Designing and Implementing Urban Water and Resource Management Systems Which Recover Water, Energy, and Nutrients," In *Water-Energy Interactions in Water Reuse*, Lazarova, V., Choo, K-H, and Cornel, P., Ed., IWA Publishing, London, 2012.

Daigger, G. T., "A Vision for Urban Water and Wastewater Management in 2050," In *Toward a Sustainable Water Future: Visions for 2050*, Grayman, W. M., Loucks, D. P., and Saito, L., Ed., American Society of Civil Engineers, Reston, VA, 2012.

Daigger, G., "Integrating Water and Resource Management for Improved Sustainability," In *Water Infrastructure for Sustainable Communities: China and the World*, Hao, X., Novotny, V., and Nelson, V. Ed., IWA Publishing, London, 2010, 11-21.

Manuals

Foundational

Using Graywater and Stormwater to Enhance Local Water Supplies: An Assessment of Risks, Costs, and Benefits, The National Academies Press, Washington D.C., 2016, Committee Member.

Diplomacy for the 21st Century: Embedding a Culture of Science and Technology Throughout the Department of State, The National Academies Press, Washington D.C., 2015, Committee Member.

Sustainability for the Nation: Resource Connections and Governance Linkages, The National Academy Press, Washington D.C., 2013. Committee Member.

Pathways to Urban Sustainability: A Focus on the Houston Metropolitan Region, Summary of a Workshop, The National Academies Press, Washington, D.C., 2012. Task Force Member

Review of the Waters Network Science Plan, The National Academies Press, Washington D.C., 2010. Task Force Member

Aerobic Fixed-Growth Reactors, A Special Publication, Water Environment Federation, Alexandria, VA, 2000. Major Contributor

Research Priorities for Debottlenecking, Optimizing, and Rerating Wastewater Treatment Plants, Water Environment Research Foundation, Project 99-WWF-1, 1999. Major Contributor

Design of Municipal Wastewater Treatment Plants, Manual of Practice No. 8, 4th Edition, Water Environment Federation, Alexandria, VA, 1998. Task Force Chair

Managing Wastewater in Coastal Urban Areas, National Research Council Press, Washington, D.C., 1993. Major Contributor

Design Manual for Fine Pore Aeration Systems, United States Environmental Protection Agency, EPA/625/1-89/023, Risk Reduction Engineering Laboratory (September 1989). Major Contributor

Summary Report: Fine Pore (Fine Bubble) Aeration Systems, United States Environmental Protection Agency, EPA/625/8-85/010., Water Engineering Research Laboratory, October, 1985. Major Contributor

Nutrient Removal

Review of the EPA's Economic Analysis of Final Water Quality Standards for Nutrients for Lakes and Flowing Waters in Florida, The National Academies Press, Washington D.C., 2012. Committee Chair

Water Environment Research Foundation, *Characterizing Mechanisms of Simultaneous Biological Nutrient Removal During Wastewater Treatment*, Project 00-CTS-17UR, 2004. Major Contributor

Nitrogen Control Manual, United States Environmental Protection Agency, EPA/625/R-93/010, 1993. Major Contributor

Membrane Bioreactor

Membrane Bioreactors, Manual of Practice No. 36, Water Environment Federation, Alexandria, VA, 2011. Task Force Chair

Membrane Technology: Feasibility of Solids/Liquids Separation in Wastewater Treatment, Water Environment Research Foundation, Alexandria, VA, Website and CD-ROM, 2001. Principal Investigator

Refereed Publications

Foundational

Boltz, J.P., B. Smets, B. E. Rittmann, M. C. M. van Loosdrecht, E. Morgenroth, G. T. Daigger, "From Biofilm Ecology to Reactors: A Focused Review," *Wat. Sci. Technol.*, **75**(8), 1753-1760, 2017. doi: 10.2166/wst.2017.061

Daigger, G. T., J. S. Siczka, T. F. Smith, D. A. Frank, J. A. McCorquodale, "Marrying Step Feed with Clarifier Improvements Increase Wet Weather Capacity: Integrated Methodology," *Water Environment Research*, **89**, 724-731, 2017. doi: 10.2175/106143017X14839994523983.

Daigger, G. T., "Flexibility and Adaptability: Essential Elements of the WRRF of the Future," *Water Practice & Technology*, **12**(1), 156-165, 2017. doi: 10.2166/wpt.2017.019.

Boltz, J. P., B. R. Johnson, I. Takács, G. T. Daigger, E. Morgenroth, D. Brockmann, R. Kovács, J. M. Calhoun J-M Choubert, and N. Derlon, "Biofilm Carrier Migration Model Describes

Reactor Performance,” *Water Science & Technology*, 2818-2828, 2017. DOI: 10.1666/SWT.2017.160, 2017

Daigger, G. T., S. Murthy, N. G. Love, and J. Sandino, “Transforming Environmental Engineering and Science Education, Research, and Practice,” *Environmental Engineering Science*, **34**(1), 42-50, 2017. DOI: 10.1089/ees.2015.0353.

Daigger, G. T., J. S. Siczka, T. F. Smith, D. A. Frank, and J. A. McCorquodale, “Characterizing Shallow Secondary Clarifier Performance Where Conventional Flux Theory Over-Estimates Allowable Solids Loading Rate,” *Wat. Sci. & Tech.*, **74**(2), 324-332, 2016.

Zaffaroni, C., Daigger, G., Nicol, P., Lee, T.W., “Wastewater Treatment Challenges Faced by the Petrochemical and Refinery industry, and Opportunities for Water Reuse,” *Water Pract. & Tech.*, **11** (1), 104-117, doi: 10.2166/wpt.2016.012, 2016.

Novak, P. J., W. A. Arnold, B. Henningsgaard, R. M. Hozalski, K. Kessler, T. L. LaPara, A. Parrella, L. Rogacki, C. Thompson, R. Thorson, R. A. Zimmerman, C. B. Bott, G. T. Daigger, J. B. Neethling, “Innovation Promoted by Regulatory Flexibility,” *Env. Sci. & Tech.*, doi.org/10.1021/acs.est.5b05394, 2016.

Sicard, C., C. Glen, B. Aubie, D. Wallace, S. Jahanshahi-Anbuhi, K. Pennings, G. T. Daigger, R. Pelton, J. D. Brennan, C. D. M. Filipe,” Tools for Water Quality Monitoring and Mapping Using Paper-Based Sensors and Cell Phones,” *Water Research*, **70**, 360-369, 2014.

Graedel, T. E., D. Swackhamer, R. Anex, W. F. Carroll, Jr., G. T. Daigger, P. Ferrão, H. Frumkin, S. Katzen, A. Palmisano, S. Polasky, L. Scarlett, R. Stephens, and L. Zeise, “Sustainability for the Nation: Resource Connections and Governance Linkages,” *Environmental Science and Technology*, June, 2014, DOI 10.1021/es502328v.

Daigger, G. T., “A Practitioner’s Perspective on the Uses and Future Developments for Wastewater Treatment Modelling,” *Water Science & Technology*, **63**(3), 516-526, 2011.

Benedetti, L., J. Langeveld, A. Comeau, L. Corominas, G. Daigger, C. Martin, P. S. Mikkelsen, L. Vezzaro, S. Weijers, and P. A. Vanrolleghem, “Modelling and Monitoring of Integrated Urban Wastewater Systems: Review of Status and Perspectives,” *Water Science & Technology*, **68**(6), 1203-1215, 2013.

Plósz, B. G., L. Benedetti, L., Daigger, G. T. Langford, K. H. Larsen, H. F., Monteith, H., Ort, C., Seth, R., Steyer, J. P., and Vanrolleghem, P.A., “Modelling Micro-Pollutant Fate in Wastewater Collection and Treatment Systems: Status and Challenges,” *Water Science & Technology*, **67**(1), 1-15, 2013.

Daigger, G. T. and J. P. Boltz, “Trickling Filter and Trickling Filter-Suspended Growth Process Design and Operation: A State-of-the-Art Review,” *Wat. Envir. Res.*, **83**(5), 388-404, 2011.

Daigger, G. T., “A Practitioner’s Perspective on the Uses and Future Developments for Wastewater Treatment Modelling,” *Water Science & Technology*, **63**(3), 516-526, 2011.

- Boltz, J. P. and G. T. Daigger, "Uncertainty in Bulk-Liquid Hydrodynamics and Biofilm Dynamics Creates Uncertainties in Biofilm Reactor Design," *Water Science and Technology*, **61**(2), 307-316, 2010.
- Boltz, J. P., B. R. Johnson, G. T. Daigger, and J. Sandino, "Modeling Integrated Fixed-Film Activated Sludge and Moving-Bed Biofilm Reactor Systems I: Mathematical Treatment and Model Development," *Water Environment Research*, **81**(6), 555-575, 2009.
- Boltz, J. P., B. R. Johnson, G. T. Daigger, J. Sandino, and D. Elenter, "Modeling Integrated Fixed-Film Activated Sludge and Moving-Bed Biofilm Reactor Systems II: Evaluation," *Water Environment Research*, **81**(6), 576-586, 2009.
- Boltz, J. P., Goodwin, S. J., Rippon, D., and Daigger, G. T., "A Review of Operational Control Strategies for Snail and Other Macrofauna Infestations in Trickling Filters," *Water Practice*, **2**(4), 2008.
- Witherspoon, J. R., G. Adams, W. Cain, E. Cometto-Muniz, B. Forbes, L. Hentz, J. T. Novack, M. Higgins, S. Murthy, D. McEwen, H. T. Ong, and G. T. Daigger, "Water Environment Research Foundation (WERF) Anaerobic Digestion and Related Processes, Odour and Health Effects Study," *Water Science And Technology*, **50**(4), 9-16, 2004.
- Morgenroth, E., G. T. Daigger, A. Ledin, and J. Keller, "International Evaluation of Current and Future Requirements for Environmental Engineering Education," *Water Science and Technology*, **49**(8), 11-18, 2004.
- Bradley, B. R., Daigger, G. T., Rubin, R., and Tchbanaglou, G., "Evaluation of Onsite Wastewater Treatment Technologies Using Sustainable Development Criteria," *Clean Technology and Environmental Policy*, **4**, 87-99, 2002.
- Witherspoon, J. R., A. Sidhu, J. Castleberry, L. Coleman, K. Reynolds, T. Card, and G. T. Daigger, "Odour Emission Estimates and Control Strategies Using Models and Sampling for East Bay Municipal Utility District's collection Sewage System and Wastewater Treatment Plant," *Water Science and Technology*, **41**(06), 65-71 (2000).
- Kitis, M., C. D. Adams, J. Kuzhikannil, and G. T. Daigger, "Effects of Ozone/Hydrogen Peroxide Pretreatment on Aerobic Biodegradability of Nonionic Surfactants and Polypropylene Glycol," *Environmental Science and Technology*, **34**, 2305-2310 (2000).
- Daigger, G. T. and E. Bailey, "Improving Aerobic Digestion by Prethickening, Staged Operation, and Aerobic-Anoxic Operation: Four Full-Scale Demonstrations," *Water Environment Research*, **72**, 260-270 (2000).
- Kitis, M., Adams, C. D., and Daigger, G., "The Effects of Fenton's Reagent Pretreatment on the Biodegradability of Non-Ionic Surfactants: Laboratory Studies and Economic Analysis," *Water Research*, **33**(11), 2561-2568, 1999.
- Daigger, G.T. and D. Nolasco, "Evaluation and Design of Full-Scale Wastewater Treatment Plants Using Biological Process Models," *Water Science and Technology*, **31**(2), 45-255, (1995).

Daigger, G.T., T.A. Heinemann, G. Land, R.S. Watson, "Practical Experience with Combined Carbon Oxidation and Nitrification in Plastic Media Trickling Filters," *Water Science and Technology*, **29**(10-11), 189-196 (1994).

Daigger, G.T., L.E. Norton, R.S. Watson, D. Crawford, and R.B. Sieger, "Process and Kinetic Analysis of Nitrification in Coupled Trickling Filter/Activated Sludge Processes," *Water Environment Research*, **65**, 750 (1993).

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APPENDIX A: WASTEWATER TREATMENT PLANT EXPERIENCE

Plant	Capacity (m³/day)
Changi East WWTP, Republic of Singapore	2,400,000
Hyperion WWTP, Los Angeles, CA;	1,500,000
Passaic Valley WWTP, Newark, NJ	1,500,000
Blue Plains WWTP, Washington, DC	1,440,300
Belmont WWTP, Indianapolis, IN	450,000
Southport WWTP, Indianapolis, IN	450,200
Central WWTP, Denver, CO; 5 mgd Bonita Springs WWTP, FL	454,200
San Jose/Santa Clara Water Pollution Control Plant, CA	630,000
West Point WWTP, Seattle, WA	600,000
Central WWTP, Dallas, TX	570,000
North WWTP, Memphis, TN	510,000
Jones Island Wastewater Treatment Plant (WWTP), Milwaukee, WI	470,000
Hamilton, Ontario, Canada WWTP	450,000
EBMUD WWTP, Oakland, CA	450,000
Manakau WWTP, Auckland, NZ	450,000
Iona Island WWTP, Vancouver, BC	450,000
South Shore WWTP, Milwaukee, WI	380,000
Morris Foreman WWTP, Louisville, KY	380,000
Columbia Boulevard WWTP, Portland, OR	380,000
Western Treatment Plant, Melbourne, Australia	350,000
Southside WWTP, Dallas, TX	340,000
Eastern Treatment Plant, Melbourne, Australia	330,000
Southeast Water Pollution Control Plant, San Francisco, CA	320,000
South Valley WRF, Utah	300,000
Orange County Sanitation District, HPO Plant, CA	300,000
Alexandria, VA, WWTP	265,000
Akron, OH, WWTP	265,000
McAlpine Creek WWTP, Charlotte, NC	240,000
Salt Lake City, UT Water Reclamation Plant	212,000
Fields Point WWTP, Narragansett Bay Commission, Providence, RI	208,000
Upper Occoquan Sewage Authority WWTP, Centerville, VA	204,000
South WRF, Orange County, FL	200,000
Green Bay, WI, WWTP	197,000
Rock Creek WWTP, Hillsboro, OR	191,000
Wyoming Valley WWTP, Wilkes-Barre, PA	189,000
Little Blue Valley WWTP, Independence, MO	189,000
Ina Road WRF, Pima County, AZ	189,000

four plants, Jacksonville, FL, Electric Authority	189,000
Northside WWTP, Tulsa, OK	160,000
VIP WWTP, Norfolk, VA	150,000
Duck Creek WWTP, Garland, TX	150,000
Pt. Woronzof WWTP Anchorage, AK	150,000
New Haven, CT, WWTP	150,000
Durham WWTP, Tigard, OR	150,000
South River WWTP, Atlanta, GA	150,000
R. L. Sutton WWTP, Cobb County, GA	150,000
Cedar Rapids WWTP, IA	150,000
Adams Field WWTP, Little Rock, AR	150,000
Riverside WRF, Spokane, WA.	150,000
Stockton, CA WWTP	150,000
Leon Creek WWTP, San Antonio, TX	132,000
Salado Creek WWTP, San Antonio, TX	132,000
Brightwater WWTP, King County, WA	132,000
Agua Nueva Water Reclamation Plant, Tucson, AZ	120,000
Allentown, PA WWTP	120,000
Fayetteville, NC WWTP	114,000
Lubbock, TX, WWTP	114,000
Missouri WWTP, Omaha, NB;	114,000
Bustamante WWTP, El Paso, TX	114,000
East WRF, Orange County, FL	114,000
South Bay International WWTP, San Diego, CA	95,000
Monterey Water Reclamation Plant, CA	95,000
H. L. Mooney Water Reclamation Facility, VA	91,000
Rowlett Creek WWTP, Garland, TX	90,000
Regional Plant No. 4, Chino Basin Municipal Utility District, CA	90,000
Hoboken, NJ, WWTP	90,000
Cross Creek WWTP, Fayetteville, NC	90,000
Bellingham, WA, WWTP	90,000
Carbon Canyon WWTP, Chino Basin Municipal Utility District, CA	80,000
Govalle WWTP Austin, TX	75,000
LOTT WWTP, Olympia, WA	75,000
Oceanside WWTP, San Francisco, CA	75,000
Terminal Island WWTP, Los Angeles, CA	75,000
Palo Alto, CA, WWTP	75,000
Stamford, CT, WWTP	75,000
Merramec WWTP, St. Louis, MO	75,000
Lethbridge, Alberta, WWTP	49,000
Beloit, WI, WWTP	68,000

Sunnyvale, CA WWTP	68,000
Paul R. Noland WWTP, Fayetteville, AR	64,000
West County WWTP, Louisville, KY	57,000
Seven Mile Beach WWTP for Cape May County Municipal Utilities Authority, NJ	57,000
Laguna WWTP, Santa Rosa, CA	57,000
Abilene, TX, WWTP	57,000
Kanapaha WWTP, Gainesville, FL;	57,000
Jordan Basin WRF, Utah	57,000
Caspar, WY, WWTP	53,000
14 WWTP's with total of 1,200 mgd of capacity for New York City, NY	4,500,000
North WRF, Orange County, FL	51,000
Visalia, CA, WWTP	45,000
Broad Run WWTP, Loudoun County, VA	45,000
Flat Creek WRF, Gainesville, GA	45,000
Tahoe-Truckee Sanitary Authority, Truckee, CA;	38,000
Tracy, CA, WWTP	38,000
Roseburg, OR, WWTP	38,000
Econchate WWTP, Montgomery, AL	38,000
Key West, FL, WWTP	38,000
Manhattan WWTP, KS	38,000
Grand Island WWTP, NB	38,000
Clear Creek WWTP, Redding, CA	38,000
West Camden, New South Wales, AU	36,000
Landis Sewage Authority WWTP, Landis, NJ;	32,000
Gippsland Water Factory, Tralagon, VIC, Australia	32,000
Tri-City WWTP, Oregon City, OR	31,000
Traverse City, MI WWTP	30,000
Muskogee, OK, WWTP	28,000
Twin Falls, ID, WWTP	28,000
Parkway WWTP, Laurel, MD	28,000
Marcy Gulch WWTP, Highlands Ranch, CO	26,000
Chickasaw WWTP, Bartlesville, OK;	26,000
Grand Strand, SC, WWTP;	25,000
Morristown, NJ, WWTP	23,000
Wilsonville, OR, WWTP	20,000
Northern WWTP, Cairns, Northern Territories, AU	19,400
Southern WWTP, Cairns, Northern Territories, AU	19,400
Okmulgee WWTP, OK	19,000
Bonita Springs WWTP, FL	19,000
Leesburg, VA, WWTP	19,000

Stillwater WWTP, Redding, CA	19,000
Eagle River WWTP, Anchorage, AK	19,000
Laei WWTP, HI	19,000
Kearney WWTP, NB	19,000
Olivehurst, CA, WWTP	19,000
Linwood WRF, Gainesville, GA	19,000
Port Townsend, WA, WWTP	17,000
Lower Township, NJ, WWTP	15,000
North Funen, DK, WRRF	11,500
Benicia, CA, WWTP	11,000
Port Charlotte, FL, WWTP	11,000
Anacortes, WA, WWTP	11,000
Woodburn, OR, WWTP	9,500
Hillsboro, OR, WWTP	7,600
Mainside WWTP, Quantico Marine Base, VA	7,600
Harriman, TN, WWTP	7,600
West Jefferson WWTP, Evergreen Metro District, CO	3,800
Girdwood, AK, WWTP	2,800