

CHIQUITA CANYON, LLC [FACILITY ID No. 119219] – EXHIBIT A TO DECLARATION OF CRAIG H. BENSON, PHD, PE, BCGE,
BCEE, NAE

CRAIG H. BENSON, PHD, PE, BCGE, BCEE, NAE

*Wisconsin Distinguished Professor Emeritus, University of Wisconsin-Madison
Dean of Engineering Emeritus, University of Virginia*

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EDUCATION

BSCE, Lehigh University - 1985

MSE, University of Texas at Austin – 1987 (Civil Engineering, Geotechnical/Geoenvironmental)

PhD, University of Texas at Austin – 1989 (Civil Engineering, Geotechnical/Geoenvironmental)

REGISTRATION AND APPOINTMENTS

US National Academy of Engineering, Inducted 2012

US National Academy of Inventors, Inducted 2018

American Association for Advancement of Science, Fellow, Inducted 2019

Professional Engineer, State of Wisconsin, License No. 34108-006

Board Certified Environmental Engineer, American Society of Environ. Engrs. & Scientists

Board Certified Geotechnical Engineer, Geo-Institute of the American Society of Civil Engineers

ACADEMIC LEADERSHIP APPOINTMENTS

Dean, School of Engineering, University of Virginia, Charlottesville, Virginia, July 2015 – June 2021
(Reappointed June 2020, Retired July 2021, Emeritus December 2022).

Director of Sustainability Research and Education and Co-Director of the Office of Sustainability,
University of Wisconsin, Madison, Wisconsin, 2011-2015.

Chair, Civil & Environmental Engineering, University of Wisconsin, Madison, Wisconsin, 2011-
2015.

Chair, Geological Engineering, University of Wisconsin, Madison, Wisconsin, 2007-2015.

Chair, Civil & Environmental Engineering, University of Washington, Seattle, WA, 2008-August
2009.

Director, Recycled Materials Resource Center, University of Wisconsin, Madison, Wisconsin, 2007-
2011. ①

Director, Wisconsin Geotechnics Laboratory, University of Wisconsin, Madison, Wisconsin, 2000-
2015.

Management Board, Consortium for Risk Evaluation and Stakeholder Participation, US
Department of Energy, 2009-present. ①

Associate Chair for Environmental Science and Engineering, Dept. of Civil & Environmental
Engineering, University of Wisconsin, Madison, Wisconsin, 2004-2007.

Co-Director, Consortium for Fly Ash Use in Geotechnical Engineering, University of Wisconsin-
Madison, Co-Director, 1999-2007.

PROFESSIONAL AND COMMUNITY LEADERSHIP APPOINTMENTS

Public Works Commission, Town of Middleton, Wisconsin, Commissioner, 2025-present.
Park Commission, Town of Middleton, Wisconsin, Commissioner, 2010-12.
Roundtable Linking Defense Basic Research to Leading Academia Research and Engineering Communities, National Academy of Engineering and US Department of Defense, 2019-2021.
Board of Trustees, Lehigh University, Bethlehem, Pennsylvania, 2018-2021.
Engineering Advisory Board, Lehigh University, Bethlehem, Pennsylvania, 2018-2020.
Sustainability Advisory Panel, ExxonMobil Corporation, Irving, Texas, 2017-2023 (disbanded).
National Academy of Engineering, Washington, DC.
Nominating Committee (2025–2026).
Committee on Awards (2019-2022, Vice Chair 2020–2021, Chair 2021-2022)
Section 4, Chair (2021 – 2023), Vice Chair (2019 – 2021), Secretary (2016 – 2018), Nomination Committee (Chair, 2016 – 2018)
Committee on Grand Challenges and Opportunities in Environmental Engineering and Science for the 21st Century (2017-2018).
Board of Directors, Commonwealth Center for Advanced Manufacturing, Disputanta, Virginia, 2015-2021, Chair (2018-2021), Vice Chair (2016–2018), Executive Committee (2015–2021), Compensation Committee (2018-2021), Governance Committee (Chair, 2016–2018; Vice Chair, 2018-2021).
Advisory Board, Global Waste Research Institute, California Polytechnic Institute at San Louis Obispo, 2010-present.
Board of Directors, Sustain Dane, Madison, Wisconsin, 2014-2015.
Geo Institute of ASCE, Board of Governors, Board Member 2007-2014, Treasurer 2010-11, Vice President 2011-12, President, 2012-13.
Editor-in-Chief, *Journal of Geotechnical and Geoenvironmental Engineering*, 2004-06.
Executive Committee, Committee D18 on Soil & Rock, ASTM International, 2006-2013, Liaison to Geo Institute Board of Governors, 2007-2011, Vice Chair, 2011-2013.
Glacier's End Homeowners Association, Town of Middleton, WI, President, 2012-2015, 2026-present; Vice President, 2010 – 2012, 2020-2026; Covenants Committee Chair, 2024-present.
Independent Technical Review Committee for On-Site Disposal Facilities, US Department of Energy, Appointed by Asst. Secretary J. Rispoli, Chair 2007-2010 (disbanded).
Research Council, Environmental Research and Education Foundation, 2011-2024, Vice Chair 2016-2017, Chair 2017-2018.

INDUSTRY EXPERIENCE

Dr. Benson has been extensively engaged by the environmental, energy, mining, and manufacturing industries over the last 40 years. His recent roles include specialty engineering consultant, strategy advisor, leadership advisor, expert witness in litigation support, and corporate board director/chair. Dr. Benson's industry experience spans six continents and more than 100 companies. More information on Dr. Benson's industry experience can be provided on request.

FACULTY APPOINTMENTS

Hamilton Endowed Chair in Engineering, University of Virginia, 2015-2022 (Emeritus Dec. 2022).
Honorary Professor, Southwest Jiaotong University, Chengdu, China, 2017.

Adjunct Professor, School of Civil, Environmental, and Mining Engineering, University of Western Australia, Crawley, WA, Australia, July 2015.

Wisconsin Distinguished Professor, University of Wisconsin, Madison, Wisconsin, 2007, Geological Engineering, Civil & Environmental Engineering (Emeritus May 2021).

Affiliate Professor, Nelson Institute for Environmental Studies, University of Wisconsin, Madison, Wisconsin, 2010-2015.

A.H. Fuller Professor, University of Washington, Seattle, WA, 2008- 2009.

Professor, University of Wisconsin, Madison, Wisconsin, 2000-2007 (joint appointment in Geological Engineering, Civil & Environmental Engineering).

Associate Professor, University of Wisconsin, Madison, Wisconsin, 1995-2000 (joint appointment in Geological Engineering, Civil & Environmental Engineering).

Assistant Professor, University of Wisconsin, Madison, Wisconsin, 1990-1995 (joint appointment in Geological Engineering, Civil & Environmental Engineering).

HONORS AND AWARDS

Professional

L. David Suits Award, Committee D35 on Geosynthetics, ASTM International, 2024

Kappe Lecturer, American Academy of Environmental Engineers and Scientists, 2024 ^①

Karl Terzaghi Award, Geo-Institute of the American Society of Civil Engineers, 2021

A. Ivan Johnson Outstanding Achievement Award, ASTM International, 2015

Fellow, ASTM International, 2011

Fellow, American Society of Civil Engineers, 2009

Fellow, Sigma Xi, Scientific Research Honor Society, 2017

Academy of Distinguished Alumni, University of Texas at Austin, 2009 ^①

Diplomate, Geotechnical Engineering, Academy of Geo-Professionals, 2009 ^①

Research

Lyman C. Reese Distinguished Lecturer, University of Texas at Austin, 2023

Best Paper Award, *Geotextiles and Geomembranes J.*, 2019

Best Paper Award, *Geosynthetics International J.*, 2019

Superior Paper Award, Waste Management Symposium, 2019, 2021, 2024

Spencer J. Buchanan Lecturer, Texas A&M University, 2014 [■]

Best Paper Award, Waste Management Symposium, 2014

G. Leonards Lecturer, Purdue University, 2013

Best Paper Honorable Mention (2nd Place), *Geosynthetics International*, 2013.

Ralph B. Peck Award, American Society of Civil Engineers, 2012 [■]

Outstanding Article on the Practice of Geotechnical Testing, ASTM International, 2011, 2013

Croes Medal, American Society of Civil Engineers, 1998 and 2008

Alfred P. Noble Prize, American Society of Civil Engineers, 2008

IJOG Excellent Paper Award, Intl. Assoc. Computer Methods & Advances in Geomechanics, 2008

Second Paper Award, Global Waste Management Symposium, 2008

Kellett Mid-Career Research Award, University of Wisconsin, 2005

Walter L. Huber Civil Engineering Research Award, ASCE, 2000

Casagrande Award, American Society of Civil Engineers, 1995

Middlebrooks Award, American Society of Civil Engineers, 1995, 2013

Collingwood Prize, American Society of Civil Engineers, 1994

Distinguished Young Faculty Award, U.S. Department of Energy, 1991

Presidential Young Investigator, National Science Foundation, 1991

Teaching

Polygon Outstanding Instructor Award, College of Engr., Univ. of Wisconsin, 1991, 93, 97

Outstanding Professor Award, ASCE Wisconsin Student Chapter, 1992

Top 100 Educators Award, Wisconsin Students Association, Univ. of Wisconsin, 1991

Professional Service

Honor Medal, Eurasian National University and Kazakhstan Geotechnical Society, 2013

Order of the Engineer, Geo Institute, 2011

Award of Merit, ASTM International, 2011

Richard S. Ladd Standards Development Award, Committee D18, ASTM International, 2002, 03, 04, 06, 08, 11

Special Service Award, Committee D18, ASTM International, 2007

Academics

Ford Foundation Fellowship, Univ. of Texas at Austin, 1989

John A. Focht Endowed Presidential Scholarship in Civil Engr., Univ. of Texas at Austin, 1988

Dawson Endowed Presidential Scholarship in Civil Engr., Univ. of Texas at Austin, 1986

Engineering Foundation Fellowship, University of Texas at Austin, 1985

John B. Carson Prize in Civil Engineering, Lehigh University, 1985

Phi Beta Kappa, Chi Epsilon, and Tau Beta Pi

CONGRESSIONAL TESTIMONY & DISCUSSION

Invited Testimony on Proposed USEPA Regulations Related to Coal Combustion Products; House Small Business Committee, Congressman H. Shuler, Chair (D-NC), 22 July 2010. 

Invited Discussion on Environmental Regulation and Sustainable Materials Management; Senators for Environmental Policy and Sustainability, 29-30 May 2012.

LEADERSHIP DEVELOPMENT

Academic Leadership Program, Committee on Institutional Cooperation, Big10 Academic Alliance, 2010 – 2011. 

Manager's Boot Camp, Center for Executive Education, Haas School of Business, University of California-Berkeley

Negotiations and Influence, Center for Executive Education, Haas School of Business, University of California-Berkeley

Philanthropy Fundamentals: Developing and Stewarding Donors, UW Foundation

UNIVERSITY SERVICE

Academic Council, UW Dept. of Civil and Environmental Engineering (1994-99, Chair 1997-99)

Academic Planning Council, UW Nelson Institute for Environmental Studies (2012-2016)

Ad Hoc Committee on Fossil Fuel Use and Climate Change, UW (2013-2014)

Admissions Chair, UW Geotechnical Engineering Program (1990-2006)

Becker Award Committee, UW Civil and Environmental Engineering (Chair 2002-04)

Bicentennial Commission, Future of Public Education Committee, UVA (2017-2022)

Bollinger Academic Staff Award Committee, UW (2010-11, Chair)

Byron Bird Award Committee, UW College of Engineering (1995)
Chancellor's Campus Budget Model Committee, UW (2013-2014)
Civil and Environmental Engineering Strategic Hiring Committee, UW (2010-12, Chair 2010)
Civil and Environmental Engineering Merit Committee, UW (1998, 2002, 2004-2006, Chair 2002)
Classroom Space Utilization Committee, Co-Chair, UW (2014)
Climate Change Solutions Committee, UW (2013-2015, Chair)
College of Engineering Search Committee for Executive Associate Dean, UW (Chair, 2014)
College of Engineering Leadership Council, UW (2013-2015)
College of Engineering Promotion and Tenure Committee, UW (2014-2015)
College of Engineering Search Committee for Associate Dean for Advancement, UW (2013)
College of Engineering Search Committee for Assistant Dean for Facilities, UW (2013)
College of Engineering Academic Planning and Curriculum Committee, UW (1996-99)
College of Engineering Curriculum Committee, UW (1997-99, 2002-04)
College of Engineering Diversity Committee, UW (2002-04)
Conflict of Interest Oversight Committee, University of Wisconsin (2000-02)
Governance Committee, UW Nelson Institute for Environmental Studies (2012-2015).
Graduate Committee, UW Geological Engineering (1999-2006, Chair 1999-2001, 2003-2006)
Master Planning Committee, Deans' Council Representative, University of Virginia (2018-19)
Scholarship Committee, UW Dept. of Civil and Environmental Engineering (1998-2002)
Search Committee for Vice President for Research, UVA (2015-2017)
Search Committee for Assoc. Vice Chancellor for Facilities Planning & Mgmt., UW (Chair, 2012)
Search Committees for UW Geological Engineering (Chair, 1997-98, 2003-04)
Tau Beta Pi, Virginia Alpha Chapter, Advisor, 2019 – 2022.
Undergraduate Committee, UW Geological Engineering (Chair, 2002-2008)
University of Wisconsin Information Technology Committee (2010-12)
University of Wisconsin Honors Committee (2010-2011)

PROFESSIONAL SERVICE & AFFILIATIONS

National Academy of Engineering, 2012-present.
Science Advisory Board, Environmental Engineering Committee, US Environmental Protection Agency, 2015-2018 (committee disbanded).
Steering Committee, Performance and Risk Assessment Community of Practice, US Department of Energy, 2013-2022, co-Chair 2024-present.
Research Council, Environmental Research and Education Foundation, 2013-2024, Vice Chair 2015-2016, Chair, 2017-2018.
External Advisory Board, School of Engineering, University of Connecticut (2019)
American Association for the Advancement of Science
Colorado School of Mines
 External Advisory Board, College of Earth Resource Sciences and Engineering (2016)
 External Advisory Board, Dept. of Geology and Geological Engineering (2015, 2018)
 External Advisory Board, College of Engineering (2012)
External Advisory Board, Department of Civil and Environmental Engineering, University of Delaware (2026-present)
External Advisory Board, Department of Civil and Environmental Engineering, Vanderbilt University (2015-2022)
External Advisory Board, Engineering School of Sustainable Infrastructure & Environment, University of Florida (2011)

ASTM International

D18 Executive Committee (2006-13, Vice Chair 2011-13)

D18.04 - Hydrologic Properties of Soil & Rock (1991-present, Chair 1996-2006)

D18.14 – Sustainable Geotechnical Construction (founding member, 2008-present)

D18.19 - Frozen Soil & Rock (1992-present)

Geo-Institute of the American Society of Civil Engineers (Fellow ASCE)

Board of Governors (Treasurer 2010-11, V. President, 2011-12, President 2012-13)

Org. Committee, Geo-Chicago 2016: Sustainability, Energy, & Geoenviron. Conf. (2014-16)

Awards Committee (Chair, 1999-01, Member 2023-current)

Editor-in-Chief, *JGGE*, 2004-06, Editor *JGGE*, 1996-99, Ombudsman *JGGE*, 2023-2025).

Geoenvironmental Engineering Committee (1990-present, chair 1996-99)

Geo-Strata Magazine Task Force (1997-99)

Technical Publications Committee (1993-99, 2004-2006, BoG Liaison 2010-2013)

TPC Subcommittee on Policies for Specialty Conferences (1997-99)

American Geophysical Union

British Geotechnical Association

Canadian Geotechnical Society

International Geosynthetics Society

National Ground Water Association

North American Geosynthetics Society

Soil Science Society of America

PATENTS

Apparatus and Method for Testing the Hydraulic Conductivity of Geologic Materials, United States Patent No. 6,178,808.

Pressure Plate Extractor, United States Patent No. 6,718,835.

Bentonite Collars for Wellbore Casings, United States Patent No. 9,080,419.

LIVE INTERVIEWS, KEYNOTE AND SPECIAL LECTURES

Geosynthetic Clay Liners for Aggressive Liquids: Lessons Learned from Practice, Rowe Lecture, 13th International Conference on Geosynthetics, Montreal, Quebec, 15 September 2026.  

Director's Cut, Interview with Brad Keelor of the ASCE Geo Institute, 13 February 2026. 

Field Hydrologic Performance of Final Covers for High Elevation Mine Waste Containment, 2025 Annual British Columbia-MEND ML/ARD Workshop, Vancouver, British Columbia, 3 Dec. 2025. 

Field Hydrologic Performance of Final Covers for High Elevation Mine Waste Containment, Mines & Environment Symposium 2025, Rouyn-Noranda, Québec, 10 June 2025.

Performance of Final Covers for Waste Containment Systems: Lessons Learned from the Field, Kappe Lecture, American Academy of Environmental Engineers and Scientists, Drexel University, 2 April 2025.

Elevated Temperature Landfills (ETLFs): Causation, Impacts, and Best Management Practices Learned from the Field, Kappe Lecture, University of Miami, 28 March 2025.

Does Harvesting Coal Ash for Use as Cementitious Material Promote Sustainability? Kappe Lecture, University of Nebraska-Lincoln, 20 February 2025.

Does Harvesting Coal Ash for Use as Cementitious Material Promote Sustainability? Kappe Lecture, Missouri University of Science and Technology, 12 February 2025.

- Elevated Temperature Landfills (ETLFs): Causation, Impacts, and Best Management Practices Learned from the Field*, Kappe Lecture, St. Louis University, 11 February 2025.
- Elevated Temperature Landfills (ETLFs): Causation, Impacts, and Best Management Practices Learned from the Field*, College of Engineering and Computer Science (CECE) Distinguished Lecturer Series, University of Central Florida, 5 December 2024.
- Performance of Final Covers for Waste Containment Systems: Lessons Learned From the Field*, Kappe Lecture, American Academy of Environmental Engineers and Scientists, University of New Mexico, 13 November 2024.
- Does Harvesting Coal Ash for Use as Cementitious Material Promote Sustainability?* George Mason Univ., Dept. of Civil Engineering Distinguished Speaker Lecture Series, 24 October 2024. ↻
- Elevated Temperature Landfills (ETLFs): Causation, Impacts, and Best Management Practices Learned from the Field*, Kappe Lecture, American Academy of Environmental Engineers and Scientists. LA County Sanitation District, 25 June 2024, 📄; Clemson University, 10 October 2024, 📄.
- Performance of Waste Containment Systems for Long-Lived Waste Forms: Lessons Learned from the Field*, Lymon C. Reese Distinguished Lecture, University of Texas at Austin, Austin, Texas, 14 April 2023. 📄
- Lessons Learned for the Practicing Engineer: How and When Geosynthetic Clay Liners are Effective for Containment*, Keynote Lecture, GeoANZ 1 Advances in Geosynthetics, Brisbane, Queensland, Australia, 9 June 2022.
- In-Service Condition of Radon Barriers over Uranium Mill Tailings Disposal Facilities in the United States*, Craig H. Benson, National Council on Radiation Protection and Measurements 2022, Bethesda, Maryland, USA, 29 March 2022 📄
- Stress-Induced Porewater Pressures in the Vadose Zone Beneath a Composite-Lined Landfill*, 3rd International Symposium on Coupled Phenomena in Environmental, Kyoto, Japan, October 2021. 📄
- Tackling Geoenvironmental Problems in the Unsaturated Zone: Principles and Practice*, Keynote Lecture, 12th Asian Regional Conference of the International Association of Engineering Geologists, Jeju Island, Korea, September 2019.
- Factors Affecting the Long-term Hydraulic Conductivity of Geosynthetic Clay Liners used in Liners*, Workshop on Advances In Characterization of Hydraulic Barrier Performance of GCLs, ASTM International, Denver, Colorado, June 2019.
- Using Life Cycle Analysis to Evaluate Options to Promote Infrastructure Sustainability*, Sustainability in Urban Planning and Infrastructure, Celfi Sustentabilidad Y Desarrollo, Universidad Nacional de Córdoba, Córdoba, Argentina, May 2019.
- Sustainability in Geoengineering: A New Paradigm for Engineering with Earthen Materials*, 8th International Congress on Environmental Geotechnics, Hangzhou China, November 2018.
- Water Balance Covers for Waste Containment: Engineering with Unsaturated Soils from Theory to Practice*, Dr. Arthur T. Corey Distinguished Lecture Series, Colorado State University, Fort Collins, Colorado, October 2018.
- Sustainability: Compelling Value Proposition for Engineers*, Southwest Jiaotong University, Chengdu, China, November 2017.
- Principles of Unsaturated Soil Behavior to Design Water Balance Covers for Waste Containment*, Pan-Am UNSAT 2017, Dallas, Texas, November 2017.
- Infusing Sustainability into Geotechnics: Opportunity for a New Value Proposition*, Geo-Chicago 2016 - Sustainability, Energy, & the Geoenvironment, ASCE Geo-Institute, Chicago, August 2016.

- Earthen & Geosynthetic Covers for Mine Waste Containment – Lessons Learned from Case Histories*, Symposium on Caps and Covers for Mine Waste, Society for Mining Engineers, Pocatello, Idaho, April 2016.
- Civil & Environmental Engineering: Creating a Compelling Value Proposition for the Future*, Lehigh University, 150th Anniversary Reunion, April 2016.
- Engineering Bentonite-Polymer Composite Materials for Extreme Environmental Applications*, T.H. Wu Distinguished Lecture, Ohio State University, March 2016.
- Are We Designing for Sustainability? Using Life Cycle Analysis to Assess Sustainability Accomplishment*, Higley Endowed Lecture, Case Western Reserve University, April 2015.
- Next Generation GCLs with Polymer-Bentonites for Extreme Environmental Applications*, Keynote Lecture, Global Waste Research Institute, San Luis Obispo, CA, February 2015.
- Landfill Covers: Water Balance, Unsaturated Soils, and the Pathway from Theory to Practice*, Spencer J. Buchanan Lecture, Texas A&M University, November 2014. ▣
- Polymer-Modified Bentonites for Extreme Environmental Applications*, Keynote Lecture, 7th Intl. Conference on Environmental Geotechnics, Melbourne, Australia, November 2014.
- Strategies for Long-Term Monitoring and Stewardship, Best Practices for Risk-Informed Remedy Selection, Closure, and Post-Closure Control of Contaminated Sites*, National Academy of Sciences, Washington, DC, January 2014.
- Sustainable Closure of Waste Containment Systems Using Water Balance Covers: Lessons Learned from a Nationwide Field Experiment*, Distinguished Lecture Series, University of Texas at Austin, November 2013.
- Organoclays: Barrier Media for Managing Groundwater Flow and Transport At NAPL-Sites*, University of Michigan, November 2013.
- Solid Waste in the USA: Moving from Disposal to Sustainable Materials and Energy Management*, University of California, Los Angeles, November 2013.
- Organoclays: Novel Barrier Media for Managing Groundwater Flow and Transport at NAPL-Contaminated Sites*, 11th G. A. Leonards Lecture, Purdue Geotechnical Society, April 2013.
- Sustainability -- Opportunity for Innovation in the Solid Waste Industry*, Engineering Society of Detroit, Keynote, April 2013.
- Earthen and Geosynthetic Final Covers for Mine Waste Containment*, Geosynthetics in Mining, Pocatello, ID, February 2013.
- The Solid Waste Industry as a Sustainability Industry: Moving from Disposal to Materials and Energy Management*, Keynote Lecture, Global Waste Management Symp., Phoenix, AZ, October 2012.
- Geosynthetic Clay Liners (GCLs): Lessons Learned from Full-Scale Applications*, 2012 Ralph M. Peck Lecture, ASCE Geo Institute, Oakland, CA, March 2012. ▣
- Designing Water Balance Covers for Sustainable Waste Containment: Transitioning State-of-the-Art to State-of-the-Practice*, GeoCongress 2012, ASCE Geo Institute, Oakland, CA, March 2012.
- Unsaturated Geotechnics: Transitioning from State-of-the-Art to State-of-the Practice*, 5th Asia-Pacific Conference on Unsaturated Soils, Bangkok, Thailand, February 2012.
- Recycled Materials, Infrastructure, and Sustainability*, Waste Management Association of Australia National Conference 2011, Adelaide, S. Australia, August 2011.
- Novel Developments in Geosynthetic Clay Liner Technology*, Innovations in Geosynthetic Materials Used in Environment and Infrastructure Symposium, Ministry of Environment and Ministry of Interior, Almaty, Republic of Kazakhstan, February 2011.
- Role of Recycled Materials in Sustainable Infrastructure*, Weston Roundtable Lecture, Nelson Institute for Environmental Studies, University of Wisconsin-Madison, January 2011.

- Sustainable Bioreactor Landfills: North American State-of-the-Practice and State-of-the-Art in North America*, Keynote Lecture, Sixth Asian Pacific International Landfill Symposium, Seoul, Korea, October 2010.
- Physical and Chemical Processes Altering Geosynthetic Clay Liners In Situ*, Distinguished Lecture Series, Department of Geology, Korea University, Seoul, Korea, October 2010.
- Hydraulic & Chemical Properties of Geosynthetic Clay Liners Exhumed from Landfill Final Covers: Lessons Learned from a Decade of Research*, Keynote Lecture, 3rd International Symposium on Geosynthetic Clay Liners, International Geosynthetics Society and SKZ – ConSem GmbH, Wurzburg, Germany, September 2010.
- Evaluating our Predictive Capabilities in Geoenvironmental Engineering*, Distinguished Lecture Series, Dept. of Civil and Materials Engineering, University of Illinois-Chicago, April 2010.
- Prediction in Geoenvironmental Engineering: How Good are our Models?*, Keynote Lecture, GeoFlorida 2010, Advances in Analysis, Design, and Modeling, ASCE Geo Institute, West Palm Beach, FL, February 2010.
- Final Covers for Waste Containment: Lessons Learned from a Nationwide Field Experiment*, Sowers State-of-the-Art Lecture, 12th Annual George F. Sowers Symposium, Georgia Institute of Technology, Atlanta, Georgia, May 2009.
- Chemical Alterations and Their Impact on the Hydrologic Properties of Bentonite*, Monash University, Melbourne, Victoria, Australia, December 2008.
- Hydrology and Settlement in Bioreactor Landfills*, Cutting Edge Technological Advances in Design and Operation, Reducing Leachate Quantity, Spatial Needs, and Costs, and Accelerating Landfill Gas Recovery Rates, World Bank, Washington, DC, November 2007.
- Modeling Unsaturated Flow and Atmospheric Interactions*, Keynote Speaker, Second International Conference on Mechanics of Unsaturated Soils, Weimar, Germany, March 2007.
- Geosynthetic Clay Liners for Waste Containment: Panacea or Future Problem?*, Geosynthetic Research Institute, Drexel University, Philadelphia, November 2005.
- Effects of Heterogeneity on Mineral Fouling of Permeable Reactive Barriers*, 2nd International Conference on Reactive Barriers, Belfast, Northern Ireland, March 2004.
- Lessons Learned from North American Failures*, Keynote Lecture, Fifth International Conference on Environmental Geotechnics, ISSMGE, Rio de Janeiro, Brazil, August 2002.
- Waste Containment Systems: Strategies and Performance*, Keynote Lecture, GeoEnvironment 2002, Australian-New Zealand Geomechanics Society, Newcastle, NSW, Australia, Nov. 2001
- Engineered Barriers*, Keynote Lecture, National Academy of Sciences, Washington, DC, July 2001.
- Solid Waste Containment Systems*, Keynote Lecture (with M. Manassero), GeoEng2000, Melbourne, Australia, November 2000.
- Liners and Covers for Waste Containment*, Keynote Speaker, Fourth Kansai International Geotechnical Forum, Creation of a New Geo-Environment, Japanese Geotechnical Society, Kyoto, Japan, June 2000.
- Environmental Geotechnics in the New Millennium*, Keynote Speaker, Geotechnics for Developing Africa, African Geotechnical Society, Durban, South Africa, March 1999.
- Final Covers for Waste Containment Systems: A North American Perspective*, Keynote Speaker, XVII Conference of Geotechnics of Torino, Control and Management of Subsoil Pollutants, Italian Geotechnical Society, Torino, Italy, January 1999.

WEBINARS, SHORTCOURSES, AND VIDEO CLIPS

Understanding Elevated Temperature Landfills (ETLFs): Causation, Monitoring, & Best Management Practices, Webinar sponsored by the Solid Waste Association of North America and Environmental Research and Education Foundation, 22 September 2026, by M. Barlaz and C. Benson. 

Elevated Temperatures and Landfill Fires – What’s The Difference?, Science Sessions, Environmental Research and Education Foundation, 9 December 2025, with M. Barlaz, W. Meyer, and Bryan Staley.  

Validating the Performance Assessment: Hydrologic Monitoring of the Water Balance (ET) Final Cover at the Monticello Uranium Mill Tailings Disposal Site, RP3C Community of Practice, American Nuclear Society, 31 October 2025. YouTube  or ANS 

Black Goo: What is This Stuff and What Can We Do About It?, Engineering Science and Wastewater Technology Program, Waste Management Inc., 15 May 2025. 

Black Goo: What is This Stuff and What Can We Do About It?, Kappe Lecture Webinar, American Academy of Environmental Engineers and Scientists, 20 March 2025. 

Principles of Soil Physics and Vadose Zone Hydrology Applied to Practice, Electric Power Research Institute, 2024. 1 – *What is the Vadose Zone?*  ; 2 – *Quantifying Water Movement in the Vadose Zone*  ; 3 – *Simulating Variably Saturated Flow for Practical Problems*  ; 4 – *Measuring Hydraulic Properties in the Laboratory*  ; 5 – *Measuring Hydraulic Properties in the Field*  

Landfill Design for Coal Combustion Products, Electric Power Research Institute, 2024.

0–Introduction and course content  

1–Basics of CCP Landfills: Foundational Principles and Concepts  

2–Geosynthetics in CCP Landfill Design  

3A–Principles of Compacted Soil Liners  

3B–Construction Considerations for Compacted Clay Liners  

4–Geosynthetic Clay Liners  

5–Leachate Collection Systems  

6–Final Covers for Waste Containment Facilities  

7–Performance Based Design: Making the Case for Alternative Liners  

8–Slope Stability for Landfills  

Water Balance Covers: Principles, Performance Prediction, and Performance, Iowa Dept. of Natural Resources, 16 July 2024. Entire course ; Purpose and Scope ; Introduction to Water Balance Covers ; Water Balance Cover Modeling ; Monitoring and Case Histories .

Black Goo II - Understanding and Treating Black Goo in Landfills, SCS Learning Center, 23 April 2023.

Science Session - Black Goo: The Unseen Challenge in Modern Waste Management, Environmental Research and Education Foundation, 16 August 2023. 

Identifying and Managing Elevated Temperature Landfills, SCS Learning Center, 27 July 2023. 

Bentonite-Polymer Composite Geosynthetic Clay Liners for Heap Leach Liners, 5th International Conference on Heap Leach Mining Solutions 2022, Sparks, Nevada, 17 October 2022.  [starts at 36:34].

Lessons-Learned in the Design and Construction of Capping Systems Used in the Closure of Near Surface Disposal Facilities, International Atomic Energy Agency’s International Low Level Waste Disposal Network (DISPONET) Meeting on Lessons Learned from the Disposal of Low-Level Waste, Bulgaria, 4 October 2022.  

- Enhancing Armored Final Covers for Radioactive Waste Disposal Facilities Through Naturalization, Performance and Risk Assessment* Community of Practice, US Dept. of Energy, Washington, DC, 17 August 2022. 
- Plastic Recycling and Upcycling as an Element of Sustainable Waste Management*, USAID, Washington, DC, 12 August 2022.
- In-Service Condition of Radon Barriers over Uranium Mill Tailings Disposal Facilities in the United States*, National Council on Radiation Protection and Measurements 2022, Bethesda, Maryland, 29 March 2022. 
- PFAS Containment by Modern Liner Systems: the Good News – and the Bad!*, Craig H. Benson and R. Kerry Rowe, International Geosynthetics Society-North America, 13 January 2022. 
- In-Service Condition of Final Covers Over Historic Uranium Mill Tailings Disposal Facilities*, International Webinar Series - Geoenvironmental Engineering: Polluted Land, Waste Management & Sustainability/Resiliency, University of Illinois-Chicago, 15 October 2021. 
- A Career in Environmental Engineering with Geosynthetics*, Simak's Geosynthetics Podcast, 16 March 2021. 
- Bentonite-Polymer Composite Geosynthetic Clay Liners for Containment of Highly Aggressive Leachates*, International Webinar Series - Geoenvironmental Engineering: Polluted Land, Waste Management & Sustainability/Resiliency, University of Illinois-Chicago, 29 April 2021.  
- Performance-Based Landfill Liner Design*, 21st National Course on Solid Waste Landfill Design, University of Wisconsin Madison, 23 March 2021.  
- Geosynthetic Clay Liners*, 21st National Course on Solid Waste Landfill Design, University of Wisconsin Madison, 23 March 2021.  
- Final Covers for Waste Containment Facilities*, 21st National Course on Solid Waste Landfill Design, University of Wisconsin Madison, 23 March 2021.  
- Elevated Temperature Landfills*, 21st National Course on Solid Waste Landfill Design, University of Wisconsin Madison, 24 March 2021.  
- Stability of Final Covers*, 21st National Course on Solid Waste Landfill Design, University of Wisconsin Madison, 23 March 2021.  
- In-Service Condition of Final Covers Over Historic Uranium Mill Tailings Disposal Facilities*, Australasian Chapter of the International Geosynthetics Society, 24 February 2021. 
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Standards

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- Benson, C., Wang, X. and Kim, H. (2007), Standard D 6836, Test Methods for Determination of the Soil Water Characteristic Curve for Desorption Using a Hanging Column, Pressure Extractor, Chilled Mirror Hygrometer, and/or Centrifuge, *Annual Book of Standards*, ASTM Intl., 04.09.

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- Ladd, R. and Benson, C. (2000), Standard D 5084, Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter, *Annual Book of Standards*, ASTM Intl., 04.09. Extensive revision in 2000 by R. Ladd and C. Benson. Originally developed by J. Dunn and D. Daniel.
- Yesiller, N., Shackelford, C., and Benson, C. (2005), Standard D 7100, Standard Test Method for Hydraulic Conductivity Compatibility Testing of Soils with Aqueous Solutions that may Alter Hydraulic Conductivity, *Annual Book of Standards*, ASTM Intl., 04.09.

SPONSORED RESEARCH

Environmental Containment Systems

- Field and Laboratory Assessment of the Radon Barrier at the Mexican Hat, Utah Disposal Site, US Department of Energy, Office of Legacy Management, with W. Likos.
- Understanding, Managing, and Preventing Clogging of Landfill Systems with Black Sticky Material, Environmental Research and Education Foundation.
- Effectiveness of Landfill Liners to Control Transport of PFAS in Leachate, Environmental Research and Education Foundation.
- Spatial and Temporal Correlation Between Physical and Chemical Odor Measurements and Odor Complaints, Advanced Disposal Services, with A. Benson.
- Evaluation and Management of High-Moisture Waste Disposal in Municipal Solid Waste Landfills, Environmental Research and Education Foundation, with J. Scalia and C. Bareither (Colorado State University).
- Geochemical Assessment of Long Term Leachate Quality and Impacts of Wastewater Management Practices at Coal Combustion Product (CCP) Disposal Facilities, Electric Power Research Institute, with D. Kosson (Vanderbilt University).
- Water Balance Analysis and Data Quality Assurance Assessment for Monticello and Grand Junction Disposal Cell Lysimetry, Navarro Corporation and US Department of Energy.
- Service Life of Bentonite-Polymer Geosynthetic Clay Liners, CETCO, Inc.
- Behavior of Bentonite-Polymer Geosynthetic Clay Liners Permeated with Aggressive Leachates, CETCO, Inc., with W. Likos.
- Evaluating the Long-Term Performance of the SDF Closure Cap, Savannah River Remediation, Inc. and US Department of Energy.
- Understanding and Predicting Temperatures in Municipal Solid Waste Landfills, Environmental Research and Education Foundation, with M. Barlaz, NC State University.
- Evaluating Effectiveness of Surface Covers for Controlling Water and Radon Fluxes at Uranium Mill Tailings Disposal Facilities, US Nuclear Regulatory Commission, with W. Likos.
- Behavior of Polymer-Modified Bentonites Contacted with Aggressive Leachates, Colloid Environmental Technologies Corporation, with W. Likos.
- Compatibility of Compacted Clay Liners and Leachate from CCP Containment Facilities, Electric Power Research Institute.
- Compatibility of Geosynthetic Clay Liners and Leachate from CCP Containment Facilities, Electric Power Research Institute.

Bench-Scale Comparison of EVOH and HDPE Geomembranes as Barriers to VOC and Methane Emissions, Kuraray America Inc.

Consortium for Risk Evaluation and Stakeholder Participation, US Department of Energy, with Vanderbilt University, Rutgers University, New York University, Oregon State University, University of Pittsburgh, Howard University, University of Arizona, Robert Wood Johnson Medical School.

Coupling Effects of Erosion and Hydrology on the Long-Term Performance of Engineered Surface Barriers, US Nuclear Regulatory Commission

Predicting the Long-Term Performance of Surface Barriers for LLRW Containment, US Department of Energy, Consortium for Risk Evaluation with Stakeholder Participation

Effectiveness of Engineered Covers: From Modeling to Performance Monitoring, US Nuclear Regulatory Commission

Bentonite-Polymer Nanocomposites for Geoenvironmental Applications, National Science Foundation, with T. Edil and C. Shackelford

Prion Transport in Porous Media: Influence of Electrostatic and Non-DLVO Interactions, National Science Foundation, with J. Pedersen and J. Aiken

Effect of Stress, Hydration, and Ion Exchange on the Hydraulic Conductivity of Geosynthetic Clay Liners, Colloid Environmental Technologies Corporation

Innovative Methods for Natural Restoration of Final Covers for Mill Tailings, US Dept. of Energy, with W. Albright and J. Waugh

Evaluating Long-Term Impacts on Final Covers - Exhumation of the ACAP Test Sections, National Science Foundation, US Environmental Protection Agency, Environmental Research and Education Foundation, with D. Fratta and W. Albright

Toxin/Pathogen Inactivation and Disposal of Intentionally Contaminated Foods, National Center for Food Protection and Defense, US Dept. of Homeland Security, with D. Noguera

Predictive Tools for Sustainable Solid Waste Management Using Bioreactor Landfills, National Science Foundation, with M. Barlaz (*Bioreactor Partnership*)

The State of Municipal Solid Waste Bioreactor Landfills-II, US Environmental Protection Agency, with M. Barlaz

VOC Transport Through Composite Landfill Liners, Groundwater Research Advisory Council, State of Wisconsin, with T. Edil.

VOC Transport in Lined Containment Facilities, Groundwater Research Advisory Council, State of Wisconsin, with T. Edil.

Hydrology of the Monticello Water Balance Cover, Stoller Corporation and US Dept. of Energy.

Effect of Freeze Thaw on Compacted Soil Liners and Covers, University of Wisconsin Graduate School.

Fate and Transport of Chronic Waste Disease Prions in Municipal Solid Waste Landfills, US Environmental Protection Agency, with J. Pedersen and J. Aiken.

Evaluation of VOC Contamination of Groundwater from Lined Landfills in Wisconsin, Groundwater Research Advisory Council, State of Wisconsin.

Hydrologic Modeling of Covers Used for Mine Waste Containment, US Environmental Protection Agency, with C. Shackelford.

Bioreactor Landfills: State of the Practice, US Environmental Protection Agency, with D. Lane and M. Barlaz.

Field Performance of Alternative Covers, US Environmental Protection Agency.

Integrated Long-Term Stewardship for Low-Level Radioactive Waste, US Department of Energy and Flour Fernald, Fernald, Ohio.

Chemical Interactions Between Mine Waste Liquids and Geosynthetics, Groundwater Research Advisory Council, State of Wisconsin, with T. Edil.

Long-term Chemical Compatibility of Geosynthetic Clay Liners, National Science Foundation, with C. Shackelford.

Hydraulic Conductivity Testing Protocols for Paper Sludges, National Council of the Pulp and Paper Industry for Air and Stream Improvement.

Dry Barriers for Waste Containment, National Science Foundation, with S. Kung

Alternative Cover Assessment Program, United States Environmental Protection Agency, with W. Albright (Desert Research Institute) and Glendon Gee (Battelle PNNL).

Large-Scale Verification of a VOC Transport Model for Composite Liners, Groundwater Research Advisory Council, State of Wisconsin, with T. Edil.

Field Assessment of Geosynthetic Clay Liners in Final Covers, United States Environmental Protection Agency.

Unsaturated Hydraulic Properties of Alternative Cover Soils, Waste Management, Waste Connections, Bluestem Solid Waste Authority, and Marina Solid Waste Management District

Alternative Covers for Waste Containment in Southern California, San Bernardino County, CA.

Equivalency of Subtitle D and Alternative Earthen Covers, City of Glendale, Arizona.

Development of *Win*UNSAT-H, a Windows Implementation of UNSAT-H, WMX Technologies.

Hydraulic Characterization of Mine Rock Backfill for the Flambeau Mine, Flambeau Mining Company, Ladysmith, WI

Hydraulic Characterization of Mine Rock Backfill for the Flambeau Mine: II-In Situ Verification, Flambeau Mining Company, Ladysmith, WI

Field Hydraulic Conductivity Assessment of the NCASI Test Plots, National Council of the Paper Industry for Air and Stream Improvement

Effect of Freeze-Thaw on the Hydraulic Conductivity of Compacted Papermill Sludge, the National Council of the Paper Industry for Air and Stream Improvement.

Engineering Properties of Paper Sludges Used for Hydraulic Barriers in Landfill Covers, Solid Waste Research Program, State of Wisconsin.

Shear Strength of Municipal Solid Waste, WMX Technologies, Inc., with T. Edil.

Evaluating the Effectiveness of Landfill Liners, Groundwater Research Advisory Council, State of Wisconsin, with T. Edil.

Laboratory and Field Evaluation of the Effects of Freeze-Thaw on Barrier Materials, United States Environmental Protection Agency.

Field-Evaluation of Geinsulation-A Geosynthetic Insulation Material, Envotech Limited Partnership, with P. Bosscher

Hydraulic Conductivity Assessment of Compacted Soil Liners, Waste Management of North America, Inc.

Rational Construction Quality Control Criteria for Compacted Soil Liners, University of Wisconsin Graduate School.

Final Cover Hydrologic Evaluation, Waste Management of North America, Inc.

Evaluation of Freezing and Thawing on the Hydraulic Conductivity of a Test Pad, Waste Management of Wisconsin, Inc.

Improved Design Methods for Landfill Final Covers, National Science Foundation.

Quality Assurance and Hydraulic Conductivity Assessment of Compacted Soil Liners, Waste Management of North America and Chemical Waste Management, Inc.

Hydrologic Analysis of a Co-Composting Landfill, Solid Waste Research Council, State of Wisconsin.

Sustainability and Sustainable Infrastructure

Center for Mineral and Metal Oxide Removal from Biomass (CMORE), Schmidt Sciences and the Foundation for Food & Agriculture Research, with Idaho National Laboratory, Iowa State University, University of Kansas, and Idaho State University.

Using Harvested Ash in Concrete and Cement Production, Electric Power Research Institute, Palo Alto, California.

Multi-University Center on Chemical Upcycling of Waste Plastics (CUWP), Office of Energy Efficiency and Renewable Energy US Department of Energy, with U. Wisconsin-Madison, U. Massachusetts, and Iowa State U.

Greenhouse Gas Emissions, Climate Change, and the Impacts of Climate Policy on the Global Coal Industry, Vigoris Coal Coalition LLP, Vancouver, BC.

Sustainability Assessment and Greenhouse Gas Implications of Envirocoal, Adaro Energy PT, Jakarta Indonesia.

Exchange Network for Expanded Polystyrene Bio-Shipping Containers, People, Prosperity, & Planet (P3) Program-Phase II, US Environmental Protection Agency

Exchange Network for Expanded Polystyrene Bio-Shipping Containers, People, Prosperity, & Planet (P3) Program-Phase I, US Environmental Protection Agency

Leaching from Roadways Constructed with Unencapsulated CCPs: Data Assessment & Synthesis, Electric Power Research Institute, with T. Edil.

Climate Change Mitigation and Adaptation in Dairy Production Systems of the Great Lakes Region, United States Department of Agriculture, National Institute of Food and Agriculture, with Matthew Ruark (PI) and others.

Recycled Materials Resource Center – Third Generation, Federal Highway Administration Pooled Fund, with T. Edil.

Recycled Materials Resource Center, Federal Highway Administration and United States Environmental Protection Agency, with K. Gardner

Environmental Benefits of Using Coal Combustion Products in Construction, Electric Power Research Institute, with T. Edil

Engineering Behavior of Recycled Unbound Materials, US Dept. of Transportation Pooled Fund, with T. Edil.

Assessing Environmental Impacts Associated with Bases and Subgrades Stabilized with Coal Combustion Products, Center for Freight and Infrastructure Research and Education, US Department of Transportation, with T. Edil.

User Guidelines for Waste and By-Product Materials in Highway Pavements, US Environmental Protection Agency, with A. Graettinger and J. Jambeck

Gravel Equivalency of Fly Ash Stabilized Reclaimed Roads, Minnesota Local Roads Research Board, with T. Edil

In Situ Stabilization of Gravel Roads with CCPs, Combustion Byproducts Recycling Consortium, US Dept. of Energy, with T. Edil

Leaching of Heavy Metals from Gray-Iron Foundry Slags Used in Geo Engineering Applications, Solid Waste Research Council, State of Wisconsin, with T. Edil.

Monitoring and Analysis of Leaching from Subbases Constructed with Industrial Byproducts, FHWA Recycled Materials Research Center, with T. Edil.

Ash Utilization in Low Volume Roads, Minnesota Department of Transportation, with T. Edil

Integrated Approach for Assessing Groundwater Impacts from Fly Ash Stabilized Soils, Alliant Energy, with T. Edil.

Geoenvironmental Assessment of Soft Soils Stabilized with High Carbon Fly Ashes, Solid Waste Research Program, State of Wisconsin, with T. Edil.

Are High Carbon Fly Ashes Effective Stabilizers for Soft Organic Soils?, National Science Foundation, with T. Edil.

Consortium for Beneficial Reuse of Fly Ashes, Alliant Energy, Northern States Power, and Mineral Solutions, Inc., with T. Edil.

Reuse of Fly Ash for Soil Stabilization, US Dept. of Energy, with T. Edil.

Field Demonstration of Earth Structures Constructed with Soil-Tire Chip Mixtures, Solid Waste Research Council, State of Wisconsin, with T. Edil.

Use of Foundry Sands in Hot Mix Asphalt, University Industrial Relations, with H. Bahia

Fly Ash Stabilization of Soft Subgrades, US Dept. of Energy, Mineral Solutions, Inc., and Alliant Power, with T. Edil.

Field Demonstration of Beneficial Reuse of Foundry Byproducts in Highway Subgrade, Wisconsin Department of Transportation, with T. Edil.

Properties of Foundry Sand Relevant to Design of Embankments and Retaining Wall Backfill, State of Wisconsin, Recycling Market Development Board, with T. Edil.

National Practice Survey: Beneficial Re-use of Waste Foundry Sands, State of Wisconsin Recycling Market Development Board, with T. Edil.

Using Waste Foundry Sands as Hydraulic Barriers, Solid Waste Research Council, State of Wisconsin, with T. Edil.

Field Assessment of Barrier Layers Constructed with Foundry Sands, Solid Waste Research Council, State of Wisconsin, with T. Edil.

Use of Shredded Waste Tires in Highway Construction, United States Environmental Protection Agency, with T. Edil.

Sub-base Replacement with Waste Foundry Sands, State of Wisconsin, Recycling Market Development Board, with T. Edil.

Using High Carbon Class F Fly Ash as a Lining Material: I-Laboratory Study, Solid Waste Research Council, State of Wisconsin, with T. Edil.

Using High Carbon Class F Fly Ash as a Lining Material: II-Field Verification, Solid Waste Research Council, State of Wisconsin, with T. Edil.

Reinforcement of Soils with Shredded Waste Tires, Solid Waste Research Council, State of Wisconsin, with P. Bosscher.

Use of Reclaimed Waste HDPE as Soil Reinforcement, Solid Waste Research Council, State of Wisconsin.

Groundwater

Leaching and Mobility of Per and Polyfluoroalkyl Substances (PFAS) from Concrete and Asphalt, Strategic Environmental Research and Development Program, US Dept. of Defense, with J. Guelfo and D. Kosson.

Sorption and Transport of Polycyclic Aromatic Hydrocarbons in Organoclays used for Permeable Adsorptive Barriers, CH2M Hill Inc. and Union Pacific Inc.

Environmental Impacts of Engineered Nanomaterials, Nanoscale Science and Engineering Center, National Science Foundation, with J. Pedersen and R. Hammers

Gray-Iron Foundry Slags as a Reactive Medium for Removing Arsenic from Ground Water and Drinking Water, Groundwater Research Advisory Council, State of Wisconsin, with D. Blowes.

Innovative Treatment of COPR Wastes in Coastal Areas, US Dept. of Transportation, with T. Edil.

Development of Large-Scale Application for Remediation of Chromium Ore Processing Residue, University Industrial Relations, University of Wisconsin, with T. Edil.

An Integrated Approach to Evaluating Environmental Impacts from Soils Stabilized with Fly Ashes, State of Wisconsin Recycling Program and Alliant Energy, Inc.

Uncertainty Based Design of Permeable Reactive Barriers, Wisconsin Ground Water Research Advisory Council, with G. Eykholt

Innovative Groundwater Treatment: Reactive Walls Constructed with Excess Foundry Sand, Wisconsin Groundwater Research Advisory Council, with G. Eykholt.

Development of Integrated Decision Support System for Wellhead Protection, Wisconsin Water Resources Council, State of Wisconsin.

Reducing Uncertainty in Subsurface Characterization, U.S. Department of Energy.

Ultrasonic Probe to Evaluate the Integrity of Borehole Seals, Federal Highway Administration, with T. Edil.

Field Assessment of Monitoring Well Seal Integrity, Groundwater Research Advisory Council, State of Wisconsin, with T. Edil.

A Tool for Evaluating the Integrity of Monitoring Well Seals, Groundwater Research Advisory Council, State of Wisconsin, with T. Edil.

Characterization of Air Plumes and Modeling Mass Removal During In Situ Air Sparging, Groundwater Research Advisory Council, State of Wisconsin, with G. Eykholt.

Education

Wisconsin-Puerto Rico Partnership for Research and Education in Materials [Wi(PR)EM], US National Science Foundation, with J. de Pablo, J. Pedersen, et al.

A Modular Geoenvironmental Curriculum, National Science Foundation, with other faculty from Wisconsin, Northwestern, Michigan, and Argonne National Laboratory.

Research Experience for Undergraduates Site, Geothermal and Energy Geotechnics, National Science Foundation, with J. Tinjum (PI), D. Fratta (co-PI), and S. Bradshaw.

Transforming CEE/GLE 330, Soil Mechanics, to Blended Learning, Division of Continuing Studies, University of Wisconsin-Madison.

Other Topics

Wisconsin Highway Research Program, Wisconsin Department of Transportation, with T. Edil.

Fate and Transport of Chronic Waste Disease Prions in Waste Water Treatment Plants, US Environmental Protection Agency

Stiffness and Stress State in Unsaturated Soils, Minnesota Department of Transportation, with T. Edil.

Thermal Conditions Below Highway Pavements During Winter, Wisconsin Department of Transportation, with P. Bosscher.

Design Protocols for Cellular Confinement with Geoweb, University Industrial Relations and Presto Products, Appleton, WI, with T. Edil.

Equivalency of Subgrade Improvement Methods, Wisconsin Department of Transportation, with T. Edil.

Reinforcement of Soft Subgrades with Geosynthetics, Wisconsin Department of Transportation, with T. Edil.

Evaluation of the DCP and SSG for Subgrade Evaluation, Wisconsin Department of Transportation, with T. Edil.

Shear Strength of Granular Backfill Materials, Wisconsin Department of Transportation, with T. Edil.

Correlating Index Properties and Engineering Behavior of Wisconsin Soils, Wisconsin Department of Transportation, with T. Edil.

Incorporating Alternative Subgrade Improvement Methods in Pavement Design, Wisconsin Department of Transportation, with T. Edil.

STEM TEACHER ENGAGEMENT

The following STEM teachers have been engaged in our research and educational programs through NSF's *Research Experience for Teachers* (RET) program:

Hayden, Matthew, Earth Science Teacher, Glacier Creek Middle School, Middleton-Cross Plains School District, Middleton, Wisconsin.

Kisting, Richard, Science Teacher, Badger Ridge Middle School, Verona Area School District, Verona, Wisconsin.

GRADUATE STUDENTS SUPERVISED

PhD Students

Abichou, T., Hydraulic Properties of Foundry Sands, co-advised with T. Edil, 1999.

Albrecht, B., Passive Dry Barriers: Air Circulation and Mass Transfer, 2001.

Albright, W., Field Performance of Landfill Covers, 2005.

Apiwantragoon, P., Alternative Covers: Field Performance and Modeling Methods, 2007.

Bareither, C., Settlement of Bioreactor Landfills: Compression Mechanisms, co-advised with T. Edil, 2010.

Breitmeyer, R., Unsaturated Hydraulic Properties of Solid Waste and Hydrology of Bioreactor Landfills, co-advised with T. Edil, 2010.

Bin-Shafique, S., Leaching of Heavy Metals from Fly Ash Stabilized Soils, co-advised with T. Edil, 2002.

Chalermyanont, T., Reliability Analysis of Mechanically Stabilized Earth (MSE) Walls, 2002.

Chang, P., Geophysical Characterization of Water and Solute Movement in an Arid Climate, 2003, co-advised with D. Alumbaugh.

Chen, J., Chemical Interactions between Coal Combustion Products and Geosynthetic Clay Liners, 2015.

Elder, C., Effect of Heterogeneity on Performance of Permeable Reactive Barriers, 2000.

Eun, J., Diffusive Transport of Organic Compounds in Liquid and Gas Phases through Co-Extruded EVOH Geomembranes, with J. Tinjum, 2014.

Foose, G., Leakage Rates and Chemical Transport Through Composite Landfill Liners, co-advised with T. Edil, 1997.

Gulec, S., Compatibility of Geosynthetics and Mine Waste Liquids, co-advised with T. Edil, 2003.

Gustitus, S., Accelerated Degradation and Service Life Prediction of Bentonite-Polymer Composite GCLs, 2021.

Hunter, E., Sorption of Radionuclides in Engineered Barrier Materials, with J. Tinjum, 2014.

Jo, H., Fundamental Factors Affecting Interactions Between Bentonite and Inorganic Liquids, 2003.

Khire, M., Field Hydrology and Water Balance Modeling of Earthen Final Covers for Waste Containment, 1995.

Kim, H., Oxygen Transport Through Multi-Layer Caps Over Mine Waste, 2000.

Kim, W., Alternative Subgrades Stabilization with Geosynthetics, co-advised with T. Edil, 2003.

Komonweeraket, K., Mechanisms Controlling Release of Trace Elements from Soils Stabilized with Fly Ash, co-advised with T. Edil, 2010.

Lee, T., Using Waste Foundry Sands as Reactive Media in Permeable Reactive Barriers, 2002.

Li, L., Impacts of Mineralogical Fouling of Permeable Reactive Barriers in Heterogeneous Environments, 2004.

- Nokkaew, K., Unsaturated Hydraulic Behavior of Recycled Base Course Materials, co-advised with J. Tinjum, 2014
- Othman, M., Effect of Freeze/Thaw on the Structure and Hydraulic Conductivity of Compacted Clays, 1992.
- Park, M., Transport of VOCs in Composite Landfill Liners, co-advised with T. Edil, 2011.
- Scalia, J., Bentonite-Polymer Nanocomposites for Environmental Containment, 2012.
- Tachavises, C., Flow Rates Past Vertical Groundwater Cut-Off Walls: Influential Factors and Their Impact on Wall Selection, 1998.
- Tanyu, B., Equivalency of Alternative Subgrade Stabilization Methods, co-advised with T. Edil, 2003.
- Tian, K., Life Expectancy of Geomembranes Used in Low-Level Radioactive Waste Containment, 2015.
- Tinjum, J., Innovative Remedial Treatment of Chromium Ore Processing Residues, co-advised with T. Edil, 2006.
- Yesiller, N., Ultrasonic Evaluation of Cased Borehole Seals, 1994, co-advised with T. Edil.
- Yu, T., Effect of PFAS on Effectiveness of Landfill Liner Systems, 2023, in progress.

MS Students

- Abichou, T., Field Evaluation of Geosynthetic Insulation for Protection of Clay Liners, 1993.
- Abu Hassanein, Z., Using Electrical Resistivity Measurement as a Quality Control Tool for Compacted Clay Liners, 1994.
- Acosta, H., Stabilization of Soft Subgrade Soils Using Fly Ash, with T. Edil, 2002.
- Albrecht, B., Effect of Desiccation on Hydraulic Conductivity of Compacted Clays, 1995.
- Akpinar, M., Interface Shear Strength of Geomembranes and Geotextiles at Different Temperatures, 1997.
- Bahner, E., Soil Nailing Case Histories in Wisconsin, 1993.
- Baker, D., Physical Modeling of In Situ Air Sparging, 1996.
- Bareither, C., Geological Controls on the Shear Strength of Wisconsin Sands, with T. Edil, 2006.
- Basantis, A., Hydraulic Properties of Sluiced Coal Ashes, 2021.
- Bashel, M., Flow Rates in Composite Landfill Liners, 1993.
- Baugh, J., Fly Ash Stabilization of Gravelly Soils, with T. Edil, 2008.
- Benavides, J. Marie, Hydrologic Predictions for Coal Combustion Products Disposal Facilities, did not finish thesis.
- Beuermann, S., Dielectric Sensor for Measuring Suction in Dry Soils, 1999.
- Bohnhoff, G., Predicting the Water Balance of Alternative Covers Using UNSAT-H, 2005.
- Bozyurt, O., Effect of Deleterious Materials on the Mechanical Properties of RAP and RCA, with T. Edil, 2011.
- Bradshaw, S., Effects of Stress, Hydration, and Ion Exchange on Geosynthetic Clay Liners, 2008.
- Bridstrup, J., Transport of Polyfluorinated Compounds Through Engineered Barrier Materials, 2020.
- Brown, B., Leaching of Trace Elements from Roadways Constructed with CCPs, 2015.
- Camacho, L., Analysis of Landfill Failure Using Three-Dimensional Limit Equilibrium Methods, with T. Edil, 2002.
- Camargo, F., Equivalency of Fly-Ash Stabilized RPM and Gravel Base Course, with T. Edil, 2008.
- Chen, C., Meteorological Conditions for Design of Monolithic Alternative Earthen Final Covers (AEFCs), 1999.
- Chiang, I., Effect of Fines and Gradation on Soil Water Characteristic Curves of Sands, 1998.

- Christman, M., Annular Well Seals: A Geophysical Study of Influential Factors and Seal Quality, with T. Edil, 1999.
- Cope, D., Treating TCE-Contaminated Groundwater with Gray-Iron Slag, 2007.
- Cooper, S., An Evaluation of How Subsurface Characterization Using Soil Classifications Affects Predictions of Containment Transport, 1993.
- Dingrando, J., Beneficial Reuse of Foundry Sands in Controlled Low Strength Material, with T. Edil, 1999.
- Eberhardt, M., Leaching of Heavy Metals from Gray-Iron Slags with and without Carbonation, 2008.
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