Michael Voorhees

Management, Water Resources

Broomall, PA
mlvoorhees@gmail.com - T: 610-325-2174 M: 610-635-5141

Highly Experienced Hydrology, Groundwater Resources and Modeling with Excellent Leadership
Authorized to work in the US for any employer

WORK EXPERIENCE

Senior Consultant/Project Manager

Environmental Resources Management (ERM) - Philadelphia, PA - 2012 to Present

Deep Well Injection of Environmental Waste Review 2016
Senior Consultant/Project Manager
Modeling review for EPA Class I deep wells waste injection into sandstone geology;
•Developed and reviewed conservative simulations for 200 year post-operation
•Performed Conservative fate and transport modeling review utilizing SWIFT (Sandia Waste Isolation Flow and Transport) model originally developed by the US Department of Energy

Three-dimensional Regional Saline Fate and Transport Groundwater Model, Qatar 2014
Senior Project Manager
Developed regional saline transport groundwater model for modeling of arid unsaturated zone infiltration/ percolation, and groundwater aquifer recharge for initial siting of wetlands treatment facility.
•Prepared detailed, comprehensive conceptual model from existing data for an area covering several thousand square kilometers with a horizontal grid resolution of 250m
•Identified Karstic depression regions during the conceptual model development and approximated these by flow simulation
•Used SEAWAT model for saltwater intrusion simulation, modified to provide unsaturated zone infiltration approximation to simulate wetland recharge enhancement and regional intrusions (coastal and upconing) that validated model setup
•Used MODFLOW UZF package integrated with SEAWAT for unsaturated flow analysis
•Simulated Salinity density-dependent transport by SEAWAT using MT3DMS fate and transport model

Independent Sub-Contractor/Contractor

Environmental Consulting Service - Broomall, PA - 1998 to Present

Three-dimensional FEFLOW Groundwater Model, Geohydros Reno Nevada 2008 – 2012
Independent Subcontractor, Environmental Consulting Service
Performed calibrations of FEFLOW finite element groundwater flow and transport models, providing basis for simulating groundwater flow and benzene transport through surficial aquifer and into deep aquifer to support site closure.
•Calibrated groundwater parameters associated with complex (28 model layers) 3D FEFLOW finite element groundwater flow model (multi-aquifer system, with number of model layers reflecting fundamental goal to fully represent the lithologic complexity in the region of interest while minimizing computational demands
•Performed calibration using DIRECT global Lipschitzian optimization algorithm, programmed for linkage with the FEFLOW simulator

•Performed numerous optimization computer runs (several thousand of FEFLOW simulations) using this FEFLOW-DIRECT model to minimize objective function numerically representing simulation result deviations from a large field data observation network database
•Performed detailed statistical analysis for optimization computer run results, using R Project for Statistical Computing software for statistical Exploratory Data Analysis

Wetlands Permitting and Design, USA, Babcock Ranch, Punta Gorda, FL 2007 – 2011
Independent Subcontractor, Environmental Consulting Service
Led linked surface and groundwater runoff analysis for permitting and preliminary design for a proposed sustainable development in Charlotte and Lee Counties in South Florida.
•Ran Development of software linking one-hour radar precipitation to surface water runoff model
•Developed surface water HEC-HMS model to be subsequently utilized in development of USGS GSFLOW model for surfacewater/groundwater interaction

Groundwater Resource and Mining Study, Lee County, FL 2004 – 2007
Independent Subcontractor, Environmental Consulting Service
Performed study to examine groundwater resources and rock mine resources.
•Developed three-dimensional calibrated ground water model, calibrating land cover categorized recharge from measurements of shallow monitor wells, with extensive lime-rock mining activities included in the calibration
•Performed verification of recharge with calibration obtained for selected sub-basins

Horizontal Sparge Well Groundwater Remediation Design, Chadds Ford PA 2003 – 2004
Independent Subcontractor, Environmental Consulting Service
Developed and applied software for groundwater sparging remediation (immiscible, two-phase, compressible, non-isothermal) air flow for horizontal wells for saturated groundwater remediation.
•Software developed performs the design of horizontal well size, screen, and air flow, with software successfully applied to several contamination sites

Wellfield/Wellhead Groundwater Supply Environmental Protection Ordinance, Collier County, FL 2002 – 2003
Independent Contractor, Environmental Consulting Service
Led regional calibration of three-dimensional groundwater flow model using optimization. Reverse particle tracking advective transport modeling provided pathline travel times with dispersive uncertainy.
•Software development performed the calibration as well as uncertain reverse pathline travel times and distances to production wells which were used in the ordinance for sustainable source water protection for over a decade.

Selected Earlier Projects
•Superfund Contamination Groundwater Remediation Site Fate and Transport Modeling Litigation Support
•Groundwater Resource Wellfield/Wellhead Protection Modeling Study, USA, Broward County Florida Department of Natural Resource Protection
•Fate and Transport Modeling of Proposed Landfill for Rosebud Sioux Indian Reservation, USA, Chemrox Technologies Loveland CO
•Website Server Development and Maintenance of the ENVIROMOD Software Repository
•Software Development, USA, Hydrosoft Sarasota
•Groundwater Modeling Optimization Geostatistics and Neural Network Technology for RCRA Site, USA, Star Enterprises, ESE Sarasota
•Development and Application of a Wetland Hydroperiod Simulator (HYDROSIM), USA, South Florida Water Management District, ESE Sarasota

•Salt Water Intrusion and Groundwater Flow Modeling and Litigation Support, USA, South Brevard Water Authority Melbourne FL
•Remediation System Design Model Development and Support, USA, Confidential Client, ESE Sarasota
•Groundwater Flow and Transport Modeling Litigation Support, USA, Great Lakes Chemical
•Contamination Assessment Study, USA, Sharpe Army Depot, ESE Sarasota

EDUCATION

Ph.D. in Civil Engineering
University of Illinois Urbana-Champaign - Urbana, IL
1977 to 1981

M.S. in Agricultural Engineering
University of Illinois Urbana-Champaign - Urbana, IL
1974 to 1976

B.S, in Agricultural Engineering
Colorado State University - Fort Collins, CO
1969 to 1973

SKILLS

/Core Competencies/ Conceptual Model * Climate * Hydrodynamics * Fate * Transport * Software Development * Modeling * Water * Hydrology * Environmental * Contamination * Wastewater * Assessment * Remediation * Hortonian * Surfacewater/Groundwater * Dunnian * Soils * Vadose Zone * Unsaturated Flow * Geology * Urbanization * Urban Hydrology * Urban Hydraulics * Stormwater * Urban Flood Mitigation * Statistical Analysis * Optimized Calibration * Optimized Design * Sensitivity * Uncertainty * Risk * Sustainability * Scientific Visualization * Project Reporting * Permitting * Litigation Support * (10+ years)

AWARDS

Graduation with Distinction, B.S., Agricultural Engineering, Colorado State University
March 1974

Jesse E. Hackett Fellowship Recipient, M.S., Agricultural Engineering, University of Illinois
September 1975

Invited Publication, The Ven T. Chow Memorial Publication, Journal of Hydrology
February 1984

Invited Lecturer, American Institute of Hydrology, First C.V. Theis Memorial, November 1988, Tampa, FL
November 1988

CERTIFICATIONS

Professional Engineer
August 1986 to August 1994

PUBLICATIONS

Selected Hand-Held Calculator Codes for the Evaluation of Cumulative Strip-Mining Impacts on Groundwater Resources

http://www.worldcat.org/title/selected-hand-held-calculator-codes-for-the-evaluation-of-cumulative-strip-mining-impacts-on-groundwater-resources/oclc/12859255

March 1981

Prickett, T.A. and M.L. Voorhees, “Selected HandHeld Calculator Codes for the Evaluation of Cumulative Strip-Mining Impacts on Groundwater Resources,” Prepared for the Office of Surface Mining, Region V, Denver, Colorado, by Thomas A. Prickett & Associates, Urbana, Illinois, March 1, 1981.

Comparison of one-, two-, and Three-Dimensional Models for Mass Transport of Radionuclides

https://inis.iaea.org/search/search.aspx?orig_q=RN:12589417

September 1979

Prickett, T.A., Voorhees, M.L., and B.L. Herzog, “Comparison of one-, two-, and Three-Dimensional Models for Mass Transport of Radionuclides,” Camp Dresser and McKee/WRD, Technical Memorandum for Lawrence Livermore Laboratories, University of California, not for reprint, 87 pages, September 1979.

Guidance manual for the Intersat ground-water solute transport model

http://www.worldcat.org/title/guidance-manual-for-the-interstat-ground-water-solute-transport-model/oclc/16620161

1985

Voorhees, M.L., 1985, Guidance manual for the Intersat ground-water solute transport model, HydroSoft, Inc.

Tractionability as a Function of Soil Moisture

http://elibrary.asabe.org/abstract.asp?aid=35653&confalias=

Voorhees, M.L., and P.N. Walker, “Tractionability as a Function of Soil Moisture,” Transactions of the ASAE, Vol. 20, No. 5, pp. 806-819, 1977. (Note: cited by S. A. Shoop, June 1993, “Terrain Characterization for Trafficability”, NTIS for military vehicle application)

Urban design-storm sensitivity and reliability

http://www.sciencedirect.com/science/journal/00221694/68

February 1984

Voorhees, M. L. & Wenzel, H. G. (1984). Urban design-storm sensitivity and reliability. Journal of Hydrology, The Ven Te Chow Memorial, 68(1-4), 39–60. doi:10.1016/0022-1694(84)90203-8.

Advanced Methods for the Selection of Urban Runoff Design Storms

http://www.worldcat.org/title/advanced-methods-for-the-selection-of-urban-runoff-design-storms/oclc/733625199/editions?editionsView=true&referer=br

1982

Voorhees, Michael L., “Advanced Methods for the Selection of Urban Runoff Design Storms”, Ph.D. Dissertation, Civil Engineering Department, University of Illinois, Urbana-Champaign, 1981. (Note: Early continuous runoff simulator developed for this dissertation.)

Urban Stormwater Hydraulics and Hydrology-Proceedings of the Second International Conference on Urban Storm Drainage

http://www.wrpllc.com/books/ushh.html

June 1981

Voorhees, M.L., and H.G. Wenzel, “Sensitivity and Reliability of Design Storm Frequency,” in Ben Chie Yen (University of Illinois), Urban Stormwater Hydraulics and Hydrology. Proceedings of The Second International Conference on Urban Storm Drainage, Urbana, Illinois, June 14-19, 1981. (Note: This book is considered

a classic in addressing concerns of urban flood mitigation), Water Resources Publications, LLC, April 2012, Hardcover, pp. 556, ISBN 13:978-1-887201-72-8.

http://www.worldcat.org/search?q=Yen+Urban+Stormwater+Hydraulics+and+Hydrology&qt=notfound_page&search=Search

Groundwater Modeling Utilities

https://www.crcpress.com/Groundwater-Modeling-Utilities/Walton/p/book/9780873716796
April 1992
Walton, W.C., Groundwater Modeling Utilities, Lewis Publishers, ISBN 0-87371-679-5, 1992.
(Contributor - Intersat Version 3.5 Copyright 1985 Michael L. Voorhees example simulation review contributions)
http://www.worldcat.org/search?q=Walton+Groundwater+Modeling+Utilities&qt=results_page

Conceptual Model for Regional Radionuclide Transport from a Basalt Repository Site

http://www.osti.gov/scitech/biblio/5417143/
May 1980
Walton, W.C., Voorhees, M.L., and T.A. Prickett, “Conceptual Model for Regional Radionuclide Transport from a Basalt Repository Site, “ Technical Memorandum for Lawrence Livermore Laboratories, University of California, not for reprint, May 1980.

Hydrology: An Environmental Approach

https://www.crcpress.com/Hydrology-An-Environmental-Approach/Watson/p/book/9781566700870
1993
Watson, I. & Burnett, A. (1993). Hydrology: An Environmental Approach. Cambridge, Ft. Lauderdale: Buchanan Books. ISBN 1566700876 (Contributor InterSat review, page 600).

An Evaluation of the Urban Design Storm Sensitivity

http://iwaponline.com/content/16/8-9/219
August 1984
Wenzel, H.G. and M.L. Voorhees, “An Evaluation of the Urban Design Storm Sensitivity,” Water Science & Technology, Vol 16, No. 8-9, pp. 219-236, 1984.

An Evaluation of the Urban Design Storm Concept

http://web.extension.illinois.edu/iwrc/pdf/164.pdf
August 1981
Wenzel, H.G. and M.L. Voorhees, “An Evaluation of the Urban Design Storm Concept,” University of Illinois Water Resources Center Publication, WRC Research Report No. 164, August 1981.

Adoption of ILLUDAS (Illinois Urban Drainage Area Simulator) for Continuous Simulation

http://cedb.asce.org/CEDBsearch/record.jsp?dockey=0009860
November 1980
Wenzel, H.G., Jr., and M.L. Voorhees, “Adoption of ILLUDAS (Illinois Urban Drainage Area Simulator) for Continuous Simulation,” ASCE Jour. Of Hydraulics, Vol. 106, No. HY11, pp. 1795-1812, November 1980. (Note: Early continuous Urban Runoff Simulation Models)

Evaluation of the Design Storm Concept

http://xpsolutions.com/webhelp/SECTION_20__REFERENCES/REFERENCES.htm
Wenzel, H.G., Jr., and M.L. Voorhees, “Evaluation of the Design Storm Concept,” paper presented at the 1978 Fall meeting of American Geophysical Union (AGU), San Francisco, December 7, 1978.

Illinois Least-Cost Sewer System Design Model: ILSD-1&2 User's Guide

http://web.extension.illinois.edu/iwrc/pdf/188.pdf

May 1984

Yen, B.C., Cheng, S.T., Byong-Ho, J., Voorhees, M.L., and Wenzel, H.G. "Illinois Least-Cost Sewer System Design Model: ILSD-1&2 User's Guide, "University of Illinois at Urbana-Champaign Water Resources Center, UIL-WRC-84- 188 Research Report 188, May 1984.

Conventional Urbanization and Its Effect on Storm Runoff

http://www.isws.illinois.edu/pubdoc/cr/iswscr-177.pdf

August 1976

Terstriep, M.L., Voorhees, M.L., and M.J. Bender, "Conventional Urbanization and Its Effect on Storm Runoff", Illinois State Water Survey, Urbana, IL, August 1976.

Applications of Sensitivity and Second Order Uncertainty Analysis in Formulating Regional Groundwater Contamination Risks

http://www.floridahealth.gov/environmental-health/onsite-sewage/research/_documents/research-reports/_documents/ostds-practices.pdf

February 1987

Voorhees, M.L., and J.M. Rice, "Applications of Sensitivity and Second Order Uncertainty Analysis in Formulating Regional Groundwater Contamination Risks", February 1987 NWWA Conference on "Solving Groundwater Problems with Models". (pg. 10-18)

Anderson, D.L., J.M. Rice, M.L. Voorhees, RA Kirkner, and K.M. Sherman. 1988. Groundwater modeling with uncertainty analysis to assess the contamination potential from onsite sewage disposal systems in Florida. p. 264-273. In On-Site Wastewater Treatment. Proc.Fifth National Symp. on Individual and Small Community Sewage Systems. Chicago, IL, Dec.14-15, 1987. ASAE, St. Joseph, MI.

For State-wide research project in Florida to examine the impact of septic effluent on the groundwaters of the State. Performed onsite sewage disposal system research in Florida; Risk Assessment of Onsite Sewage Disposal Systems for selected Florida hydrogeologic regions in the State of Florida.

ADDITIONAL INFORMATION

Modeling Pollutant Movement in Groundwater, September 1988 ---

Conference Leader & Planning Committee Member as well as Participating Instructor for the Conference entitled "Modeling Pollutant Movement in Groundwater" (included three days of instruction activity). This course was presented to over 40 conferees from throughout the U.S. by the University of Wisconsin Extension Engineering Department. Several presented computer models were developed by Dr. Voorhees and used in a Microcomputer Instructional Lab. (Hydrosoft Inc., water resource software development, President, Sarasota FL)