

Bruce M McEnroe, PhD, PE

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Current Positions

Principal at Bruce McEnroe Consulting LLC
Professor Emeritus, University of Kansas

Education: B.S. in Civil Engineering, University of Kansas, 1976
M.S. in Mechanics and Hydraulics, University of Iowa, 1978
Ph.D. in Engineering, University of Kansas, 1983

Professional Licensure: Professional Engineer in Kansas and Missouri

Employment History

Professor, Department of Civil, Environmental and Architectural Engineering, University of Kansas, Lawrence, Kansas, 1996-2018 (Associate Chair, 2010-2018; Director of Graduate Studies, 2003-2018).

Associate Professor, Department of Civil and Environmental Engineering, University of Kansas, Lawrence, Kansas, 1990-1996.

Assistant Professor, Department of Civil and Environmental Engineering, University of Kansas, Lawrence, Kansas, 1987-1990.

Assistant Professor, Department of Civil Engineering, Kansas State University, Manhattan, Kansas, 1983-1987.

Research Civil Engineer (IPA), Environmental Laboratory, U.S. Army Engineer Waterways Experiment Station, Vicksburg, Mississippi, May 1986-July 1987 and May-August 1989.

Graduate Teaching Assistant, Department of Civil Engineering, University of Kansas, Lawrence, Kansas, August 1980-1981.

Hydraulic Engineer, Hydraulic Analysis and Design Section, Harza Engineering Company, Chicago, Illinois, November 1978-May 1980.

Teaching-Research Fellow, Institute of Hydraulic Research, University of Iowa, Iowa City, Iowa, August 1976-July 1978.

Publications

Book Chapters

- McEnroe, B. M., "Hydraulics of Leachate Collection and Cover Drainage," Chapter 6.2, *Landfilling of Waste: Barriers*, T. H. Christensen, R. Cossu, and R. Stegmann, ed., E & FN Spon (Chapman and Hall), London, U.K., 1994.
- McEnroe, B. M., "Chapter 5: Hydrology and Introduction to Water Quality," *Design and Construction of Urban Stormwater Management Systems*, Manuals and Reports on Engineering Practice No. 77, American Society of Civil Engineers, 1993.

Papers and Discussions

- Young, C. B., & McEnroe, B. M. (2014). Evaluating the Form of the Rational Method. *Journal of Hydrologic Engineering*, 19(1), 265-269.
- McEnroe, B. M., C B. Young and J. E. Shelley (2014). "Scaling of Reference Reach for Desired Bankfull Discharge," *International Journal of Geosciences*, 2014(5), 475-477.
- McEnroe, B. M. and C. B. Young (2012). "Calibration of Storm Drainage Design Inputs for a Small Urban Watershed," *Proceedings, World Environmental and Water Resources Congress 2012*, American Society of Civil Engineers.
- Young, C. B., and B. M. McEnroe (2012). "Calibration of Runoff Curve Numbers for a Small Urban Watershed," *Proceedings, World Environmental and Water Resources Congress 2012*, American Society of Civil Engineers.
- McEnroe, B. M., J. E. Shelley and C. B. Young (2010). "An Analytical Reference-Reach Method for Natural Channel Design," *Proceedings, World Environmental and Water Resources Congress 2010*, American Society of Civil Engineers.
- Shelley, J. E., C. B. Young and B. M. McEnroe (2010). "The Rosgen Rosetta Stone: Translating Rosgen Terminology," *Proceedings, World Environmental and Water Resources Congress 2010*, American Society of Civil Engineers.
- Young, C. B., B. M. McEnroe and A. C. Rome (2009). "Empirical Determination of Rational Method Runoff Coefficients," *Journal of Hydrologic Engineering*, 14(12), 1283-1289.
- McEnroe, B. M. (2009). "Hydrologic Design of Bridges and Culverts: A Historical Review," *Great Rivers History*, J. R. Rogers, ed., American Society of Civil Engineers
- Young, C. B., B. M. McEnroe and A. C. Rome (2009). "Empirical Support for the Rational Method." *TRB 88th Annual Meeting: Compendium of Papers DVD*, Transportation Research Board of the National Academies, Washington, D.C.
- McEnroe, B. M., J. E. Shelley and C. B. Young (2009). "A Simple Analytical Design Method for Small Alluvial Channels," *Proceedings, World Environmental and Water Resources Congress 2009*, American Society of Civil Engineers.
- Young, C. B., B. M. McEnroe and A. C. Rome (2009). "Are Rational C Values Too Low?" *Proceedings, World Environmental and Water Resources Congress 2009*, American Society of Civil Engineers.

- Young, C. B., B. M. McEnroe, and A. C. Rome (2009). "Regional Regression Analysis and the Rational Method," *Proceedings, World Environmental and Water Resources Congress 2009*, American Society of Civil Engineers.
- Shelley, J. E., C. B. Young and B. M. McEnroe (2009). "Bankfull Discharge for Kansas Natural Alluvial Channel Design," *Proceedings, World Environmental and Water Resources Congress 2009*, American Society of Civil Engineers.
- McEnroe, B. M. (2006). "Hydraulic Design of a Lazy River," *Proceedings, World Water and Environmental Resources Congress 2006*, American Society of Civil Engineers.
- McEnroe, B. M., and Heatherman, W. J. (2006). "Simplified Detention Requirements with Watershed-Wide Benefits," *Proceedings, World Water and Environmental Resources Congress 2006*, American Society of Civil Engineers.
- Young, C. B. and B. M. McEnroe (2006). "Updated Precipitation Frequency Estimates for Kansas City: A Comparison with TP-40 and Hydro-35," *Journal of Hydrologic Engineering*, 11(3), 214-221.
- Young, C. B. and B. M. McEnroe (2003). "Sampling Adjustment Factors for Rainfall Recorded at Fixed Time Intervals," *Journal of Hydrologic Engineering*, 8(5), 294-296.
- Zhao, H. and B. M. McEnroe (2000). "Lag Times for Urban and Developing Watersheds in Kansas," *Building Partnerships: Proceedings of the 2000 Joint Conference on Water Resources Engineering and Water Resources Planning and Management*, American Society of Civil Engineers.
- McEnroe, B. M. (1999). "Hydraulic Performance of Curb and Gutter Inlets on Grade," *Proceedings, 1999 International Water Resources Engineering Conference*, American Society of Civil Engineers.
- Zhao, H. and B. M. McEnroe (1999). "Lag Times and Peak Coefficients for Small Watersheds in Kansas," *Proceedings, 1999 International Water Resources Engineering Conference*, American Society of Civil Engineers.
- Young, C. B., B. M. McEnroe and R. Quinn (1998). "AGIS-Based Processing of NEXRAD Precipitation Estimates for Flood Studies," *Water Resources and the Urban Environment*, American Society of Civil Engineers, 165-170.
- Zou, S., A. Parr and B. McEnroe (1998). "Effects of Infiltration on Agricultural Runoff Contamination," *Journal of Environmental Engineering*, 124(9), 863-868.
- McEnroe, B. M. and B. J. Treff (1998). "Temporary Erosion Control for Highway Construction," *Water Resources and the Urban Environment*, American Society of Civil Engineers, 722-727.
- Parr, A. D., S. Zou and B. M. McEnroe (1996). "Loss of Contaminants from Soil During Runoff Events," in *Engineered Contaminated Soils and Interaction of Soil Geomembranes*, Geotechnical Special Publication No. 59, ASCE, 72-81.
- McEnroe, B. M. and L. M. Johnson (1995). "Hydraulics of Flared End Sections for Pipe Culverts," *Transportation Research Record*, No. 1483, 72-79.
- McEnroe, B. M. (1995). "Impacts of Sand and Gravel Pits on Low Streamflows," *Groundwater Management*, American Society of Civil Engineers, 283-287.
- McEnroe, B. M. (1995). Discussion of "Subcritical Flow over a Rectangular Side Weir" by P. K. Swamee et al., *Journal of Irrigation and Drainage Engineering*, 121(4), 309.

- McEnroe, B. M. (1994). "Hydraulics of Safety End Sections for Highway Culverts," *Transportation Research Record*, No. 1471, 18-23.
- McEnroe, B. M. (1994). "Drainability of Granular Bases for Highway Pavements," *Transportation Research Record*, No. 1434, 23-28.
- McEnroe, B. M. (1993). "Maximum Saturated Depth Over a Landfill Liner," *Journal of Environmental Engineering*, 119(2), 262-270.
- McEnroe, B. M. And S. Zou (1993). "Simulation of Subsurface Drainage of Highway Pavements," *Hydraulic Engineering '93*, Vol. 1, American Society of Civil Engineers, 483-488.
- Bartley, J. A. and B. M. McEnroe (1993). "Hydraulic Analysis of Culvert End Sections Designed for Collision Safety," *Hydraulic Engineering '93*, Vol. 1, American Society of Civil Engineers, 234-239.
- Parr, A. D., S. Limback, B. M. McEnroe, and S. Zou (1994). "Nonpoint Source Pollution from Inter-Rill Flow Areas," *Journal of Irrigation and Drainage Engineering*, American Society of Civil Engineers, 120(6).
- McEnroe, B. M. (1992), "Preliminary Sizing of Detention Reservoirs to Reduce Peak Discharges," *Journal of Hydraulic Engineering*, 118(11), 1540-1549.
- McEnroe, B. M. (1992). "Sizing Stormwater Detention Reservoirs to Reduce Peak Flows," *Hydraulic Engineering*, American Society of Civil Engineers, 719-724.
- McEnroe, B. M. (1992). "Design of Landfill Drainage Systems," *Environmental Engineering*, American Society of Civil Engineers, 246-251.
- McEnroe, B. M. (1989). "Steady Drainage of Landfill Covers and Bottom Liners," *Journal of Environmental Engineering*, 115(6), 1113- 1121.
- McEnroe, B. M. (1989). "Drainage of Landfill Covers and Bottom Liners: Unsteady Case," *Journal of Environmental Engineering*, 115(6), 1102-1112.
- McEnroe, B. M. (1989). Discussion of "Overview of Landfill Bottom Liner Hydraulics" by A. C. Demetracopoulos, *Water Resources Bulletin*, 25(2), 443-445.
- McEnroe, B. M. (1989). Discussion of "Hydraulic Friction Factors for Pipe Flow," by F. Z. Kamand, in *Journal of Irrigation and Drainage Engineering*, 115(5), 915-916.
- Hua, J., J. M. Steichen, and B. M. McEnroe (1989). "Orifice Plates to Control the Capacity of Terrace Intake Risers," *Applied Engineering in Agriculture*, 5(3), 397-401.
- McEnroe, B. M. (1989). "Hydraulics of Leachate Collection and Cover Drainage in Sanitary Landfills," *Proceedings, Second International Landfill Symposium*, International Solid Waste Association, Porto Conte, Italy, pp. XIII 1-8.
- McEnroe, B. M. (1989). "Infiltration and Overland Flow: Coupled vs. Uncoupled Modeling," *Water Resources for the Future: The Management Challenge*, American Society of Civil Engineers, 493-496.
- McEnroe, B. M. (1989). "Perforated Riser Outlets for Stormwater Detention Basins," *Water Resources for the Future: The Management Challenge*, American Society of Civil Engineers, 489-492.
- McEnroe, B. M. (1989). "Drainage of Landfill Covers and Bottom Liners," *Proceedings, 1989 National Water Conference*, American Society of Civil Engineers, 334-341.

- Limback, S., A. Parr, and B. McEnroe (1989). "Two-Dimensional Inter-Rill Flow Model for the Analysis of Agricultural Runoff," *Proceedings of the 1989 National Conference on Hydraulic Engineering*, American Society of Civil Engineers, 893-898.
- McEnroe, B. M. (1989). "Effect of Infiltration on Runoff Volumes," *Proceedings, Water and the Future of Kansas Conference*, Kansas State University, Manhattan, Kansas.
- McEnroe, B. M., and P. R. Schroeder (1988). "Leachate Collection in Landfills: Steady Case," *Journal of Environmental Engineering*, 114(5), 1052-1062.
- McEnroe, B. M., J. M. Steichen, and R. L. Schweiger (1988). "Hydraulics of Perforated Riser Inlets for Underground-Outlet Terraces," *Transactions of the American Society of Agricultural Engineers*, 31(4), 1082-1085.
- Visser, K. K., J. M. Steichen, B. M. McEnroe, and J. Hua (1988). "Hydraulics of Perforated Terrace Inlet Risers," *Transactions of the American Society of Agricultural Engineers*, 31(5), 1451-1454.
- Visser, K. K., J. M. Steichen, and B. M. McEnroe (1987). "Hydraulics of Terrace Intake Risers with Orifice Plate," *Optimum Erosion Control at Least Cost*, ASAE Publication 08-87, American Society of Agricultural Engineers, 391-400.
- McEnroe, B. M. (1986). "Characteristics of Intense Storms in Kansas," *World Water Issues in Evolution*, American Society of Civil Engineers, 933- 940.
- McEnroe, B. M. (1986). "Stormwater Management in Kansas," *World Water Issues in Evolution*, American Society of Civil Engineers, 919-924.
- McEnroe, B. M. (1983). "Design Storm Methods for Urban Drainage Design," (abstract), *Frontiers of Hydraulic Engineering*, American Society of Civil Engineers, New York, NY, 607.
- McEnroe, B. M., and S. C. Jain (1980). "Two-Dimensional Heated Jet in Shallow Water," *Journal of the Energy Division*, 106(EY1), 33-44.

Reports

- McEnroe, B.M. and B.A. Hoffman (2017). *Hydraulic Analysis of Embedded Culverts*, Report No. K-TRAN KU-16-2, Kansas Department of Transportation.
- McEnroe, B. M., M. R. Lurtz, R. L. Parsons and M. Neupane (2017). *Guidelines for Replacement of Deficient Bridges with Low-Water Stream Crossings in the Rural Midwest*, Report No. FHWA-KS-16-19, Kansas Department of Transportation.
- McEnroe, B. M., C. B. Young, R. M. Pohl and Z. Wei (2016). *Calibration of Runoff Curve Numbers and Rational Runoff Coefficients for the Kansas City Metropolitan Area*, Kansas City Metro Chapter, American Public Works Association.
- McEnroe, B. M., C. B. Young, R. M. Pohl and Z. Wei (2016). *Development of New Precipitation Frequency Tables for Counties in the Kansas City Metropolitan Area Using NOAA Atlas 14*, Kansas City Metro Chapter, American Public Works Association.
- Young, C. B., B. M. McEnroe, Z. Wei and R.A. Gamarra Zapata (2016). *Updated Regional Flood Frequency Equations for Small, Rural, Unregulated Watersheds in Kansas*, Report No. FHWA-KS-15-12, Kansas Department of Transportation.

- McEnroe, B. M., C.B. Young and R.A. Gamarra Zapata (2016). *Estimation of Watershed Lag Times and Times of Concentration for the Kansas City Area*, Report No. KS-16-01, Kansas Department of Transportation.
- McEnroe, B. M., C. B. Young and R. A. Gamarra Zapata (2015). *Hydrology of the Wilshire Woods Watershed with Application to Storm Drainage in the Kansas City Metro*, Stormwater Management Program, Johnson County Public Works and Infrastructure, Kansas.
- McEnroe, B. M. and C. B. Young (2014). *Development of New Precipitation Frequency Tables for Counties in Kansas Using NOAA Atlas 14*, Report No. K-TRAN: KU-14-13, Kansas Department of Transportation.
- Young, C. B., B. M. McEnroe, R. Gamarra, Y. Luo and M. Lurtz (2014). *Estimating the Discharge for Ordinary High Water Levels in Kansas*, Report No. K-TRAN: KU-13-1, Kansas Department of Transportation.
- McEnroe, B. M., C. B. Young, A. R. Williams and M. Hinshaw (2013). *Estimating Design Discharges for Drainage Structures in Western Kansas*, Report No. K-TRAN: KU-12-4, Kansas Department of Transportation.
- McEnroe, B.M. and C. B. Young (2011). *Calibration of Hydrologic Design Inputs for a Small Urban Watershed in Johnson County, Kansas*," City of Overland Park and Johnson County Stormwater Management Program.
- McEnroe, B. M., C. B. Young and J. E. Shelley (2010). *Stream Realignment Design Using a Reference Reach*, Report No. K-TRAN: KU-09-4, Kansas Department of Transportation.
- McEnroe, B. M., C. B. Young and J. E. Shelley (2009). *Guidelines for Stream Realignment Design*, Report No. K-TRAN: KU-08-2, Kansas Department of Transportation.
- McEnroe, B. M. (2008). *Guidelines for Continuous Simulation of Streamflow in Johnson County, Kansas, with HEC-HMS*, Johnson County Public Works and Infrastructure.
- McEnroe, B.M. and T. R. Malone (2008). *Hydraulic Resistance of Small-Diameter Helically Corrugated Metal Pipe*, Report No. K-TRAN: KU-07-5, Kansas Department of Transportation.
- McEnroe, B. M. (2007). *Sizing of Highway Culverts and Bridges: A Historical Review of Methods and Criteria*, Report No. K-TRAN: KU-05-4, Kansas Department of Transportation.
- McEnroe, B.M. and C. B. Young (2007). *Flood Frequency Relationships for Small Watersheds in Kansas*, Report No. K-TRAN: KU-06-4, Kansas Department of Transportation.
- McEnroe, B. M. (principal author) (2006). *KDOT Design Manual, Vol. I, Road Section, Part C, Elements of Drainage and Culvert Design*, Kansas Department of Transportation.
- McEnroe, B. M. (2006). *Downstream Effects of Enlarged Waterway Openings*, Report No. K-TRAN: KU-04-9, Kansas Department of Transportation.
- McEnroe, B. M., and S. A. Gonzalez (2005). *Storage Considerations in Culvert Sizing*, Report No. K-TRAN: KU-04-3, Kansas Department of Transportation.
- McEnroe, B. M., and P. Gonzalez (2003). *Storm Durations and Antecedent Conditions for Flood Discharge Estimation*, Report No. K-TRAN: KU-02-04, Kansas Department of Transportation.
- Young, C. B. and B. M. McEnroe (2002). *Precipitation Frequency Estimates for the Kansas City Metropolitan Area*, Kansas City Metropolitan Chapter of the American Public Works Association.

- McEnroe, B. M and H. Zhao (2001) *Lag Times of Urban and Developing Watersheds in Johnson County, Kansas*, Report No. K-TRAN: KU-99-5, Kansas Department of Transportation.
- McEnroe, B. M., and H. Zhao (2000). *Lag Times and Peak Coefficients for Small Rural Watersheds in Kansas*, Report No. K-TRAN: KU-98-1, Kansas Department of Transportation.
- McEnroe, B. M., R. P. Wade and A. K. Smith (1999). *Hydraulic Performance of Curb and Gutter Inlets*, Report No. K-TRAN: KU-99-1, Kansas Department of Transportation.
- Young, C. B., B. M. McEnroe and R. J. Quinn (1999). *Utilization of Precipitation Estimates Derived from Composite Radar*, Report No. K-TRAN: KU-96-7, Kansas Department of Transportation.
- McEnroe, B. M. and R. P. Wade (1998). *Hydraulic Performance of Set-Back Curb Inlets*, Report No. K-TRAN: KU-98-3, Kansas Department of Transportation.
- McEnroe, B. M. and B. J. Treff (1997). *Performance of KDOT Temporary Erosion Control Measures*, Report No. K-TRAN: KU-97-2, Kansas Department of Transportation.
- Treff, B. J. and B. M. McEnroe (1997). *KDOT Temporary Erosion-Control Manual: A Guide for the Design, Installation, Inspection and Maintenance of Temporary Erosion-Control Measures in Kansas*, Kansas Department of Transportation.
- McEnroe, B. M., C. B. Young and G. Athey. (1995). *Hydraulic Characteristics of KDOT Flume Inlets*, Report No. K-TRAN: KU-95-1, Kansas Department of Transportation..
- Schroeder, P. R., T. S. Dozier, P. A. Zappi, B. M. McEnroe, J. W. Sjostrom, and R. L. Peyton (1994). *The Hydrologic Evaluation of Landfill Performance (HELP) Model: Engineering Documentation for Version 3*, EPA/600/R-94/168b, U.S. Environmental Protection Agency Office of Research and Development.
- McEnroe, B. M., and L. M. Johnson (1994). *Development of Hydraulic Design Charts for Type I and Type III Metal and Concrete End Sections for Pipe Culverts*, Report No. K-TRAN: KU-94-4, Kansas Department of Transportation.
- McEnroe, B. M. and K. Zhao (1994). *Rainfall Inputs for Simulation of Design Floods in Kansas*, Report No. K-TRAN KU-93-5, Kansas Department of Transportation.
- McEnroe, B. M. (1994). *Drainability of Granular Bases for Highway Pavements*, Report No. K-TRAN KU-93-4, Kansas Department of Transportation.
- McEnroe, B. M. and J. A. Bartley (1993). *Development of Hydraulic Design Charts for Type IV End Sections for Pipe Culverts*, Report No. K-TRAN: KU-93-5, Kansas Department of Transportation.
- McEnroe, B. M. (1992). *Evaluation and Updating of Hydrologic Analysis Procedures Used by KDOT*, Report No. K-TRAN: KU-92-1, Vol. I, Kansas Department of Transportation.
- McEnroe, B. M., and J. P. Jones (1992). *Rainfall Tables for Kansas Counties*, Report No. K-TRAN: KU-92-1, Vol. II, Kansas Department of Transportation.
- McEnroe, B. M., D. Chase, and W. Sharp (1990). *Field Testing of Water Mains to Determine Internal Roughness*, Environmental Laboratory, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.
- Stoner, L. M., and B. M. McEnroe (1990). *Potential Long-Term Impact of Upstream Landfills on the Kansas River Water Supply of Johnson County Water District #1*, Final Report, CRINC Proj. #8730.

- Schroeder, P. R., R. L. Peyton, B. M. McEnroe, and J. W. Sjostrom (1988). *Hydrologic Evaluation of Landfill Performance (HELP) Model, Volume III: User's Guide for Version 2*, Environmental Laboratory, U.S. Army Engineer Waterways Experiment Station, Vicksburg, MS.
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- Schroeder, P. R., and B. M. McEnroe (1988). *Dye Tracer Study at the Saginaw Bay, Michigan, Confined Disposal Facility*, Miscellaneous Paper EL-8817, U.S. Army Engineer Waterways Experiment Station.
- McEnroe, B. M. (1988). *Infiltration and Runoff Volumes from Rainfall Events*, Contribution No. 269, Kansas Water Resources Research Institute, Manhattan, Kansas, 1988.
- McEnroe, B. M., and R. L. Smith (1985). *Stormwater Management in Kansas: An Evaluation of Current Practices*, Contribution No. 248, Kansas Water Resources Research Institute, Manhattan, Kansas, 1985.
- Koelliker, J. K., and B. M. McEnroe (1985). *Development of a Microcomputer Demonstration Model for Residential Water Conservation*, Contribution No. 249, Kansas Water Resources Research Institute, Manhattan, Kansas.
- McEnroe, B. M. (1984). *Synthetic Storm Models for Drainage Design*, *Publication No. 84-03693*, University Microforms, Ann Arbor, Michigan, 156 pp.

Grants and Contracts

- “Hydraulic Analysis of Embedded Culverts,” Kansas Department of Transportation, principal investigator, 2016, \$30,000.
- “Calibration of Storm Durations and Runoff Curve Numbers for the Kansas City Metro,” Kansas City Metro Chapter of the American Public Works Association, principal investigator, 2015-16, \$99,000.
- “Practical Design Guidelines for Replacement of Deficient Bridges with Low-Water Stream Crossings,” Kansas Department of Transportation (federal pooled-funds study), principal investigator, 2015-16, \$165,086.
- “Evaluation of HEC-RAS 2-D and SRH-2D,” Kansas Department of Transportation, co-principal investigator, 2015, \$82,000.
- “Lag Times and Times of Concentration for Storm Drainage Design,” Johnson County Public Works and Kansas Department of Transportation, principal investigator, 2014, \$90,000.
- “Updated and Expanded Hydrologic Analysis of Wilshire Woods Watershed,” City of Overland Park and Public Works and Johnson County Public Works, co-principal investigator, 2014, \$30,000.
- “Developing New Precipitation Frequency Tables for 2013 and Beyond Using NOAA Atlas 14,” Kansas Department of Transportation, co-principal investigator, 6/13-8/14, \$25,000.
- “Estimating the Discharge for Ordinary High Water Levels in Kansas,” Kansas Department of Transportation, co-principal investigator, 2013-2014, \$60,000.

“Workshop on Natural Stream Design, Part 2,” Kansas Department of Transportation, 2012, \$4,771.

“Estimating Design Discharges for Drainage Structures in Western Kansas,” Kansas Department of Transportation, principal investigator, 10/11-10/12, \$56,000.

“Workshop on Natural Stream Design,” Kansas Department of Transportation, co-principal investigator, 3/11-11/11, \$10,000.

“Calibration of Hydrologic Design Inputs for a Small Urban Watershed,” City of Overland Park, principal investigator, 10/10-9/11, \$65,000.

“Sediment Baseline Research Methodologies,” Kansas Water Resources Institute, co-principal investigator, 3/09-2/11, \$157,224.

“Reference Reach Methods for Stream Realignment Design,” Kansas Department of Transportation, co-principal investigator, 9/08-9/09, \$50,000.

“Development of Guidelines for Stream Realignment Design, Kansas Department of Transportation, principal investigator, 9/07-9/08, \$50,000.

“Development of Guidelines for Continuous Simulation of Streamflow in Johnson County,” Johnson County Public Works, Stormwater Management Program, principal investigator, 5/07-2/08, \$50,000.

“Hydraulic Resistance of Small-Diameter Helically Corrugated Metal Pipe,” Kansas Department of Transportation, principal investigator, 5/06-5/07, \$35,000.

“A Calibrated Rational Method for Larger Watersheds,” Kansas Department of Transportation, principal investigator, 8/05-11/06, \$40,000.

“History of Criteria and Methods for Sizing of Culverts and Bridge Openings,” Kansas Department of Transportation, principal investigator, 8/04-8/05, \$30,000.

“Downstream Effects of Enlarged Waterway Openings,” Kansas Department of Transportation, principal investigator, 7/03-9/04, \$30,000.

“Storage Considerations in Culvert Sizing,” Kansas Department of Transportation, principal investigator, 7/03-9/04, \$30,000.

“Storm Durations and Antecedent Conditions for Flood Discharge Estimation,” Kansas Department of Transportation, principal investigator, 5/01-7/02, \$40,000.

“Revised Precipitation Frequency Estimates for the Kansas City Metropolitan Area,” Kansas City Metropolitan Chapter, American Public Works Association, co-principal investigator, 9/00-11/01, \$50,000.

“Rainfall Analysis and Maintenance of Rainfall Data Archives,” Kansas Department of Transportation, principal investigator, 9/99-9/00, \$10,000.

“Lag Times and Times of Concentration for Urban Watersheds in Eastern Kansas,” Kansas Department of Transportation, principal investigator, 5/99-8/00, \$35,000.

“Hydraulic Performance of KDOT Curb and Gutter Inlets,” Kansas Department of Transportation, principal investigator, 5/98-9/99, \$35,000.

“Use of KDOT Storm Analysis System to Improve Flood Discharge Estimates,” Kansas Department of Transportation, principal investigator, 7/97-9/98, \$30,000.

“Hydraulic Testing of Improved Curb Inlets,” City of Leawood, Kansas, and Kansas Department of Transportation, principal investigator, 5/97-4/98, \$20,000.

“Performance of KDOT Temporary Erosion Control Measures,” Kansas Department of Transportation, principal investigator, 5/96-1/98, \$35,000.

“Utilization of Precipitation Estimates Derived from Composite Radar,” Kansas Department of Transportation, principal investigator, 5/95-5/97, \$49,900.

“Hydraulic Testing of Curb Inlets,” Cities of Overland Park, Olathe, Lenexa, and Shawnee, Kansas, principal investigator, 1/95-5/95, \$15,030.

“Hydraulic Characteristics of KDOT Flume Inlets,” Kansas Department of Transportation, principal investigator, 5/94-1/95, \$29,500.

“Development of Hydraulic Design Charts for Type I and Type III Metal and Concrete End Sections for Pipe Culverts,” Kansas Department of Transportation, principal investigator, 6/93-6/94, \$19,900.

“Development of a Scour Evaluation Program for Kansas Bridges--Phase V,” A. D. Parr (principal investigator) and B. M. McEnroe (co-principal investigator), Kansas Department of Transportation, 5/93-12/93, \$62,400.

“Analysis of Pavement Subdrainage by Continuous Simulation,” Kansas Department of Transportation, principal investigator, 6/92-8/93, \$29,500.

“Rainfall Inputs for Simulation of Design Floods for Kansas Streams,” Kansas Department of Transportation, principal investigator, 6/92-8/93, \$29,500.

“Development of Hydraulic Design Charts for Type IV End Sections for Pipe Culverts,” Kansas Department of Transportation, principal investigator (A. D. Parr, co-investigator), 6/92-7/93, \$29,000.

“Evaluation and Updating of Hydrologic Analysis Procedures Used by KDOT,” Kansas Department of Transportation, principal investigator, 6/91-7/92, \$35,236.

“Research on Water Systems Operations,” Water District No. 1 of Johnson County, Kansas, principal investigator, 1/90-12/90, \$28,226.

Contract with U. S. Army Engineer Waterways Experiment Station, to develop Army-wide standards for field testing of water mains to determine internal roughness, 6/89-8/89, \$13,687.

“Fully Transient Modeling of Landfill Drainage,” Graduate Research Fund, University of Kansas, principal investigator, 7/89-6/90, \$5,566.

Contract with U.S. Army Engineer Waterways Experiment Station to prepare report “Dye Tracer Study at the Saginaw Bay, Michigan, Confined Disposal Facility,” 8/88, \$2,400.

“Hydraulic Performance of Cover Systems for Municipal Solid-Waste Landfills,” New Faculty General Research Program, University of Kansas, principal investigator, 7/88-6/89, \$5,000.

“Infiltration and Runoff Volumes from Rainfall Events,” Kansas Water Resources Research Institute, principal investigator, 4/87-3/88, \$9,151.

Contract with U.S. Army Engineer Waterways Experiment Station, to assist with development of HELP (Hydrologic Evaluation of Landfill Performance) computer model for U.S. Environmental Protection Agency, 5/86-7/87, \$27,946.

“Stormwater Management in Kansas,” Kansas Water Resources Research Institute, co-principal investigator, 9/84-8/85, \$15,000.

“Development of a Residential Water Conservation Module,” Kansas Water Resources Research Institute, co-principal investigator, 9/84-8/85, \$15,000.

Courses Taught

Water Resources Engineering Design (undergraduate, KU)
Hydrology (undergraduate, KU)
Fluid Mechanics (undergraduate, KU)
Watershed Hydrology (graduate, KU)
Free Surface Flow I (graduate, KU)
Pipe-Flow Systems (graduate, KU)
Urban Hydrology and Stormwater Management (graduate, KU)
Hydraulic Engineering (undergraduate, KSU)
Hydrologic Methods Laboratory (undergraduate, KSU)
Open Channel Flow (graduate, KSU)
Analysis of Groundwater Flow (graduate, KSU)
Water Distribution and Wastewater Collection (graduate, KSU)

Short Courses Taught

“Recent Advances in Hydrology for Engineering Design,” KU Professional Development Series, 4/2017
“Practical Hydrology for Design Engineers,” KU Professional Development Series, 4/2014
“Understanding NOAA Atlas 14, Vol. 8: New NOAA Precipitation Frequency Estimates for the Kansas City Metropolitan Area,” Johnson County Stormwater Management Program, 6/2013
“Natural Stream Design for Kansas,” sponsored by Kansas Department of Transportation, 5/2012 and 8/2011.
“Hydrologic Data Resources for Engineers,” KU Professional Development Series, 5/2011
“Channel Design for Stream Restoration and Stormwater Projects,” KU Professional Development Series, 5/2009
“Hydrologic Design of Bridges and Culverts,” KU Professional Development Series, 4/2007
“Hydraulic Analysis of Pumping Systems,” KU Professional Development Series, 4/2005
“Flowmeter Operator Certification Course” for Kansas Department of Agriculture, Division of Water Resources, 2/2004 and 4/2004
“Urban Hydrology for the Kansas City Area,” KU Professional Development Series, 5/2003
“Hydrologic Modeling for Flood Studies,” KU Professional Development Series, 10/2000
“Stormwater and Flood Analysis Using HEC-1,” one-day course offered through KU Continuing Education, Kansas City, 5/1995
“Stormwater and Floodplain Analysis Using HEC-1 and HEC-2,” with A. D. Parr, three-day course offered through KU Continuing Education, 5/1990, 1/1991, 5/1991, 8/1992, and 5/1993
“Hydrologic Analysis of Landfill Performance,” one-day course sponsored by Water Resources Associates, Phoenix, 12/1990

“Floodplain Analysis: Hydrology and Hydraulics,” with A. D. Parr, three-day course offered through KU Continuing Education, 5/1989

Selected Affiliations

American Society of Civil Engineers, since 1976 (Fellow since 2003; Life Member since 2019; President, Kansas Section, 1996-97)

Lawrence Rotary Club, since 1990

Fort Leavenworth Hunt, since 2004 (Whipper-In since 2010)

Volunteer, CASA of Douglas County, Kansas, since 2019