

W. Kent Muhlbauer, PE

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Mr. Muhlbauer is an internationally recognized authority on pipeline risk management. In this field, he is an author, lecturer, consultant, and software developer. Techniques developed by Mr. Muhlbauer are in use by the largest pipeline operators in the U.S. and in pipeline operations in many other countries. Mr. Muhlbauer is an advisor to private industry, government agencies, and academia, as well as a frequently invited speaker at industry conferences worldwide. Mr. Muhlbauer also has an extensive background in pipeline design, operations, and maintenance, having held technical and management positions in a pipeline operating company for over 13 years prior to becoming a full time pipeline risk management consultant

Overview of Pertinent Work History for Mr. Muhlbauer:

Pipeline Risk Management, 1986-present

As owner and principal of WKM Consultancy, Mr. Muhlbauer presently advises and consults internationally, specializing in pipeline risk management, pipeline quality management, regulatory compliance, and technical aspects of pipeline designs and operations.

- Developer and implementer of modern approaches to comprehensive pipeline risk assessment and risk management
- Presented and published methodologies in four published technical books, at numerous technical conferences, and in multiple trade journals.
- Creator and content manager for www.pipelinerisk.net and Center of Excellence for Risk Management (CERM) non-commercial resource sites for all stakeholders
- Industry advisor for US DOT-sponsored study of pipeline risk management.
- Trainer of PHMSA federal and state auditors for pipeline risk management.
- Consulting projects for numerous pipeline operators in the U.S. and internationally.
- Consultations to academia, municipalities, and other government agencies regarding possible impacts arising from pipeline projects.
- National Academy of Science committee appointment (2012-2015)
- Designed and developed several computer software applications for the pipeline industry.
- Expert witness testimony and report preparations for court proceedings.

Pipeline Design, Operations, and Maintenance, 1982-1994, Dow Chemical Company

- Extensive, direct experience in the design, operation, maintenance, and management of pipeline systems, encompassing construction, field operations, control center operations, and testing of new technology.
- Developed a new approach to comprehensive pipeline risk assessment while performing field analysis and data collection for cross-country pipelines at 12 sites worldwide, encompassing over 40 different products transported.
- Performed technical audits of pipeline facilities worldwide. Re-organized and re-staffed two departments to improve operational efficiency.
- Most recent management positions at Dow included:
 - Direct supervision of a pipeline control center (staff of 13) which provided 24 hr/Day monitoring and control of a 9-system (3000 mile) pipeline network; and
 - Area manager responsible for field operations of a 1200-mile pipeline network (staff of 34 people and an annual budget of approximately \$12 million (1980)).

Total Quality Management, 1990-1992, Dow Chemical Company

- Designed and implemented Total Quality Management processes for Dow's pipeline and storage operations department of 180 people in two states.
- Designed workshops and conducted training for supervisors and employees.
- Certified Quality Engineer (CQE) by American Society for Quality Control (ASQC).

Instructor/Trainer, 1984-present

Designed, developed, and instructed numerous courses in:

- Pipeline Risk Assessment; Pipeline Risk Management including on-going instruction for PHMSA inspectors beginning 2012.
- Total Quality Management; Statistical Quality Control; Statistical Process Control
- Data Collection and the Use of Measurements
- Community College Courses: Land Surveying Theory and Techniques; Industrial Safety and Loss Prevention; Spreadsheets (computer software course)

Created template to certify pipeline risk engineers based on detailed descriptions of expected qualifications and competency areas in required aspects of pipeline design, operations, and maintenance.

Designed and conducted workshops on Pipeline Risk Management for operators and government agencies in the U.S. as well as international audiences in countries including Belgium, Bolivia,

Brazil, Canada, China, Colombia, Ecuador, France, Indonesia, Malaysia, Mexico, The Netherlands, Peru, Trinidad, and UK.

Professional Society Volunteer Assignments, 1987-present

Initial chairman of *American Society of Civil Engineers* technical committee "Pipeline Risk Management".

Past chairman of *American Society of Civil Engineers (ASCE)* technical committee, "Pipeline Crossings", developing international conferences and 'manual of practice'.

Past chairman of program committee for ASCE pipeline technical conference on pipeline engineering.

Past committee chairman in *National Society of Professional Engineers* and previously active in *American Society for Quality Control*.

Books, Publications, and Product Development Authored by W. K. Muhlbauer

- Pipeline Risk Assessment: The Definitive Approach and Its Role in Risk Management, 2015, Expert Publishing, LLC, Austin, TX.
- Creator and content manager for www.pipelinerisk.net and CERM (2022), non-commercial resource sites for all stakeholders in pipeline risk management
- Pipeline Risk Management Manual, 1992, Gulf Publishing Company, Houston, TX.
- Pipeline Risk Management Manual, 2nd Edition, 1996, Gulf Publishing Company, Houston, TX.
- Pipeline Risk Management Manual, 3rd Edition, 2004, Elsevier Publishing Company.
- Author and designer of resource website: www.pipelinerisk.net, 2015.
- Pipeline Risk Controller, commercial software package, 1994, 1997, Gulf Publishing Company, Houston, TX.
- PipeCalc version 4.0, commercial software package, 1995, Gulf Publishing Company, Houston, TX. .
- Pipe Line Rules of Thumb CD, commercial software package, 1998 & 2002.

- Various custom software applications.
- Author of quarterly column on Pipeline Risk Management for *Pipelines International* magazine, beginning 2011.
- Reviewer of technical article submissions to *Journal of Risk and Reliability*
- Session Chairman and technical article reviewer for IPC, International Pipeline Conferences
- Numerous journal and technical conference articles and presentations.

Education

Graduated Summa Cum Laude from University of Missouri, Bachelor of Science, Civil/Environmental Engineering, Dec 1981.

Post-graduate and continuing education in areas of Business Administration (University of Houston at Clear Lake), Total Quality Management, and Engineering.

Licensed professional engineer in Texas since 1984.

Pipeline Design, Construction, Operations, and Maintenance Experience of W. Kent Muhlbauer

Supplement to work history of resume for W. Kent Muhlbauer, PE

Pipeline Design and Construction, 1982-1990, Dow Pipeline Company

During this period, Mr. Muhlbauer held a variety of positions at Dow Chemical's Pipeline Division in Texas. As an operations engineer for a pipeline district field office, Mr. Muhlbauer was responsible for the technical aspects of 800 miles of cross-country pipelines (transporting hazardous liquids and gases) and a fresh water reservoir system. As project engineer and project manager, he was responsible for estimation, design, construction, and cost control for numerous projects including:

- Compressor station design, hot tap of 30" high pressure natural gas line, associated piping and metering;
- Hot tap and valving for numerous new natural gas connections;
- 15 mile, high pressure ethylene line repair, recommission, and decommission;
- In-service lowerings of numerous high pressure propylene, ethylene, LPG, and natural gas pipelines;
- Refurbishment of styrene/benzene pipelines through a congested process plant;
- Onshore water/wastewater recovery system design and installation for an offshore pipeline in natural gas service;
- Design and installation of horizontal directionally drilled water crossing in an environmentally sensitive area;
- Design and construction of 7+ miles of new natural gas pipeline in urban areas around Pittsburg, CA, including dehydration and metering stations;
- Numerous new pipeline connections and major maintenance projects in many product services;
- Preparation of numerous pipeline technical guidelines, procedures, and operating manuals for all aspects of pipeline operations; and
- Conducting computer modeling and research in pipeline technology, including leak detection, drag-reducers, infrared imaging, AC-induced currents, leak dispersion modeling,

underground explosive effects, risk assessment, expert systems, and satellite communications for SCADA.

Pipeline Operations and Maintenance, 1990-1994, Dow Chemical Company

In several management positions, Mr. Muhlbauer was responsible for various aspects of pipeline system operations and maintenance for Dow Chemical's Pipeline Division. Key assignments during this period included:

- Management of a pipeline control center overseeing operations of a 3,000 mile / 9 system pipeline network handling numerous products and two large fresh water storage and delivery systems. Direct responsibility for 13 employees and an annual operating budget of approximately \$4 million. Supervised all staffing, logistical, and hardware/software changes required to combine two working control centers into a single center.
- Management of pipeline field office with staff of 35 and annual operating budget of approximately \$12 million. Responsible for operations and maintenance of 1,200 miles of pipeline in southern Louisiana. Supervised the reduction in manpower and cost-cutting measures to streamline this operation.
- Designed and implemented Total Quality Management processes for a department of 180 people. Developed and conducted training programs for supervisors and employees.
- Prepared and participated in numerous start-up audits, safety audits, and project reviews.

Independent Pipeline Consultant, 1994-Present, WKM Consultancy, LLC

As an independent consultant, Mr. Muhlbauer has been a primary investigator and consultant in numerous pipeline technical projects for over 50 clients. Clients include major pipeline operators in the U.S. and overseas, consulting engineering companies; academicians; pipeline regulatory agencies; attorneys engaged in pipeline issues; and insurance companies. Larger projects include¹ the following (in some cases, sponsoring company names have been omitted at their request):

- Conduct independent and owner/operator-assisted pipeline risk assessments on thousands of miles of pipeline systems worldwide. Create detailed risk assessment systems for some of world's largest hydrocarbon and water transmission, gathering, distribution, and processing operations.
- Designed, installed, trained, and provided oversight of migration of desktop risk management systems to enterprise database environments.

¹ This is not an exhaustive list
WKM Consultancy
Updated Sept 2022

- Set-up and administer pipeline integrity management programs for both gas and liquid systems for mid-stream operator of ~1,100 pipeline miles. Oversee all aspects of IMP execution and participate in audits.
- Designed and conducted risk assessments on underground hydrocarbon storage facilities with related surface facilities and pipelines.
- Design and implement pipeline risk assessment models for two large operators of North Slope AK oil and gas production fields. Highly sophisticated models incorporate unique arctic threats and operating conditions, and thousands of individual inspection results accumulated over several decades. Includes forecasting module that provides economic analysis for repair/replace/abandon decision-making.
- Design risk assessment model for specific class of gas distribution service pipelines for operator of over 75,000 such services in U.S. Participate in presentation of model and results to public utility commission overseeing gas distribution systems.
- Team member of IMP committee overseeing all aspects of regulatory IMP programs; six different companies with gas gathering, gas transmission, gas distribution, hazardous liquids gathering, hazardous liquids transmission assets.
- Develop risk assessment algorithms for facilities—pump stations, tank farms, compressor stations, metering stations, etc.
- INGAA Technical Committee member, serving on two technical committees, on behalf of a large gas pipeline operator.
- Design specialized risk assessment models specifically for pipelines with unusually high exposures to geohazards.
- Design specialized risk assessment models to measure risk in offshore pipelines with changes in burial and seabottom stability conditions.
- Design specialized risk assessment models to measure risk non-hydrocarbon pipelines associated with facilities in 33 countries.
- Design specialized risk assessment models to measure risk associated with encased pipelines.
- Develop and support, as technical leader of project teams, risk assessments for major pipeline systems in China, Mexico, Brazil, Ecuador, Canada, Bolivia, France.
- Design risk assessment system for major gas transmission/distribution company; apply risk assessment to distribution system of over 4M services.

- Set up IMP programs, gas and liquid, for operator of small pipeline system in connection with chemical processing facility.
- Prepare report and make presentation to international development bank executives on subject of ROW encroachments and land use risk issues in Bolivia.
- Consult with designers of pipeline risk assessment software. Establish specifications and capabilities; support product development; beta-test programs.
- Assist in design of new risk assessment model to meet IMP requirements for operator of over 6,000 miles of natural gas transmission pipelines.
- Risk assessment study and report for ~4,000 km, large diameter natural gas pipeline across China.
- Risk assessment study and pilot program for several existing and pending liquid and gas hydrocarbon pipelines in China.
- Preparation of full regulatory integrity management plan (IMP) for ethylene, propylene, and other HVL pipelines in Louisiana, including dispersion calculations, hazard zone estimations, and risk assessment model.
- Comparative assessment and report on competing pipeline risk assessment methodologies for gathering systems in Oklahoma and Texas and refined products transportation in the NE
- Preparation of various risk reports and analyses documents for regulatory approval process of on-and offshore pipeline project proposed between Canada and U.S. in Pacific Northwest.
- Development of risk assessment methodology for tank farms and pumps stations for major pipeline operating company.
- Risk assessment study and failure investigation on special plastic pipe installations for major urban gas distribution systems in NE U.S.
- Pilot risk assessment of 200 mile system and subsequent expansion to cover 5,400 mile large diameter hazardous liquid pipeline system;
- Development of risk management and MAOP determinations for hazardous liquid and gas pipeline systems countrywide in Bolivia;
- Pre-installation risk assessment study of a new large diameter, high-pressure offshore pipeline in Taiwan.

- Risk assessment consultations and field investigation of a major pipeline in Republic of Georgia involving conversion of portions of an old Soviet pipeline system.
- Risk management training for gas distribution system operators in Colombia, SA.
- Pipeline system risk evaluation for proposed hazardous liquid pipeline in Michigan, as part of preparations for *Public Services Commission* hearings;
- Under direction of US regulatory agencies (EPA, DOT, and DOJ), produce consulting reports on pipeline technical issues and risk management for conversion of crude oil pipeline to gasoline service, in Texas;
- Conducting pipeline risk management training sessions for all regional offices of National Association of Pipeline State Regulators (NAPSR), under contract for *Department of Transportation, Office of Pipeline Safety*;
- Risk assessment study and report for City of San Diego water department including all transmission pipelines, pump stations, reservoirs, and treatment plants.
- Identification of high consequence areas and preparation of integrity management plan for Louisiana hydrocarbon complex.
- Risk assessment and management report for proposed butadiene pipeline through congested urban area in south Texas.
- System safety and integrity evaluation study for purchasers of a crude oil pipeline system in Texas;
- Conduct risk assessment analysis for major terminals and HVL pipelines in Mexico;
- Development of risk assessment and risk management systems for a major city gas distribution system
- Evaluation and performance estimation report on SCADA system leak detection capabilities for crude oil system in Texas;
- Design and cost estimation for new pipeline risk management software suite of tools.
- Serve on technical advisory committee for Canadian pipeline software and technology company
- Development of procedures manuals and training materials for refinery and terminal operations;

- Create software programs for purchase order management and regulatory compliance ‘tickler’ for natural gas transmission company in Texas.
- Evaluation of operations and maintenance procedures for hydrogen pipeline operated in south Texas;
- Evaluation of pipeline safety systems and regulatory compliance for chemical plant in Louisiana
- Consultant for technical software acquisitions to publishing company specializing in the oil and gas industry;
- Create software for refinery to track progress towards regulatory compliance of operations and maintenance procedure manuals.
- Numerous reports and consultations with attorneys representing pipeline companies; parties injured by pipelines; and municipalities concerned with pipeline issues.

Expert Witness Testimony and Services in Support of Legal Proceedings

Mr Muhlbauer has been involved in legal matters involving pipelines since the 1980's. As an impartial consultant, he has performed requested services in support of legal proceedings on behalf of numerous pipeline operating companies as well as for parties seeking damages from pipeline owners and from government agencies negotiating with pipeline companies. A partial listing of such services is shown below.

- Key author of portions of the Environment Assessment Report prepared in matter of United States District Court Western District of Texas, Austin Division, "Ethel Spiller, et al. Plaintiffs, v. Robert M. Walker, et al Defendants Civil no. A-98-CA-255-SS", a settlement agreement involving plaintiffs and U.S. Environmental Protection Agency and U.S. Department of Transportation concerning Longhorn Partners Pipeline conversion of service of pipeline in Texas, October 2001. Written declaration was also prepared for this case.
- Consultations to attorneys in subsequent change-in-service notifications in matter of Longhorn Pipeline operations in Texas (2012).
- Written declaration and direct expert testimony on behalf of Wolverine Pipeline Company before Michigan Public Service Commission in matter "Application of Wolverine Pipe Line Company for Authority to Construct, Operate and Maintain a Pipeline System in Jackson, Ingham, and Clinton Counties, Michigan Case No. U – 12334", June 2000.
- Written report and oral deposition on behalf of Colonial Pipeline Company in matter of "United States v. Colonial Pipeline Company; Civil Action No. 1:00-CV-3142 (US District Court, N.D. Georgia)", April 2002.
- Written and oral testimony before the Canadian National Energy Board (NEB) on behalf of GSX Pipeline (Williams Gas Pipeline), Joint Review Panel Commission Hearing Order GH-4-2001; GSX Canada Pipeline Project; Application to construct and operate a new natural gas pipeline and related facilities (in U.S. and Canada); hearing held in Sidney, British Columbia/Sidney, March 2003
- Consultations to attorneys on behalf of parties injured by natural gas pipeline in south Texas.
- Consultations to Town of North Andover, MA in matter of proposed new natural gas pipeline (Maritimes Northeast) through town limits.
- Consultations to attorneys in matter of Olympic pipeline accident in Bellingham, WA.
- Consultations to attorneys in matter of PG&E pipeline accident in San Bruno, CA. (2010-2011)

- Consultations to attorneys in matter of ExxonMobile pipeline accident in Mayflower, AR. (2013-2015). Written expert witness report prepared.
- Consultations to attorneys in matter of ExxonMobile pipeline accident on Yellowstone River in Montana. (2014-2015). Written expert witness report prepared.
- Consultations to attorneys in matter of Atlanta Gas Light distribution pipeline accident in Atlanta. (2013). Written expert witness report prepared.
- Consultations to attorneys, preparation of expert witness report, and deposition in matter of Plains Gas Solutions, LLC v Tennessee Gas Pipeline Company, LLC in Houston, TX. (2014-2017) CAUSE NO. 2013-62528, PLAINS GAS SOLUTIONS VS TENNESSEE GAS PIPELINE COMPANY, IN THE DISTRICT COURT OF HARRIS COUNTY, TEXAS, 151ST JUDICIAL DISTRICT.
- Consultations to attorneys in matter of Enbridge, LLC crude oil spill in Marshall, MI (2015).
- Consultations to attorneys in matter of Apache pipeline accident in Australia. (2010--2011)
- Consultations and preparation of preliminary report at request of insurance agency in matter of insurance claims settlement involving a pipeline rupture in California.
- Preparation of expert witness report in matter of In Matter of Columbia Gas Transmission Corporation v. Faison-Colonial Retail Associates, LP Civil Action No. 3:06cv524 Proposed Land Development by Faison-Colonial Retail Associates LP Over Pipelines Operated by Columbia Gas Transmission Company. Aug 2007.
- Preparation of expert witness report in matter of ENTERPRISE PRODUCTS OPERATING, L.P., Plaintiff, v.E-BIRCHTREE, LLC, THE WILLIAMS COMPANIES, INC. AND WILLIAMS NATURAL GAS LIQUIDS, INC., Defendants. Cause NO. 2006-44994 IN THE DISTRICT COURT OF HARRIS COUNTY, TEXAS 270th JUDICIAL DISTRICT, May 2008. Coordinate report preparation with APTECH Engineering in Houston.

Presentations and Training Programs Prepared and Conducted

Multi-day workshops and courses

Private Courses/Workshops

Numerous: Routinely providing in-house training seminars for pipeline operating companies ranging in length from 1 hour to multiple days, beginning in 1994.

Public Courses/Workshops:

Over 60 multi-day public workshops on pipeline risk management created and delivered worldwide since 1994.

Conference Presentations and Journal Publications

Over 40 papers and articles published since 1992.

Other

Author of multiple books on subject of pipeline risk management
Quarterly column on Pipeline Risk Management for *Pipelines International* magazine.
Owner and designer of resource website: www.pipelinerrisk.net