

## **December 9 Technical Roundtable Participant and Observer Biographies**

### **Michael Baker, Chief of Drinking and Ground Waters Division, Ohio Environmental Protection Agency**

Michael Baker is Chief of the Division of Drinking and Ground Waters at the Ohio Environmental Protection Agency where he has worked for over 26 years. He has served as Chief for 13 years responsible for characterizing and protecting Ohio's ground water resources and ensuring Ohio's citizens have access to adequate supplies of safe drinking water by administering the State of Ohio's Public Water Supply Supervision Program, Ground Water Characterization and Protection Programs, Class 1 and 5 Underground Injection Control Programs, Source Water Protection Program, the Drinking Water State Revolving Loan Program, and the Water and Wastewater Operator Certification Program. He has advised and directed numerous state drinking water and ground water protection initiatives including currently serving on an inter-agency work group established to ensure safe development of Ohio's unconventional oil and gas resources. He has also helped establish national water policy having served two terms on US EPA's National Drinking Water Advisory Council and is active in both the Ground Water Protection Council and the Association of State Drinking Water Administrators, having served as president of both associations. He has twice been invited to provide testimony on water related issues to the U.S. Senate Environment and Public Works Committee. He graduated with a BS from The Ohio State University School of Natural Resources.

### **John R. Baza, Director, Utah Division of Oil, Gas and Mining**

John Baza is currently the Director of the Utah Division of Oil, Gas and Mining, having been appointed to that position on May 6, 2005. He is a Petroleum Engineer by education and work experience, with a career spanning over 33 years working with the energy and mineral extractive industries. His experience includes engineering positions with several major and independent petroleum companies including Phillips Petroleum Company, Amoco Production Company and Flying J Oil and Gas Incorporated. He has been involved in petroleum exploration and development in Wyoming, North Dakota and Utah, and he has also worked on geothermal power projects in Utah, Nevada and California. He has accumulated over 21 years of state government service at the Division of Oil, Gas, and Mining, with nearly 15 of those years working strictly in the Oil and Gas Program before assuming the role of Division Director. Among his duties as Director, he leads the Division's efforts in the areas of petroleum development. He has previously been responsible for regulation of the upstream oil and gas industry in Utah. Both his government and private industry experience have given him hands-on experience with flowback and produced water issues. He is a Registered Professional Engineer in Utah. He has been a member of the Interstate Oil and Gas Compact Commission and is currently the Vice Chair of that organization. He is also a 36-year member of the Society of Petroleum Engineers, having held various officers positions including section chairman, program chairman and scholarship committee chairman. He has MS and BS degrees in Petroleum Engineering from Stanford University.

**Tim Buscheck, Chevron Fellow and Consulting Hydrogeologist, Chevron**

Tim Buscheck is a Chevron Fellow and Consulting Hydrogeologist in the Site Assessment and Remediation Team of the Health, Environment and Safety Department with Chevron, where he has worked since 1985. Prior to this he worked with Sohio Petroleum Company, Energy Resources Company, and Exxon Research and Engineering Company. At Chevron, Buscheck leads a Remediation Strategic Research program and provides consulting to Chevron Operating Companies on site assessments and remediation for marketing, chemical, refining and upstream facilities throughout the United States and internationally. In 2008 he wrote a guidance document for Compound Specific Isotope Analysis, which has been widely distributed to Chevron consultants responsible for demonstrating monitored natural attenuation. Buscheck led an Oxygenates Research program from 1998 to 2003. He led a Remediation Long Range Research program from 1992 to 1997. He has authored papers on the subjects of compound specific isotope analysis, natural attenuation, ethanol fate and transport, and multi-site plume studies, as well as several Chevron protocols for monitoring natural attenuation of contaminants in groundwater. He has conducted numerous short courses for regulatory agencies across the country since 1990. Between 1998 and 2002 he taught a two-day oxygenates short course with a California State Water Resources Control Board (CA SWRCB) toxicologist, offered through the CA SWRCB, US EPA, the National Ground Water Association and the University of California Extension Program. Between 1997 and 2000 he taught a one-day natural attenuation short course for regulatory agencies in six states. He holds a BS in Chemical Engineering from Lafayette College and a MS in Geological Engineering from the University of California, Berkeley.

**Lawrence Cenegy, Senior Corrosion Engineering Advisor, Hess Corporation**

Lawrence Cenegy is a Senior Corrosion Engineering Advisor, providing corrosion and water management support to Hess business units worldwide. He is currently involved in several unconventional resource water management projects involving water sourcing, application, and reuse, and he is a member of the Hess-internal Water Advisory Technical Resource team. Prior to joining Hess, he held the position of CAPEX Projects Manager for Nalco Company, focusing on chemical treatment programs for both land-based and deepwater projects. Before that position, he was a Research Section Leader for Nalco Company and earlier for Exxon Chemical Company, managing group projects in the areas of water treatment and flow assurance. His 35-plus years of industry experience include projects in all the major oil production regions worldwide. He has co-authored over 15 technical papers and patents and he is a member of the Society of Petroleum Engineers, National Association of Corrosion Engineers, and American Chemical Society. He holds a BA in Chemistry from the College of New Jersey and a MBA from the University of St. Thomas in Houston.

**Jason Clark, General Manager Drilling & Completions, HighMount Exploration & Production**

Jason Clark started working in the oil and gas industry in 1998 with a primary focus on drilling and completions. He has been involved in most major unconventional resource plays across the US as well as several international plays, ranging from start-ups to established plays with 50-

plus rigs operating in a basin. He is currently based in Oklahoma City, OK, as General Manager of Drilling and Completions for HighMount Exploration and Production, an independent oil and gas company. In addition to multiple leadership positions, he has experience as a technical lead with respect to tubular design and ground water protection. He has degrees in both Mathematics and Petroleum Engineering from Marietta College.

### **Jeffrey Davis, Senior Consultant, Cardno Entrix**

Jeffrey Davis is a Senior Hydrogeologist and Professional Engineer with over 20 years of experience in the areas of groundwater and GIS modeling and software and model development. He has provided consulting services for local, national, and international clients pertaining to modeling and visualization projects. He has extensive knowledge of groundwater flow and transport principles and has lectured and taught numerous workshops and classes worldwide. He currently works in the oil and gas industry in the areas of hydraulic fracturing and groundwater protection and produced water management. He is part of the National Groundwater Association (NGWA) subcommittee over hydraulic fracturing and serves on another committee overseeing the implementation of the National Groundwater Monitoring Network. He has given a number of presentations recently through Continuing Legal Education International on hydraulic fracturing and groundwater protection and is a sought after speaker with many other organizations. He also is active in the mining industry in water management and remediation and other groundwater related activities. Besides NGWA, he is actively involved with the International Water Association, International Mine Water Association and the Energy and Mineral Law Foundation. He has graduate and undergraduate degrees in Civil and Environmental Engineering from Brigham Young University.

### **Michael Dunkel, Director of Sustainable Development, Pioneer Natural Resources**

Michael Dunkel is the Director of Sustainable Development for Pioneer Natural Resources. He is responsible for water and air initiatives that promote long-term sustainable development plans. A major focus of the initiatives is finding economically viable alternatives to reduce fresh water used for drilling and hydraulic fracturing. The group has evaluated approximately 100 companies' technologies for water treatment and water management. He is also responsible for technical innovations to measure air emissions, reduce leakage of gas and reduce Pioneer's carbon footprint. He has held positions with Pioneer Natural Resources in engineering management, project management and business development over the last 15 years. His experience with Pioneer includes projects and developments in Tunisia, South Africa, Gabon and Argentina, before joining the Sustainable Development Group. Prior to Pioneer, he was employed at Marathon Oil in a variety of engineering and business development roles for 15 years. His involvement in successful developments covered Texas, Louisiana and North Africa. He is a 30-year member of the Society of Petroleum Engineers (SPE). He was a founding SPE member and officer of the Tunisia Section. He earned a BS in Mechanical Engineering from Rose-Hulman Institute of Technology.

**Harold Fitch, Director of the Office of Oil, Gas, and Minerals, Michigan Department of Environmental Quality**

Harold Fitch has served as Director of the Office of Oil, Gas, and Minerals (OOGM) of the Michigan Department of Environmental Quality since 1996. The OOGM regulates oil, gas, and brine wells and facilities, underground disposal wells, mineral exploration test wells, and surface and underground mines. He began his career as a geologist with the U.S. Geological Survey in Denver, Colorado, where he spent two years doing geologic mapping and resource evaluation. He then returned to his home state and joined the Geological Survey Division, predecessor of the OOGM. Prior to his appointment as Director of the OOGM, he worked as a field inspector, ground water specialist, and district supervisor, and was stationed at several field offices in northern Michigan as well as at Lansing. He earned a BS in Geology from Michigan Technological University in 1972 and did graduate work in Hydrology at the University of Arizona.

**Lloyd Hetrick, Professional Engineer and Certified Safety Professional, Newfield**

Lloyd Hetrick is a Registered Professional Engineer and a Certified Safety Professional with over 33 years of experience in the exploration and production industry, which includes drilling, completions, production operations and HSE. Prior to joining Newfield, he worked for a super major and several smaller exploration and production operators. His areas of expertise include well design, well construction, well operations and well failure analysis relevant to hydraulic fracturing as described more fully in a case study presented to the US EPA during their initial Hydraulic Fracturing Technical Workshop series during March 2011. His current role with Newfield includes establishing best practices for well design and construction, plus water and chemical management during hydraulic fracturing operations.

**Christopher B. Hill, Environmental Engineer, Chesapeake Energy Corporation**

Christopher Hill is an Environmental Engineer in the Environmental Health and Safety Regulatory and Scientific Affairs Department at Chesapeake Energy Corporation. At Chesapeake he has served as a technical lead on a number of scientific research initiatives related to hydraulic fracturing and other oil and gas activities, applying sound scientific and quality principles. He has actively participated in multiple aspects of US EPA's broader hydraulic fracturing research initiatives including the prospective and retrospective cases studies. Prior to joining Chesapeake, he worked for a major oil and gas company, as a Facility Engineer, supporting process safety initiatives for natural gas and natural gas liquid pipelines and facilities. He has a BS in Civil Engineering, a MS in Environmental Engineering and is currently pursuing a MS in Construction Management from North Dakota State University.

**Stephen Jester, Senior Principal Environmental Engineer, ConocoPhillips**

Stephen Jester is a Senior Principal Environmental Engineer with ConocoPhillips based in Houston, TX. He is recognized in the oil and gas industry for his experience in water issues related to hydraulic fracturing. He has 29 years of experience in managing projects related to characterization and remediation of soil and groundwater, and water and wastewater treatment, including 15 years in the oil and gas industry. He is currently responsible for

managing water issues related to hydraulic fracturing for ConocoPhillips' Lower 48 region, including evaluating recycle and reuse opportunities, fresh water and alternative water sourcing, and regulatory changes. He formed and led the Eagle Ford Water Consortium, a group of experts from 18 oil and gas companies who manage water issues for hydraulic fracturing in the Eagle Ford Shale. This group funded a study that provided more accurate and timely water use data to the University Of Texas Bureau Of Economic Geology to enable a more robust analysis of water use in hydraulic fracturing in Texas. He has studied and presented on water supply and demand for hydraulic fracturing in Eagle Ford, including presentations to the US EPA Hydraulic Fracturing Work Group (March 2011), and various conferences and groups in Texas. He is currently working with the American Petroleum Institute to update the "Water Management Associated with Hydraulic Fracturing" guidance document to include recommended practices on baseline water sampling. He has extensive experience in groundwater contamination and remediation throughout the United States, with past responsibilities that included a large project portfolio and remediation technology development. In addition to his experience above, he is the President of Harris County Municipal Utility District, a public office in the State of Texas with responsibilities that include managing the community's water supply and wastewater treatment systems. He has also designed water and wastewater treatment plants for municipal systems. He holds a BS in Civil and Environmental Engineering from Cornell University and an MBA from Villanova University.

### **George King, Distinguished Engineering Advisor, Apache Corporation**

George King is an Apache Corporation Distinguished Engineering Fellow and a Registered Professional Engineer (Oklahoma PE 10831 and Texas PE 110993) with over 40 years of oilfield experience since starting with Amoco Production Research in 1971. His technical background includes basic research on energized fracturing, production and fracturing chemicals, acidizing, asphaltenes, perforating cleanup, well integrity and completions, complex formations (North Sea chalk, San Juan coal, Alaskan and Canadian heavy/viscous oil, US tight gas, GoM Deep Water, and Niobrara shale), unconventional resources in the Barnett Shale, Horn River Shale, Eagle Ford Shale, Fayetteville Shale, and Gothic Shale), sand control, low pressure gas well operations and applications work on coiled tubing, cutoff, formation damage and well repair operations. His technical accomplishments include 60 technical papers, a book on completions and workovers, Distinguished Lecturer on foam fracturing for the Society of Petroleum Engineers (SPE) during 1985-1986, and a Completions Course Lecturer on horizontal wells for the SPE Short Course series in 1999. Industry positions held include Technical Chairman of the 1992 SPE Annual Fall Meeting, past American Petroleum Institute subcommittee chair on perforating, 11 years adjunct professor at the University of Tulsa (teaching senior level and graduate credit well completions and fracturing courses at night), and numerous SPE committees on forums, paper selection committees and Applied Technology workshops. Awards include the Amoco Vice President's Award for Technology from Amoco in 1997, API's service award in 1994, and the 2004 SPE Production Operations Award. He holds a BS in Chemistry from Oklahoma State, a BS in Chemical Engineering from University of Tulsa and a MS in Petroleum Engineering from University of Tulsa.

**Joseph Lee, Jr., Manager, Division of Compliance and Data Management, Bureau of Oil and Gas Management, Pennsylvania Department of Environmental Protection**

Joe Lee is Manager of the Division of Compliance and Data Management, Bureau of Oil and Gas Management, in the Department of Environmental Protection for the Commonwealth of Pennsylvania and a Licensed Professional Geologist. His present area of work is in the development and implementation of compliance programs and data management for the state's oil and gas management program. Prior to his present position, he managed the Source Water Assessment and Protection Program including the Wellhead Protection Program, and the state's Ground Water Protection Program. From 1988 to 1998, he supervised the development and implementation of the Filter Plant Performance Evaluation Program designed to optimize drinking water treatment plant operations. Prior to entering the Safe Drinking Water Program, he worked for the Bureau of Mining and Reclamation where he evaluated the impacts of coal mining and quarries on surface and ground water systems. He has served on the Board of Directors of the Ground Water Protection Council for over ten years and is presently the immediate Past President.

**Ann Maest, Buka Environmental, Inc.**

Ann Maest is an aqueous geochemist with expertise in the fate and transport of natural and anthropogenic contaminants in groundwater and surface water, with over 25 years of research and professional experience as a geochemist. She has worked on natural systems as well those that have been impacted by industrial activities, especially hard rock mining and oil and gas exploration and development. She has evaluated environmental conditions at many such sites in the United States and Latin America. After completing her PhD, she was a Research Geochemist in the U.S. Geological Survey's National Research Program, where she conducted research on oil-field brines, metal and metalloid speciation, analytical chemistry methodology and redox geochemistry in surface water and groundwater. She has served on a number of national and international committees, including several National Academy of Sciences committees related to mining and oil and gas research issues. She is a member of the American Chemical Society, the Society of Mining, Metallurgy, and Engineering, and the Geological Society of America. In the area of hydraulic fracturing and drinking water, she is especially interested in baseline water quality monitoring, produced and flowback water quality, and the potential transport of chemicals used in hydraulic fracturing to groundwater and surface water resources. She has a PhD in Geochemistry and Water Resources from Princeton University.

**Mark Mazoch, Manager of Water Team, Fayetteville Shale Division, Southwestern Energy**

Mark Mazoch is a Professional Engineer with Southwestern Energy where he is the Manager of the Water Team for the Fayetteville Shale Division. The Water Team is focused on both operations of the water life cycle as well as planning and executing water infrastructure development projects (water sourcing, reuse/recycling, treatment and disposal) in support of the development of the Fayetteville Shale in Arkansas. The primary objectives of these projects

are to reduce the development cost while providing secure sources of water and treatment operations, which may be accomplished in a long-term, sustainable manner. He has over 20 years of engineering and consulting experience, which includes the development of large scale, complex infrastructure and environmental restoration projects. He has led complex projects that required extensive regulatory agency coordination and public involvement. He is particularly interested in investigating/developing small scale, cost effective desalination plants and finding beneficial uses of both freshwater and concentrated brine. He is a member of the Society of Petroleum Engineers and has a BS in Civil Engineering and a MS in civil/geotechnical engineering from Texas A&M University.

### **JoAnn McMahon, Manager of Environmental Services Group, Baker Hughes**

Joann McMahon is Manager of the Environmental Services Group for Baker Hughes. She has 32 years direct experience in ecotoxicological research related to the petrochemical industry. She is co-author of several patents and technical publications on development of environmentally acceptable oilfield chemistries. She is also co-developer of the Chemical Evaluation Process Review (CEPR) assessment program to support the Baker Hughes SmartCare™ family of environmentally responsible solutions. She has a MS in Environmental Studies.

### **Woldezion Mesghinna, Founder, Natural Resources Consulting Engineers, Inc.**

Woldezion Mesghinna founded Natural Resources Consulting Engineers, Inc. (NRCE) in 1989 after 17 years of domestic and international experience in water resources. Since this time, he has worked as President and Principal Engineer at NRCE on a variety of projects for Indian Tribes and the Government of Eritrea related to groundwater wells, energy development, water acquisitions and detailed hydrologic and water quality modeling. He is an expert and has significant experience in surface water and groundwater hydrology, water quality and constituent mixing, water demands and planning, water infrastructure project design and water marketing and acquisition. Relevant projects have included analysis of mixing of groundwater and water quality constituents as part of a well testing program of groundwater quality and flow characteristics; subsurface investigations, soil sampling, rock coring, and permeability testing; design of a dewatering system through groundwater hydrologic analysis for a sub-aqueous tunnel; investigation of groundwater resources for development potentials; design of and utilization of embankment grouting injection wells for several dam projects in the United States and Eritrea to prevent subsurface seepage flows; and water treatment and wastewater treatment feasibility design studies in Eritrea and the western United States. Recently, he presented *Water Based Constraints on Tribal Energy Development in the Southwest* at a Tribal Energy conference hosted by Law Seminars International. He is a Licensed Professional Engineer in Arizona, California, Colorado, Wyoming and a member of the National Society of Professional Engineers, American Society of Civil Engineers, American Society of Testing & Materials, American Water Works Association and the Colorado River Water Users Association. He has a MS in Civil Engineering, with a concentration in Hydraulics and Hydrology and a PhD in Irrigation and Drainage Engineering.

**Glenn Miller, Professor of Environmental and Resource Science, University of Nevada, Reno**

Glenn Miller is a Professor of Environmental and Resource Sciences at the University of Nevada, Reno (UNR). He is also presently Director of the Graduate Program in Environmental Sciences and Health at UNR. Current areas of research include precious metals pit water quality and acid mine remediation using anaerobic sulfate reducing systems. He also is working on a variety of issues related to the measurement and fate of organic contaminants in the environment. He was also involved in a project providing comments on the New York Environmental Impact Statement on hydraulic fracturing. He has a BS in Chemistry from the University of California, Santa Barbara and a PhD in Agricultural and Environmental Chemistry from the University of California at Davis. After completing his graduate studies, he spent a year of postdoctoral study at US EPA's Environmental Research Laboratory in Athens, Georgia.

**Peter Miller, Range Resources**

Peter Miller has 20 years of professional experience in water management, industrial wastewater treatment, environmental remediation, and environmental consulting. His professional experience spans across a broad range of industries, including oil and gas, microelectronics, landfills, alternative energy, and food and beverage among others. Prior to starting with Range Resources in February of 2010, he worked for such companies as USFilter, Veolia, Siemens Water Technologies, and Tetra Tech NUS. At Range Resources, he is focused on managing water resources from sourcing, transportation, treatment, storage, reuse, and disposal. He is active in the Marcellus Shale Coalition and has been the Chairman of their Waste and Recycle Subcommittee for the past 2 years. He is a Registered Professional Environmental Engineer in the State of Pennsylvania (1997), holds a BS in Civil Engineering from the University of Pittsburgh (1992), an MBA from Robert Morris University (2009) and is a Certified Project Management Professional (PMP) through the Project Management Institute.

**Briana Mordick, Staff Scientist, Natural Resources Defense Council**

Briana Mordick is a Staff Scientist at the Natural Resources Defense Council (NRDC). Prior to joining NRDC, she worked for Anadarko Petroleum for six years as a petroleum geologist on projects including shale gas, tight gas sands, and CO<sub>2</sub> enhanced oil recovery. At NRDC, she serves as a Technical Advisor on issues related to oil and natural gas extraction and geologic sequestration of carbon dioxide. This work includes the identification of regulatory solutions and industry best practices to address the environmental impacts of oil and natural gas extraction. She has written and spoken frequently on these topics including to the National Academies of Science, US EPA and the Yale Environmental Law Conference. She served as a representative to the Operations and Environment and Policy Subgroups of the 2011 National Petroleum Council Study on the Prudent Development of North American Resources and is currently a member of the Unconventional Resources Technology Advisory Committee, a Federal Advisory Committee to the Secretary of Energy. She is particularly interested in the fate and transport of fluids in the subsurface through both manmade and natural pathways related to hydraulic fracturing and drinking water. She holds a BA in Earth Sciences from Boston University and a MS in Geological Sciences from the University of North Carolina at Chapel Hill.

### **Kris Nygaard, Senior Stimulation Consultant, ExxonMobil's Upstream Fracturing Center of Excellence**

Kris Nygaard is Senior Stimulation Consultant coordinating ExxonMobil's Upstream Fracturing Center of Excellence. He began his career at Exxon Production Research in 1992 following a post-doctoral research and teaching assignment at the University of Arizona. He has provided consulting to Exxon affiliates on wellbore hydraulics, completion design, formation damage and removal, and was involved in the development of the High Pressure/High Temperature laboratory facility for testing phase behavior and production chemistry of well fluids and chemicals. He also gained extensive experience in the area of production logging, providing expert production log interpretations, and often taught in ExxonMobil's internal schools. Between 1998 and 2004, he coordinated and led Piceance Basin (Colorado) field trials of ExxonMobil's breakthrough hydraulic fracturing "Multi-Zone Stimulation Technology." Between 2005 and 2010, he moved through several technical and managerial positions at the Upstream Research Company (URC) in the areas of drilling, subsurface engineering, well completions, and unconventional resources. In 2010, he was assigned to lead the Upstream Fracturing Center of Excellence, coordinating ExxonMobil's worldwide hydraulic fracturing resources and fracturing related technical interfaces. In his current role, he is relied upon widely by the Upstream for his expertise in stimulation technology and applications to new and existing business opportunities. He also advises the Research and Development Program at ExxonMobil's Upstream Research Company and works closely with ExxonMobil's business units on technology strategy, deployment, and applications. He holds a BS in Mechanical Engineering, a MS in Aerospace Engineering and a PhD in Mechanical Engineering all from the University of Arizona.

### **Jeffrey Oxenford, Principal and Owner, Oxenford Consulting, LLC**

Jeffrey Oxenford is the Principal and Owner of Oxenford Consulting, LLC. He has worked for Stratus Consulting, the American Water Works Association Research Foundation and the New Jersey Department of Environmental Protection. He has over 25 years' experience in water quality and treatment and has managed and directed cutting edge water quality research on issues such as volatile and synthetic organic chemicals, natural organic matter, disinfectants and disinfection by-products, arsenic, algal toxins, taste and odor, *Cryptosporidium*, and distribution system water quality. He has also led research on water treatment technologies that include source water protection strategies, alternative disinfectants, granular and powdered activated carbon and membrane technology. He is particularly interested in the potential impact of hydraulic fracturing on drinking water quality and strategies that utilities should employ to project water quality. He has a MSE in Environmental Engineering from the University of North Carolina at Charlotte and a BA in Chemistry and Environmental Management from Warren Willson College.

**Peter Pope, Assistant Director, Site Remediation Section, Oil & Gas Division, Railroad Commission of Texas**

Peter Pope is the Assistant Director of the Site Remediation Section, Oil & Gas Division, Railroad Commission of Texas. He has over 20 years of experience practicing hydrogeology and performing risk-based environmental assessments for private industry and public sector clients. He has expertise in aquifer characterization, fate and transport of chemicals in soil and groundwater, numerical simulations of subsurface transport processes and statistical analysis of environmental data. He has worked for the Railroad Commission of Texas since September 2001. He has a BS in Geology from Purdue University and a MA in Geology from Rice University.

**Joseph P. Smith, Senior Research Associate, ExxonMobil Upstream Research Company**

Joseph Smith is a Senior Research Associate at ExxonMobil Upstream Research Company where he serves as Senior Technical Professional Advisor for Environmental Research. After postdoctoral appointments at the University of Wisconsin and Argonne National Laboratory, he joined Exxon Production Research Company in 1981 and has been active in research on the environmental aspects of oil and gas operations since 1990. His current research interests include the environmental aspects of water use, treatment and disposal in unconventional gas production, the environmental fate of methane in the ocean, the environmental fate and effects of marine discharges of drilling and production wastes, and the effects of seawater usage for thermal management by offshore facilities. He served on the Bureau of Ocean Energy Management, Regulation, and Enforcement's Outer Continental Shelf Scientific Committee from 2003 to 2011 and is currently co-chair of the Offshore Operators Committee Environmental Sciences Subcommittee. He is a member of the Society of Petroleum Engineers (SPE), where he serves as Associate Technical Editor for *SPE Production and Operations*, and the American Chemical Society. He holds a PhD in Physical Chemistry from the University of California at Berkeley and a BS in Chemistry from the University of Rochester.

**Thomas Starosta, Environmental Engineer Consultant, Pennsylvania Department of Environmental Protection**

Thomas Starosta is a Professional Engineer and Environmental Engineer Consultant with the Pennsylvania Department of Environmental Protection. For the past ten years, he has been lead engineer for calculation of water quality-based effluent limits (WQBELs) for point source discharges to surface waters in Pennsylvania. WQBELs are the effluent limits for NPDES discharges that will assure that water quality standards and criteria for conventional and toxic pollutants will be protected in rivers and streams. He maintains the computer tools, models, and technical documentation supporting the methods and bases for determination of WQBELs, and serves as a technical resource to support regional permit engineers and writers. He has broad experience related to NPDES permitting of natural gas and shale gas extraction wastewater discharges and the associated pollutants of concern, including total dissolved solids and its component solids. In addition to water quality concerns related to protection of aquatic life and potable water supply, he has been involved with controlling bromides based on their

potential to produce disinfection byproducts during the chlorination process. His background in the nuclear power industry has helped Pennsylvania deal more effectively with the NORM (Naturally Occurring Radiological Materials) contained in natural gas wastewater, including radium 226/228. Based on the unique threat to water quality posed by inadequately treated natural gas and shale gas extraction wastewater, Pennsylvania regulations have greatly restricted these discharges since 2010. He has a BS in Environmental Engineering Technology from Temple University with graduate work at Penn State University.

### **Denise Tuck, Senior Product Champion for Production Enhancement, Halliburton**

Denise Tuck is a Senior Product Champion for Production Enhancement at Halliburton. She provides technical support on chemistry and fluids for stimulation and hydraulic fracturing. Formerly, she held the positions of Environmental Compliance and Permitting Manager and Global Chemical Compliance Manager in Health, Safety and Environment for Halliburton. She joined Halliburton in 1990 and has over 30 years of experience in environmental pollution control systems design and regulatory permitting and compliance for the upstream and downstream oil and gas industry. She co-authored two sections in the National Petroleum Council Report on *Prudent Development – Realizing the Potential of North America’s Abundant Natural Gas and Oil Resources* and participates on several American Petroleum Institute and Society of Petroleum Engineers committees. She has a BS in Chemical Engineering from Auburn University.

### **Norm Warpinski, Halliburton Fellow, Director of Technology, Pinnacle – A Halliburton Service**

Norm Warpinski is a Halliburton Fellow and is the Director of Technology for *Pinnacle – A Halliburton Service* in Houston, Texas, where he is in charge of developing new tools and analyses for hydraulic fracture mapping, reservoir monitoring, hydraulic fracture design and analysis, and integrated solutions for reservoir development. He joined Pinnacle in 2005 after previously working as a Senior Scientist at Sandia National Laboratories from 1977 to 2005 on various projects in oil and gas, geothermal, carbon sequestration, waste repositories, and other geomechanics issues. He has extensive experience in various types of hydraulic fracture mapping and modeling and has been involved in large scale field experiments from both the hardware and software sides. He has also worked on formation evaluation, geomechanics, natural fractures, *in situ* stresses, rock behavior and rock testing. He received his MS and PhD in Mechanical Engineering from the University of Illinois, Champaign/Urbana in 1973 and 1977, respectively, after receiving a BS in Mechanical Engineering from Illinois Institute of Technology in 1971.

### **Harry Zhang, Industrial Water Resources Lead and Principal Engineer, CH2M Hill**

Harry Zhang is Industrial Water Resources Lead and a Principal Engineer and at CH2M HILL. He is a Registered Professional Engineer in Virginia and Maryland. He has 18 years of diversified experience in water sustainability, water quality modeling and monitoring, watershed management, Total Maximum Daily Load development and implementation, stormwater management, groundwater contaminant transport, water resources planning, NPDES

permitting, nonpoint source control, hydrologic and hydraulic analysis, source water protection, uncertainty analysis and environmental systems engineering. His recent projects include the review of regulatory and permitting requirements applicable to flowback and produced water treatment for 14 states with shale gas development. In addition, he co-authored a paper entitled “Hydraulic Fracturing in the Context of Sustainable Water Management” in the book Contemporary Technologies for Shale-Gas Water and Environmental Management published by Water Environment Federation (WEF). He is the Chair of Hydrology and Watershed Management Committee at American Water Resources Association (AWRA). He also co-chaired the certification team of the Sustainable Watershed Task Force of WEF's Sustainability Community of Practice. He is particularly interested in the issues of water lifecycle analysis and water quality management related to hydraulic fracturing and drinking water. He has a BS in Environmental Engineering, a MS in Environmental Engineering with a minor in Geo-environmental Engineering and a PhD in Environmental Engineering (Water Resources) with a minor in Systems Engineering.

## **Observers**

### **Adam Carpenter, Government Affairs, American Water Works Association**

Adam Carpenter works in American Water Works Association (AWWA) District of Columbia Government Affairs Office and serves as an expert on a diverse set of drinking water issues including climate change, hydraulic fracturing, consumer confidence reports, carbon capture and storage, the energy-water nexus, and other water and environmental issues. Along with his colleagues, he works to further AWWA’s mission of supporting clean, affordable drinking water through sound application of science into policy, source water protection, sensible regulation, public awareness, and building stakeholder consensus. He holds a BS from George Washington University in Biology, a MS from Johns Hopkins in Environmental Sciences and Policy and is pursuing a PhD in Environmental Policy from George Mason University.

### **Stephanie Meadows, Senior Policy Advisor, Upstream Department, American Petroleum Institute**

Stephanie Meadows is Senior Policy Advisor in the Upstream Department of the American Petroleum Institute (API), a national trade association representing over 500 companies involved in all aspects of the oil and natural gas industry. She currently manages and coordinates API’s upstream environmental advocacy activities. In this role, she focuses on the impact of federal and state regulations and legislation on operations, the development of industry standards and best practices and cultivating strong relationships with other aligned industries, associations, and government. She joined API in March 1987 and has gained extensive industry experience in several different roles within the organization. She has been API’s point person on hydraulic fracturing since 2007. She received her BS from Bowling Green State University and completed her graduate studies in Marine Affairs at the University of Virginia.