

Well Injection Roundtable Participants and Observers

Participants

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.

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.

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 include 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.

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 1985-86, 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.

Randy LaFollette, Director of Applied Reservoir Technology, Baker Hughes Pressure Pumping

Randy LaFollette is the Director of Applied Reservoir Technology for Baker Hughes Pressure Pumping and works from the Technology Center in Tomball, Texas. He has 35 years of experience in the oil industry, including field, region, and research level positions and has worked for The Western Company of North America, Reservoirs, Incorporated, BJ Services, and Baker Hughes. He is active in the Society of Petroleum Engineers, aiding with conference organization and presenting on various reservoir and completion/stimulation topics. He was the keynote speaker at the American Association of Petroleum Geologists (AAPG) Geosciences Technology Workshop Hydraulic Fracturing: New Controversies and Key Plays workshop, August 13, 2012. He has also presented on shale topics at AAPG, Society of Petrophysicists and Well Log Analysts, Society of Economic Geologists and other industry group meetings, and has developed and teaches a one-day short course entitled Hydraulic Fracturing of Shale Reservoirs for AAPG/Energy Minerals Division and a one-day short course entitled Hydraulic Fracturing for

Geologists for AAPG. He is a co-author of “Modern Fracturing, Enhancing Natural Gas Production.” His current job responsibilities include management and coordination of laboratory and applied support projects. He is also responsible for structuring and implementing geospatial and data-mining studies of stimulation effectiveness linking reservoir quality, well architecture, well completion, and treatments performed to production results. A subject matter expert for Baker Hughes, he also provides stimulation and remedial treatment recommendations, trains personnel, and consults with operators and BHI field/ region personnel on technical support matters. He has a BS in Geological Science from Lehigh University in Bethlehem, Pennsylvania.

Hugh MacMillan, Senior Researcher, Food & Water Watch

Hugh MacMillan is a Senior Researcher at Food & Water Watch, which he joined in 2011 after one year as a Science Advisor in the U.S. Senate and ten years in academia. He is an applied mathematician with extensive experience working on diverse computational problems, including the development of numerical models to quantify multiphase fluid flow through porous and fractured media, geochemical and microbiological processes, and crack propagation. Further, he is an expert in mathematical and statistical methods used to estimate uncertainties inherent to such modeling.

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.

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 CO₂ 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.

Tom Myers, Independent Consultant, Hydrogeology and Water Resources

Tom Myers is an Independent Consultant in Hydrogeology and Water Resources. He has over 16 years of experience in groundwater including modeling, mine dewatering, groundwater monitoring design, and contaminant transport. He has been working on contamination concerning hydraulic fracturing issues since 2008. He recently published the peer-reviewed article, *Potential Contaminant Pathways from Hydraulically Fracture Shale to Aquifers* in the journal *Ground Water*. Other peer reviewed articles have included a contaminant transport model of selenium movement in the Blackfoot River Basin of Idaho and a numerical modeling study of coal-bed methane development in Montana entitled *Groundwater Management and Coal Bed Methane Development in the Powder River Basin of Montana* published in the *Journal of Hydrology*. He is a member of the National Groundwater Association, American Geophysical Union, American Water Resources Association, and the International Association of Hydrogeologists. He is particularly interested in the issues of contamination caused by injection

related to hydraulic fracturing. He has a BS in Civil Engineering and a MS and PhD in Hydrology/Hydrogeology.

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.

Eugene Pine, Chief of Well Plugging and Subsurface Activities Division, Pennsylvania Department of Environmental Protection

Eugene Pine is Chief of the Well Plugging and Subsurface Activities Division for Pennsylvania's Department of Environmental Protection, Oil and Gas Management Program. He directs the planning, management, development, coordination and implementation of all subsurface drilling, casing, cementing, stimulation, completion, gas storage, well plugging and related technical and administrative activities within the Bureau of Oil and Gas Planning and Program Management. He has conducted multiple presentations on Pennsylvania's subsurface regulations, along with associated subsurface-related technical issues, with industry trade groups, academic institutions, and non-profit business entities. He also represented the Department in July 2010 as part of the STRONGER (State Review of Oil and Natural Gas Environmental Regulations) review of Pennsylvania's Oil and Gas Program in their evaluation of the Commonwealth's requirements regarding hydraulic fracturing. He has worked for the Department for over 33 years, and has been with the Oil and Gas Program over four years. Prior to coming to the Oil and Gas Program, he was the Senior Hydrogeologist for the Municipal and Residual Waste Program in the Department's Bureau of Waste Management. He also was the

Senior Hydrogeologist during the implementation and management of the Commonwealth's Hazardous Sites Cleanup Program and the Land Recycling Program. He earned his BS in Geology in 1977 from the Pennsylvania State University, and has completed post-graduate work in Hydrogeology, Aqueous Geochemistry and Engineering Geology at Millersville University. He earned his Professional Geologist's license in 1994.

Steve Pohler, Senior Technical Consultant, Marathon Oil

Steve Pohler is a Senior Technical Consultant at Marathon Oil Corporation with over 31 years of industry experience, 23 years with Marathon Oil Corporation, three years with an Independent and five years with ExxonMobil. He has experience in deepwater completions, production operations, well optimization, workover/completions, and drilling. He worked on the start up of Marathon Sakhalin Project and worked in Equatorial Guinea and Angola for ExxonMobil on deep water completions on floaters and tension leg platforms. He helped in the development of the Marathon Oil Corporation-owned Annual Velocity Enhancer (AVE) Technology, the true bore sliding sleeve, and toe sleeve. He has a BS in Petroleum Engineering from Texas Tech University.

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.

Wilma Subra, President, Subra Company

Wilma Subra is president of Subra Company and provided technical assistance to Louisiana Environmental Action Network. She has over 45 years of experience in sampling and chemical and microbiologic analysis of ground water and surface water resources, monitoring of impacts on water resources, monitoring the environmental impacts of oil and gas drilling and production activities, oil and gas waste treatment and disposal practices and associated environmental and human health impacts, environmental and human health impacts of injection well operations, analysis of chemical components in drilling fluids, pit construction and resulting contamination from pit operations, and environmental and human health impacts of shale development. Her current work is focused on the environmental impacts of various aspects of shale development, the human health impacts associated with various specific units and activities of shale development, the development of appropriate parameters for monitoring ground water and surface water resources to detect impacts of shale development, and the development of guidelines for the regulation of state programs dealing with shale gas development. She is a member of the American Chemical Society. She has a BS and MS in

Microbiology and Chemistry from the University of Southwestern Louisiana (University of Louisiana at Lafayette).

Ching-Tzone Tien, Chief, Groundwater Discharge Permit Division, Maryland Department of the Environment

Ching-Tzone Tien is currently Chief of the Groundwater Discharge Permit Division of the Maryland Department of the Environment and Program Manager for Maryland's Underground Injection Control Program. He has been with the Maryland Department of the Environment since July of 1975, and has over 30 years of experience in groundwater hydrology and groundwater pollution control. He has authored or co-authored 32 research papers, book chapters, conference proceedings and governmental publications relating to environmental engineering and water pollution control. He is a faculty member of the Office of Advanced Engineering Education at the University of Maryland, College Park, teaching two graduate courses including a course entitled Groundwater Hydrology and Pollution Control. His specialties include but are not limited water and wastewater treatment, water pollution control, waste management, groundwater hydrology and water quality protection. Maryland's Underground Injection Control Program will support the State's Mining Program in implementing mechanical integrity testing and will require a permit for any discharge of hydraulic fracturing wastewater into the subsurface. He has a BS in Civil Engineering, a MS and a PhD in Environmental Engineering and is a Professional Engineer licensed in the State of Maryland.

John Veil, Founder, Veil Environmental, LLC

John Veil founded Veil Environmental, LLC, a consulting practice specializing in water issues affecting the energy industries, upon his retirement from Argonne National Laboratory in January 2011. He spent more than 20 years as the manager of the Water Policy Program for Argonne National Laboratory. Before joining Argonne, he managed Maryland's regulatory programs for industrial wastewater discharge and injection and served as a faculty member of the University of Maryland. He has been recognized by the Society of Petroleum Engineers as a Distinguished Lecturer in 2008-2009 and 2013-2014 and as the recipient of the 2009 international award for Health, Safety, Security, Environment and Social Responsibility. He has 32 years of experience in wastewater treatment and water quality, 22 years of experience in managing produced water, and five years of experience with flowback water and hydraulic fracturing. He has published many articles and reports and is frequently invited to make presentations on produced water and flowback water management, shale gas, hydraulic fracturing, and chemical disclosure, among other topics. He was invited to testify before Congress in 2007 on produced water as an alternate water supply. He has a BA degree in Earth and Planetary Science and MS degrees in Zoology and Civil Engineering.

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.

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.

Greg Dierkers, Program Director for Environmental, Energy and Transportation, National Governors Association

Greg Dierkers is a Program Director in the Environment, Energy and Transportation (EET) Division for the NGA Center, where he provides project management oversight. In this capacity he provides program and management support for NGA Center on a range of energy topics including energy efficiency and renewable energy, electricity infrastructure, carbon capture and storage, natural gas, nuclear energy, energy assurance, and transportation fuels. At NGA he has supported NGA Chair's initiatives on energy and infrastructure and has helped author reports on clean energy finance and 'greener' fuels. Previously, he analyzed state and local transportation and energy policies at the Center for Clean Air Policy. He has a BS in Environmental Science from Bowling Green State University and a MEM in Policy and Economics from Duke University.

Dan Hill, Haudenosaunee Environmental Task Force

Dan Hill is known for his music, art and performances in Native and Non-Native audiences. As a Cayuga Nation Council Member and Cayuga Nation Representative for the Haudenosaunee Environmental Task Force and as an Environmental Technician, he is responsible to speak out for the Natural World according to his Grandmother's teachings. As a Cayuga Nation Citizen, the protection of the waters is only part of the Cycle of the Natural World and the teachings of protecting the Earth and the Life Cycle that supports us for seven generations. We are to leave the earth better than what we were given.

Amy Mall, Senior Policy Analyst, Natural Resources Defense Council (NRDC)

Amy Mall is a Senior Policy Analyst with the NRDC. She has more than 20 years of experience in public policy and government at the state, federal and local level. She has been with NRDC since 2001, where her work focuses on policies that protect natural habitats from irresponsible industrial development. Since 2006, her work has exclusively focused on oil and gas exploration and production, including hydraulic fracturing and risks to drinking water. Her work includes publication of the 2007 NRDC report *Drilling Down: Protecting Western Communities from the Health and Environmental Effects of Oil and Gas Production*. She has a BA from Cornell University and a MS in Public Policy from the John F. Kennedy School of Government at Harvard 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.