



CALIFORNIA OIL, GAS AND GROUNDWATER

November 2-3, 2016 Bakersfield Marriott at the Convention Center



Photo provided by Aera Energy LLC

CONFERENCE PROGRAM



Groundwater
Resources
Association
of California

CELEBRATING 25 YEARS!

WELCOME MESSAGE

Please be sure to stop by their booths and do business with them! Their contributions made this symposium possible!

The Groundwater Resources Association of California (GRA) welcomes you to the California Oil, Gas and Groundwater 2016 Symposium - a day and a half chock full of expert speakers to present the latest information on the wise production, protection and monitoring of California groundwater near oil and gas exploration sites. This is a follow up symposium to GRA's successful February 2015 event on the same topic, and will cover important updates on the regulations, research, industry practices, legislative actions, and groundwater protection efforts that have taken place since that time. An optional field trip to a major working oil field to learn about their efforts on operations, water treatment, and community outreach will cap off the event.

Since the passage of Senate Bill SB-4 (Pavley) in 2013, there have been numerous activities related to the new requirements on the oil and gas industry on groundwater monitoring and groundwater protection. For example, the State Water Resources Control Board developed model criteria for groundwater monitoring that were adopted on July 7, 2015. These criteria contained three main components, including 1) Area-Specific groundwater monitoring near stimulation activities required by operators; 2) Requirements for designated contactor sampling and testing; and 3) Regional scale groundwater monitoring to be implemented by the State Water Board and the U.S. Geological Survey (USGS). Many of these will be discussed at the Symposium.

In addition, there has been significant activity related to the State's Underground Injection Control (UIC) program, aquifer exemptions, produced water disposal at pits or ponds, treatment and reuse options, and investigations into the interaction (or lack of) between the oil and gas fields and groundwater. The use of groundwater for operations in a drought environment, and potential reuse of produced water for recharge or agriculture as an assist to the Sustainable Groundwater Management Act (SGMA) are being seriously considered and will be topics at the Symposium.

The 2016 California Oil, Gas, and Groundwater Symposium is intended to provide the latest information on the successful applications and/or problems encountered with the current requirements for groundwater monitoring and protection related to oil and gas activities in California. The organizing committee worked hard to bring together a slate of high quality speakers and poster presenters to inform you about the current practices and requirements, and the successes and challenges that create the context for the relationship between petroleum production and groundwater management in California. We hope that you enjoy and benefit from the information provided at the Symposium, and encourage you to participate with the speakers during the audience Q&A session. Also, please take the opportunity to visit the exhibitors who help make this event possible.

Sincerely, The Organizing Committee:

Ted Johnson, Jean Kulla, Brent Miyazaki, Lynn Edlund, Murray Einarson, Rob Gailey, Sarah Kline, Brian Lewis, Bill Pipes, Dan Segal, Ghina Yamout

CONFERENCE SCHEDULE

November 2 - 3, 2016 Bakersfield Marriott at the Convention Center

DAY 1 – NOVEMBER 2, 2016

7:00AM Registration/Continental Breakfast

Session 1 - Welcome & Keynote Address Moderator: Ted Johnson, Water Replenishment District of Southern California

8:00AM - 8:15AM Conference Welcome

GRA President, Chris Petersen

8:15AM - 9:00AM

Overview of Current Water Board Activities with Oil, Gas and Groundwater (SB-4, UIC, Ponds/Pits, Aquifer Exemptions, other) - John Borkovich, State Water Resources Control Board

9:00AM - 9:45AM

Oil Fields and Groundwater in the Central Valley: an Overview - Bill Bartling, CA Department of Conservation, Division of Oil, Gas & Geothermal Resources

9:45AM - 9:55AM

Meet the Sponsors & Exhibitors

9:55AM - 10:20AM

Break - Exhibit Area

Session 2 - Groundwater Supply and Protection Moderator: Lynn Edlund, Trihydro

10:20AM - 10:45AM

Overview of Regional Monitoring of the Potential Effects of Oil and Gas Development on Groundwater Resources in California - Matt Landon, United States Geological Survey

10:45AM - 11:10AM

Water Available for Water Available for Replenishment - Rich Juricich, Department of Water Resources

11:10AM - 11:35AM

Science Advisory Board's Review of USEPA's Draft Assessment of Potential Impacts of Hydraulic Fracturing on Drinking Water Resources - Steve Bohlen, Lawrence National Livermore Laboratory

11:35AM - 12:00PM

General Orders for Discharges to Land - Clay Rodgers, Central Valley Regional Water Quality Control Board

Lunch & Keynote Speaker Moderator: Murray Einarson, Haley & Aldrich

12:00PM - 1:30PM

Fracking, Wellbore Integrity and Groundwater Quality: A Canadian Perspective - Richard Jackson, GeoFirma Engineering Ltd.

Session 3 - Assessment and Monitoring - Part 1 Moderator: Brent Miyazaki, AECOM

1:30PM - 1:55PM

Tools for Distinguishing Background Groundwater Salinity from Impacts on USDWs by Produced Water Injection or Well Stimulation in California - Shawn Paquette, John A Connor, Lisa J. Molofsky, Kenneth L. Walker, Jr., GSI Environmental, Inc.

1:55PM - 2:20PM

Multi-Depth Monitoring Systems to Support Oil & Gas Monitoring in California - Murray Einarson, Haley & Aldrich

2:20PM - 2:45PM

Groundwater Characterization for Unconventional Oil, Gas and Mine Developments - John Sankey, TrueBlue Technologies, Inc.

2:45PM - 3:10PM

Use of Airborne and Surface Geophysics for Mapping Changes in Groundwater Salinity and Geology - Lindsay Ball, USGS

3:10PM - 3:30PM

Break - Exhibit Area

Session 4 - Water Supply, Handling and Recycling Moderator: Jean Kulla, K2 Enviro, Inc.

3:30PM - 3:55PM

Produced Water: Valuable Resource or Waste By-Product? - Earl Hagstrom, Sedgwick, LLP

3:55PM - 4:20PM

How is SGMA Being Implemented in Kern County? - Eric Averett, Kern Groundwater Authority

4:20PM - 4:45PM

New Water from Produced Water Desalination Plants in the Edison Oilfield, Kern County - Christine Zimmerman, Valley Water Management Company

4:45PM - 5:10PM

Industry's Water Stewardship in Oil and Gas Production in the Central Valley - Aera's Case Study on Water Use and Management - Willie Morris, Aera Energy

Reception & Poster Session

5:10PM - 7:00PM

POSTER PRESENTATIONS

Preliminary Prioritization of California Oil and Gas Fields for Regional Groundwater Monitoring Based on Intensity of Petroleum Resource Development and Proximity to Groundwater Resources

Tracy A. Davis, Matthew K. Landon, and George Bennett U.S. Geological Survey

Converting Scanned Oil Well Data into Usable Digital Data

David Shimabukuro and Ashley Ducart, California State University, Sacramento, Geology Department

Calculation of Groundwater Salinity Using the Resistivity-Porosity (RP) Method on Digitized Geophysical Logs from California Oil and Gas Fields

Michael Stephens and David Shimabukuro, California State University, Sacramento, Geology Department and Janice Gillespie, U.S. Geological Survey

Scaling Up Well Log Interpretation for Groundwater Salinity Mapping in the Age of Big Data

William Chang, Tule Analytics, David Shimabukuro, California State University, Sacramento, Janice Gillespie, U.S. Geological Survey, Michael Stephens, California State University, Sacramento

Mechanical Properties of Siliceous Mudstones Relative to Composition, Porosity, and Diagenesis. Upper Monterey Formation, Belridge Oil Field, San Joaquin Basin, California.

Ryan, M. Weller and Richard J. Behl, California State University Long Beach.

Optimization to Reduce Water Use while Increasing Asset Value

K. D. Gordon, L. W. Lake, E. J. Núñez, INTERA Petroleum Consultants

The Tracer Pulse Flowmeter and Depth Dependent Sampler: High Resolution Groundwater Data from Long-Screened Test Wells and Boreholes

Lucas Allen-Williams, BESST, Inc.

CONFERENCE SCHEDULE...CONTINUED

November 2 - 3, 2016 Bakersfield Marriott at the Convention Center

DAY 2 – NOVEMBER 3, 2016

7:00AM Registration/Continental Breakfast
8:00AM - 8:15AM Welcome

Session 5 - Groundwater Assessment and Monitoring - Part 2 Moderator: Bill Pipes, Amec Foster Wheeler

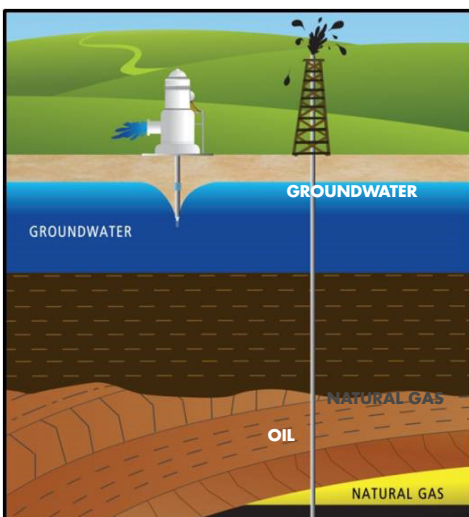
8:15AM - 8:40AM Concepts and Examples of Regional Groundwater and Produced Water Monitoring Design Near Selected Oil Fields - Peter McMahon, USGS
8:40AM - 9:05AM Water Quality Profiles from Well Logs: Simple Solutions are Often Not the Best Solutions - Deborah Olson, PayZone
9:05AM - 9:30AM Mapping Fluid Salinity Near Oil Fields in Kern County Using Existing Water Sample Data and Oil Well Borehole Geophysical Log Analysis - David Shimabukuro, California State University, Sacramento
9:30AM - 9:55AM Results of Exploratory Groundwater and Produced – Water Sampling in Selected Oil and Gas Areas and Sources of High Methane Concentrations in Los Angeles Groundwater - Justin Kulongoski, USGS
9:55AM - 10:20AM Break - Exhibit Area

Session 6 - Legislative and Water Quality Updates and Issues Moderator: Rob Gailey, Consulting Hydrogeologist

10:20AM - 11:45AM Oil, Gas and Groundwater - Latest Legislative Activities - Thomas Minter, AECOM
10:45AM - 11:10AM Risk Evaluation on using Treated Produced Water for Agriculture - Luis Navarro, ERM
11:10AM - 11:35AM CEQA Implementation Related to Oil, Gas and Groundwater - Bill Gorham, AECOM
11:35AM - 12:00PM Groundwater Banking and Oil Fields - Jon Parker, Kern Water Bank
12:00PM - 12:05PM Conference Closing Comments and Field Trip Information - Ted Johnson, Water Replenishment District of Southern California

Optional Field Trip

12:30PM - 5:00PM Moderator: Jean Kulla, K2 Enviro, Inc.
Lunch included. Limited Seating (first 40 sign ups only). Field trip to the Belridge Producing Complex of Aera Energy LLC will take place on the afternoon of November 3rd. The Belridge Producing Complex is located about an hour west/northwest of Bakersfield and includes oil and gas exploration and production operations in the North and South Belridge (sixth most productive field in the U.S.), Lost Hills, Cymric and McKittrick oil fields. Representatives from Aera will discuss how the fields are operated, how production fluids (including water) are handled and will share best practices on communication efforts with neighbors and agriculture as the industry works to build stronger relationships and transparency with the public. Bus will stop occasionally for photo opportunities.



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William Pipes, Principal Geologist Amec Foster Wheeler

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Amec Foster Wheeler, Inc., is a worldwide leading engineering, consulting, and project management organization. The company provides a full range of services to clients in a wide range of market sectors including government, clean energy, industrial/commercial, water, transportation/infrastructure, mining, and oil and gas. Amec Foster Wheeler is well represented in California with multiple offices and technical staff providing the state's oil and gas industry with expertise and solutions to meet the challenges of unconventional and conventional oil and gas development, especially in the integrated sourcing and management of water supplies.

Chris Petersen, Senior Hydrogeologist GEI Consultants, Inc.

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GEI Consultants, Inc. brings to our clients a refreshing blend of technical expertise, collaborative spirit and innovation that is rare in our profession. We are a trusted source of technical expertise to hundreds of clients nationwide who value high quality service and work products, and who seek a strong partner to achieve their desired project outcomes. Founded in 1970, we have completed more than 35,000 projects in all 50 states and 25 countries.

MEMBER EXHIBITORS

Jason Myers, Western Regional Sales Manager Aquatic Informatics

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Aquatic Informatics™ provides leading software solutions that address critical water data management and analysis challenges for the rapidly growing environmental monitoring industry. Aquatic Informatics is the trusted provider of hydrologic management solutions to hundreds of federal, state/provincial and local government departments, hydropower operators, mining companies, academic groups, and consulting organizations around the world, who collect, manage, and process large volumes of water quality or quantity data.

Francis Thie, Vice President Blaine Tech Services

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Blaine Tech Services (WBE/WOSB) is a specialty contractor that focuses exclusively on groundwater sampling and related field services. Our trained technicians operate custom, purpose-built vehicles and can safely and efficiently execute the most complex field sampling procedures on the most challenging sites. Groundwater sampling services include Traditional Purging & Sampling, Low Flow Sampling, Westbay System sampling, Barcad wells, PDBs, HydraSleeves, CMTs and Deep Well Sampling (1,000' + bgs). Other services include Surface Water Sampling, Soil Vapor Sampling, Soil Sampling, Well Development, Pump Test Support and Wellhead Repair & Maintenance. Five offices in California and Washington serve the West Coast and beyond.

Megan Kerns, President Confluence Environmental

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Confluence Environmental is a field services provider committed to providing the highest level of sampling and technical field services at competitive prices. With our extensive experience we offer a broad range of expertise to keep jobs running safely, smoothly, and efficiently. Complicated and challenging sites with specific intensive protocol are our specialty.

Dennis Dorning, Director of Business Development Enthalpy Analytical/Curtis & Tompkins

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Enthalpy Analytical has been providing reliable and specialty testing of wastewater, groundwater, drinking water, storm-water, soil, sludge, hazardous waste and air for over 93 years. Located in Orange County, Enthalpy facilities are comprised of over 20,000 square feet of laboratory space equipped with state of the art instruments to handle projects of all sizes with a very large capacity and focus in rush capacity. Enthalpy offers a complete offering of methods for virtually all environmental projects. Our priority focus is to provide quality analytical and customer services to all clients regardless of project size. All methods performed by Enthalpy follow strict conformance with Environmental Protection Agency (EPA) method guidelines as well as additional internal QA/QC criteria. From remediation sites, to groundwater investigations, to hazardous waste determination, Enthalpy is your partner for success.

Curtis and Tompkins (C&T) was founded in 1878 to support the regional wine industry and is now the leading California provider of a wide array of analyses for Organic, Metals and General Chemistry. From commercial to federal, C&T has a long history of supporting Department of Defense, USEPA Superfund, and other programs. C&T joined the Enthalpy family in 2015 and has been able to offer expanded services and range in the short time since. C&T specializes in client oriented approach to project and data management, whether it be more focused on fast turnaround time, comprehensive reporting or unique logistic needs. C&T labs provides a comprehensive array of environmental analytical services to industrial, engineering/consulting and government clients locally, nationally, and internationally with a staff of 85 chemists and technicians and 45,000 square feet of lab facilities located in Berkeley, CA. C&T provides analyses of groundwater, storm water, wastewater, drinking water, soil, ambient air, source air, soils, sediment, hazardous waste, solid waste, and biota.

**Stacy Hoch, Business Development Manager
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SGS Accutest is now part of SGS Environmental, Health & Safety (EHS), North America offering an ever-growing breadth of industry-leading services through the SGS family of companies. These services include Industrial Hygiene analysis and monitoring through SGS Galson, UltraTrace analysis (Dioxins/Furans, PCB Congeners, PBDE) at the Wilmington, NC Ultratrace Lab and Environmental Drilling services. SGS is the world's leading inspection, verification, testing and certification company. Recognized as the global benchmark for quality and integrity, we employ over 85 000 people and operate a network of more than 1,800 offices and laboratories around the world.

**Leo Raab, Business Development Manager
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Weck Laboratories, Inc. (SBE/MBE) located in Southern California, is a full-service environmental testing facility with National Environmental Laboratory Program (NELAP) accreditation. We take pride in providing nationwide customers with quick turnaround time, excellent customer service and defensible data for the analyses of water, soil and hazardous waste samples for over 52 years. Weck has been on the forefront providing analysis of Emerging Contaminants with all three of USEPA's Unregulated Contaminant Monitoring Rule cycles and have analyzed for other parameters such as Pharmaceuticals, Personal Care

Products, Hormones, Endocrine Disruptors, Pyrethroids, PBDES, PFOS/PFOA and Alkylphenols in various environmental matrices.

NON-MEMBER EXHIBITORS

**Calvin Cotton, Marketing Consultant
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BC Laboratories is a Full-Service, Environmental Laboratory certified by the States of California and Nevada for analysis of waters, soils, and air/vapor. Established in 1949, we provide services from our 25,000 square foot facility to all of California and Nevada through an internal courier service and network of service centers. Our services cover the spectrum of analytical needs for the following requirements: 1) Title 22 Drinking Water, 2) NPDES Permits, 3) RCRA, 4) CERCLA, 5) UST Sites.

**Glenn Olsen, Marketing Director
FGL Environmental**

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FGL Environmental is a full service laboratory designated by the State Water Board as a third-party contractor able to conduct well water analyses on injection and formation waters in accordance with the standards and protocols set forth for Groundwater Monitoring in Areas of Oil and Gas Well Stimulation. We have (5) laboratories in California to serve you. Contact us for details and a quote at (805) 392-2000 or www.fglinc.com.

**Randy Blackburn, Product Manager
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In business for over 35 years, Solinst is dedicated to providing clients with high quality groundwater and surface water monitoring instrumentation. They offer a broad range of practical equipment used by hydrogeologists and hydrologists around the world. Their product line features Leveloggers, Telemetry Systems, Water Level Meters, Interface Meters, Peristaltic Pumps, Drive-Points, Groundwater Samplers, Multilevel Systems and the Waterloo Emitter. They provide exceptional customer service, and leading-edge instruments designed for repeatable accuracy, ease-of-use, and durability.

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