Environmental Compliance in the Oil Patch

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Abstract

Environmental compliance has historically been a low priority to the oil and gas industry. This lack of urgency has not been due to the unwillingness of operators to comply with environmental laws but, rather, because of the remote nature of the business and the lack of enforcement. Now that oil and gas operations are moving into suburbia in multiple states across the Union, the oil patch is under the gun to comply with environmental laws. The focus of this article is to outline and briefly discuss the major exploration and production (E&P) environmental hot buttons facing the oil and gas industry today. Our goal is to provide the small independent with a focus on environmental programs that affect his business and hands on solutions so that he can continue to explore and produce energy resources without compromising human health or the environment.

Waste in the Oil Patch

Waste rules can be an extremely complex area of environmental law, one that has been called “mind-numbing.”1 Contrary to popular belief, even the limited area of E&P wastes is heavily regulated at both the federal and state levels. E&P operations generate a lot of waste, such as drilling mud, lubricating oil, hydraulic fluid, produced water, basic sediment and water (BS&W), tank bottoms and, yes, hydraulic fracturing fluids. Each of these waste materials (as well as other E&P waste) could potentially harm (Continued on Page 21)

Academic Achievement and Success

Recently, the Board of Directors of the SIPES Foundation announced that nine scholarships, totaling $20,500, had been awarded to students enrolled in nine different universities (see page 34). The committee that reviewed the applicants reported that the process of choosing the awardees was quite challenging because of the high quality of the applicants. The level of academic achievement, as well as apparent character and genuine need made narrowing the list to the final recipients daunting. All of the students were upper level or graduate students with cumulative GPAs of not less than 3.5 on a 4.0 scale. SIPES Members should celebrate the quality of the applicants who applied and give themselves a well-deserved "pat-on-the-back" for the financial support its Foundation provides the successful scholars. I am hopeful that all of the recipients, past and present, will remain in the profession and will emerge as successful leaders in their chosen field. However, there is something additional we should consider.

Let me first warn you, that what is about to follow, may upset some of the membership, as it might be construed as a ‘dig’ on (Continued on Page 11)
The following reports on national energy and environmental issues were prepared by SIPES Vice President of National Energy Eduardo Riddle, and Environmental Committee Chair George Carlstrom. The views and opinions expressed are those of the authors. Some of the information presented is in the public domain and is available from a variety of sources; other references were selected by the authors, and are noted in their reports.

**NATIONAL ENERGY**

Approximately ten years ago, I recall attending the monthly meeting of the SIPES Corpus Christi Chapter to learn about Cheneire Energy’s plans to build an LNG import terminal in Corpus Christi, Texas. It was one of three facilities of its type that were on the drawing board for our area of the Gulf Coast. At that time, gas was thought to be in short supply and the markets reflected this view. It was obvious from the questions being asked following the presentation that there was a concern that LNG would depress gas prices and compete for limited pipeline capacity. I confess to being one of them. That was then. Now, the overabundance of supply brought on by drillers developing oil and liquids rich gas shale plays, coupled with weak demand as a result of depressed industrial and manufacturing usage and storage at full capacity from mild winters, Cheneire and others, have rewritten their business plans to focus on the exportation of LNG. As a “gas heavy” producer, I am cheering them on.

In May 2011, The Brookings Institution Energy Security Initiative (ESI) began a year-long study into the prospects for a significant increase in liquefied natural gas (LNG) exports from the United States. The Energy Security Initiative (ESI) is a cross-program effort by the Brookings Institution designed to foster multidisciplinary research and dialogue on all aspects of energy security today. ESI recognizes that public and private choices related to energy production and use will shape the global economic, environmental and strategic landscape in profound ways and that achieving a more secure future will therefore require a determined effort to understand the likely consequences of these choices and their implications for sound policymaking. The ESI Policy Brief Series is intended to showcase serious and focused scholarship on topical issues in one or more of these broad research areas, with an emphasis on targeted policy recommendations.

What follows are the Conclusions and Recommendations of Policy Brief 12-01 published May 2012. The full text is available online at www.brookings.edu/research/reports/2012/05/02-lng-exports-ebinger

**Liquid Markets: Assessing the Case for U.S. Exports of Liquefied Natural Gas**

This paper has attempted to answer two questions:
Are U.S. LNG exports feasible? If so, what are the implications of U.S. LNG exports?

For exports to be feasible, several demand and supply-related conditions need to be met. On the supply side, adequate resources must be available and their production must be sustainable over the long-term. The regulatory and policy environment will need to accommodate natural gas production to ensure that the resources are developed. The capacity and infrastructure required to enable exports must also be in place. This includes the adequacy of the pipeline and storage network, the availability of shipping capacity, and the availability of equipment for production and qualified engineers.

On the demand side, LNG exports will compete with two main other domestic end uses for natural gas: the power-generation sector, and the industrial and petrochemical sector. According to most projections, the U.S. electricity sector will see an increased demand for natural gas as it seeks to comply with policies and regulations aimed at reducing carbon-dioxide emissions and pollutants from the power-generation fleet. Cheaper natural gas in the industrial sector has the potential to lower the cost of petrochemical production and to improve the competitiveness of a range of refining and manufacturing operations. Advocates of natural gas usage in the transportation fleet — particularly in heavy-duty vehicles (HDVs) — see it as a way to decrease the country’s dependence on oil.

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although absent major policy support, this sector is unlikely to represent a significant source of gas demand.

For increased U.S. LNG exports to be feasible, they will also need to be competitive with supplies from other sources. The major demand centers that would import U.S. LNG would be Pacific Basin consumers (Japan, South Korea, and Taiwan, and increasingly China and India), and Atlantic Basin consumers, mostly in Europe. The supply and demand balance in the Atlantic and Pacific Basins and, therefore, the feasibility for natural gas exports from the United States, depend heavily on the uncertain outlook for international unconventional natural gas production. Recent assessments in countries such as China, India, Ukraine, and Poland indicate that each country has significant domestic shale gas reserves. If these reserves are developed effectively — which is likely to be difficult in the short-term due to a lack of infrastructure, physical capacity, and human capacity — many of these countries would dramatically decrease their import dependence, with negative implications for existing and newcomer LNG exporters.

Detailed analysis of the foregoing factors suggests that the exportation of liquefied natural gas from the United States is logistically feasible. Based on current knowledge, the domestic U.S. natural gas resource base is large enough to accommodate the potential increased demand for natural gas from the electricity sector, the industrial sector, the residential and commercial sectors, the transportation sector, and exporters of LNG. Other obstacles to production, including infrastructure, investment, environmental concerns, and human capacity, are likely to be surmountable. Moreover, the current and projected supply and demand fundamentals of the international LNG market are conducive to competitive U.S.-sourced LNG.

While LNG exports may be practically feasible, they will be subject to approval by policy makers if they are to happen. In making a determination on the advisability of exports, the federal government will focus on the likely implications of LNG exports: i.e., whether LNG exports are in the “public interest.” The extent of the domestic implications is largely dependent upon the price impact of exports on domestic natural gas prices. While it is clear that domestic natural gas prices will increase if natural gas is exported, most existing analyses indicate that the implications of this price increase are likely to be modest. Natural gas producers will likely anticipate future demand from LNG exports and will increase production accordingly, limiting price spikes. The impact on the domestic

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industrial sector is likely to be marginal: to the extent that LNG exports raise domestic gas prices above the level at which they would have been in the absence of such exports, they will negatively affect the competitiveness of U.S. industry relative to international competitors.

However, the competitiveness of natural-gas intensive U.S. companies relative to their counterparts is likely to remain strong, given the large differential between projected U.S. gas prices and oil prices, which are the basis for industrial feedstock by competitor countries. Further, LNG exports are likely to stimulate domestic gas production, potentially resulting in greater production of natural gas liquids such as ethane, a valuable feedstock for industrial consumers. LNG exports are also unlikely to result in an increase in price volatility. The volume of LNG exports is capped by the capacity limitations of liquefaction terminals. If liquefaction terminals are running at close to full capacity, an increase in international demand will do little to affect domestic demand for — and therefore domestic prices of — natural gas.

The potential benefits of U.S. LNG exports relate to trade, macroeconomics, and geopolitics. Exports of natural gas would bring foreign exchange revenues to the United States and have a positive effect on U.S. balance of payments, although in the context of overall U.S. trade, the impact of LNG revenues are likely to be small. The construction, operation, and maintenance of LNG export facilities and related infrastructure will also likely lead to some, limited, job creation. Exports may also serve as a stimulus to continue and even increase production of natural gas, which may result in an additional supply of employment. With some domestic production — mainly dry gas with little liquid content — being suspended due to gas prices being too low for continued economic extraction, exports may serve as an important source of incremental demand to support necessary volumes to stabilize gas prices. To the extent that gas for export is produced at zero or negative cost in association with unconventional oil, such gas can be seen as a consequence, rather than a detriment to increased U.S. energy security.

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Additional volumes of U.S. LNG will be beneficial to the global gas market. While U.S. export volumes are unlikely to transform the existing fragmented structure of existing LNG trade, it will help to erode the basis of oil-linked contracts that have characterized it for decades, and to move the market toward global price convergence. In the short-term, the emergence of the United States as an exporter comes at a time of tightening global supply, meaning U.S. exports will provide much needed liquidity to natural gas consumers around the world, potentially improving the energy costs for consumers in LNG-dependent countries like Japan and India. While the economic benefits of this are clear, the progression towards a more global LNG market has substantial geopolitical implications as well. Although the U.S. government cannot directly influence the destination of each LNG cargo exported from the United States, U.S. foreign policy interests are served through a better-supplied global LNG market and through assistance to import-dependent strategic allies in Europe who will gain strategic leverage from the increased competition to Russian gas.

Beyond a simple cost-benefit analysis, there is a larger, more fundamental consideration that the U.S. government must consider when evaluating the merits of U.S. LNG exports. Policy makers should recognize that the non-exportation of U.S. LNG comes at the opportunity cost of forgoing the benefits of the free market. As a principal advocate and beneficiary of a global trading system characterized by the free flow of goods and capital, the United States has a long-term economic and political incentive to refrain from intervention in the market wherever possible. The economics of U.S. LNG exports — both the costs associated with producing, processing, and transporting LNG and the competitive nature of the global market — are likely to impose market-determined boundaries on their viability. Irrespective of the status of permits, incremental additions to actual export capacity will be dependent on long-term financing and interest from contracting parties. Increases in domestic natural gas prices as a result of marginal increases in demand negatively impact the economics of additional export projects, thereby protecting domestic consumers from unlimited exports and price rises.

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A proscription or limitation on LNG exports would constitute a de facto subsidy to domestic consumers at the expense of domestic producers. History suggests that government intervention in the allocation of rents can lead to inefficient outcomes and unintended consequences. To avoid these outcomes, the U.S. government should neither act to prohibit nor to promote LNG exports. In refraining from intervention in the gas market, the government will ensure that U.S. gas is allocated to its most efficient end uses, many of which will bring ancillary political and economic benefits to the United States and its partners and allies around the world.

ENVIRONMENTAL REPORT

The Cost of Compliance: a Case History

The Western states are a significant source of oil and gas production and fertile ground for new petroleum exploration. They are also rich in natural beauty, wildlife habitat, cultural sites and federal acreage. The existing regulations designed to protect these public lands and wildlife are arduous and expensive to negotiate on their own, but when the prevention of development is on the agenda of government agencies, it can become formidable and expensive to persist in getting drilling permits.

The following is a summary of the timeline of a company currently attempting to get a drilling permit on a federal tract. Because this is an active project, the company name and well location have been omitted from the report. Remember the rules. The BLM issued the lease, but the local BLM office can do everything in their power to delay issuing a drilling permit while the clock is ticking on the lease. Surveys, archeological excavations and environmental assessments are paid for by the operator but are subject to technical review and approval by the BLM.

Timeline

- **July 7, 2011** — the first NOS (Notice of Staking) was filed.
- **August 17, 2011** — the onsite inspection for the access road was conducted. Nine to ten archeological sites and a Desert Bighorn Sheep population were found. A Golden Eagle nest was found immediately adjacent to an existing upgraded access road, and a rare plant survey is anticipated. Big game winter stipps (stipulations) are in effect from December 1st through April 30th. The company waited for the BLM regarding how to access the proposed drill site, how to mitigate archeological sites and if a third access route would be advised.
- **January 23, 2012** — they called the BLM regarding the ability to get an approved permit in 2012. The BLM assured the company that an approved permit in 2012 was not going to happen for the following reasons: 1) too much snow on the ground to determine alternate access route before mid-March or early April, 2) once the final route is determined, a new Notice of Staking will need to be filed and a new onsite inspection will have to be conducted, 3) an APD could not be filed before May or June, 4) mitigation of the archeological sites, raptor surveys and Desert Big Horn Sheep management will be required. Also, there is potential for greater delays if the state requires a full Mexican Spotted Owl survey. This would take two years, ending in June 2013, 5) The EA (environmental assessment) will take one to two months to write, and the NEPA review will take five to six months. It will be February 2013 at the earliest to finish the review and issue a FONSI (finding of no significant impact), 6) an approved APD will not be possible before March to June 2013.
- **March, 27, 2012** — a phone conference was held with the natural resource specialist for this project. During this conversation, it was stated that determining an access route for this location was not likely because no one really wants to see development in this area. Maybe the company will be like previous operators and quietly go away. He was reminded that if the BLM did not want to see development of minerals in this area, they shouldn’t have sold the leases. The company will not be going away; this area is important to future development plans, and the BLM does not have the right to deny access to the minerals.

The company currently has environmental consultants conducting the Mexican Spotted Owl surveys and has been required to conduct archeological data testing and recovery for fifteen cultural sites. Nine C-14 samples were collected and tested. They have spent $64,000 on archeological surveys, in addition to $15,000 to collect the C-14 samples plus $1,000 each for the analysis.

A bone (human toe bone) was found at one site. This bone was washed into the site along with other debris and was not a burial site. Because of the bone, a Native American consultation was scheduled. At this consultation, the tribal members were told that this was a significant archeological site, and a visit would be necessary to determine what mitigation will be required. If the visit is not conducted soon, the area will be covered by snow, and it will be March or April 2013, before it can be rescheduled.

The company has spent over $154,000 on “compliance” to date, the bills are still coming in and there is no immediate resolution in sight.

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AGI News

Median Salaries Across Industry Sectors for Geoscience-related Occupations in 2011*

The most recent salary data from the U.S. Bureau of Labor Statistics indicate that geoscience-related occupations have competitive salaries across a variety of industry sectors. Petroleum engineers and natural science managers have the largest range in median salaries across industries ($84,770 - over $187,200 and $73,290-$180,160, respectively). Petroleum engineering occupations are found in nine broad-level industry sectors and natural science manager occupations are found in 15 broad-level industry sectors. Atmospheric, earth, marine and space science post-secondary teachers and geography post-secondary teachers have the smallest range in median salaries ($78,820-$84,590 and $60,820-$69,420, respectively), while environmental science post-secondary teachers have the largest range in median salaries ($32,700-$66,930) within the education industry sector. Of the non-management geoscience-related occupations, environmental science occupations (e.g. environmental engineers, environmental scientists, and environmental and environmental engineering technicians), soil and plant scientists, and geoscientist occupations are found in more than ten broad-level industry sectors.

*The 2011 median salaries for geoscience-related occupations by industry are on average 6% (+/- 5%) lower than the corresponding mean salary. We use median salaries instead of mean salaries because salary data are often asymmetrically distributed, and thus the median values give better estimates of centrality or a “typical” salary of an occupation.

Conviction of Italian Seismologists

On October 22, 2012, in L’Aquila, Italy, six seismologists and one Italian government official were convicted of manslaughter and sentenced to six years in prison. The seismologists and official had been on trial for not adequately warning the public about the danger of a potential earthquake prior to the L’Aquila earthquake in April 2009 that killed 309 people. Central to the question of manslaughter was whether there was a direct link between the reassuring statements of the commission on which the defendants served and the deaths from the earthquake.

Scientists are frequently called on to serve direct public needs, as indeed they should be. The American Geosciences Institute (AGI) believes that this is an appropriate role for earth scientists to undertake when the question is in their area of expertise, just as a medical doctor may be expected to assist in a medical emergency. Likewise, just as that medical doctor can assume protection from liability as long as standard and accepted procedures were followed at the scene of the emergency, AGI believes that scientists should be allowed to present their best recommendations without fear of retribution. This case, while complicated, puts scientists worldwide on alert that they may be attacked if, in hindsight, their best recommendations fell short of serving the public good. AGI feels that this is bad for science, and bad for the public good.

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<th>Occupation</th>
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*The U.S. Bureau of Labor Statistics reports this wage as “greater than $90.00 per hour or $187,200 per year”

In a blog on EARTH Magazine’s website, Dr. Thomas Jordan, the 2012 winner of AGI’s Outstanding Contribution to the Public Understanding of the Geosciences Award and Director of the Southern California Earthquake Center (SCEC), told EARTH Magazine, “This won’t help those of us who are trying to improve how risks from natural hazards are communicated between scientists and the public.”

AGI believes the best approach to mitigating the effects of future earthquakes is to advance education, public awareness, and preparedness initiatives such as SCEC’s ShakeOut earthquake drills. When these initiatives are paired with robust natural hazards research and development efforts and continued use of observational, analytical, and monitoring tools, we can begin to reduce the significant toll natural hazards have on society. Scientists must be allowed to communicate their findings through carefully defined relationships between appropriate scientists and those public officials responsible for civil protection, without fear of retribution when those findings are the result of best practices at the time.

AGI Geoscience Policy Program Document

In September AGI’s Geoscience Policy Program published a policy document, Critical Needs for the Twenty-first Century: The Role of the Geosciences. The updated document, first published in 2008 for the last presidential election, provides a list of critical needs for natural resources, environmental quality, and resilience from risks, and policy actions to meet these needs with the help of the geoscience community. It is organized around eight key areas, and was distributed to policymakers in Washington DC including members of congress and both presidential campaigns:

- Ensure reliable energy supplies in an increasingly carbon-constrained world
- Provide sufficient supplies of water
- Sustain ocean, atmosphere, and space resources
- Manage waste to provide a healthy environment
- Mitigate risks and build resilience from natural and human-made hazards
- Improve and build needed infrastructure that couples with and uses Earth resources while integrating new technologies
- Ensure reliable supplies of raw materials
- Inform the public and train the geoscience workforce to understand Earth processes and address these critical needs.

Impacts of Fiscal Cliff

AGI’s Government Affairs Program has launched a new webpage that outlines estimated impacts of the impending sequestration on federal geoscience programs. The website lists budget cuts by federal agencies, and also estimates the impact on each state. Templates of letters to representatives are included on the site. See www.agiweb.org/gap/legis112/sequestration.html.

Election Changes in Cabinet & Congress

AGI’s GAP reports that the Secretaries of Energy and of the Interior may soon step down, along with the administrator of the EPA, but it was not clear yet who will be nominated to fill the vacancies.

The chair of the Senate Committee on Energy and Natural Resources will change due to Jeff Bingaman’s (D-NM) retirement in January. He is currently sponsoring several bills in the committee including the Nuclear Waste Administration Act of 2012; Clean Energy Standard Act of 2012 which would require electric utilities to sell a percentage of electric energy from clean energy sources; and the Helium Stewardship Act of 2012. This bill would continue funding for the BLM Helium Reserve which currently supplies a third of worldwide helium.

James Inhofe (R-OK), ranking member of the Environment and Public Works Committee, will be stepping down as committee chair as he has reached the six-year term limit. He will remain a member of the committee and David Vitter (R-LA) is expected to replace him as ranking member and to continue work on reauthorizing the Water Resources Development Act. The House Science, Space and Technology Committee will also see leadership changes. Chairman Ralph Hall (R-TX) will step down due to his six-year term as chairman. Three house members have announced interest in serving as the next chairman: Lamar Smith (R-TX), Jim Sensenbrenner (R-WI) and Dana Rohrabacher (R-CA).

Gas-Fired Power Plants Use Less Water than Coal

AGI has reported that in a study funded by the George and Cynthia Mitchell Foundation, U.S. Department of Energy and the National Science Foundation, switching coal-fired for gas-fired power plants would conserve 60 percent of fresh water used for energy generation in Texas. The study was part of a nationwide effort to study water use. The coal in Texas is rich in lignite which requires higher water volumes than other types of coal. Therefore this study is not applicable across the U.S.

SIPES Constitutional Vote

In November, ballots were sent to Full and Honorary Members on proposed changes to the SIPES Constitution and Bylaws. The changes occur in the following Articles and Sections, and are all-inclusive to address a single issue: clarification of the intended meaning of the term “member.” The proposed changes are posted on the SIPES website for viewing. Ballots must be signed and returned to the Dallas Office by December 31. Please remember to vote!

- Article 3. Membership - Sections 1, 2, 3, 5(b), and 8.
- Article 4. Board of Directors and Officers - Section 1 (a)
- Article 7. Chapters
- Article 10. Amendment to the Constitution, Bylaws and Code of Ethics
- Article 11. Term and Dissolution - Section 1
SOCIETY OF INDEPENDENT PROFESSIONAL EARTH SCIENTISTS

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2013 CONVENTION ADVERTISING RATES

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Your ad will appear in the 2013 Convention registration book, the program book, and the 2013 Membership Directory CD.

2013 CONVENTION SPONSORSHIP RATES

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<td>(Gold Sponsors receive one complimentary convention registration)</td>
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<td>Platinum Sponsor</td>
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<td>(Platinum Sponsors receive one complimentary convention registration, a complimentary 1/2 page ad, and the opportunity to include advertising materials in the convention registration packets)</td>
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<td>(Emerald Sponsors receive two complimentary convention registrations, a complimentary full page ad, the opportunity to include advertising materials in the convention registration packets, and other forms of recognition)</td>
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<td>(Diamond Sponsors receive the same benefits as Emerald Sponsors, plus additional perks)</td>
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(Continued)
Mr. T. Thompson was among the academic elite, correct? The reality is far from this assumption. The fact is I was not ready for college. I was not at a level of maturity that is required for pursuit of higher learning. I was the recipient of a high-quality education from a Jesuit prep school, and was without question academically prepared. However, I was not prepared for the rigor of making well-thought-out choices regarding various activities that were available to me as an entry-level student. As a result, I stumbled miserably. I found myself on academic probation two of the first four semesters I was in college. Additionally, I was continually short of funds and found myself having to scramble for work to keep my studies funded. The rigors of juggling the demands of study, work, and recreation were
President’s Column Continued

Dennis Gleason

a constant challenge for me in the beginning. As a result, I was performing as an average to mediocre student. At least by the measure of academic performance, that is what our scholarship review process suggests. By now, you have probably concluded that I am an advocate of modifying the scholarship review and award process to include some of the "under-achievers" lurking about in academia. Nothing is further from the truth!

I would be willing to wager a good steak dinner that the overwhelming majority of our organization’s membership fall into the same category as me, a student with high potential and low to poor apparent performance. Most of us were required to work to put ourselves through school. Most of us had a less than stellar academic performance throughout college. Most of us had to learn time management on the fly. Some of us were married, and maybe a few had already started families while they were in college. All of these life issues make it challenging if not impossible to operate at the level of achievement that is required to qualify for our Foundation scholarships. So what is the point I am trying to make?

I had occasion to attend a Tarrant County Community College Geology Department field trip to the Arbuckle Mountains a few weeks ago. Some of you may be aware that I teach one evening class of fundamentals of geology on that campus and have for the past three or four years. There were approximately fifty students and five instructors, including yours truly, who participated in this trip. I can state with some certainty that the majority of these students were simply taking the course to "punch" a ticket for the science requirement in their course of study and will likely never see the inside of a geology classroom again. However, there are a few who are planning to pursue geology at a four-year institution, or who are open to the possibility of taking more course work to further their inquiry into the earth science profession. In my opinion, all of the students fall in the same category as most of our organization’s membership. The category I am referring to is the one described in the paragraph immediately preceding this, one of high potential but low to poor apparent performance. These students are hungry for some validation that there is value in pursuing a higher degree and that there is a good future to be had by making the sacrifices needed to achieve that higher education. What they need is a "real life" mentor. They need the contact and input from successful professionals like YOU! Men and women who have walked the walk and can now talk the talk – not that their current instructors are inadequate, most are well qualified, but there is no substitute for someone who has "walked the journey" before.

The community college forum provides a fundamental platform for the "so-called" life challenged student to manage the events in their lives on the journey to achieve the qualifications and credentials needed to enter the workforce in the high-tech economy in which we participate. These students are, in my opinion, the most likely to succeed because they have already had to learn how to prioritize many aspects of personal and professional life. They have most likely developed the skill set that most of us possess that has helped us become successful, and thus the backbone of SIPES membership. These students are the students who are most like the membership of SIPES. Because there are community colleges in most large to major cities in the country, I would propose that finding a way to interact in these institutions would be an effective way that SIPES members could significantly impact the future of our profession and organization. Imagine the force multiplier that could occur if each of the 1300 members mentored two or three students per year in their pursuit of a career in earth science. In the most extreme and optimistic case, our membership could impact over 15,000 potential entry level earth scientists in a five-year period. Imagine what an impact that could have on our profession, not to mention the impact that might occur on public perception of our profession by those students who choose not to pursue an earth science career.

Dreams are the foundation upon which success is built. The students today possess dreams no less impressive than the dreams we imagined when we began our careers. Each of us can point to an event or a person who provided that mentoring platform for us to succeed. I believe the greatest gift SIPES can give to the future, is for each member to dedicate a portion of his or her time to seek out and mentor a budding earth scientist. Find a way to engage them in a manner that will encourage them to seek the challenging path of scientific study. You will find them to be intelligent, curious and well intentioned. You will find them to be persons of good character and rock solid integrity. In doing so you might just discover the next SIPES member and thus insure the future of our organization.

"These students are hungry for some validation that there is value in pursuing a higher degree and that there is a good future to be had by making the sacrifices needed to achieve that higher education."
DENVER

The Denver Chapter didn’t meet in July. Our annual picnic was held on August 26 at Fox Hollow in Lakewood; this was in lieu of a chapter meeting.

On September 26, local chapter officers and some past presidents joined the SIPES Board of Directors for a reception at the Magnolia Hotel in downtown Denver. The national board of directors was in Denver for a quarterly board meeting.

The following day, the chapter held its September meeting at the Wynkoop Brewery, joined by the national board members. Our speaker was Mike Pollok, #2512, an Oklahoma City SIPES member, who gave an excellent talk entitled “My Odyssey Through the Mississippian Subcrop.” Mike presented this paper at the 2012 SIPES Annual Meeting in Bar Harbor. Mike related his past 25 years’ experience mapping the subcrops of the Mississippian System in northern Oklahoma and southern Kansas, all the while avoiding the “state-line fault.” He stressed the complexity of the system demonstrated by his and others’ successes and failures during that time. “Homogeneity can be thrown out the window.” An ongoing partner in his efforts is Denver SIPES Member, Mike Austin, #2366.

Ron Lloyd
Secretary

News of Members

Orville R. Berg, #2830, is serving as secretary of the Shreveport Geological Society for 2012-13.

Joe H. Smith, #1179, of Plano, Texas, has been named to the College of Science Advisory Board of the University of Texas at El Paso.

C. Al Taylor, Jr., #2946, of Reston, Virginia has been unanimously elected the second SIPES Director At-Large. (See page 35)
FORT WORTH

The September 2012 meeting of the Fort Worth SIPES Chapter was held at the Petroleum Club of Fort Worth. Thirty-one members and guests were in attendance when Chairman Wayne Hoskins called the meeting to order. After announcements he asked Vice Chairman Jay Moore to introduce the speaker, Charlie Jackson of Baker Hughes in Houston.

The presenter’s talk was entitled “Evaluation Techniques for Unconventional Wells.” Mr. Jackson reviewed a variety of downhole tools especially designed and applied to the evaluation of and production from wellbores within shale and other tight-rock formations. An “Integrated Petrophysical” approach, the suite includes proprietary products [STARTRACK, KINETIX, ROCKVIEW] and current practices of full-hole diamond coring and shear wave imaging. The latter can “see” fractures not intersecting the wellbore giving the interpreter appreciation for future development and/or frac design. Another interpretive tool provides a mineralogical review identifying and assessing a variety of elements, and arithmetically removes this “matrix” to yield TOC value. Yet another is useful to eliminate zones not susceptible to frac treatment, thereby saving valuable completion dollars.

Asked to comment on the costs of such state-of-the-art interpretive services, Mr. Jackson allowed the logging costs were expensive yet appropriate to the already high costs of drilling and evaluating wellbores in unconventional wells. Conclusions of the talk included:

- Unconventional plays require unconventional formation evaluation techniques
- Different formations can be fully evaluated using the appropriate evaluation techniques
- Conventional formation evaluation techniques are usually not effective in unconventional reservoirs
- Stimulation effectiveness can vary significantly in the same well/reservoir based on measurable formation parameters.

The speaker was knowledgeable and articulate about the subject matter, and presented the information about complicated tool-systems that was easily understood. It was an excellent talk, one member-visitor commented that this was one of the best presentations he had heard at a SIPES chapter meeting; we should recommend the talk to other SIPES chapters.

Dan Earl Duggan
Secretary

IN MEMORIAM

We regret to note the passing of the following members:

James D. Cobb, Jr., #1821
of Midland, Texas
who died on June 24, 2012

Paul D. Friemel, #2506
of Boerne, Texas
who died on June 29, 2012

Robert J. Gutru, #311
of Wichita, KS
who died on October 6, 2012

Charles E. Jacobs, #2223
of Corpus Christi, Texas
who died on October 7, 2012

Sanford P. Mandell, #1037
of Dallas, Texas
who died on November 25, 2011

W. B. Perry, Jr., #763
of Midland, Texas
who died on October 2, 2012

James B. Shirreff, #535
of Dallas, Texas
who died on February 7, 2012

John F. Sulik, #1059
of Corpus Christi, Texas
who died on September 4, 2012
DALLAS

The Dallas Chapter of SIPES took the summer off in July and August. We did enjoy some barbeque and beverages at the Shiels’ ranch for the Fourth of July. It is a well-known fact that professional earth scientists seldom turn down the opportunity to barbeque and enjoy the out-of-doors.

Our September luncheon meeting was Tuesday the 18th at the Petroleum Club. The speakers were Frank Shiels and Jim Dickenson, both vice presidents from Frost Bank. They addressed “Oil & Gas Financing & Covering Your Risk through Insurance.” Frank discussed Frost’s long-time role in the Texas oil and gas industry and its customer-focused approach to the borrower’s needs. He specifically recommended facilitating the process through a line of credit. Jim’s insurance portion was focused on the multi-faceted insurance umbrella that can be fashioned to protect the independent from professional and financial, as well as environmental liability.

Carol Shiels
Secretary

September guest speakers (L to R) Frank Shiels and Jim Dickenson with Vice Chairman David Shiels (one of this month’s featured article authors.)

SIPES Chapter Meeting Information

AUSTIN
Chairman: John Newberry
Secretary: TBA
Treasurer: Dwight Cassell
Meets: The County Line
(On the Hill)
1st Thursday

CORPUS CHRISTI
Chairman: David Desenberg
V-Chrmn: Eldon West
Secretary: TBA
Treasurer: David Desenberg
Meets: Town Club
Last Tuesday of month

DALLAS
Chairman: Sirman Hollabaugh
V-Chrmn: David Shiels
Secretary/ Treasurer: Carol Shiels
Meets: Dallas Petroleum Club
3rd Tuesday

DENVER
Chairman: Travis Brown
V-Chrmn: TBA
Secretary: Ron Lloyd
Treasurer: Tom Stander
Meets: Wynkoop Brewing Co.
4th Thursday

FORT WORTH
Chairman: Wayne Hoskins
V-Chrmn: Jay Moore
Secretary: Dan Earl Duggan
Treasurer: Lee Petersen
Meets: Fort Worth Petroleum Club
Variable dates

HOUSTON
Chairman: John Hankey
V-Chrmn: Glen Pankonien
Secretary: Dick Bishop
Treasurer: Don Neville
Meets: Petroleum Club
3rd Thursday

LAFAYETTE
Chairman: Danny Fredericks
V-Chrmn: Travis Helms
Secretary/ Treasurer: Steve Sinitiere
Meets: Petroleum Club
2nd Wednesday

MIDLAND
Chairman: Craig Smith
V-Chrmn: Brian Miller
Secretary: David Farmer
Treasurer: John Kullman
Meets: Midland Country Club
3rd Wednesday

NEW ORLEANS
Chairman: Louis Lemarie
V-Chrmn: TBA
Secretary: Art Johnson
Treasurer: Reese Pinney
Meets: Andrea’s Restaurant
3rd Tuesday

OKLAHOMA CITY
Chairman: Harold Hanke
V-Chrmn: Jim Franks
Secretary: Mike Pollok
Treasurer: Victor Cooper
Meets: The Petroleum Club
Bank One Bldg., 35th Floor
1st Wednesday

SAN ANTONIO
Chairman: John Patterson
Co-V-Chrmn: Bill Bennett and Jerry Witte
Secretary/ Treasurer: Joe Finger
Meets: Petroleum Club
3rd Thursday
LAFAYETTE

The Lafayette Chapter kicked off the fall/spring season with one of our own Tim Bennett, #3174. His presentation was entitled “Fluvial Deltaic Channel Facies” and we had a great turnout for the meeting.

Tim began his career in 1978 with Unocal and worked in the exploration department for twenty years. He served as exploration manager with Fife Oil for six years, and is currently associated with Orbit Energy in Lafayette. Bill Finley presented Frank Harrison, #209, with the SIPES Outstanding Service Award. He also updated the membership on this year’s convention in Bar Harbor, Maine, which was co-hosted by the SIPES Lafayette Chapter.

Danny Fredericks
Chairman

NEW ORLEANS

After taking the summer off, the New Orleans Chapter reconvened on September 18 at Andrea’s Restaurant in Metairie. The speaker was Chapter Secretary Art Johnson, #3153, who spoke on “The Impact of Market Forces on Emerging Technology.” The presenter discussed how market forces such as natural gas prices are driving some technologies forward while holding others back. A number of interesting technologies and opportunities that are currently on the sidelines will emerge when gas prices rise. While North America has a glut of natural gas, East Asia has had sustained high natural gas prices since the Fukushima disaster forced the shutdown of Japan’s nuclear power sector, with imported LNG being used to make up for the shortfall. With high imported LNG prices Japan, India, and South Korea are actively pursuing alternatives such as gas hydrate that are far from commercial viability in North America.

The speaker then explored the different approaches to economics used by the oil and gas industry as compared to companies and government agencies involved with alternative energy. In particular, the use of “EROI” (the Ratio of Energy Returned on Energy Invested) instead of simple financial Rate of Return (ROI) makes some alternative energy resources appear far more commercially viable than a simple, business calculation would yield. The use of mandates, tax credits, and subsidies has further skewed the energy markets at a significant cost to taxpayers. The impact of these costs has resulted in a reduction of many incentives in Europe, and the U.S. may follow suit. In the end, a focus on increasing U.S. oil and gas production would make a lot more sense.

Art Johnson
Secretary
MIDLAND

On Wednesday, July 18, Billy W. Harris, Limited Member, presented for our noon luncheon program his talk on “Ardmore Basin Woodford Shale Midlife Development.” He has worked in various roles and capacities in drilling, completion, and production operations, reservoir engineering and property valuation, and as an expert witness. He began his career in Midland for Conoco and has worked for the last twenty-one years for Wagner & Brown, Ltd. as senior petroleum engineer. Mr. Harris received a B.S. in petroleum engineering from Colorado School of Mines.

The liquids-rich Woodford Shale of the Ardmore Basin has proven to be a profitable play. Structurally complex and presenting certain geophysical and drilling challenges, the Ardmore Basin has produced conventionally for decades before experiencing a renewal in activity and production as an unconventional play. Our sponsor for the July meeting was Garnet W. Brock, #2516.

On Wednesday, August 15, our noon luncheon program was presented by Arthur E. Berman, #3062, of Houston, Texas. He is a geological consultant with thirty-four years of experience in petroleum exploration and production. He has an M.S. in geology from the Colorado School of Mines and a B.A. in history from Amherst College. He worked twenty years for Amoco Corporation (now BP plc) and has been an independent consulting geologist for fourteen years.

He currently is consulting for several E&P companies and capital groups in the energy sector. He frequently gives keynote addresses for investment conferences and is interviewed about energy topics on television, radio, and national print and web publications including CBS, CBC, CNBC, CNN, Platt’s Energy Week, BNN, Bloomberg, Financial Times, Rolling Stone and New York Times.

He is a director of ASPO-USA (Association for the Study of Peak Oil & Gas USA) and is a managing director and a frequent contributor at the Oil Drum, and an associate editor of the AAPG Bulletin.

He has published more than ninety articles on geology, technology, and the petroleum industry during the past five years. Topics include petroleum exploration, oil and gas price trends and cycles, and petroleum play evaluation. He has published thirteen articles on shale gas plays including the Barnett, Haynesville and Fayetteville shales.

A secular shift has occurred in the U.S. to drilling mostly shale wells. The tremendous number of wells drilled in the last several years has contributed to an over-supply of gas. Operators have indulged in an orgy of over-drilling for many reasons, but adding reserves, holding leases and company growth are among the main factors. The inevitable result has been the collapse of prices. Most analysts forecast that the future will be much like the present, and that natural gas will be abundant and cheap for decades. There are, however, strong and consistent indicators that natural gas supply may be less certain than most observers believe.

While gas prices remain at sub-commercial levels, higher demand and the flattening of supply have resulted in a 70% price increase since April 2012.

Shale gas reserve forecasts have followed a formulaic model that assumes strong hyperbolic flattening and attendant long well life and high estimated ultimate recovery. This model is based on a limited data set of tight sandstone production history that may have little application to shale gas reservoirs because of lower permeability.

Some of the shale gas plays may be at or near peak production at least at current prices. Most producing areas are in decline. Intermediate-term shale well performance is poorer than previously assumed. Continuous drilling has masked this problem so play decline rates are not recognized and overall production is always increasing. Decline rates are, however, a problem and most of a shale gas well’s reserve is produced in the first few years. Well life appears to be shorter than initial expectations.

The gold rush is over at least for now with the less commercial shale plays. The money and activity have moved to more oil-prone shale plays like the Eagle Ford and Bakken or to higher potential gas plays like the Marcellus Shale. Improbable stories like the Eagle Ford and Bakken or to higher potential gas plays like the Marcellus Shale. Improbable stories that great profits can be made at increasingly lower prices have intersected with reality. A painful adjustment is occurring in the natural gas exploration and production industry. Jobs will be lost and projects will develop more slowly. This may expose the myth of long-term natural gas abundance and cheap gas as an illusion. The good news is that this adjustment will lead to higher gas prices in a future less distant than most believe. Our sponsor for the

(Continued)
month of August was BBVA Compass Bank.

Our Wednesday, September 19 program was presented by Hoxie Smith. Mr. Smith has over twenty-five years of experience in the energy industry. Since 2003, he has directed Midland College’s Petroleum Professional Development Center, which provides continuing education for the regional Permian Basin energy industry. He is a past chairman of the SPE Permian Basin Section, and a past president of the Permian Basin Geophysical Society. Mr. Smith is a certified professional geologist licensed in the State of Texas, and a petroleum geologist certified by AAPG. He has managed or otherwise been involved with four major research projects funded by the U.S. Department of Energy.

On December 6, 2005, the U.S. Department of Energy and the newly formed FutureGen Alliance issued a solicitation for state competition in determining a host site for the first near-zero emissions coal-fired power plant of the future, dubbed “FutureGen.” On August 1, 2007, the State of Texas submitted “Best and Final Offers” for two sites, one located in the heart of the Permian Basin oil patch at Penwell, Texas. The site, fifteen miles west of Odessa, sits less than a mile from Kinder Morgan’s main Central Basin Platform CO₂ trunk line that delivers CO₂ to several tertiary EOR projects located in the Permian Basin. The Penwell site was not selected in the FutureGen competition, but will ultimately be the home of the first FutureGen-like plant in the United States. Summit Power Group, a foresighted developer of clean energy projects, has seized the opportunity to launch a commercial venture named the Texas Clean Energy Project (TCEP). On January 29, 2009, the U.S. Department of Energy (DOE) signed a $350 million dollar cooperative agreement for the TCEP through funding allocated for the third round of the “Clean Coal Power Initiative.” The DOE later added another $100 million for a total support of $450 million, the largest grant ever awarded by DOE. Summit Power Group plans to break ground on their ambitious state-of-the-art Integrated Gasification Combined Cycle (IGCC) clean coal power plant by the first half of 2013. The plant will be a 400 Mw power plant utilizing Powder River Basin low-sulfur coal as the feedstock. The coal will be gasified and separated into syngas, CO₂, and usable end-products of urea (fertilizer) and sulfuric acid. Slag will be utilized for road construction and as a cement additive. The CO₂, estimated at roughly 3.0 million tons per year, will be sold to the oilfield for use in enhanced oil recovery (EOR). The Texas Bureau of Economic Geology will handle all monitoring, verification, and accounting to see that the CO₂ is sequestered in formations that will meet a 1,000 year storage requirement.

This presentation updated SIPES members on the latest developments regarding TCEP and answered questions the audience had. The positive project economics for IGCC with CCS/EOR exists in the Permian Basin because CO₂ is a commodity, not a waste product, injected into mature oilfields to produce otherwise bypassed oil. Our sponsor for the month of August was BBVA Compass Bank.

On June 24, 2012, SIPES Member James D. Cobb Jr., #1821, passed away, and on June 29, 2012, Paul D. Friemel, #2506, passed away. Our condolences go out to both members’ families.

David Farmer
Secretary

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You can complete the form(s) online, save as a new PDF file, and attach it to an email addressed to sipes@sipes.org. Your information will be available for public viewing on the SIPES website, and will also be included, for the first time, in the 2013 SIPES Membership Directory CD. If you have questions or need assistance with your form, please call or email the SIPES office at 214-363-1780 or sipes@sipes.org.

It’s also time to send in updated photographs and contact information for the new edition of the SIPES Membership Directory. If you have more extensive changes to make, a directory information sheet is available on the SIPES website. Referral System information, photos and updated information should be received in the Dallas Office by January 31, 2013 to be included in the new directory. Members receive a new Directory DVD at no charge. Spiral bound directories are available for members at $40 each; the price includes postage. Update your information today!
SAN ANTONIO

The San Antonio Chapter of SIPES kicked off its summer program with a “bang.” In July, Schlumberger’s Andrew Graham, presented a paper on “Advances in Open Hole Logging Techniques” focusing on dielectric scanner and magnetic resonance logging in great detail. The uses for such a log are endless and it’s been a long time coming to the field. Andrew is a chemical engineer from the University of Florida. He was first deployed in Laredo, Texas and Rock Springs, Wyoming in wireline sales/data services before landing in San Antonio in 2005.

Scott Pollard, #3332.

We started our Annual Membership Drive at the Petroleum Club in August. As usual, we hand-picked twenty prospects that would fit in well at San Antonio SIPES, and asked the selected few to attend the September meeting. Whoa! San Antonio filled the room with fifty to sixty people; as of print time the chapter has eight new applicants at different levels. San Antonio is growing!

The San Antonio SIPES Chapter luncheon speaker for our September meeting was Scott Pollard, #3332. Scott is one of the few oil and gas scouts in Texas and the only one in San Antonio. He has a degree in petroleum land management and a degree in geology from the University of Oklahoma. He brings unique insight and knowledge that make his annual report to our chapter on industry activity and trends a favorite among our membership.

In this year’s report, Scott discussed the highlights of best new oil and gas completions for 2012 and best current production of oil and gas for 2012 in Texas Railroad Commission Districts 1 & 2. Further, he evaluated the Eagle Ford Shale play by identifying the most successful Eagle Ford completions with the highest chances of payout. These wells trend from northern Live Oak County through north central Karnes County and into northern DeWitt County. Scott speculated that in this trend area, Eagle Ford wells need to produce at least 60,000 barrels of oil within the first 12 months to be able to ultimately achieve 100,000 barrels of cumulative oil production, which represents his estimated return of capital. Very few wells are paying out. Geosouthern Energy Corp, (predominantly operating in DeWitt County) appears to have the most wells in the trend area that have paid out and/or have the potential to achieve payout. The Eagle Ford Shale play is starting to benefit from more competitive drilling and completion costs due to the dramatic decline in activity in the Haynesville Shale, Fayetteville Shale and Barnett Shale areas. As long as the oil posted prices stay above $70.00 per barrel of oil, the Eagle Ford will be an oil target.

Scott briefly discussed recent Pearsall Shale activity with its high initial potential production reports and extremely rapid declines. The most interesting area so far is in southeast Zavala County, but the jury is still out on this shale. The Pearsall Shale and Eagle Ford Shale plays are rapidly evolving and the San Antonio SIPES Chapter looks forward to Scott’s next presentation.

The San Antonio Chapter will continue to meet on the third Thursday of every month at 11:30 AM, at the Petroleum Club. Hope to see you there!

John Patterson
Chairman
First of all and as always, we invite anyone coming to Houston to be our guest at our monthly luncheon on the third Thursday of each month. Check on our website (www.sipeshouston.org) and call B.K. Buongiorno (713-651-1639) to let us know you are coming! Y'all come!

On July 19, 2012 the SIPES Houston Chapter held a joint meeting with Houston Geological Society on ethics. Attending this presentation satisfied the one-hour continuing education requirement in professional ethics required by the Texas Board of Professional Geologists. AAPG Distinguished Lecturer Dr. W.C. “Rusty” Riese discussed “Oil Spills, Ethics and Society: How they intersect and where the responsibilities reside.” This outstanding ethics course was also presented during the 2012 SIPES Annual Meeting in Bar Harbor, Maine.

On July 19, the Houston Chapter’s 7th Independents’ Day Celebration was held at Goode’s Armadillo Palace in the evening. Organized by Past Chairman Scott Daniel, it was another great success. The Chapter is holding this event twice a year. It is free of charge to chapter members, as well as potential members and guests. Originally organized by Past Chairman Mark Gregg to increase chapter membership, the event’s objective is still working. We received membership inquiries from more than a dozen interested nonmembers who attended. Our Membership Chair Nina Delano also came away with a list of potential new members.

The theme was Western, and over 150 members and guests enjoyed excellent barbecue. We raffled several bottles of adult beverages and dinners at local restaurants. There was also a bottle of champagne to celebrate the new producer, and a basket with an entire spaghetti meal when fortunes were not as good. The cowboy theme was supplemented by centerpieces depicting the cartoons of Ace Reid and his characters Jake and Zeb, two independent cowboys that find themselves in antics all independents can identify with. A good time was had by all.

On August 16, Dan Steffens discussed “Energy Sector Markets for 2012 and Beyond.” He is a financial analyst and president of the Energy Prospectus Group, and writes the EPG “The View from Houston” newsletter.

Bill Ellington of Ellington & Associates Inc., was our speaker on September 20, 2012. His topic was “ChromaStratigraphy: The New Stratigraphic Analysis Tool.” He described a proprietary method of measuring rock color from cuttings, cores or outcrops, and plotting it in standard log format.

WELCOME NEW MEMBERS

In accordance with the SIPES Constitution, By-Laws & Code of Ethics, the following announcement of new members unanimously approved by the SIPES Membership Committee on October 29, 2012 is printed below.

Any member in possession of information which might possibly disqualify an applicant is asked to submit this information to the secretary of the society (Douglas R. Essler) within thirty days of this publication. To be considered, this information should be in writing and bear the writer’s name. If this information is received within thirty days after the publication of the applicant’s name, the SIPES Board of Directors must reconsider its previous approval of the applicant. The board’s action, after consideration of such new information, shall be final.

William A. Walker, Jr., National Membership Committee

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human health or the environment if not managed or disposed of properly. Produced water often makes up the majority of E&P waste. E&P wastes can generally be divided into four broad categories. These categories are:

- Non-hazardous wastes
- Hazardous wastes
- Exempt hazardous wastes
- Other regulated wastes (NORM, asbestos, PCBs, and other special wastes)

Interestingly, there appears to be a widespread misconception that E&P wastes are exempt from regulation. However, a close look at state and federal environmental laws reveals that E&P wastes are, in fact, regulated. Essentially all E&P wastes, whether generated at the well site or at an offsite maintenance facility, are to some extent covered by laws and regulations, whether federal, state, or both.

For the most part, non-hazardous E&P wastes (and exempt hazardous E&P wastes) are primarily regulated at the state level. Hazardous E&P wastes are regulated at both the federal and state level. Some E&P wastes, although technically hazardous, are exempt from regulation as hazardous waste (exempt hazardous E&P wastes).2 Wastes categorized as "other regulated wastes" include those that are typically regulated under special state or federal programs.

Each waste-stream generated by E&P activities must be individually evaluated to determine how that waste will be categorized and regulated. The operator should look at each waste-stream and closely study the process by which it is created.

First, we should define waste-stream. A waste is a material that, when generated, no longer has a use, is abandoned or is inherently waste-like. A waste-stream is the pathway that the waste travels from the point of creation to its final resting place. All rivers and streams have a point of origin and a final destination; so do wastes. It is imperative that the operator examine these waste streams and look for ways to reduce their volume and/or reduce their toxicity. In addition to being a good steward of our natural resources, making these reductions often translates into cost savings.

Second, getting a handle on waste streams includes reviewing the various products the operator uses and seeing if less toxic alternatives are available. There are other regulatory programs that focus on the operator’s products such as Emergency Planning and Community Right-to-Know, discussed below, and the fracturing chemical disclosure laws3 being adopted around the country.

Waste Hot Button

The big waste hot button right now is hydraulic fracturing fluid (frac fluid). It can take millions of gallons of fresh water to complete a frac. Operators add treatment chemicals such as potassium chloride (KCL) to the fresh water and then pump it into the formation under tremendous pressure to open up pore spaces in the reservoir rock. Operators mix in propants such as sand or ceramic beads to keep the fractures open. The waste fluid (flow-back) is the hot button. What happens to that waste stream once it has served its purpose? It will most likely be disposed of in a Class II disposal well as a waste (see Safe Drinking Water Act discussion below). But, what if we could re-use or recycle the used frac fluids? What if we could eliminate the waste stream all together by running it through a waste treatment system that rendered it useful again? Why don’t we use portable waste frac fluid treatment systems on location that turn the waste stream into a useable product?

The key to all waste problems is to eliminate or minimize the waste stream on location in the first place. These activities would favorably impact the bottom line by the savings in disposal and water costs, as well as conserve one of our most valuable resources, water. Our colleagues will tell you that we often say that future wars will not be fought over oil, but they will be fought over water. We can live without oil, but we cannot live without water.

Naturally Occurring Radioactive Material or NORM is another hot button. NORM is scale build up in piping and ancillary equipment caused by the precipitation of solids that have been affected by the radioactive properties in produced water (Radium 226 or 228). Gas processing activities can cause the precipitation of radioactive Lead 206. Each state has its own NORM rules, but the waste material poses a health risk to human health and the environment. The key to solving this waste management issue is prevention. Why aren’t service companies providing NORM cleaning services at the well site? Before a well is worked over or plugged, the equipment and piping could be flushed back into the well with a cleaning chemical such as boiler treatment until the piping and equipment was "NORM Free." The service company could certify, by trained and licensed NORM survey technicians, that the equipment or piping was NORM free and the metals could be recycled rather than sitting at the old well head location and rotting.

Water Programs

Perhaps it is our waterways that are most vulnerable in the oil patch. The Environmental Protection Agency (EPA) asks that we take precautions to manage our activities in such a way that we protect "Waters of the US."4 EPA addresses this issue mostly through two programs: The Clean Water Act (CWA) and the Safe Drinking Water Act (SDWA). A good way to keep these two federal programs straight is to think of the CWA being for surface waters of the U.S. and the SDWA being for subsurface waters of the U.S.

Clean Water Act

The CWA is divided into three main programs that protect surface waters:

1. The Oil Pollution Act (OPA) where potentially harmful quantities of oil are stored and managed under a

(Continued)
site-specific Spill Prevention, Control and Countermeasures (SPCC) Plan;
2. The National Pollution Discharge Elimination System (NPDES) where stormwaters are protected through the maintenance of a Stormwater Pollution Prevention Plan (SWP); and
3. Wetland protection through permitting to prevent harmful filling or dredging of our nation’s wetlands.

Oil Pollution Act
The OPA was first promulgated in 1990 shortly after the Exxon Valdez tanker spilled oil into Prince William Sound, Alaska. This event placed renewed emphasis on the 1973 Spill Prevention, Control and Countermeasure regulations. However, the premise for this rule remained the same: “to prevent discharges of oil into navigable waters of the United States and to contain such discharges if they occur.” This is why, today, most E&P facilities are required to have and implement an SPCC plan.

The key to the SPCC program is to build your E&P locations to prevent spills of oil in harmful quantities into the environment. You can accomplish this by building safeguards into equipment to keep oil contained. Secondary containment for bulk quantities of oil will allow you to fully recover losses of production fluid. Using good common sense when building locations by including controls such as grading the location pad into a hill and building diversionary dikes or berms will allow you to recover spilled oil and protect waters of the U.S. Let’s face it, we want to sell our precious hard-earned oil rather than dispose of it as a waste. So, when storing bulk quantities of oil, you need to have a way to prevent spills.

If you can’t prevent a spill, then you must have a control or a countermeasure to protect waters of the U.S. (see 40 C.F.R. Part 110 and 112).

Stormwater Pollution Protection
Thanks to the Energy Policy Act of 2005, oil and gas E&P is exempt from the National Pollutant Discharge Elimination System (NPDES) stormwater permit requirements as long as the operator prevents or reduces pollution in stormwater runoff from a facility. As EPA published in the Federal Register, “certain stormwater discharges from field activities or operations, including construction, associated with oil and gas exploration, production, processing, or treatment operations or transmission facilities are exempt from National Pollutant Discharge Elimination System permit requirements.” However, EPA clearly encourages operators to voluntarily apply Best Management Practices (BMPs) for oil and gas field activities and operations to minimize the discharge of pollutants in stormwater runoff and protect water quality. A well implemented SPCC Plan also should accomplish this objective. The IPPA and API have published guidance for “Reasonable and Prudent Practices for Stabilization of Oil and Gas Construction Sites.”

Safe Drinking Water Act
One of the ways the SDWA protects our subsurface waters is through permitting of underground injection wells. E&P operators are required to obtain permission to inject or dispose of E&P wastes such as produced water into a Class II injection well. These wells are specifically designed so that injected fluids can be safely stored within a geologic formation. These Class II injection wells can be for the disposal of certain E&P wastes, but also used for the injection of materials for secondary recovery of oil and gas.

SDWA Hot Button
The SDWA hot button is whether Class II injection well permits will be required for hydraulic fracturing operations. The Energy Policy Act of 2005 exempted hydraulic fracturing activities from SDWA unless diesel fuel is used in the injection fuel mixture. If diesel is used, EPA’s position is the operator must obtain a Class II injection well permit. EPA is developing guidance on what constitutes “diesel fuel.” Is it the two chemicals identified by the Chemical Abstract Service number as diesel or any substance that contains BTEX (benzene, toluene, ethylbenzene, or xylene), or something in

(Continued)
between? The oil and gas industry is concerned that this EPA guidance could become the basis for regulating all fracing operations.

**Air Regulations**

The air programs across the nation are being updated and scrutinized now more than ever before. It is through the *Clean Air Act* (CAA) that EPA, and states that have been delegated CAA authority, protect our air from pollution. Most E&P activities can be permitted by rule; however, those rules are being revamped even as this article is being written. This ever changing regulatory framework is a common problem among operators and it makes compliance very difficult. No doubt, it is a moving target that is hard to hit. Staying tapped in to the latest control technologies rather than ignoring the rules can actually make you money. For instance, upgrading your dehydration unit with Volatile Organic Compound (VOC) arrestors can reduce what would have been fugitive emissions into liquids for sale. These liquids would bring you whatever the market bears for a barrel of oil. So what would seem to be a compliance headache could actually add to the profitability of your producing well with some planning.

Operators who are aware of the EPA’s underlying premise to limit fugitive emissions of hazardous air pollutants (HAPS) will place controls on equipment and route fugitive emissions to compressor units or chillers/condensers to change emission waste into fuel or liquid product. It is our responsibility as operators to build our facilities with efficiency in mind so that precious resources are saved and used rather than wasted.

**Ecological Sensitive Receptors**

Ecological sensitive receptors are protected through two main federal programs:

1. The *Endangered Species Act* (ESA); and

**The ESA**

The ESA was created in 1973 to protect plant and animal species from becoming extinct because of Human causes. The ESA makes it illegal to kill, harm or otherwise “take” a listed species without a permit from the...

(Continued)
United States Fish and Wildlife Service (USFWS). So operators must work with the USFWS if any endangered or threatened species will be impacted. One small lizard, the dunes sagebrush lizard, looked like it would shut down drilling in the Texas Permian basin when USFWS proposed to add it to the endangered species list. Industry, local landowners and the state government worked together to come up with a conservation plan to protect the tiny brown lizard, where, for instance, operators avoid putting things like caliche pads and oil pipes directly in the lizard’s habitat. The USFWS found the plan acceptable and held off on the listing. For ESA developments in Texas that may affect the oil and gas industry, the state maintains a website at http://texasahead.org/texasfirst/

The MBTA

The MBTA was first promulgated in 1918 as a result of the decline of certain bird species due to the hunting for feathers for ladies hats. Therefore, all migratory birds are protected to this day. The list of migratory birds is actually quite long and includes raptors, ducks and other water fowl, jays, thrushes, warblers, native sparrows and, yes, grackles to name a few.

The key issue for operators is whether unintended deaths of migrating birds from oil patch operations can result in criminal liability. In a recent highly-watched case, the judge dismissed criminal charges against operators for unintended bird deaths that occurred near reserve pits. Other courts, however, have reached a different conclusion. In one, the operator was found liable for dead birds in its heater-treaters, even though precautions had been taken to prevent the birds from entering. Given the uncertainty in the law, an operator should use best practices to protect migratory birds from death, injury, or harm. For example, operators should provide netting to open top tanks and pits. Again, the key here is prevention.

Who among us does not want to protect the diversity of life? If we build conservation into our site development plans, we can accomplish the goal of the ESA and MBTA to protect species from harm or extinction.

Environmental Reporting

A sometimes over-looked obligation is the reporting required by the Emergency Planning and Community-Right-to-Know Act (EPCRA). EPCRA was passed in response to the 1984 disaster in Bhopal, India. While operators are exempt from some of the reporting requirements (Section 313 Toxic Release Inventory), they are generally responsible for the other EPCRA reporting obligations if the facility stores or manages threshold levels of specified chemicals. If the hazardous chemical meets the threshold, the operator is required to submit a MSDS or a list that contains the hazardous chemical (preferred approach) to the state emergency response commission, the Local Emergency Planning Committee, and the local fire department with jurisdiction over the facility. The operator is required to annually submit an emergency and hazardous chemical inventory form (Tier I or Tier II) to these same entities by March 1.

The API developed a generic Tier II Chemical Inventory Form to assist its members. However, states such as Texas which now require the data to be submitted electronically no longer allow the use of these forms.

Spill Response Requirements

When there is a spill in the oil patch, all of the programs discussed above should be considered. The ideal premise and perhaps the most important word in this article is PREVENTION. Whether you are managing the environment, human health or safety, prevention is the key to success. However, if you can’t prevent the spill or release, you certainly should have a contingency plan to respond. If you fail to plan, then you should plan to fail.

Spills

Spills into water can have a devastating impact on the bottom line. Not only has the cost of oil spill clean-up escalated where it can easily cost thousands, if not hundreds of thousands of dollars, but also the penalties levied by governmental agencies are on the rise. As a recent example, an operator had a spill of around 300 barrels, most of which was contained in an on-site ditch. The state found the operator’s clean up efforts “exemplary” and assessed the lowest possible fine, $250. EPA took a dramatically different view, and sought penalties of over $120,000 for a “worst case” spill event in the subsequent OPA and SPCC enforcement action. The EPA proposed penalty resulted from EPA’s policy to assess per-barrel penalties rather than daily maximum penalties, and to penalize gallons which escaped secondary containment, but did not reach U.S. waters.

Generally, as mentioned above, the SPCC regulations require the preparation and implementation of a plan to prevent discharges of oil into navigable waters and contain such discharges if they occur. US EPA Region 6, which has a large portion of the nation’s oil business in its five-state area, began stepping up enforcement of the SPCC program a few years ago to raise awareness in the oil and gas industry of the program. The region used an expedited settlement program which had lower penalties than a traditional enforcement action. From the fines EPA Region 6 has been obtaining recently, it appears the EPA believes industry should be fully informed of the SPCC program requirements and the gloves are off.

In the event of a spill to water, an operator can be expected to be cited not only for the discharge, but also SPCC Plan violations. Every oil spill is considered nearly irrefutable proof of the inadequacy of the site’s SPCC Plan and grounds for an automatic and severe penalty action.
Upshot

The agencies expect the oil and gas industry to develop a safety culture, going beyond the basics of having the right plan on a shelf to actually implementing checks and balances to ensure accidents such as spills do not happen, anticipating the human error which inevitably contributes to these accidents. The agency will not find persuasive "Oh, that was so-and-so's responsibility and we fired the [employee/contractor] that let us down." The agencies require operators to develop systems ("redundancies") that do not depend on a single person's compliance.

Conclusions & Solutions

When looking back at the above brief discussion of our environmental regulations that affect E&P, it might be hard to believe that there is a lot more detail in this story (thousands of pages). Most of you would probably like for all of it to just go away. Well, it's not. But, if you develop certain corporate philosophies using these common environmental threads, you will see that all environmental rules and regulations have a single purpose; to protect human health and the environment. For example, your SPCC plans will most likely address your stormwater needs and provide controls that prevent pollution. It is always more economical to prevent spills or discharges rather than to just respond to the accidents as they happen. Good facility maintenance programs will ensure compliance. Keeping up with the latest control technologies can not only make you money, but also bring your facility into compliance and reduce releases to the environment.

Footnotes

2 A good discussion of these exempt wastes is in EPA's Guidance: http://www.epa.gov/osw/nonhaz/industri-al/special/oil/oil-gas.pdf
3 For example, the Texas regulations require the supplier/service company to provide the composition of the hydraulic fracturing fluids to the operator within 15 days after completion of the fracting. In turn, the operator must complete an online database report with this information on or before submission of the well completion report. 16 Tex. Admin. Code § 3.29.
5 33 U.S.C. § 2701 et seq.
6 38 Fed. Reg. 34163 (Dec. 11, 1973) (codified at 40 C.F.R. Part 112). The SPCC regulations resulted from public reaction to what was then the largest oil spill in the United States – 1969 blowout from an offshore platform near the coast of Santa Barbara, California. OPA increased penalties and added the Facility Response Plan requirement for facilities "posing substantial harm."
7 38 Fed. Reg. at 34164.
8 There are two exceptions: (1) if the facility has had a reportable quantity spill (see 40 C.F.R. § § 110.6, 117.21 and 302.6 for reportable quantities); or (2) if the stormwater runoff violates a water quality standard. If either of these occur, a permit is required. 40 C.F.R. §112.26(c)(1)(iii).
9 71 Fed. Reg. 33628 (June 12, 2006). The EPA made this statement when it was enacting regulations to implement this legislation. These regulations were successfully challenged and are no longer in effect. Nat'l Resources Defense Council v. U.S. Envtl. Prot. Agency, 526 F.3d 591 (9th Cir. 2008). According to EPA, the effective requirements are the regulations in place prior to the 2006 rule plus the additional Energy Policy Act clarification of the exempted activities. http://cfpub.epa.gov/npdes/stormwater/oil-gas.cfm All in all, a long way of saying that the statement is still true even though the underlying regulations were struck down.
11 http://water.epa.gov/type/ground-water/uic/class2/hydraulicfracturing/wells_hydrorout.cfm
12 The National Marine Fisheries Service plays a complimentary role to USFWS under the ESA for certain marine species like dolphins.
13 16 U.S.C. 703-712; Ch. 128; July 13, 1918; 40 Stat. 755. The MBTA has been amended eight times since 1918.
14 Section 703 provides that "it shall be unlawful at any time, by any means or in any manner, to pursue, hunt, take, capture, [or] kill . . . any migratory bird" protected under the Act. 16 U.S.C. § 703. There is also the Bald and Golden Eagle Protection Act which can require certain distance and timing restrictions based upon nest location.
16 United States v. Apollo Energies, Inc., 611 F.3d 679 (10th Cir. 2010).
17 In December 1984, more than 2,000 people suffered death or serious injury from the accidental release of methyl isocyanate from a Union Carbide plant.
18 The reporting thresholds are in 40 C.F.R. 370.
19 EPCRA Section 311.
20 EPCRA Section 312.
21 http://www.dshs.state.tx.us/tierwo/communityfaq.shtm#16
22 EPA Region 6 consists of Texas, Louisiana, Oklahoma, New Mexico and Arkansas.

The authors can be contacted at david@shielsengineering.com or Connie.Westfall@strasburger.com.
An Introduction to Geo-Navigation — Part II

by Paul Sandwell and Dee Jenkins, Energy Frontiers Services LLC
http://www.efserv.com

Review of the Basics

In the first article published in the August 2012 SIPES Quarterly, we showed how geo-navigation is the process of guiding the drilling of a horizontal wellbore so that it goes where it is supposed to go — stratigraphically. We also discussed how we need some way of telling whether our wellbore is in the target zone, out of it, or headed the wrong way, so that we can make corrections. There are different types of data and data analyses that can be used to aid in this goal, and today we will look at using gamma (GR) and resistivity data, working together and dynamically, to construct a more accurate picture of the structural cross-section and stratigraphy.

Now let us look at a real-world data set and the different interpretations derived using multi-variate data — first with older technology and later with the ability to transform all data sets at the same time.

Background of the Situation

With the advent of tools capable of Measurement While Drilling (MWD) this process is now commonplace; and other logs are being used in addition to GR, for example resistivity and density. In this example, resistivity was being acquired while drilling and analyzed using a system specifically designed for modeling stratigraphy using resistivity measured at different focal distance into the formation. At the same time, gamma data was being collected and analyzed in another independent system. The two different systems were then reconciled by the operations team. The trouble was that the job of reconciling the two interpretations was not always easy.

The well is located in the Bone Springs Sand Play of West Texas. Many areas of this play are structurally simple with little change in stratigraphic facies; however this area had little well control and very little seismic control. The target sand is only 14 feet thick at a depth of more than 11,000 feet. Overall dip was expected to be flat.

Well History

The well landed precisely in target after building curve; but after landing, a problem arose in reconciling the gamma interpretation with the resistivity interpretation. At first, priority was given to the resistivity interpretation system. It was difficult for the gamma interpreters to place the borehole in the target without calling upon some kind of facies change along the path (which was indeed a possible scenario). Figure 1 on page 27, shows the cross-section with this interpretation and Figure 2 on page 28, shows the constructed log, wherein some of the gamma data is shifted to higher counts within the target sand (the presumed facies change). This scenario was more and more difficult to support as the well progressed, despite the interpretation from the resistivity modeling which said we were in the target sand. Another clue, casting doubt on this interpretation, was the erratic dip calculations needed to maintain this idea.

To maintain this interpretation, more and more faults were needed, and data was clearly being “forced,” so an alternate interpretation suggested we actually were drilling below the main target. The operator was convinced to make an adjustment up-section (increasing angle) and fortunately we soon re-entered the clean sand target. The resistivity model was wrong, and later had to be recalibrated to the new gamma interpretation. From that point on, the gamma data took priority; with resistivity modeling in a supporting role.

Post-Drilling Events and Analysis

A second generation of the HNAV software, after the well was completed, was built to also transform resistivity and other data curves — at the same time. This gave new insights in the data and dispelled much of the prior ambiguity.

Figure 3 on page 29, is a cross-section, which demonstrates less faulting. Faults that are shown are more likely to exist at those locations. More remarkably, the constructed gamma log using the new software became much cleaner than the original, and dispelled any notion of a facies change within the target. Overall dip was actually 0.9 degrees, climbing onto an anticline.

Conclusions

Some MWD companies now offer other tools such as resistivity and density alongside the traditional gamma-ray detectors. By doing the correlation with multiple logs of different types at the same time, areas that are sometimes ambiguous with just GR become much clearer. The structural picture becomes more “certain” and the issue of facies changes is more fairly evaluated.

Other issues, such as changes in thickness and actual reservoir compartmentalization can also be addressed with multiple data curves which we hope to address in a future article.

(Continued)
Figure 1. An early interpretation of the structural cross-section using only gamma-ray data.
Figure 2. An early constructed gamma-ray log interpreting a facies change in the target sand.

(Continued)
Figure 3. A later improved interpretation of the cross-section using HNAV software that uses multiple logging curves.
Figure 4. A newer HNAV constructed log using multiple logging curves showing much improved interpretation.
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& 2013 Convention
June 17-20, 2013 Santa Fe, New Mexico

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The 2013 SIPES Convention Field Trip will be led by Kirt Kempter, a field geologist and teacher based in Santa Fe. A Fulbright Fellow and Ph.D. graduate from UT Austin, Kirt has conducted many expeditions and educational tours in the American Southwest, including programs at the Smithsonian Institution, and courses through UNM and SFCC. He has also led National Geographic Expeditions from Iceland to Antarctica. For the past ten years, Kirt has worked for the New Mexico State Map program, studying the geologic history of northern New Mexico, and has published numerous articles and maps of this area.

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The SIPES Foundation gratefully accepts all donations and acknowledges these contributions with a letter.
Due to limited space in the newsletter, we are unable to list gifts under $50.
Dallas, Texas – The SIPES Foundation, administering the scientific, educational and charitable programs of the Society of Independent Professional Earth Scientists, is very pleased to announce that nine outstanding earth science students have been selected to receive scholarship awards this year. Applications were accepted from upper-division or graduate students who were U.S. Citizens studying any field of earth science or engineering, and who had a cumulative grade point average of 3.5 or higher.

Receiving $2,500 awards from the Marvolene Speed Bennett and Carleton D. Speed, Jr. Endowed Fund; the Stephen E. Collins Scholarship Fund; and the Edward A. McCullough Endowed Fund are William Givens, a bachelor’s degree student in petroleum engineering at the Colorado School of Mines; Racha Boukadi, a doctoral candidate in petroleum engineering at the University of Louisiana at Lafayette; and Pamela A. Speciale, an undergraduate student in geology at the University of Texas at Austin.

Receiving $2,500 awards funded by the SIPES Houston Chapter were Nicholas Myziuk, a master’s degree candidate in geophysics at the University of Houston; and James Hunter Lockhart II, a master’s degree candidate in geology at Rice University.

Two $2,000 awards, funded by donations from the SIPES Midland Chapter, were presented to Amanda Labrado, an undergraduate student in environmental science and geology at the University of Texas at El Paso; and Kylian Robinson, a master’s degree candidate in hydrology at New Mexico Institute of Mining and Technology.

Also receiving $2,000 awards were Tyler H. Reed, a master’s degree student in geology at Baylor University; and Dustin Dewett, a master’s degree student in geophysics at the University of Oklahoma.

Since its establishment in 1981, the SIPES Foundation has awarded scholarships to more than 190 promising earth science students. Funding for the 2012 awards was made available through donations from SIPES members; a bequest from the estate of Marvolene Speed Bennett, widow of the society’s founding member, Carleton D. Speed, Jr.; the Stephen E. Collins Scholarship Fund; the Edward A. McCullough Endowed Fund; the SIPES Midland Chapter and the SIPES Houston Chapter. The SIPES Foundation also conducts and films educational seminars, contributes funding to earth science publications and continuing education programs, and also maintains an extensive library of earth science films.

The Society of Independent Professional Earth Scientists is a national organization of more than 1,300 self-employed geologists, geophysicists and engineers engaged primarily in domestic energy exploration and development. SIPES has eleven chapters located in oil and gas centers of the United States.

# # #

Mr. Evans,

I would like to sincerely thank you for awarding me the 2012 SIPES Foundation Earth Science Scholarship.

This financial gift is much appreciated and will no doubt pay future dividends to the industry by supporting my academic endeavors. It is foundations and organizations such as yours that provide future explorationists with the financial ability to complete their studies and progress to bright careers in the industry.

Again, I would like to thank you and the entire SIPES Foundation for your financial generosity. I hope that one day our paths will meet again.

Best Regards,

Hunter Lockhart
Master’s Student - Geology
Rice University
Houston, Texas

Please remember to send your donation to:

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In addition to the SIPES members associated with local chapters, SIPES has a significant group of non-chapter affiliated professionals that comprise our At-Large membership. SIPES’s total membership is about 1283 and 12.4% of these members are characterized as At-Large. Currently there are 159 At-Large SIPES members: 156 domestic and 3 international. At-Large domestic members represent thirty continental states spanning Washington to Florida and New Hampshire to California. The top four At-Large membership states are Kansas (53), Texas (30), Mississippi (10) and Louisiana (8). Listed below are state and region distribution counts. The following conterminous USA map depicts the geographic distribution of our At-Large membership.

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At-Large Regions:  Count

- ARK-LA-Tex: 10
- California: 4
- Colorado: 6
- Kansas: 53
- Oklahoma: 4
- Northeast: 19
- Northwest: 3
- Southeast: 15
- Southwest: 7
- TX Central - Dallas: 4
- TX Central East Dallas: 8
- TX S - San Antonio: 5
- TX W - Midland: 13
- West: 5
- International: 3

**USA**: 156

**International**: 3

**Total**: 159

Geographic Distribution of Domestic SIPES At-Large Members
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SIPES Vision Statement

To be the pre-eminent organization for furthering the professional and business interests of independent practitioners of the earth sciences. In achieving this vision, emphasis will be placed on
(1) professional competence,
(2) professional business ethics, and
(3) presenting a favorable, credible and effective image of the Society.

Adopted by the SIPES Board of Directors
September 21, 1996