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White Paper

# Shale Gas Issues: Squeezed Between Necessity and Reality

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# Shale Gas Issues: Squeezed between necessity and reality

"Total annual production volumes of 3 to 4 trillion cubic feet may be sustainable for decades. This potential for production in the known onshore shale basins, coupled with other unconventional gas plays, is predicted to contribute significantly to the US's domestic energy outlook."

~ *Modern Shale Gas Development in the United States—A Primer,* US Department of Energy (April 2009).

"Estimates of these [fracturing] distances…are at best imprecise. Clues about the direction in which fractures are likely to run from the well may be derived from seismic and other data, but virtually nothing can be done to control that direction; the fractures will follow Mother Nature's fault lines in the formation…. One difficulty is that the material facts are hidden below miles of rock, making it difficult to ascertain what might have happened."

~ *Coastal Oil and Gas Corp. v. Garza Energy Trust, et al.,* 268 SW 3d 1 (Tex. 2008).

"For whoever owns the soil, it is theirs all the way to Heaven and down to Hell."

~ *United States v. Causby*, 328 US 256, 260-261 (1946), citing Lord Coke's approval of the ancient maxim.[1]

## Section 1. Introduction

The relatively recent technological development of combining hydraulic fracturing and horizontal drilling to produce large quantities of natural gas (and liquids in many cases) from shale formations in the United States has and will likely continue to have significant impact on energy production. These developments will influence not only the price of hydrocarbons but also the economics of alternative energy development. At the same time, the prospect of conducting drilling activities, particularly in densely populated areas and those not familiar (at least recently) with oil and gas operations, has focused attention on potential risks associated with these activities. Not surprisingly, then, there has been a great deal of positive and negative excitement due to the current growth in hydrocarbon exploration and production in shale formations. This paper addresses three legal risk areas: (1) environmental regulatory and litigation risks, (2) nearby property owner damage and contamination litigation risks, and (3) securities law risks—with an acknowledgement to the concomitant political risks. While these risks cannot be eliminated, the purpose of the paper is to provide recommendations to those involved in the development and production of shale gas reserves that will mitigate these risks. We focus here on natural gas, but many of the issues will be similar for shale oil.

In Section 2 and 3, this paper discusses the basics of shale gas reserves and the process required for their development. While most of the controversy has centered on hydraulic fracturing, the use of horizontal drilling also plays a role in the current and expected controversies. The current growth in shale gas operations has been accompanied by highly publicized environmental concerns, primarily based on the possibility of groundwater contamination and the large amounts of water required for fracturing operations. These concerns have begun to produce a tentative regulatory response in the form of proposed legislation and regulations by the various state and federal governments. In addition, lawsuits have been filed by public interest groups as well as local landowners. These cases are typically based on the common law causes of action for trespass, negligence and nuisance, with or without a request for injunctive relief, and strict liability for violation of statutory and regulatory prohibitions. Due to their relatively recent vintage, these cases have not yet resulted in reported appellate decisions. The environmental and regulatory aspects of hydraulic fracturing of shale gas formations are discussed in Section 4.

Migration of frac fluids across property lines, resulting in claims of contamination of neighboring properties, can also lead to actions in trespass. Less well known, but immediately apparent upon review of local newspapers and blog sites, is the perceived "lesser twin" of fracing, namely the common concern of nearby landowners and leaseholders about the possibility of the subsurface drainage of oil and natural gas from their property to an adjacent property as a result of powerful hydraulic fracturing of deep shale deposits. This concern, even in regions as distant from Texas as Pennsylvania, often includes dire reference to a 2008 Texas Supreme Court case, referred to around the country as the *Garza* case. The common law "rule of capture" plays a pivotal role in resolving drainage disputes, and its application (or lack thereof) provides a legal rationale for the differing treatment of drainage and contamination. Section 5 will analyze the common law principles that will play an important part in shaping the claims of nearby landowners with respect to the primary areas of concern, contamination and drainage.

Finally, for publicly traded companies the very recent commencement of shale gas exploration and production, and resulting limitations in the production data available from which to estimate reserves in place and those economically recoverable, create new challenges for securities law disclosures. These requirements raise issues that may prove problematic until shale gas production and its associated technology mature and become better understood. Securities issues associated with shale gas reserves and their development are discussed in Section 6.

## Section 2. Shale Reservoirs

The United States has very extensive reserves of oil and natural gas locked in large shale formations across the country. These shale formations often overlap conventional natural oil and gas basins, but are typically more than a mile deep. Because of the very low permeability of shale, these formations have only relatively recently been explored, and only a few have begun to be developed, most notably the Barnett Shale in North Texas, the Bakken Shale in the Dakotas and Montana, the Marcellus Shale in the Appalachians, the Eagle Ford Shale in South Texas, the Haynesville Shale in Louisiana and the Woodford Shale in Oklahoma. Development is currently more active in the fields that are rich in liquids because of the current low price of gas in the United States and the high price of oil. Commercial production from these shale fields requires directional drilling, in

which a drill goes vertically into the earth for several thousand feet to the desired depth and is then turned so as to drill horizontally to access a larger portion of the reservoir. Since the shale formations are made up of hard, impermeable rock with micro-pores filled with natural gas and some liquids, it is then necessary to crack, or fracture, this rock to allow the gas and liquids to flow back up the wells.[2] This technique is called hydraulic fracturing, or "fracing" as commonly known in the energy industry.

## Section 3. Hydraulic Fracturing In Shale Gas Formations

While hydraulic fracturing is not itself a new technique, the combination of fracturing and horizontal drilling to produce natural gas from tight shale formations only began in earnest in 2002-2003.[3] The primary difference between modern shale gas development and conventional natural gas development is the extensive use of this combination of horizontal drilling and high-volume hydraulic fracturing.[4] The combination of these two technologies that have been available for decades, coupled with technological advances in equipment and cost reductions, is the key to unlocking the vast reserves of shale gas. A well is typically more than a mile deep and its horizontal, or lateral, length may extend from 1,000 to 5,000 feet. The hydraulic pressure creates fissures, or cracks, in the rock that propagate along natural fault lines in an elongated elliptical pattern up to 3,000 feet from the well bore in opposite directions.

The hydraulic fracturing of shale is typically performed in four or more "stages," with each stage using different volumes and compositions of water-based fluids. The fracturing fluid is primarily water (90%), chemical additives (1-2%) and proppants (8-9%). The chemical additives have included hydrochloric acid (to initiate cracks by dissolution), glutaraldehyde (to act as a biocide), ammonium persulfate (to delay polymer breakdown), dimethyl formamide (to inhibit corrosion), borate salts (to maintain fluid viscosity), polyacrylamide (to reduce friction), hydroxyethel cellulose (to support the proppant), citric acid (to control iron), potassium chloride (to create a brine carrier fluid), ammonium bisulfate (to scavenge oxygen), sodium carbonate (to adjust pH), ethylene glycol (to inhibit scale) and isopropanol (to act as surfactant) among other things.

Behind the water/chemical fluid comes a slurry containing small granules called "proppants"—sand, ceramic beads or bauxite—that lodge themselves in the

fissures, propping them open against the enormous subsurface pressure that would otherwise force them shut as soon as the fluid was removed.

The fluid is then drained back out of the well, leaving the fissures and cracks open for oil and gas to flow to the wellbore. Hydraulic fracturing increases the well's effective exposure to the formation, allowing greater production. However, the injection of the fluid is controversial from an environmental standpoint, and the removal of the flowback and produced water requires disposal either by permanent injection into a separate waste injection well or delivery to conventional municipal wastewater disposal systems, or treatment and reuse of the water in oil field operations, such as further fracing.

The technique of hydraulic fracturing, whether in conventional oil and gas fields or shale formations, can implicate the conflicting principles of protection of property rights and groundwater and the full development of natural resources. Hydraulic fracturing results in cracking of deep geological formations, and the horizontal extent of its subterranean impact and recovery cannot be known with 100% certainty for any given well, although micro-seismic logging during the hydraulic fracturing process are now able to provide fairly accurate measurement of the "fracturing length." In the past, this lack of precision has led to claims by adjacent landowners of drainage of subterranean formations by conventional hydraulic fracturing, and in recent years to an increasing number of claims of groundwater contamination allegedly caused by hydraulic fracturing of shale formations. Since 2009, lawsuits alleging groundwater contamination caused by shale fracturing have been filed in Arkansas, Colorado, Louisiana, New York, Pennsylvania, Texas and West Virginia. These cases have either been settled on confidential terms or are still in the early stages of litigation with no reported appellate decisions.

Similarly, the potential rewards and risks of shale gas development give rise to concerns of a "bubble" in the market of shale gas properties and of companies that are involved in exploration and production of shale gas. Also, because no long-term history of shale gas production exists, the size of the reserves and the future feasibility of extracting those reserves may be difficult to predict. Litigation against publicly traded companies by disgruntled investors or of securities enforcement actions by regulators are therefore to be expected.

## Section 4. Environmental Concerns and the Rise of Regulations

A series of sources—including the movie "Gasland," newspapers (especially *The New York Times*), academic reports and legal news services—has sparked questions about the risks and costs of using hydraulic fracturing to develop oil and gas shale plays. One result, not surprisingly, is that government responses to hydraulic fracturing are rapidly evolving.

That many such reports have contained errors or been biased is no reason to dismiss all public concern out of hand. Although there still does not appear to be any documented case of the fracturing process itself causing contamination of underground drinking water, combinations of circumstances, sometimes involving inappropriate well installations, have contributed to the presence of natural gas in potable water wells and occupied structures near production sites. Such problems are a particular concern for the industry in places where standards for the installation of residential drinking water wells are lax and uneconomic pockets of shallow hydrocarbons are present outside the production zone, because it is tempting to blame hydraulic fracturing for the manifestation of pre-existing problems. Beyond that, uncontained fracturing fluid spills and well blowouts have caused environmental incidents at the ground surface. And as with other oil and gas activities, production from low permeability formations carries inherent risks of incidental discharges, air emissions, fluid leak-off into the subsurface, and disposal of flowback water and produced water. Fueled by the 2010 Deepwater Horizon well incident in the Gulf of Mexico, the estimated contributions of hydrocarbons to greenhouse gas emissions, and images of residential well water on fire, environmental activists have been doing a good job of tying hydrocarbon production in general, and fracturing in particular, to every real or imagined environmental issue.

The resulting clamor has caused regulators at the federal, State and local levels to re-examine their regulations pertaining to environmental aspects of hydrocarbon exploration and production. The energy industry and state regulatory bodies generally believe that existing and proposed state regulations will be adequate to protect water resources during the development of shale gas fields. On the other hand, a growing contingent of landowners, environmental groups and citizen groups are calling for further investigation of hydraulic fracturing and enhanced

regulation, including federal standards, due to concerns about possible drinking water contamination and water usage, among other things.

Among the many ongoing regulatory initiatives relating to fracturing are the following:

- Federal legislation (the "FRAC Act") has been proposed in this area, but faces strong opposition from the industry. If passed in its present form, which at this point seems unlikely, the FRAC Act would repeal an existing provision in the Safe Drinking Water Act that expressly exempts most hydraulic fracturing from underground injecting control ("UIC") permitting obligations and would require the industry to disclose the chemical constituents (but not proprietary chemical formulae) in hydraulic fracturing fluids.[5]
- The US Environmental Protection Agency ("US EPA") appears to be moving slowly but steadily towards fracturing regulation. The agency has (i) launched a study of the water cycle in hydraulic fracturing, especially the potential impacts to drinking water resources, that is expected to be completed in 2014; (ii) concluded that an underground injection permit is required to use fracturing fluid that contains diesel fuel;[6] (iii) proposed air regulations to require "reduced emissions" during new completions and re-completions of hydraulically fractured gas wells;[7] (iv) announced a plan to develop standards for discharges to surface water of hydraulic fracturing wastewater; and (v) decided to start working on a proposed rule to gather data on fracturing chemicals and mixtures.
- The US Department of the Interior ("DOI") has been working on fracturing regulations for federal lands that are expected to focus on disclosure of chemical identities, well-bore integrity and management of wastewater disposal. [8, 9]
- The Delaware River Basin Commission has proposed a comprehensive set of regulations intended to protect water resources within its jurisdiction from any adverse impact due to gas wells.
- Several states have promulgated regulations directed at hydraulic fracturing (often covering disclosure of fracturing substances, permitting, and operational requirements), including: Arkansas, Colorado, Michigan, Montana, West Virginia and Wyoming. In perhaps the most drastic step, New York has suspended most permitting for shale gas drilling pending

completion of a review by the New York Department of Environmental Conservation. In 2010, then-governor David Paterson issued an executive order imposing a moratorium specifically on high-volume hydraulic fracturing combined with horizontal drilling, pending the release of a final Supplemental Generic Environmental Impact Statement ("SGEIS") by the New York State Department of Environmental Conservation ("NYSDEC"). NYSDEC has issued a revised draft SGEIS that recommends issuing permits to allow hydraulic fracturing, subject to a variety of operational controls. For example, enhanced well casing would be required in most situations.

- Many local governmental entities likewise have started to regulate or even prohibit the drilling or hydraulic fracturing of oil and gas wells within—and even outside—their jurisdictional boundaries (which raises obvious preemption questions). Local governmental entities in New York and Pennsylvania have been particularly active, but this localized regulatory activity also has occurred in Colorado and Texas. Such restrictions can effectively hinder or prohibit the drilling of wells even where permitted by state regulatory authorities.

All these efforts can be expected to feed upon one another, with one requirement potentially catalyzing development of a new round of regulations elsewhere. The trend therefore is toward increased fracturing regulation.

Even when an operator believes it has followed applicable regulations, it may find itself embroiled in enforcement actions or personal injury lawsuits. In some instances, an operator may even be subject to strict liability, without regard to whether it acted in compliance with law or was negligent. Below are two of the better-known incidents involving non-conventional hydrocarbon production that have resulted in legal claims:

- US EPA Region VI issued a unilateral administrative order to Range Resources after methane, benzene, toluene, ethane, propane and hexane reportedly were detected in drinking water wells near a Range production site in the Barnett Shale in Texas. The Agency directed Range to provide replacement water, survey all nearby drinking water wells, and submit a sampling and investigation plan. Deposition testimony indicated that US EPA did not make a determination of the exact pathway by which contaminants reached the well. Rather, the Agency expected Range to provide that certainty pursuant to the order. Federal enforcement

continues, even though the Texas Railroad Commission found that Range was not the source of the contamination.

- Residents of Dimock, Pennsylvania alleged that Cabot Oil and Gas Corporation's nearby Marcellus Shale fracturing and production operations resulted in migration of hydrocarbons, including methane, and other contaminants into their drinking water wells. Under threat of having its statewide operations terminated, Cabot agreed to comply with a State of Pennsylvania order requiring, among other things, restoration or replacement of residential drinking water. Cabot and the State eventually entered a settlement requiring Cabot to offer the 19 families who drew water from the wells payments of twice the value of their homes, install whole-house gas mitigation devices for them as requested, and pay the State $500,000 for its investigation costs. Ultimately, the State concluded that the cause of the problem was faulty well casing. After the State allowed Cabot to stop supplying temporary drinking water, US EPA weighed in, saying the drinking water continues to pose a health risk and promising delivery of an alternative supply, then backtracking by saying more study was needed and withdrawing its offer to supply water, and next flip-flopping again to promise water deliveries to four homes. Meanwhile, affected families are continuing a lawsuit against Cabot that alleges health and property damage.

Pre-existing conditions may complicate responses to such incidents. While today's operators may be targeting deep geologic formations, shallow zones may contain hydrocarbons as well. Extracting them may be uneconomical at present, but they still may end up in people's homes and in groundwater along with other contaminants. For example, a recent study sponsored by The Center for Rural Pennsylvania compared the water quality in 233 groundwater wells within 5,000 feet of Marcellus well pads before and after drilling. No major influences of gas well drilling on water quality were detected, as evidenced by a lack of statistically significant increases in pollutants that are most prominent in drilling waste fluids, such as total dissolved solids ("TDS"), chloride, sodium, sulfate, barium and strontium.[10] There was no increase of dissolved methane levels near hydraulically fractured sites and no correlation between dissolved methane and distance to the nearest Marcellus well. But it bears emphasizing that approximately 24 percent of the groundwater wells contained detectable dissolved methane prior to the nearby drilling activities. The study also found that approximately 40 percent had at least one pre-existing water quality problem (typically an exceedance of drinking

water standards for coliform bacteria, turbidity, and/or manganese). In another recent study, an evaluation of more than 1700 water wells prior to proposed gas drilling in northeastern Pennsylvania found that methane was ubiquitous in shallow groundwater and that water wells located in lowland valley areas exhibit significantly higher dissolved methane levels than water wells in upland areas, with no relation to proximity of existing gas wells.[11] Investigating whether gas drilling is affecting drinking water in Pavillion, Wyoming, moreover, US EPA found a variety of hydrocarbons in groundwater, the presence of some of which would be consistent with naturally occurring hydrocarbons or releases of refined product. Even a chemical known to be a fracturing additive may be the result of releases from other sources. Press reports are describing US EPA's Pavillion investigation, for example, as having detected 2-butoxyethanol, which has been used in dry cleaning solutions, herbicides, latex paint and home cleaning products, among other things, as well as fracturing fluid.

Significant effort and investigation, meaning significant cost, will be needed to defend a well operator against any allegation that its activities caused groundwater or other impacts separate from pre-existing conditions. The best way of defending against claims arising out of environmental incidents is having a program that prevents them from happening in the first place; the second best is having a strategy in advance for managing the residual risk. In part, this means understanding local conditions sufficiently to demonstrate that a well owner's/operator's operations are not responsible for any alleged problem, and responding promptly when they are.

In putting such plans together for non-conventional hydrocarbon production, compliance with the directly applicable regulations may not be enough. Well owner/operators should consider adopting internal procedures that utilize the "best" parts of industry standards and of regulations from other jurisdictions to go beyond compliance. Here are a few features that might be included, whether or not expressly required:

## Baseline environmental surveys

It obviously would be better for a shale well operator to identify problems in drinking water wells and potential pathways to those wells (such as abandoned well bores) *before* a neighbor alleges poor water quality was caused by recent fracturing. Well-managed surveys, conducted *before* problems arise, can both

insulate an operator from unfounded claims and forestall claims that the surveys were designed, after the fact, to limit liability.

In deciding upon the area to be surveyed, the length of a horizontal well should be considered along with relevant State standards and technical data. In Pennsylvania, for example, the operator of an oil or gas well is presumed to be responsible for the pollution of a water supply that is within 1,000 feet of the well if the pollution occurred within six months after completion of drilling or an alteration. An operator has several potential avenues for rebutting the presumption, including having conducted a pre-drilling or pre-alteration survey showing the contamination to be a pre-existing condition. A Pennsylvania State commission has recommended increasing that distance to 2,500 feet.

As noted above, many substances undesirable in drinking water wells may originate from natural sources. Homeowners (and opponents of fracturing), however, are likely to blame hydrocarbon well drilling, fracturing, or other recent production activities for those pre-existing substances. A baseline environmental study can help mitigate the risks that a well operator and others would be found liable or responsible for contamination in such instances.

## Geologic studies that include conditions relevant to environmental analysis

Northeastern Pennsylvania (which includes the town of Dimock) contains gas-bearing and potable water-bearing formations well above the depth of the targeted Marcellus Shale. Various fracture, joint, and fault networks provide pathways for migration and build-up of shallow methane. Driller unfamiliarity with such conditions may contribute to gas migration incidents.

## Developing and documenting facts as well installation and operations proceed

Anecdotal evidence suggests that improperly sealed wells, rather than fracturing itself, may be the most likely contributor to cases of water contamination and hydrocarbon migration. Therefore, risk mitigation measures might include designing a cement job that optimizes cement placement, implementing that design, and confirming with up-to-date testing methods that the well is properly designed and constructed to contain hydrocarbons. Such verification then could

extend to the fracturing job, followed by checks of well and equipment integrity over time, with documentation at each step along the way.

## Designs that minimize environmental risks going forward

The use of more eco-friendly substances is a common way to minimize environmental problems. For hydraulic fracturing, a first step in such a strategy would be to ensure that diesel fuel is not used, since that could be viewed as triggering underground injection control ("UIC") permitting obligations. Another option might be to use the results of any baseline survey to restrict constituents so as to reduce the chances of being enmeshed in arguments about whether fracturing additives commingled with chemicals that originated elsewhere. Consideration also might be given to "environmentally friendly" fracturing fluids based on food-grade chemicals, to the extent available and consistent with operational considerations.

Another focus for design optimization should be surface operations. Fracturing commonly is defended on the grounds that it occurs far below any useable drinking water aquifer underneath impervious geologic zones that are isolated by a sealed well-bore. But, before being injected, fracturing additives are handled at the surface where there may be a direct path to drinking water, and a substantial portion will return to the surface as flowback, or produced, water at the completion of the fracturing along with dissolved constituents from the deep subsurface. Preliminary results from a University of Texas study indicate that many allegations of groundwater contamination arising from shale gas drilling are actually due to aboveground problems rather than hydraulic fracturing. All the effort of designing and implementing a safe fracturing job potentially will be wasted if fracturing chemicals are spilled or leaked onto the ground surface. Measures for reducing the risk of surface problems would include appropriate containment (including use of tanks and impervious berms as practical instead of earthen surface impoundments). Poor design and construction may beget environmentally significant leakage. Drainage and erosion patterns should be considered sufficiently so that natural events do not cause uncontrolled discharges by flooding chemical handling areas (including any impoundments that *are* used) or undercutting equipment.

## Measures to assure problems are quickly identified and fixed

Even the best-laid plans go awry. In managing environmental liabilities, a faster response often limits the extent of the problem. Beyond that, it demonstrates a commitment to being a good neighbor, which can help prevent objections from escalating to public outcry. It makes sense to consider written standard operating procedures covering operations, start-up, shutdown, malfunctions and emergency procedures—all backed up by appropriate oversight. Any emergency response plan should be practical and robust (which is not a synonym for lengthy), customized as appropriate to a particular location, and backed by sufficient training that emphasizes the specific role of each individual in avoiding environmental problems. And, in many cases, addressing landowners' concerns, without admitting liability and even while investigation is ongoing, can reduce hostility.

## Drilling and fracturing contracts that are consistent with control programs

The Deepwater Horizon incident provides a large-scale, graphic reminder of what can happen when there are questions about who is supposed to do what. Obligations should be spelled out as plainly as reasonably possible. The well owners/operators must also be aware that they can be found primarily liable in the first instance for the actions of their contractors.

## Effective monitoring to ensure compliance with company policy

In the absence of effective procedures to monitor compliance, even the best compliance policies can become a liability rather than an advantage, as deviations from policy can serve to indict even careful operation. As a result, it is critically important that procedures exist to ensure that all operations, including those of drillers and other subcontractors, are conducted in compliance with applicable regulations and policies and that compliance with the monitoring procedures and prompt action on detection of deviations is documented and acted upon appropriately.

However a well owner/operator eventually chooses to manage potential liabilities from non-conventional oil and gas production, the stakes are sufficiently high to make the relevant decisions up front rather than muddling through when problems arise. While conducting operations strictly to applicable regulations

often is a successful strategy, consideration of "best practices" for non-conventional production may offer worthwhile benefits. Development of shale oil and gas has relied upon evolving technology; liability management techniques should match.

## Section 5. Drainage and Contamination Viewed from The Rule of Capture: An old tool applied to new problems

Until such time as there is a body of statutory or case law addressing hydraulic fracturing operations, existing law involving analogous operations will necessarily be the starting point for analyzing legal claims of local landowners and leaseholders that are likely to arise from these operations. With the most prolific history of conventional hydraulic fracturing, waterflooding and deep-well injection of industrial waste, Texas has a small, but significant, body of case law that provides a conceptual framework for issues that will likely confront hydraulic fracturing of shale fields.

While other torts such as negligence and nuisance are available, the archetypal hydraulic fracturing case is likely to be based on some aspect of trespass. Because the application (or distinguishing absence) of the so-called "rule of capture" is the guiding principle in these trespass cases, and because the rule of capture is derived from the common law of England and followed by the majority of the states, these cases provide a useful starting point for analyzing trespass-related issues, such as drainage and contamination, that are likely to arise out of shale fracturing.[12] The unrestrained application of the rule of capture was found historically to produce waste, with too many wells being drilled and damage being done to the reservoir. This led to the development of conservation laws that limited the ability of each landowner to drill his own well. Therefore, the companion doctrine of correlative rights was developed to protect landowners/lessees from the effects of the rule of capture in a regulated environment.

Conventional hydraulic fracturing often results in the intrusion of fractures, and possibly the intrusion of the fracturing liquids and proppants, into the subsurface of adjacent property. Subsequent *drainage* of oil and gas from that same adjacent property may result. The adjacent property owner in such cases may seek to recover for trespass to its subsurface. As shown in the following cases, claims based on *drainage* of oil and gas from adjacent property will typically be

precluded by the "rule of capture," a robust concept that generally overrides the right of a property owner to prevent others from adversely impacting his property. On the other hand, claims based on *contamination* resulting from the subsurface migration of injected fracturing fluids may not be similarly precluded, although considerable deference will likely be given to regulatory compliance. There are three significant cases from the Texas Supreme Court spanning a period of 49 years that provide a basis for predicting when hydraulic fracturing will likely be immunized from claims by adjacent property owners, and when it likely will not.

The first case, *Railroad Commission of Texas et al. v. Dorothy N. Manziel, et al.*, 361 S.W.2d 560 (Tex. 1962, rehearing denied), does not involve hydraulic fracturing but rather "waterflooding," which is a secondary recovery method by which salt water is injected to drive oil or gas toward other wells. In *Manziel*, the Texas Supreme Court rejected the attempt of an adjacent mineral rights owner, Manziel, to set aside a Texas Railroad Commission order permitting Whelan's injection of salt water into an "injection well" at an "irregular" interval from the adjoining Manziel lease.[13] Manziel attacked the order because it permitted Whelan to waterflood too close to Manziel's adjacent lease line which would cause salt water to migrate onto Manziel's lease, ultimately drowning out the hydrocarbon production from her wells.

The evidence showed that due to low reservoir pressure, the best method of recovery for the mature field was waterflooding. In fact, Manziel was herself practicing waterflooding on her own leases, and the salt water injected into one of the Manziel wells had already crossed the boundary of the Whelan lease, forcing oil from the Whelan lease onto other Manziel leases on the opposite side of the Whelan lease. Manziel was attempting to prevent the placement of the Whelan injection well, Eldridge No. 11, at an irregular interval because it would cause more oil under the Whelan lease to be forced back to Whelan wells than would be the case if the injection well was placed at the "regular" setback distance interval of at least 660 feet from the property line.

In granting the order, the Railroad Commission found that the authorization of injection wells at an "irregular" interval was necessary to prevent waste and protect "correlative rights" by encouraging operators such as Whelan to initiate waterflooding and other secondary recovery programs. Manziel conceded that Whelan had the right to protect his lease from drainage, and that the Commission had the power to issue reasonable orders to aid such purpose, including the drilling of wells at "irregular" intervals. However, after conceding this right and

power, Manziel asserted that the Railroad Commission could not authorize, nor Whelan carry out, a trespass by injected salt water that would result in loss and injury to her oil and gas interests caused by premature flooding.

The Texas Supreme Court first relied on the general principle that when the Railroad Commission's orders are necessary to prevent waste or to protect correlative rights, the fact that the application of the order will result in loss to some persons does not warrant a finding that there has been a deprivation of property without due process of law. *Manziel*, 565.

In reviewing the evidence before the Railroad Commission, the supreme court found the following:

> [t]here is no dispute as to the necessity of injecting larger amounts of water into the reservoir to prevent waste in the field, and from the evidence it appears that regardless of whether the Eldridge #11 well is located at a regular or irregular spacing there will be no appreciable difference in the amount of oil recoverable from the reservoir as a whole. The only dispute is as to where the necessary injection well should be located to serve the dual purpose of facilitating efficient recovery of oil and the protection of the correlative rights of [the parties]. *Manziel*, 572.

The supreme court further found that unless Whelan's Eldridge No. 11 was placed at an irregular interval, the Manziel well would recover five times the amount of oil it would have been able to recover based on the estimated original productive acre-feet of oil beneath the Manziel well as compared to that of the field as a whole. Such disparate recovery would result from drainage from Whelan's lease and would not, therefore, be correlative to Whelan's rights. As a result, the supreme court upheld the Texas Railroad Commission's order on the ground that there was substantial evidence that the exception to the field rules here in question was necessary "to protect the correlative rights of the Whelan Brothers-Vickie Lynn Unit and to prevent drainage from such unit across lease lines to the Manziel Estate's Hollandsworth leases." *Manziel*, 574.

The Texas Supreme Court found that the Railroad Commission order achieved a proper balance between the common law "rule of capture" and the statutory protection of "correlative rights", *Manziel*, 572.

The supreme court also addressed Manziel's trespass argument. The court acknowledged that the allegations in Manziel's pleading—that the injection of salt water by Whelan would cause damage to Manziel's well and would result in loss and injury to Manziel's oil and gas interests due to premature flooding—were "sufficient to give rise to the issue of trespass in considering the status of encroaching secondary recovery waters" into Manziel's subsurface. *Manziel*, 566.

After discussing the importance of secondary recovery and the likelihood of subsurface migration of substances, the supreme court stated,

> [If], in the valid exercise of its authority to prevent waste, protect correlative rights, or in the exercise of other powers within its jurisdiction, the Commission authorizes secondary recovery projects, a trespass does not occur when the injected, secondary recovery forces move across lease lines, and the operations are not subject to an injunction on that basis. The technical rules of trespass have no place in the consideration of the validity of the orders of the Commission. *Manziel*, 568, 569.

In support of this non-trespass statement, the supreme court quoted with approval an authoritative treatise for the expansion of the rule of capture to include substances injected for oil and gas recovery:

> What may be called a "negative rule of capture" appears to be developing. Just as under the rule of capture a land owner may capture such oil or gas as will migrate from adjoining premises to a well bottomed on his own land, so also may he inject into a formation substances which may migrate through the structure to the land of others, even if this results in the displacement under such land of more valuable with less valuable substances. *Manziel*, 568.

In recognition of public policy and necessity, the supreme court recognized that the importance of secondary recovery requires, as a practical matter, that the migration of secondary recovery substances not be considered to be trespass,

> ...if the Manziels' theory of subsurface trespass be accepted, the injection of salt water in the East Texas field has caused subsurface trespasses of the greatest magnitude.
>
> The orthodox rules and principles found by the courts as regards surface invasions of land may not be appropriately applied to

> subsurface invasions as arise out of secondary recovery of natural resources. If the intrusions of salt water are to be regarded as trespassory in character, then under common notions of surface invasions, the justifying public policy considerations behind secondary recovery operations could not be reached in considering the validity and reasonableness of such operations. *Manziel*, 568.

However, prior to commencing the foregoing analysis of the trespass issue, the supreme court qualified its review of the trespass issue by stating,

> The subsurface invasion of adjoining mineral estates by injected salt water of a secondary recovery project is to be expected, and ***in the case at bar we are not confronted with the tort aspects of such practices***. Neither is the question raised as to whether the Commission's authorization of such operations throws a protective cloak around the injecting operator who ***might otherwise be subjected to the risk of actual damages to the adjoining property***; rather we are faced with [the] issue of whether a trespass is committed when secondary recovery waters from an authorized secondary recovery project cross lease lines.

*Manziel*, 566 (emphasis added). The court went on to observe in a similar vein that

> … if, in the valid exercise of its authority to prevent waste, protect correlative rights, or in the exercise of other powers within its jurisdiction, the Commission authorizes secondary recovery projects, a trespass does not occur when the injected, secondary recovery forces move across lease lines, and the operations are not subject to an injunction on that basis. ***The technical rules of trespass have no place in the consideration of the validity of the orders of the Commission.***

*Manziel*, 568 (emphasis added).

This language and the fact that the *Manziel* case was an attack on a Railroad Commission order—not a claim against Whelan for damages—limit the significance of the *Manziel* court's statements concerning non-trespass. This limited construction of the *Manziel* court's non-trespass holding is re-affirmed in the *FPL Farming* case, discussed below.

In summary, the Texas Supreme Court in *Manziel*:

- affirmed the authority of the Texas Railroad Commission to approve recovery measures in order to prevent waste or to protect correlative rights, even when such measures are expected to result in the migration of injected material across lease lines, and
- reserved for the future the question whether the migration of injected material across lease lines constitutes trespass, but did recognize (1) that a finding of trespass in such cases would be incompatible with secondary recovery and the avoidance of waste, and (2) the correlation between the injection of substances that may migrate into the subsurface of others and the rule of capture.[14]

While *Manziel* did not expressly address hydraulic fracturing and its holding is limited as to trespass issues, the 2008 Texas Supreme Court decision in *Coastal Oil & Gas Corp. v Garza Energy Trust, et al*, 268 S.W.3d 1 (Tex. 2008, rehearing den'd), does address subsurface trespass issues in the context of hydraulic fracturing. In *Garza*, Salinas owned the minerals in a 748-acre tract known as Share 13. Coastal was the mineral lessee for Salinas' Share 13, and Coastal also owned the minerals on Share 12, adjacent to Share 13. A natural gas reservoir, the Vicksburg T formation, lies between 11,688 and 12,610 feet below these tracts.

Prior to 1993, Coastal drilled successful wells on both its own Share 12 and, as lessee, on Salinas' Share 13. In 1996, Coastal drilled Coastal Fee No. 1 in the northeast corner of Share 12, as close to Share 13 (and the Salinas No. 3) as the Texas Railroad Commission's statewide spacing Rule 37 permitted, 467 feet from the Share 13 boundaries to the north and east.

Subsequently, Salinas sued Coastal for breach of its implied covenants to develop Share 13 and prevent drainage, and for trespass, alleging that Coastal's hydraulic fracturing of Coastal Fee No. 1 invaded the reservoir beneath Share 13, causing substantial drainage of gas from Share 13 (on which Coastal owed Salinas a royalty) to Share 12 where Coastal was both owner and operator, unburdened by any royalty obligation.

The Vicksburg T is a "tight" sandstone formation, relatively impermeable, from which natural gas cannot be commercially produced without hydraulic fracturing. For Coastal Fee No. 1, the "hydraulic length", the distance that the fracturing fluid will travel, was designed to reach over 1,000 feet from the well. (The "propped length" is the slightly shorter distance that the proppant will reach, and the

"effective length" is the still shorter distance within which the fracturing operation will actually improve operation.)

The distance from the Coastal Fee No. 1 to the Salinas lease lines was between 467 to 660 feet. The parties agreed that both the hydraulic and the propped lengths exceeded 660 feet, but disagreed as to whether the effective length did. These lengths cannot be measured directly, and each side based its assertion on the opinion of its expert. As measured by the amount of proppant that was injected, the hydraulic fracturing of Coastal Fee No. 1 was "massive" according to Salinas' expert. Salinas' expert further testified that because of the fracing operation on Coastal Fee No. 1, 25-35% of the natural gas it produced drained from Share 13. He explained that he could not be more definite because of two factors that could not be directly ascertained: the exact direction taken by the fractures and the extent of their incursion into Share 13, and whether conditions in the reservoir varied from Share 12 to Share 13. The jury found, among other things, that Coastal failed to reasonably develop Share 13, causing Salinas $1.75 million damages in lost royalties and interest and that Coastal's hydraulic fracturing of Coastal Fee No. 1 trespassed on Share 13, causing substantial drainage and $1 million in lost royalties.[15]

The supreme court first addressed Salinas' contention that the incursion of hydraulic fracturing fluid and proppants into another's land two miles below the surface constitutes trespass which can lead to drainage for which the mineral owner can recover damages equal to the value of royalty on the natural gas thereby drained from that land.

In this regard, the court noted that as a mineral lessor, Salinas has only "a royalty interest and the possibility of reverter should the lease terminate", but "no right to possess, explore for, or produce the minerals." The court stated that Salinas' reversion interest in the minerals leased to Coastal is similar to a landlord's reversion interest in the surface estate, and as such, Salinas' claim for trespass seeks redress for a permanent injury to that interest—a loss of value because of wrongful drainage. The court found that Salinas' claim was not speculative; actual, concrete harm was alleged, either in reduced royalty payments or in loss of value to the reversion. The court noted, however, that because Salinas only had a royalty or reversion interest in the minerals, Salinas' claim of trespass would not support nominal damages, (which are damages that do not require proof of an actual loss or injury) but only damages for actual injury. *Garza*, 9-11.

The supreme court noted that its ruling was narrowed by the fact that Salinas' reversionary interest meant that its trespass claim required proof of the existence of actual injury (rather than being a trespass claim for nominal damages) by stating, "We have not previously decided whether subsurface fracing can give rise to an action for trespass. We need not decide the broader issue here." Having required the existence of actual injury based on the drainage that was caused by the trespass as an element of Salinas' trespass claim, the court then ruled out any actual injury for drainage by invoking the rule of capture, "In this case, actionable trespass requires injury, and Salinas's only claim of injury—that Coastal's fracing operation made it possible for gas to flow from beneath Share 13 to the Share 12 wells—is precluded by the rule of capture." *Garza*, 11-13.

The supreme court further explained the basis for its ruling: "[The rule of capture] gives a mineral rights owner title to all the oil and gas produced from a lawful well bottomed on the property, even if the oil and gas flowed to the well from beneath another owner's tract. The rule of capture is a cornerstone of the oil and gas industry and is fundamental to both property rights and to state regulations. Salinas does not claim that the Coastal Fee No. 1 violates any statute or regulation. ***Thus the gas he claims to have lost simply does not belong to him.***" *Garza*, 13 (emphasis added).

In recognition of the significance of the "rule of capture" as the basis of its ruling, the supreme court then added, "[Salinas] does not claim that the hydraulic fracturing operation damaged his wells or the Vicksburg T formation beneath his property. In sum, Salinas does not claim damages that are recoverable." *Garza*, 13. The court then rejected Salinas' argument that the rule of capture does not apply because hydraulic fracturing is "unnatural" by pointing out that

- the very activity of drilling wells is itself unnatural;
- hydraulic fracturing has long been commonplace throughout the industry and is necessary for commercial production in the Vicksburg T and many other formations; and
- the law affords Salinas ample relief, namely himself using hydraulic fracturing to stimulate production from his own wells and drain the gas to his own property—and the right to sue Coastal for not having done so which Salinas had in fact done in this case.[16] *Garza*, 13.

The supreme court also dispensed with Salinas' argument that stimulating production through hydraulic fracturing that extends beyond one's own property

is no different from drilling a slant well that bottoms on another's property, a practice that is unlawful. The court distinguished slant wells by stating, "the rule of capture determines title to gas that drains from property owned by one person onto property owned by another. It says nothing about the ownership of gas that has remained in place. The gas produced through a [slant] well does not migrate to the wellbore from another's property; it is already on another's property." *Garza*, 13-14.

The supreme court then listed reasons why the rule of capture should not be changed to allow one property owner to sue another for oil and gas drained by hydraulic fracturing that extends beyond lease lines:

- The law already affords the owner who claims drainage full recourse. If the drained owner has no well, he can drill one to offset drainage from his property. If the minerals are leased and the lessee has not drilled a well, the owner can sue the lessee for breach of the implied covenant in the lease to protect against drainage. In addition, the owner (or his operator) may offer to pool, and if the offer is rejected, he may apply to the Railroad Commission for forced pooling, the recognized method of protecting correlative rights.
- Allowing recovery for the value of oil and gas drained by hydraulic fracturing usurps to the courts and juries the lawful and preferable authority of the Railroad Commission to regulate oil and gas production. Such recovery would assume that the oil or gas belongs to the owner of the minerals in the drained property, contrary to the rule of capture. While a mineral rights owner has a real interest in the oil and gas in place, this right does not extend to the *specific* oil and gas beneath the property; ownership must be considered in connection with the rule of capture, which is recognized as a property right as well. The rule of capture makes it possible for the Railroad Commission, through rules governing spacing, density and production allowable of wells, to protect the correlative rights of owners with interests in the same mineral resources, while securing the state's goals of preventing waste and conserving natural resources. The mineral owner is entitled not to the molecules of oil and gas actually residing below the surface, but to a fair chance to recover oil and gas under his land.
- Determining the value of oil and gas drained by hydraulic fracturing is the kind of issue the litigation process is least equipped to handle. One

difficulty is that the material facts are hidden below miles of rock, making it difficult to ascertain what might have happened. In addition, trial judges and juries cannot take into account social policies, industry operations, and the greater good that are all tremendously important in deciding whether hydraulic fracturing should be allowed. Hydraulic fracturing is not optional; it is essential to the recovery of oil and gas in many areas as with the Barnett Shale in north Texas, which is entirely dependent on hydraulic fracturing, and hydraulic fracturing cannot be performed to both maximize reasonable commercial effectiveness and avoid all drainage. Some drainage is virtually unavoidable.

- The law of capture should not be changed to apply differently to hydraulic fracturing because no one in the industry appears to want or need the change. Amicus curiae briefs to the court from every corner of the industry all opposed liability for hydraulic fracturing. Though hydraulic fracturing has been commonplace in the oil and gas industry for over 60 years, neither the Legislature nor the Railroad Commission has ever seen fit to regulate it. *Garza*, 14-17.

As a result of its holding that the rule of capture prevents a finding of actual injury to Salinas, the claim for trespass by drainage was not actionable. The supreme court did, however, go on to state that the rule of capture cannot be used to shield misconduct that is illegal, malicious, reckless or intended to harm another without commercial justification. *Garza*, 17. Along with these stated exceptions, the oil and gas industry should remain mindful of the court's statement referenced above that "[Salinas] does not claim that the hydraulic fracturing operation damaged his wells or the Vicksburg T formation beneath his property. In sum, Salinas does not claim damages that are recoverable." *Garza*, 13. This dictum is a warning to hydraulic fracture operators that only trespass claims based on drainage are subject to preclusion by the rule of capture, and, therefore, trespass based on damage to adjoining wells or formations may be actionable.[17] In summary, the supreme court in *Garza*:

- held that the rule of capture precludes recovery for drainage of oil and gas resulting from hydraulic fracturing on adjacent property, thereby preventing an action in trespass based on actual damages for drainage,
- reserved for the future the question of whether hydraulic fracturing can give rise to an action for trespass based on nominal damages,

- held that the rule of capture does not shield misconduct that is illegal, malicious, reckless or intended to harm another without commercial justification,[18] and
- suggested that hydraulic fracturing that damages neighboring wells or formations may be actionable trespass.

While *Garza* reserved final judgment on whether trespass could ever qualify as the basis for a claim arising from hydraulic fracturing, it certainly cast strong doubt on any such possibility, because it will generally be difficult, absent a violation of a Railroad Commission rule or order, for a claimant to prove liability and actual damages in a case involving alleged injury to neighboring hydrocarbon wells or formations.

In *FPL Farming Ltd. v. Environmental Processing Systems, L.C.*, 2011 WL 3796612 (Tex. 2011), the Texas Supreme Court held that the issuance of permits by the Texas Commission on Environmental Quality (TCEQ) did not provide immunity to the operator of wastewater injection wells (EPS) against claims by the adjoining property owner (FPL) for tort damages for trespass based on the subsurface migration of waste injected in the permitted wells.[19] The wastewater injection wells were "non-hazardous," but were used to inject wastewater-containing substances such as acetone and naphthalene into salt water zones approximately a mile and a half below the surface and below any drinking water zone, which is normally found at a few hundred feet.

After a contested hearing before the TCEQ, the administrative law judge found that the waste plume would radiate 3,021 feet from the well facility after ten years (a plume that would naturally extend into FPL's subsurface land). The administrative law judge further concluded that FPL had no right to exclude others from the deep subsurface; that FPL's rights would not be impaired by the permits; and operation of the wells would not amount to an unconstitutional taking. The TCEQ approved the permits. FPL appealed to the district court which affirmed the agency's decision, and then to the Austin Court of Appeals which also affirmed the TCEQ's decision.

FPL then filed suit against EPS alleging trespass, negligence and unjust enrichment, and requesting a permanent injunction and damages. After a jury trial the judge entered a take-nothing judgment against FPL. FPL appealed, and the Beaumont Court of Appeals decided the case on the threshold issue of whether FPL could pursue a trespass claim when the TCEQ had approved the permit

allowing EPS to inject the wastewater "and the information before the Commission showed that EPS' waste plume was projected to migrate into the deep subsurface of the formation underlying FPL's property." *FPL Farming*, 305 S.W.3d 739, 742 (Beaumont, Ct. App.). The Beaumont Court of Appeals concluded that EPS was shielded from liability for trespass by the permits. The Texas Supreme Court then granted the FPL's petition for review.

The supreme court held that, as a general rule, a permit granted by an agency does not act to immunize the permit holder from civil tort liability to private parties for actions arising out of the use of the permit. The court went on to say that while "statutory remedies may preempt common law actions or other standards that may set the bar for liability in tort, [generally] a permit is not a get out of tort free card." The court's reasoning is based on its analysis of the policy and purpose of the Injection Well Act that authorized the TCEQ to issue EPS the permit,

> …to maintain the quality of fresh water in the state to the extent consistent with the public health and welfare and the operation of existing industries, taking into consideration the economic development of the state, to prevent underground injection that may pollute fresh water, and to require the use of all reasonable methods to implement this policy. *FPL Farming*, *4.

As a result of this analysis, the supreme court held in *FPL Farming* that a permit to inject wastewater does not prevent adjacent property owners from suing for trespass, because the stated policy and purpose of the enabling Injection Well Act does not indicate any legislative intent to authorize the TCEQ to determine the ownership of the deep subsurface or determine whether authorized migration invades property rights. *FPL Farming*, *4.[20]

In distinguishing this case from its prior opinions in *Manziel* and *Garza*, the supreme court stated, "The case before us is distinguishable on several grounds. Both of those cases [*Manziel* and *Garza*] dealt with the extraction of minerals in the oil and gas industry, and ***thus the rule of capture" applied***. The court when on to state,

> The rule of capture, and administrative deference to agency interpretation, was critical to our holding in *Garza*.[21]…[I]njecting substances to aid in the extraction of minerals serves a different purpose than does injecting wastewater. We held [in *Garza*] that the rule of capture precluded damages for drainage by fracturing, and

thus the Salinases could not recover [in that case]." *FPL Farming*, *6 (emphasis added).

The supreme court also further explained the *Manziel* decision, and emphasized that the court stated there that it was "not confronted with the tort aspects" of subsurface injected water migration, nor did it decide "whether the [Railroad] Commission's authorization of such operations throws a protective cloak around the injecting operator who might otherwise be subjected to the risks of liability." *Manziel*, 566. The *FPL Farming* court stated, "Instead [in *Manziel*], we held that Railroad Commission authorizations of secondary recovery projects are not subject to injunctive relief based on trespass claims." *FPL Farming*, *6.

As *FPL Farming* shows, when there is no "extraction of minerals", the rule of capture does not apply. And, when the rule of capture does not apply, the grounds in *Manziel* and *Garza* are not present. Therefore, when there is no extraction of minerals, the subterranean injection of materials that migrate onto the property of adjacent landowners may constitute a trespass.

In summary, the Texas Supreme Court in *FPL Farming*,

- distinguished between subsurface injection for the extraction of minerals and subsurface injection of wastewater, based on the applicability of the rule of capture in the former situation and its absence in the latter, and
- held that a permit to inject wastewater does not prevent adjacent property owners from suing for trespass, because the stated policy and purpose of the enabling Injection Well Act does not indicate any legislative intent to authorize the TCEQ to determine the ownership of the deep subsurface or whether authorized migration invades property rights,
- arguably implied, based on "deference" to Railroad Commission authority and the importance of the rule of capture, that a future court will not recognize an action for trespass based on nominal damages in the case of hydraulic fracturing.

While the question is still open as to whether other states facing these issues will produce similar dispositions, the rule of capture as applied in the foregoing cases indicates certain outcomes for an operator that hydraulically fractures a shale (or other) formation. In the absence of regulatory or contractual constraints to the contrary, these cases predict that the operator:

- will not be liable in trespass for drainage of neighboring property, as a result of the preclusive effect of the rule of capture;
- will *probably* not be liable in trespass for nominal damages for the migration of hydraulic fracturing liquids onto the subsurface of neighboring property, based on the importance of hydraulic fracturing to the extraction of oil and gas resources and deference to regulatory approval—and, even if nominal damages are allowed, injunctive relief is not likely given the requirements for equitable remedies; and
- will *probably* be liable in trespass for actual damages to wells on, and formations beneath, neighboring property caused by hydraulic fracturing (subject, however, to considerable difficulties in proof and to the rule of capture);

Because *Garza* held that the rule of capture does not shield misconduct that is illegal, malicious, reckless or intended to harm another without commercial justification, the first two bullet points are subject to those exceptions, including violations of Railroad Commission rules or orders.[22] In addition, as with any operator drilling a well, an operator performing hydraulic fracturing in a *negligent* manner may be liable for damage to a common reservoir or a neighbor's property through a negligence claim, without resort to a claim for trespass.[23]

Case law specifically dealing with hydraulic fracturing of shale formations will undoubtedly develop over time. Until then, existing case law involving analogous operations, along with newly promulgated regulations, provide guidance for legal issues arising out of shale gas development. With that guidance, it is therefore critical that an operator obtain an appropriate order for its operations from the relevant agency and that it stay within the guidelines of that order to be protected by the rule of capture and its preclusive effects.

## Section 6. Security Regulation Concerns: An Unforeseen Consequence

A key factor for publicly traded companies to avoid liability relating to shale gas development under the securities laws—whether from the government or private plaintiffs—is making appropriate and timely disclosures of the facts as currently known, and of risks and uncertainties both as to reported facts and as to forward-looking estimates or predictions.[24] Given the relative novelty of shale gas

development technology and the short production histories available relative to the long productive lives assumed in reserve estimates, especially as compared to more mature technologies and methods, and the current uncertainty in the environmental and legal regimes as discussed above, producers must grapple with considerable uncertainty in crafting appropriate disclosures to minimize litigation risks. This section discusses three principal areas of disclosure that will be of great importance to publicly traded companies involved with the exploration and production of shale properties: (1) reporting natural gas reserves; (2) disclosing potential environmental risks and liabilities; and (3) disclosing regulatory risks associated with evolving laws and regulations.

## Reporting Natural Gas Reserves

Recently updated SEC regulations allow drillers to report "proved," "probable" and "possible" gas and oil reserves to investors.[25] This represents a change from prior reporting requirements, where only "proved" reserves were reportable. In some respects, this change is an opportunity for producers, who can classify reserves that they honestly believe are capable of exploitation, but which would not qualify as "proved." However, due to their complex and technical nature, the new reporting standards may at times be more difficult to apply, and having to exercise judgment in classifying reserves means that that judgment can be second-guessed by plaintiffs or regulators. Producers are well advised to treat disclosure of "probable" and "possible" shale reserves with caution.

It is well known that a failure to report reserves accurately can and has proved extremely costly to energy companies. For example, in August 2004, the SEC instituted enforcement actions against Royal Dutch Petroleum Company ("Royal Dutch") and the Shell Transport and Trading Company ("Shell") for allegedly overstating their proved oil reserves and failing to correct the overstatement in a timely fashion.[26] The SEC asserted that Royal Dutch and Shell knowingly or recklessly overstated their proved hydrocarbon reserves by 23% and materially misstated their reserves replacement ratio ("RRR"). Royal Dutch and Shell ultimately consented to paying a $120 million civil penalty and committing an additional $5 million to fund internal compliance programs; it also consented to the imposition of a cease-and-desist order finding violations of the antifraud, internal controls, record-keeping and reporting provisions of the federal securities laws.

While the Royal Dutch case was brought under the old reserves reporting regime, it demonstrates the potential consequences of inaccurately disclosing reserves. It appears that at least some of the alleged Shell overstatements involved reporting certain reserves as "proved" that may have been appropriately classified as "probable" or "possible." However, the new reporting rules do not eliminate the risk illustrated by the Royal Dutch case—in fact, they arguably exacerbate it by requiring not only that reserves be estimated accurately, but also appropriately classified.

The relative novelty of the combined technology of hydraulic fracturing and horizontal drilling in shale may complicate the estimation of shale gas reserves. For other production and extraction techniques, extensive empirical evidence has been collected over a long period of time. The lack of comparable data may make it difficult for shale gas producers to estimate the size of the potential reserves or how efficient the fracing process will be in recovering those reserves over the long run. That problem is particularly relevant in that reserve estimates for shale wells assume relatively long productive lives, with the result that small errors in decline curve projections generated from limited production histories can have potentially significant impact on overall estimates.

The limited production history relative to the assumed productive lives of shale gas wells suggests careful consideration of the scope of disclosure of associated risks, as they may differ from those commonly disclosed in relation to estimates of conventional reserves. While many such disclosures refer to the necessity of reliance on subjective judgment based on available geological, technical, contractual and economic information, it is not difficult to imagine claims that reserves were overstated without disclosure that the estimates rested on historical information that might have been considered not to have been sufficient or that was improperly interpreted. Disclosure of risks set out in publicly available critiques,[27] whether or not they are ultimately well-founded, might prove to be prudent insurance against future claims.

Regulators appear to have taken note of these difficulties. The SEC has in some cases asked companies to revise or supplement statements to investors to better describe the fracing techniques they will be utilizing, including chemicals to be used in fracing fluid—information many oil and gas companies consider proprietary.[28] Further, in July 2011, the SEC sought information from five energy companies engaged in fracing, requesting documents about how the companies calculate and publicly disclose the performance of their shale gas reserves. Still

more recently, two companies were subpoenaed by the SEC in connection with investigations into potential overstatement of their natural gas reserves, while the New York Attorney General, conducting similar investigations, has subpoenaed a number of other companies.[29]

Experience tells us that the risk of plaintiffs' securities law firms pursuing claims against companies that have "disappointing" results is particularly acute where the product or service is the subject of controversy and great media attention, as is the current case with hydraulic fracturing in shale. The problem is exacerbated where there are reports of a "bubble."[30] Again recent experience in the aftermath of the "technology bubble" and the "housing bubble" informs us that the risk of lawsuits to those with proved, probable and possible reserves will be increased where the prices in those holdings are driven up by investments in speculative properties.

To minimize the possibility of liability to shareholders or to regulators, producers will have to pay close attention to the process by which they assess and disclose reserves, and assess and disclose the uncertainties involved with shale production and reserve estimation.

## Disclosing Environmental Risks

As the Deepwater Horizon oil rig disaster in the Gulf of Mexico recently illustrated, even mature and well-understood fuel extraction technology can pose dire and unexpected environmental risks, and create proportional liability. Those risks can be magnified—or appear to be magnified—in the case of newer technology like hydraulic fracturing in shale, and especially where the operations occur in densely populated areas unfamiliar with oil and gas exploration and production operations. Opponents of hydraulic fracturing claim that the process threatens to contaminate ground water, pollute the air and endanger surrounding areas and ecosystems.[31] Proponents point out that there is little, if any, scientific evidence to support these contamination concerns. From a securities perspective, the question is whether these potential environmental risks are properly disclosed to investors. As the environmental debate continues, both federal and state lawmakers have urged government investigation into whether natural gas companies have accurately portrayed the environmental risks of fracing to their investors.[32] A company facing a material environmental event thus faces potential dual liability: direct liability to those injured by an accident, and liability to shareholders who claim to have been misled as to the environmental risks.

Following the Deepwater Horizon spill in the Gulf of Mexico in 2010, BP faced thousands of lawsuits arising from the direct environmental consequences of the oil spill. Its share price plummeted from $59.52 on the eve of the Gulf spill to a low point of $27.02 on June 25, 2011; BP now faces additional shareholder litigation for allegedly making misleading statements regarding its safety efforts.[33] Tokyo Electric Power Co.'s ("TEPCO") stock saw similar declines after the disaster at its Fukushima Daiichi nuclear power plant in March 2011. While the latter does not face the risk of US securities litigation, it appears that shareholders are seeking to be compensated in that case as well. According to sources, more than 40 TEPCO shareholders have made a written request to the firm's auditors to bring suit against 61 current and former directors.[34] They are seeking 5.5 trillion yen in damages (about $70.95 billion), alleging that the directors' negligence resulted in massive losses for the company. If the auditors fail to sue within 60 days, the shareholders may bring suit themselves. Investors in both the BP and TEPCO cases claimed to be surprised by the level of risk to which the companies were exposed.

In addition to spurring investor litigation, these cases were the subject of public outcry and drew the attention of politicians and industry regulators. But regulatory scrutiny was not limited to energy and environmental regulators; in the past, the SEC has proceeded against companies that failed to adequately report the environmental risks posed by their business. In 2006, the SEC obtained a cease and desist order against a petroleum company, after it found that the company had materially understated its financial reserves to satisfy environmental compliance obligations.[35] The company had reduced its estimate of the costs for cleaning up environmental contamination at dozens of sites for which it was responsible by 25%, and such reserves then showed an illusory decrease of almost 7% ($160 million), allowing the company to show an accompanying increase in net income. As a result, the SEC required the company to institute costly procedural changes and additional regulatory requirements. Similarly, in 2007, the SEC brought civil actions against several individual corporate executives, alleging that they improperly reduced the company's reserves for environmental compliance and its related legal obligations in order to compensate for unplanned losses.[36] The SEC found that the company's financial statements were materially misreported. As a result of the action, the executives were subject to both disgorgement of significant sums and large civil penalties.

Undue optimism by reporting entities—or optimism that, in the wake of bad luck, may appear to have been undue—may result in accusations of inadequate disclosure and, ultimately, liability to shareholders or regulators.

## Disclosing Regulatory Risks

As discussed above, environmental regulation is still developing and there is a good deal of uncertainty as to current regulations and to the course of future regulation of hydraulic fracturing in the development of shale gas and liquids. The various laws and regulations being proposed, issued or enacted by federal, state and local governments—and the lack of uniformity or predictability of these laws and regulations and the enforcement or interpretation of them—only makes the task of the reporting entities more difficult. All of this uncertainty creates risk from a securities law perspective.

The diversity of state law regulation of hydraulic fracturing is apparent in the case of the Marcellus Shale, where the affected states are currently trying to determine how to confront the likelihood of large scale drilling and fracing within their borders. A recent article observed that the six states under which the Marcellus Shale sits—New York, Pennsylvania, Maryland, Virginia, West Virginia and Ohio—have adopted six different regulatory approaches to address fracing within state lines.[37]

The second part—the risk of changing regulation—is potentially more significant. Some states, including Arkansas, Pennsylvania, Colorado, Wyoming, Michigan and Texas, have enacted requirements for well construction and location, drilling operation and/or disclosure of the make-up of fracing fluids, but nobody can predict whether the regulatory schemes will remain constant as public opinion evolves.[38] As an example, on August 25, 2011, New Jersey governor Chris Christie, conditionally vetoed a bill that would have completely prohibited fracing in the state, and instead implemented a one-year moratorium on fracing in New Jersey.[39] Christie noted that the US EPA and Department of Energy were still evaluating fracing, making a permanent statutory ban inappropriate.

Nobody yet knows how many current regulations will be interpreted and enforced or how the regulatory landscape will look over the next few years, and this is precisely the risk: no operator can predict with absolute certainty how feasible operations will be in any jurisdiction into the future. It is not unheard of for political considerations to outweigh scientific considerations. Current or

imminent wells that are perfectly proper may be made impractical or more expensive by future regulation, or prohibited outright. This risk should be appropriately recognized in any disclosures.

## Section 7. Conclusion

The advancements in technology that have created large growth in shale gas development give promise to great increases in abundant, clean and available domestic energy supplies. These advancements, however, have created a great deal of controversy and public attention. While some of the controversy may be rooted in hostility towards further hydrocarbon-based energy sources, the concerns of others may be genuine. Experience informs us that where such controversy and attention exists, legal risks follow. A producer of shale gas should understand the legal risks and take precautions to mitigate those risks. Environmental legal risks and the risks of claims of trespass are two legal risks that concern any one involved with shale gas exploration and production. The political, regulatory and legal regimes that will affect shale gas development are still evolving. The uncertainty caused by these evolving regimes gives rise to risks to the publicly traded company under the securities laws, which should be accounted for appropriately in the company's disclosures of its risk factors.

## Endnotes

1 Translated from, "*Cuius est solum eius est usque ad coelum et ad inferos.*"

2 The permeability of shale is extremely low, 6-9 orders of magnitude less than conventional deposits typically found in more porous sandstones. This permeability is so low that even with modern hydraulic fracturing techniques, the recovery factor of shale deposits is typically less than 1-2%, according to industry sources.

3 Shale Gas Production Subcommittee Ninety Day Report, Secretary of Energy Advisory Board ("SEAB"), US Department of Energy (August 11, 2011), also known as the "Department of Energy Initial Report".

4 Conventional hydraulic fracturing at shallower depths has been practiced by the oil and gas industry since the late 1940s, and includes fracturing for primary production in "tight" sandstone formations and secondary production in older, depleted fields.

5 The Safe Drinking Water Act's ("SDWA's") Underground Injection Control Program governs underground injection activities, including "Class II" wells related to oil and gas production. However, unless diesel fuel is used, hydraulic fracturing is currently expressly exempt from the SDWA. If the FRAC Act passes, the US EPA would be required to promulgate nationwide minimum requirements for hydraulic fracturing activities.

6 US EPA entered into a Memorandum of Agreement in 2003 with several service companies to eliminate diesel fuel from hydraulic fracturing fluids injected into coalbed methane production wells. In 2005,

Congress amended the Safe Drinking Water Act expressly to exclude "the underground injection of fluids or propping agents (other than diesel fuels) pursuant to hydraulic fracturing operations related to oil, gas, or geothermal production activities" from underground injection control ("UIC") permitting obligations.

7 Regarding air pollution, on July 28, 2011, the US EPA proposed new source performance standards (NSPS) for volatile organic compound (VOC) and methane emissions from certain natural gas operations, specifically including hydraulically fractured wells. According to US EPA, these emissions into the atmosphere offset some of the greenhouse benefits of using natural gas as fuel.

8 While portions of the fracturing industry initially opposed revealing the specific identity of fracturing constituents in order to protect trade secrets, several fracturing specialists have agreed to provide such information, and a number of States have imposed disclosure obligations. The balancing between protection of trade secrets and the public's right to know remains controversial.

9 The Department of Energy Final Report at 5-6. The Shale Gas Subcommittee's Second Ninety Day Report, Secretary of Energy Advisory Board, US Department of Energy (November 18, 2011), also known as the "Department of Energy Final Report" (as distinguished from the Subcommittee's Ninety Day Report known as the "Department of Energy Initial Report" (August 11, 2011)).

10 When the results of the study were first released, it was reported that five of 16 water wells within 2500 feet of drilled sites, and two of 26 water wells within 2500 feet of sites that were both drilled and hydraulically fractured, contained detectable bromide after the production activities, but not before. The researchers have since advised that the lab erred in analyzing bromide concentrations; bromide appeared only in a single well, which also was the one location with an increase in other water quality parameters commonly associated with gas drilling wastes (e.g., TDS, barium, chloride). Follow-up testing at this well 10 months later showed that nearly all parameters, including bromide, largely had returned to pre-drilling concentrations. All of the findings apparently are being reviewed, and a revised report is expected.

11 The researchers also concluded that, on a regional level, elevated methane concentrations in groundwater are a function of geologic features, rather than shale gas development. See L.J. Molofsky *et al.*, *Methane in Pennsylvania water wells unrelated to Marcellus shale fracturing*, Oil & Gas Journal at 64-67 (December 5, 2011).

12 There are two basic theories in the United States for ownership interests in oil and gas. Texas and other states follow the "ownership in place" theory for oil and gas whereby the landowner has a corporeal possessory interest in oil and gas (similar to "fee simple"), but such ownership is a "determinable fee subject to the rule of capture". Oklahoma and other states follow the "exclusive right to take" theory, where the landowner does not own the oil and gas under his land, but merely retains the "exclusive right to take", a non-corporeal interest. However, the Oklahoma theory also follows the "rule of capture" as set forth in the *Garza* and *Manziel* cases discussed in this paper. See *Fransen v. Conoco*, 64 F.3d 1481, 1491 (Tenth Cir. 1995); *Atlantic Richfield Co. v. Tomlinson*, 859 P.2d. 1088, 1094-1096 (Okla. 1993); *Haymaker v. OCC*, 731 P.2d. 1008, 1012 (Okla. 1986); *Kuykendall v. OCC*, 634 P.2d 711, 716 (Okla. 1981); and *Wood Oil Co. v. OCC*, 239 P.2d 1023 (Okla. 1950).

13 An "irregular" interval is a distance of less than the 660 feet from the well to the lease line generally required by the Texas Railroad Commission's field rules for the subject field.

14 While *Manziel* addressed material injected for secondary recovery, there is no apparent reason in principle why materials injected for secondary recovery should be treated differently than material injected for primary recovery operations such as hydraulic fracturing of shale fields.

15 The jury's trespass finding resulted in damages for lost royalty because Coastal leased the minerals on Share 13 from Salinas.

16 The court held, however, that there was no evidence in the record that a reasonably prudent operator should have prevented any portion of the total amount of drainage due to the fracing of the Coastal Fee No. 1. As a result, the court overruled the $1.75 million verdict for failure to reasonably develop Share 13.

17 *Garza* did not clarify what is meant by "damage to wells on neighboring property or formations beneath neighboring property" as the plaintiffs in *Manziel* and *Garza* did not claim any such damages. However, *Elliff* and *HECI* provide examples in this area; see endnote 14, *infra*.

18 *Garza* does not appear to overrule cases that limit the application of the rule of capture to "legitimate operations." See, *DSTJ, LLP. v. M&M Resources, Inc.* (memorandum opinion), 2008 WL 659571 (Tex. App. Beaumont, 2008) (in discussing the rule of capture in reference to "conservation statutes and orders of the [Texas] Railroad Commission", stating that "no owner should be permitted to carry on his operations in reckless or lawless irresponsibility") and *SWEPI, LP. v. Camden Resources, Inc.*, 139 S.W.3d 332 (Tex. App. San Antonio, 2004) (holding that the rule of capture only extends to oil and gas that is legally recovered) in the conjunction with *Exxon Corporation v. Emerald Oil & Gas Co. L.C.*, 331 S.W.3d 419 (Tex., rehearing decided 2010) (holding that Section 85.321 of the Texas Natural Resources Code provides a private cause of action for violation of a valid rule or order of the Railroad Commission, a law of the state prohibiting waste, or Chapter 85 of the Code).

19 Under the Injection Well Act, now found at Section 27 of the Water Code, the well injection of industrial waste is regulated by the TCEQ and the injection of oil and gas waste by the Railroad Commission.

20 The supreme court also cited as separate reasons, the statutory language of Section 27.104 of the Texas Water Code and Section 305.122 (c) of the Texas Administrative Code, the latter providing, "The issuance of a permit does not authorize any injury to persons or property or an invasion of other property rights… which is where the tort of trespass falls." *FPL Farming*, *5.

21 The rule of capture was critical in *Garza*, but not "critical" in *Manziel*, as the latter was also based on the independent ground that "[t]he technical rules of trespass have no place in the consideration of the validity of the orders of the [Railroad] Commission" and "[w]e made the point in *Manziel* that we were not deciding whether a permit holder is immunized from trespass liability by virtue of the permit." *FPL Farming*, *6.

22 See endnote 18, *supra*.

23 Notwithstanding the preclusive effect of the rule of capture, adjacent property owners may sue a driller who negligently damages a common reservoir or the neighbor's property. *Elliff v. Texon Drilling Co.*, 210 S.W.2d 558, 562-563 (1948) (The defendants negligently failed to use drilling mud of sufficient weight resulting in a well blowout that created a fissure that expanded onto the neighboring property and destroyed the plaintiff's well and released a huge quantity of gas from the formation into the air); and *HECI Exploration Co. v. Neel*, 982 S.W.2d 881, 886-888 (Tex. 1998) (Based on a cause of action for damages to a reservoir caused by a third party's illegal overproduction of its well in excess of Railroad Commission rules that caused oil to migrate into the gas cap overlying the common oil reserve, thereby diminishing the amount of oil and gas that could be recovered from the well. The record reflects that the injury was not the result of drainage, but rather the reservoir itself was damaged due to the overproduction.) There is no reason to believe a cause of action for negligence by adjacent property owners may not also apply to hydraulic fracturing in appropriate circumstances. See *Irgens v. Mobil Oil Corp.*, 442 N.W.2d 223 (N.D., 1989) (holding a lessee liable for breach of implied obligation to its lessor to develop and operate the lease in a reasonable and prudent manner when the lessee utilized hydraulic fracturing instead of acidizing near a water-bearing zone, resulting in lessor's well producing too much water and too little oil to be commercially feasible, reversed on other grounds).

24 See 17 C.F.R. 229.503(c) (Requiring the disclosure of "risk factors" that make an offering potentially risky or speculative).

25 17 C.F.R. pt. 210, 211, 229, 249; See also Press Release, SEC, SEC Modernizes Oil and Gas Reporting Requirements to Provide Investors with More Meaningful and Comprehensive Disclosure (Dec. 29, 2008), available at http://www.sec.gov/news/press/2008/2008-304.htm.

26 Cease and Desist Order *In re Royal Dutch Petroleum Co. and the "Shell" Transport and Trading Co.*, Exchange Act Release No. 50,233 (Aug. 24, 2004).

27 See, for example, Arthur E. Berman and Lynn F. Pittinger, "US Shale Gas: Less Abundance, Higher Cost," *The Oil Drum*, August 5, 2011, available at http://www.energybulletin.net/stories/2011-08-05/us-shale-gas-less-abundance-higher-cost.

28 See SEC Request Letters, available at http://searchwww.sec.gov/EDGARFSClient/jsp/EDGAR_MainAccess.jsp?search_text=hydraulic%20fracturing&sort=Date&formType=FormUPLOAD&isAdv=true&stemming=true&numResults=10&numResults=10.

29 Deborah Solomon, "SEC Bears Down on Fracing," *The Wall Street Journal* (August 25, 2011).

30 See, e.g., Joe Carroll and Jim Polson, "Shale Bubble Inflates on Near-Record Prices for Untested Fields" Bloomberg News (January 9, 2012).

31 See Department of Energy Report at endnote 9, *supra*.

32 Ian Urbina, "Lawmakers Seek Inquiry of Natural Gas Industry," *The New York Times* (June 28, 2011).

33 See, e.g., *In re BP, PLC Securities Litigation*, 758 F. Supp.2d 428 (S.D. Tex. 2010) (Consolidating the following BP securities class actions: *Ludlow v. BP PLC*, Case No. 10-CV-3043, *Johnson Inv. Counsel Inc. v. BP PLC*, Case No. 10-cv-3044, *Yuen v. BP PLC*, Case No. 10-CV-3049, *Greenfield v. BP PLC*, Case No. 10-CV-3448, *McClurg v. BP PLC*, Case No. 10-CV-3449, *Oklahoma Police Pension & Ret. Sys. v. BP PLC*, Case No. 10-CV-3452, *Safe v. British Petroleum*, Case No. 10-CV-4675).

34 TEPCO Shareholders Demand Directors Pay for Mistakes, The Asahi Shimbun (November 15, 2011), available at http://ajw.asahi.com/article/0311disaster/fukushima/AJ201111150036.

35 *In re Ashland Inc. and William C. Olasin*, Exchange Act Release No. 54830, Accounting and Auditing Release No. 2518, Administrative Proceeding File No. 3-12487 (Nov. 29, 2006). Note that in this context "reserves" refers to financial accounting reserves for contingent liabilities, rather than to oil or gas reserves.

36 *Securities and Exchange Commission v. James P. O'Donnell, et al.*, United States District Court for the District of Colorado, Civil Action, No. 07-CV-01373; Litigation Release No. 20176, Accounting and Auditing Release No. 2629 (June 29, 2007).

37 Jayne Risk and Adam Brown, *Marcellus Shale Strategies—State by State, Law*360 (Nov. 23, 2011), available at http://www.law360.com/energy/articles/287712.

38 For an outline of state legislation regulating hydraulic fracturing, see "Fracing Update: What States are Doing to Ensure Safe Natural Gas Extraction," National Conference of State Legislatures, available at http://www.ncsl.org/?tabid=23224.

39 Press Release, "Governor Chris Christie Stands Up for Sound Policymaking By Issuing One-Year Moratorium on Fracing," (conditionally vetoing S-2576) (Aug. 25, 2011), available athttp://www.state.nj.us/governor/news/news/552011/approved/20110825c.html

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