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QUENCH MY THIRST: WATER RIGHTS IN THE CONTEXT OF WATER TREATMENT TECHNOLOGIES

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BIOGRAPHICAL INFORMATION

Peter E. Hosey

Peter E. Hosey is a Partner in the San Antonio, Texas office of Jackson Walker L.L.P. He received a Bachelor of Arts degree from The University of Texas at El Paso in 1976, and is a 1979 graduate of St. Mary's University School of Law. He practices primarily in the areas of oil, gas and mineral law, title and transactional matters, real estate law, business law, and international business law. Since 1998, he has served on the Joint Editorial Board for the development of the Texas Title Examinations Standards established by the Real Property, Probate and Trust Law and Oil, Gas and Energy Resources Law Sections of the State Bar of Texas, which are published in the Texas Property Code. He is a member of the San Antonio Bar Association (has served several times as President and Treasurer of the Natural Resources Committee of the San Antonio Bar Association), a member of the American Bar Association and the State Bar of Texas. He is also a member of the College of the State Bar of Texas. Mr. Hosey is a frequent lecturer around the State of Texas at various CLE sponsored events concerning oil and gas issues, land titles, title insurance and other real estate related topics, including writing articles for and speaking at the 50th Annual Rocky Mountain Mineral Law Institute, the 23rd, the 29th the 32nd and 33rd Annual Advanced Oil, Gas and Energy Resources Law Courses, and the 33rd, 35th, 37th, and 42nd Annual Ernest E. Smith Oil, Gas and Mineral Law Institutes. Mr. Hosey has also written articles for the Section Report of the Oil, Gas and Energy Resources Law Section of the State Bar of Texas (December 2008 and June 2011) and wrote an article in the November 14, 2011, edition of the *Texas Lawyer* magazine on representing land owners in oil and gas leasing transactions. He also wrote *"Follow the Money!" Oil and Gas Leases and Division Orders*, *"To Whom it May Concern" - Title To The Title Opinion and the Duty of the Examiner*, *Title To Uranium and Other Minerals (Still Crazy After All These Years)*, *"Are We There Yet?" The Start and Finish of an Oil and Gas Lease, "What Am I Still Missing?" Mineral Title Examination and Due Diligence: Additional Selected Pitfalls and Problems, "Come Out, Come Out Wherever You Are:" Constructive Notice of Unrecorded Agreements in Oil and Gas Titles, Quench My Thirst: Water Rights in the Context of Water Treatment Technologies,* which was co-written with Jesse Lotay and published in the Oil, Gas and Energy Resources Law Section Report, Winter 2013, and *"Where There is a Well There is a Way:" Out Tract Title Issues Regarding Horizontal Wells.* He is a member of the Council of the Oil, Gas and Energy Resources Law Section of the State Bar of Texas, and has served as Editor of the Section Report, Treasurer, Secretary and Vice-Chair, and he is currently serving as the Chair-Elect. Mr. Hosey is an Adjunct Professor of Law at St. Mary's University School of Law, teaching Texas Land Titles. Mr. Hosey was named a San Antonio "Best Lawyer" by *Scene in S.A.* (2007-2009) and a "Super Lawyer" (2009-2011) by Thomson Reuters and has been named a "Who's Who in Energy (2012-2014). In 2011, he was named an "Outstanding Lawyer" by the *San Antonio Business Journal*. Mr. Hosey is a Life Sustaining Fellow of the Texas Bar Foundation and was the 2013 Distinguished Graduate of St Mary's University School of Law.

Jesse S. Lotay

Jesse S. Lotay is a partner in Jackson Walker L.L.P.'s Energy, Commodities & Derivatives, and Corporate & Securities Practices. His practice concentrates in the area of energy transactions where he handles upstream exploration and production activities, and the acquisition and sale of crude storage, pipeline, refinery, terminal, transportation, and other energy infrastructure assets.

Mr. Lotay's practice additionally concentrates in the area of energy financing. His practice includes experience in asset-based and commercial lending, capital markets, securitization, and structured finance where he focuses on derivatives transactions, including assessing and minimizing credit risk across transactions, and trading physical and financial products under ISDA Master Agreements and related ancillary documents.

Mr. Lotay is a member of the State Bar of Texas Oil, Gas and Energy Resources Law Section. He is also a member of the Association of International Petroleum Negotiators and the Trinity University Bar Association. Mr. Lotay wrote "Subprime Carbon: Fashioning An Appropriate Regulatory And Legislative Response To The Emerging U.S. Carbon Market To Avoid A Repeat Of History In Carbon Structured Finance And Derivative Instruments," *32 Houston J. Int'l. Law 459* (2010)

Mr. Lotay received a Master of Laws (LL.M.) from the University of Houston in 2009 where he concentrated in energy, environment, and natural resources.

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I. INTRODUCTION

Since its introduction to the oil and gas industry more than 60 years ago,[1] hydraulic fracturing has become one of the most significant developments in the production of oil and gas resources. Several years ago, the American Petroleum Institute and the Environmental Protection Agency estimate that 35,000 wells are hydraulically fractured in the U.S. annually, and over one million wells have been hydraulically fractured since its introduction in the 1940s.[2] It is now estimated that 90% of all wells drilled in the U.S. today are stimulated by hydraulic fracturing,[3] bringing U.S. oil and gas production to its highest levels in more than 14 years.[4] Although diminished in recent years as a result of the collapse of the price of oil, the importance of hydraulic fracturing cannot be overstated. As conventional sources of domestic hydrocarbons are depleted and become less accessible by traditional exploration and production methods, new technologies like hydraulic fracturing that enable cost-effective production of hydrocarbons from non-conventional sources are becoming increasingly important.

Hydraulic fracturing involves the use of water—*lots of water*—and it is in this context that this paper focuses. The volume of water consumed by hydraulic fracturing is dependent on several factors, including the geology of the particular formation, the characteristics of the water being used, the number of stages in the hydraulic fracturing operation, and the length of the well lateral. It is estimated that an entire hydraulic fracturing operation in the Barnett, Fayetteville, Haynesville, or Marcellus Shale requires between 2.3 to 3.8 million gallons of water per well, and in the Eagle Ford Shale, 3.2 to 6 million gallons of water per well.[5] Based on the estimate that 35,000 wells were hydraulically fractured in the U.S. annually, it is believed that between 70 billion and 140 billion gallons of water were consumed through hydraulic fracturing each year—this is equivalent to the same amount of water annually consumed by the cities of Chicago or Houston.[6]

While the volume of water used by hydraulic fracturing is relatively low when compared to other uses of water,[7] it nevertheless faces growing regulatory

* Many thanks to Brenda Eckert and Eve Searls for their diligence and hard work in the preparation of this paper.

1 Hydraulic fracturing was developed and patented by Stanolind Oil Company and first used to stimulate an oil well site near Duncan, Oklahoma on March 17, 1949. Mark McPherson, *Water Use and Water Law in Texas from an Oil and Gas Perspective*, 44 Tex. Tech L. Rev. 939, 942 (2012).

2 American Petroleum Institute, *Water Management Associated with Hydraulic Fracturing* vi, API Guidance Document HF2 (1st ed., June 2010); Alison Sider, Russell Gold & Ben Lefebvre, *Drillers Begin Reusing 'Frack Water': Energy Firms Explore Recycling Options for an Industry That Consumes Water on Pace With Chicago*, Wall St. J., Nov. 19, 2012, at B1.

3 Range Resources Corporation, *Range Answers Questions on Hydraulic Fracturing Process*, http://web.archive.org/web/20140903090846/http://www.rangeresources.com/Media-Center/Featured-Stories/Range-Answers-Questions-on-Hydraulic-Fracturing-Pr.aspx (last visited March 8, 2017).

4 Sider, Gold & Lefebvre, *supra* note 2, at B1.

5 Darrell T. Brownlow, *Water Usage in the Development of the Eagle Ford Shale*, Univ. of Tex. 38th Annual Ernest E. Smith Oil, Gas and Mineral Law Conference, (Mar. 30, 2012); Leonard H. Dougal, *Hydraulic Fracturing: Production Boom and Water Resource Challenges* 21, Texas Water Law Conference (Sept. 11, 2012); Leonard H. Dougal, *Shale Play Hydraulic Fracturing: Water Quality and Supply Issues* 27, Texas Rural Water Association Technical Conference (July 14, 2011); Russell Gold & Ana Campoy, *Oil's Growing Thirst for Water,* Wall St. J., Dec. 6, 2011; U.S. Department of Energy, *Modern Shale Gas Development in the United States: A Primer* Ex. 37 (April 2009), https://energy.gov/fe/downloads/modern-shale-gas-development-united-states-primer.

6 American Petroleum Institute, *supra* note 2, at vi; Sider, Gold & Lefebvre, *supra* note 2, at B1.

7 An average golf course requires 3 to 4 million gallons of water every nine days. Conversely, hydraulic fracturing is often a one-time occurrence per well which may, in the case of a gas well for example, yield production for 50 years or more, thus creating ongoing payment streams for both private and public benefit. Range Resources Corporation, *supra* note 3; *see* Gold & Campoy, *supra* note 5; Water Conservation & Technology Center, *Fact Sheet Planning Component 8: The Eagle Ford Hydraulic Fracturing Water Planning*

and political pressure from an increasingly environmentally conscious and water dependent society. As a result, a significant component of hydraulic fracturing involves securing timely and reliable access to sufficient water resources.[8] Competition between agricultural, commercial, industrial, municipal, oilfield, and other water uses as well as seasonal variations in precipitation make it difficult to satisfy the coexisting demand for water resources.[9] Unsurprisingly, the use of large volumes of finite water resources for hydraulic fracturing is controversial.

Further exacerbating this controversy is the permanent removal from the hydrologic cycle of large volumes of wastewater generated by hydraulic fracturing and disposed of by disposal injection well. Water used in hydraulic fracturing is pre-treated with formation-specific chemical additives.[10] These additives include anti-corrosive agents, biocides, friction reducers, lubricants, surfactant and clay stabilizers, and other chemicals and substances.[11] The combination of these additives enables a propping agent to easily be carried into and hold open fractures in the formation created by hydraulic pressure, thus permitting hydrocarbons to move more freely out of the formation into the wellbore and to the surface.[12] Though these additives comprise a small percentage of the overall volume of water used in hydraulic fracturing, it is enough to generally render the return water (known as "flowback water") non-potable and unusable. Flowback water may additionally contain "produced water"—the native oilfield brine existing within the formation itself before hydraulic fracturing occurs. Produced water may contain unique, pre-existing contaminants native to the formation, including barium, calcium, chloride, iron, magnesium, naturally occurring radioactive materials, saline, and sulfur. While the overall characteristics of flowback water vary by geologic basin and specific rock strata, it typically contains concentrations of chemical additives and contaminants that require the mineral estate owner or the mineral lessee to take appropriate measures to ensure its proper handling and disposal. The most common method of disposing wastewater is by disposal well injection into porous formations thousands of feet underground.[13] Since there exists an

Services (Texas A&M Univ., Jan. 2013)(on file with author). The U.S. Department of Energy reports that water volumes needed to hydraulically fracture a well generally comprise less than 0.8% of a given water basin. U.S. Dept. of Energy, *supra* note 5, at 65; *see also* Ed Ireland, *Water Use in the Barnett Shale,* Barnett Shale Energy Educ. Council, http://www.bseec.org/water_use_in_the_barnett_shale (last visited March 8, 2017). Dr. Darrell Brownlow reports that it takes 407 million gallons to irrigate 640 acres and grow about $200,000 worth of corn on arid South Texas land. The same amount of water can be used for hydraulic fracturing and generate $2.5 billion worth of oil. Gold & Campoy, *supra* note 5.

8 American Petroleum Institute, *supra* note 2, at 12; Gold & Campoy, *supra* note 5.

9 U.S. Dept. of Energy, *supra* note 5, at 65.

10 Hydraulic fracturing fluid typically consists of between 3 to 12 chemical additives. The volumetric composition of this fluid is generally comprised of 99.51% water and sand, and 0.49% other additives. McPherson, *supra* note 1, at 2; U.S. Dept. of Energy, *supra* note 5, at 61–62.

11 Railroad Commission of Texas, *Barnett Shale: Water Use in Association with Oil and Gas Activities Regulated by the Railroad Commission of Texas* (on file with author); U.S. Dept. of Energy, *supra* note 5, at 61.

12 Railroad Commission of Texas, *supra* note 11.

13 The Texas Railroad Commission holds primary enforcement responsibility of the state's Underground Injection Control Program and the authority to grant disposal well permits. When utilizing disposal wells, mineral interest owners can expect to encounter other obstacles in addition to cost, including obtaining approval of disposal well applications, disposal well construction standards, ongoing reporting requirements, and availability of suitable injection sites. Alternatives to disposing of wastewater by disposal well are generally limited to municipal or industrial treatment facilities, and/or placement into evaporation ponds on the surface estate. However, these alternatives also involve burdensome obstacles.

For municipal or industrial treatment facilities these burdens include the availability, capacity, and capability of these treatment facilities to adequately treat millions of gallons of wastewater from oilfield operations. Additionally, municipal treatment facilities face increasing regulatory restrictions on acceptance of wastewater and are often required to obtain approval from regulatory authorities prior to acceptance and receipt of industrial pollutants such as wastewater from oilfield operations. Even when approval is granted, treatment facilities must continually ensure that water quality standards are maintained at all times and that treatment of such pollutants do not interfere with available public water supplies or disturb existing aquatic eco-systems. For evaporation ponds these burdens include potential contamination of other water resources caused by leaks in underground pond liners, harm to livestock and crops that come in contact with wastewater, and disposal of solids

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