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Stephan Owings

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ONE MAN'S TRASH IS HIS COMMUNITY'S TREASURE: OWNERSHIP AND USES OF PRODUCED BRINE

STEPHAN OWINGS*

I. Introduction

The importance of the saltwater (brine) produced from oil and gas operations predates oil and gas recovery efforts. Before the usefulness of oil and gas was discovered, saltwater wells were drilled to obtain salts.¹ In fact, when oil or gas was discovered in the saltwater wells, its presence was considered a nuisance to the saltwater recovery operations.² More recently, the opposite has been true with the astronomical rise in value of fossil fuels. Presently, however, members of the oil and gas industry have found innovative ways to make positive use of the brine which has otherwise previously been considered nearly valueless. The impediment to further exploiting the brine to its fullest economic and socially constructive potential is a legal ambiguity present in many states as to whether a surface owner or mineral owner owns the brine. This article will explore the law across the nation related to produced brine ownership as well as make a

* The author is an Enid, Oklahoma native. He graduated from Chisholm High School and attended undergraduate studies at Oklahoma State University where he studied Russian language and literature. After graduation, he attended the University of Oklahoma College of Law with ambition to start a career in oil and gas litigation.

1. *History of Produced Water*, PETROWIKI, (last visited May 17, 2018) http://petrowiki.org/History_of_produced_water. *See also*, Wood County Petroleum Co. v. West Va. Transp. Co., 28 W.Va. 210 (W. Va. 1886).

2. *Id.*

recommendation as to how the ambiguity in its ownership should be resolved.

When oil or natural gas are produced from drilling into a reservoir deep in the earth, a large amount of brine is also pulled up with it.³ Depending on which reservoir formation has been drilled into, how it has been drilled, what place in the formation has been drilled, and whether the well has been secondarily or tertiarily developed, the amount of brine water will vary widely.⁴ For example, the Permian Basin in west Texas, a very old source of oil and gas, produces significantly more water than other formations in Texas such as the Barnett Shale or Eagle Ford.⁵ Texas is the state with the highest production of oil and gas as well as produced brine.⁶ Fresh potable water is abundant in some parts of Texas, but in west Texas, particularly in rural areas, freshwater can be quite scarce.⁷ The enterprise of drilling for and producing oil and gas itself consumes a considerable amount of water, exacerbating the problem.⁸ Given the scarcity of freshwater and abundance of produced brine from oil and gas wells, one may assume that the need for freshwater could be met by refining and filtering the produced brine for the benefit of both the community and oil and gas well operators.⁹ The operator's situation with the brine, however, is unfortunately much more complicated and challenging than a simple model of supply and demand because of ambiguity in the law.¹⁰

A. Properties of Produced Brine

Brine produced from oil and gas drilling and development can have widely varying volume and Total Dissolved Solids (TDS) concentration.¹¹ The variance in TDS concentration depends largely on the location of the formation.¹² For instance, brine from formations in Texas on average have a

3. Task Force on Environmental and Community Impacts of Shale Development in Texas, *Environmental and Community Impacts of Shale Development in Texas*, THE ACADEMY OF MEDICINE, ENGINEERING AND SCIENCE OF TEXAS (2017), at 117.

4. *Id.*

5. *Id.* at 116.

6. Linda Capuano, *Energy-Water Nexus: Water Resource Sustainability*, CENTER FOR ENERGY STUDIES: RICE UNIVERSITY'S BAKER INSTITUTE FOR PUBLIC POLICY (2017).

7. THE ACADEMY OF MEDICINE, ENGINEERING AND SCIENCE OF TEXAS, *supra* note 3, at 116–18.

8. *Id.* at 116–17.

9. *Id.* at 118.

10. *Id.* at 119.

11. *Id.*

12. *Id.*

TDS concentration of over 100,000 mg/l whereas some formations in California have significantly less TDS concentration.¹³ The TDS concentration of the brine significantly impacts the prospective value and uses that brine is fit for, as discussed later in this article.¹⁴ The solids that are found dissolved in the brine are primarily soluble salts made up of elements such as chlorine, iodine, lithium, sodium, zinc, and magnesium.¹⁵ In trace amounts these chemicals are relatively harmless if consumed, but the amounts present in produced brine are extremely toxic to human, plant, and animal life.¹⁶ To put the concentration of dissolved solids present in produced brine (100,000 mg/l) into perspective, the TDS concentration of ocean water is around 33,000 mg/l.¹⁷

B. Hazards Associated with Produced Brine

The elements within produced brine are often very corrosive to metal pipes or other metal containers, so it is often stored underground.¹⁸ The underground storage of such toxic brine can cause serious concerns over seepage into groundwater aquifers used for human consumption, although such seepage is unlikely.¹⁹ Transportation of the produced brine to underground wells can also be hazardous.²⁰ If the brine is stored and transported by commercial trucking or train, accidents can cause catastrophic harm in terms of physical damage to both humans and the environment.²¹ To remedy the damage to the surface environment caused by exposure to produced brine, the responsible entity must furnish extra topsoil where the spill occurred in order to avoid substantial erosion of the surface soil.²² When brine spills, the constituent water eventually evaporates, leaving the solutes behind in the soil.²³ The various salts left behind will intermingle with the topsoil and plants and draw out water from

13. *Id.* at 118, 125–26.

14. *Id.* at 125–26.

15. Joseph Dancy, *Oil & Gas Environmental Law: Energy, Environmental & Property Law Issues*, OU COLLEGE OF LAW, at 17–18 (last visited May 17, 2018), <http://www.lsgifund.com/OU/Text2017.pdf>.

16. *Id.*

17. THE ACADEMY OF MEDICINE, ENGINEERING AND SCIENCE OF TEXAS, *supra* note 3 at 118.

18. *Id.*

19. *Id.*

20. *Id.* at 118–19.

21. Dancy, *supra* note 15, at 50–52.

22. *Id.*

23. *Id.*

them, depriving plant life of water and causing the soil to become brittle.²⁴ The weakened soil, without plants to hold it down, will erode substantially and be incapable of sustaining agricultural use.²⁵

If the brine is transported by pipeline, metal in the pipe can be corroded by the elements within the brine, which is exacerbated by the relatively high heat of the brine as it leaves the well (~200°F).²⁶ Pipelines must be closely monitored and maintained in order to prevent leakage from causing shallow underground seepage that could drain into local groundwater.²⁷ If the produced brine intermingles with fresh groundwater sources, there is almost no remedy for the pollution except for waiting until the source naturally flushes away the contamination, which can take hundreds of years.²⁸

Another method of disposing of produced brine is depositing it on the surface of the same leased area where the well was drilled to form a pond-like area.²⁹ The surface deposition is considerably more dangerous than subsurface injection for many reasons.³⁰ The brine is highly toxic to plants and animals, and will very likely kill anything that is unwitting enough to partake of it.³¹ The brine may also diffuse into the soil and pollute groundwater sources in the area.³² This method of disposal contains a higher risk of damage to land and life.³³

Typically, after the brine is transported to wherever the disposal well destination is, the brine is injected into a well designed to confine the brine without allowing it to drain into deeper depths or the surrounding soil.³⁴ The well is then capped and left.³⁵ There is a slight risk of drainage due to poor well casing or capping, but overall it is the safest option for storing

24. *Id.*

25. *Id.*

26. THE ACADEMY OF MEDICINE, ENGINEERING AND SCIENCE OF TEXAS, *supra* note 3, at 120-22, 126. *See also*, *Produced Water Properties*, PETROWIKI (last visited May 17, 2018), http://petrowiki.org/Produced_water_properties.

27. *Id.*

28. Dancy, *supra* note 15, at 50-52.

29. *Id.* at 17-18.

30. *Id.*

31. *Id.*

32. *Id.*

33. *Id.*

34. THE ACADEMY OF MEDICINE, ENGINEERING AND SCIENCE OF TEXAS, *supra* note 3, at 125-26.

35. *Id.*

produced brine.³⁶ A severe drawback, however, is that the brine injection process is now thought to induce seismic activity.³⁷ The activity varies in strength and may cause effects ranging from slight tremors to earthquakes powerful enough to damage susceptible property.³⁸

C. Current Uses of Produced Water

For many years, produced brine was disposed of as a useless waste material that happened to accompany oil or gas production.³⁹ Recently, however, oil and gas companies began looking for ways to make positive use of the brine to reduce their demand for freshwater in scarce areas.⁴⁰ For example, many rural areas near the Permian Basin are deficient in both surface and ground-based freshwater resources.⁴¹ Oil and gas companies operating in the Permian Basin require a substantial amount of fluid for creating drilling mud, waterflooding and hydraulic fracturing wells, so their drain upon the scarce water resources of rural areas is a significant burden.⁴² To ease the burden, companies have filtered the produced brine and mixed it with freshwater to make it usable for hydraulic fracturing.⁴³ The water from the brine only has a limited use in hydraulic fracturing, however.⁴⁴ If gelled fluid is required for the hydraulic fracturing of a well, the use of filtered or diluted produced water is inefficient because the gelling substance is sensitive to the solutes in the brine.⁴⁵ If the well requires “slick water fracturing”, then treated produced brine can be used because the solutes do not react with the reagents used to create the slick water.⁴⁶

Even in water-deficient areas, the treatment and use of produced brine for oil and gas production operations may presently be uneconomic for some operators.⁴⁷ The filtration and transportation costs associated with produced brine are formidable, with somewhat limited uses and higher

36. *Id.*

37. *Id.* at 120.

38. *Id.*

39. PETROWIKI, *supra* note 1.

40. THE ACADEMY OF MEDICINE, ENGINEERING AND SCIENCE OF TEXAS, *supra* note 3, at 125–26.

41. *Id.* at 117.

42. *Id.*

43. *Id.* at 118.

44. *Id.*

45. *Id.*

46. *Id.*

47. *Id.* at 118, 125–26.

upkeep of corroded equipment as a result.⁴⁸ Transportation and handling of the hazardous material carry the risk of polluting the surface and areas deeper in the soil in the area where it is done.⁴⁹ Although the risks involved are high and potential uses may currently be few, the recycling of the produced brine is still highly encouraged by regulatory agencies across the nation.⁵⁰ The produced brine, although it has numerous environmental risks, is a resource that should be exploited to satisfy the needs of communities, companies, and surface estate owners.

II. Law on Ownership of Produced Water

A. Caselaw

1. Reasonable Use

Texas, a very prominent oil and gas producing state, once held that the brine produced from oil and gas operations remains a part of the surface estate, but is available for reasonable use by an operator for the purpose of developing the mineral estate.⁵¹ In *Robinson v. Robbins Petroleum Corp.*, an operator had taken produced brine from one mineral lease and used it to waterflood units on a non-pooled mineral lease elsewhere.⁵² The surface owner sued for the improper use of the surface estate by the operator, and the operator filed for summary judgment citing the reasonable use doctrine.⁵³ The trial court agreed with the operator and granted summary judgment; the appellate court affirmed the dismissal.⁵⁴ The court held that the transference of the brine to develop the mineral estate on a different lease was an unreasonable use of the surface owner's estate.⁵⁵ Although the operator was allowed to make reasonable use of the surface estate, which included the groundwater, the operator was limited to using the brine only for the purpose of developing the wells on that particular lease.⁵⁶

48. *Id.*

49. Dancy, *supra* note 15, at 50–52.

50. THE ACADEMY OF MEDICINE, ENGINEERING AND SCIENCE OF TEXAS, *supra* note 3, at 125–26.

51. *Robinson v. Robbins Petroleum Corp.*, 501 S.W.2d 865, 867 (Tex. 1973).

52. *Id.* at 866.

53. *Id.* at 865.

54. *Id.*

55. *Id.* at 867.

56. *Id.* at 868.

Oklahoma has similar caselaw on ownership and reasonable use of produced brine.⁵⁷ In *Holt v. Southwest Antioch Sand Unit*, an operator had used produced brine from mineral estate lease wells to perform secondary recovery on wells within the same lease.⁵⁸ The surface owner demanded damages for conversion of the brine and an accounting of the profits realized from the use of her water.⁵⁹ The operator demurred to both issues on the basis of reasonable use doctrine, and the trial court sustained the demurrer and dismissed the case.⁶⁰ The Oklahoma Supreme Court heard the surface owner's appeal and affirmed the trial court's decision.⁶¹ The court held that although the surface owner retained title to the produced brine, the operator had an implied easement to use the surface as was reasonably necessary to enjoy the full benefit of the mineral lease.⁶² The use of brine was seen as reasonably necessary to for the development of the wells on the lease, so the allowances granted by the implied easement were not exceeded.⁶³

In Oklahoma, if the produced brine from wells on a lease are used for the development of wells on the same lease, the use of the brine is a permissible use of the surface estate.⁶⁴ If, however, the brine is used for purposes beyond development of the mineral estate, the use can exceed the limits of the reasonable use doctrine in Oklahoma, absent a finding of ownership. Another exemplary case for the reasonable use doctrine in Oklahoma is *Vogel v. Cobb*, where the lease operator drilled freshwater wells and used the water for the development of oil wells off the original lease.⁶⁵ The operator also used the water as a supply for lease houses on other lands that were being used to house the laborers that were working on the lease where the water came from.⁶⁶ The surface owner sued the operator for the value of the water used for developing other mineral leases and supplying offsite lease houses.⁶⁷ The trial court awarded damages to the

57. *Holt v. Southwest Antioch Sand Unit*, Fifth Enlarged, 292 P.2d 998, 1000 (Okla. 1955).

58. *Id.* at 999.

59. *Id.*

60. *Id.*

61. *Id.* at 1000.

62. *Id.* at 999–1000.

63. *Id.*

64. *Id.*

65. 141 P.2d 276 (Okla. 1943).

66. *Id.* at 278.

67. *Id.*

surface owner, and the operator appealed.⁶⁸ The Oklahoma Supreme Court affirmed the trial court and held that the use of the water to develop other unpooled mineral leases was unreasonable.⁶⁹

2. *General Conveyances of Unnamed Minerals*

An issue related to brine ownership is what precisely is meant by a grant of “all other minerals” when a mineral estate is deeded or leased using those terms, and whether brine is implied by those terms. Technically, the water and solutes in brine are minerals in the sense that they are inorganic molecules.⁷⁰ Water is, however, not always considered to be the subject matter of “all minerals” in a deed or lease.⁷¹ Courts in different states have taken different approaches on how to characterize what exactly is meant by “minerals” in a lease or deed, and whether brine is implicitly included by the term.⁷² In Oklahoma, a case called *Mack Oil Co. v. Laurence* is helpful to determine whether freshwater is implicit in a conveyance or lease of “minerals.”⁷³ In *Laurence*, a surface owner sued the lessee of the mineral estate for drilling freshwater wells and selling the water elsewhere.⁷⁴ The lessor of the mineral estate was the owner of “all mineral rights . . . to all of the oil, petroleum, gas, coal, asphalt and all other minerals of every kind or character . . .” that were previously severed from the surface estate.⁷⁵ The court opined that since water is technically a mineral, it can be inferred that “all minerals” includes freshwater.⁷⁶ The court then said that it could use a rule of construction called *ejusdem generis* to infer that since “all other minerals” followed named minerals, the “other minerals” must be of the same kind or character of the others named in the list.⁷⁷ The court instead looked to the intention of the parties to the deed to determine what was to be included in the “other minerals” owned by the lessor.⁷⁸ Since the chain of title for the mineral estate was silent on the specific topic of water where

68. *Id.* at 279.

69. *Id.*

70. *Id.* at 280.

71. *See Mack Oil Co. v. Laurence*, 389 P.2d 955 (Okla. 1964); *Fleming Found. v. Texaco, Inc.*, 337 S.W.2d 846 (Tex. App. 1960).

72. *Id.*

73. 589 P.2d 955.

74. *Id.* at 957.

75. *Id.*

76. *Id.* at 958.

77. *Id.*

78. *Id.* at 960.

its inclusion would have been brief and easy, the court held that freshwater was not included in the ownership of “all other minerals.”⁷⁹

Texas answered the question of whether freshwater is implicit in a grant of “all minerals” in *Fleming Foundation v. Texaco, Inc.*⁸⁰ In *Fleming*, a company had bought a tract of land including half of its mineral interest.⁸¹ The company then sold the surface to an individual, but excepted all of the interest in the oil, gas, and other minerals in and under the land.⁸² The individual in turn sold the surface to a buyer who would be the lessor in the suit.⁸³ The buyer leased the surface to an operator, who began to produce freshwater from the land.⁸⁴ The company sued the operator for the value of the freshwater and the lessor for a declaration of its right to own the water.⁸⁵ Similar to the Oklahoma court, the Texas court considered the intention of the parties to the deeds to determine whether water is implicit in an exception “other minerals” in the deed.⁸⁶ The Texas court did not use the *ejusdem generis* rule to construe the phrase because the phrase preceded the specific terms on the list in the exception.⁸⁷ Even if the *ejusdem generis* rule were to have been used, the Texas court held that the freshwater is not a thing of like kind to oil and gas and would not have been included in “other minerals.”⁸⁸ The test that the Texas court used to determine whether freshwater was implicit in the phrase “other minerals” was what the phrase commonly means in the mineral industry, to consumers, and to the land owners at the time of the exception.⁸⁹ The court agreed with the holding in *Vogel v. Cobb*⁹⁰ that “other minerals” in the deed referred to minerals in the same generic class as oil and gas, which the *Vogel* court held did not include freshwater.⁹¹ The Texas court ruled that “other minerals” in this case did not include sub-surface freshwater.⁹²

79. *Id.* at 692.

80. 337 S.W.2d 846.

81. *Id.* at 847.

82. *Id.*

83. *Id.*

84. *Id.* at 848.

85. *Id.*

86. *Id.* at 851.

87. *Id.* at 852.

88. *Id.*

89. *Id.*

90. 141 P.2d 276.

91. *Fleming*, 337 S.W.2d at 852.

92. *Id.*

While these cases seem to foreclose the notion of whether freshwater is considered a “mineral” for the purpose of oil and gas leases and deeds, they do not end inquiry into the issue of whether produced brine, which is composed of not only water but also of an extremely high amount of other elements and compounds, belongs to the mineral estate.⁹³ One of the ways that the Texas Supreme Court has approached the meaning of “other minerals” in a very inclusive way was shown in *Moser v. United States Steel Corp.*⁹⁴ In *Moser*, neighbors of adjoining tracts had their property lines delineated by a winding road.⁹⁵ Once the road was straitened in 1949, the neighbors deeded to each other acreage on each side of the road so that the road would once again delineate the property lines.⁹⁶ Each deed, however, reserved “all of the oil, gas and other minerals of every kind or character.”⁹⁷ After the execution of the deeds, uranium was found on a part of one of the tracts where the acreage was exchanged.⁹⁸ The neighbor that owned the surface where the uranium was found sued the neighbor that owned the minerals in the tract to quiet title in the uranium.⁹⁹ Before this case, the Texas Supreme Court’s test for determining what is included in a conveyance of unnamed minerals was whether “a reasonable use of the surface by the mineral owner would substantially harm the surface.”¹⁰⁰ The Texas Supreme Court abandoned that test because of its uncertainty.¹⁰¹ The court reasoned that the general intent of the parties in a grant of minerals should be the focus when construing the terms of a document.¹⁰² The court considered the view that the general intent in a deed or lease of a mineral estate is to “convey all valuable substances to a mineral owner regardless of whether their presence or value was known at the time of conveyance, and to preserve the uses incident to each estate.”¹⁰³ The court held that the severance of a mineral estate included all substances within the ordinary and natural meaning of the word “minerals,” and held that uranium was a mineral within its natural and ordinary meaning, so it categorically

93. *See State ex rel. Com’rs of Land Office v. Butler*, 753 P.2d 1334, 1337 (Okla. 1987).

94. 676 S.W.2d 99 (Tex. 1984).

95. *Id.* at 100.

96. *Id.*

97. *Id.*

98. *Id.*

99. *Id.*

100. *Id.* at 101.

101. *Id.*

102. *Id.* at 102.

103. *Id.*

belonged to the mineral estate owner.¹⁰⁴ Although the court held for the mineral estate owner, it also held that if a mineral owner takes ownership of minerals that are not specifically named in a grant or reservation, the mineral owner will be liable for destruction of the surface incident to obtaining the unnamed minerals.¹⁰⁵

A more recent opinion from the Oklahoma Supreme Court has also addressed the question of what minerals are included in a deed, lease, or reservation of “all oil, gas and other minerals” from the case *Oklahoma ex rel. Commissioners of Land Office v. Butler*.¹⁰⁶ In *Butler*, Commissioners of the Land Office sold patents to public land to the predecessors in interest of the surface owner, but reserved “an undivided fifty per centum of all oil, gas, and other minerals and mineral rights” in two patents and “an undivided fifty per centum of all oil, gas, and other mineral rights” in one patent.¹⁰⁷ The surface owner brought a quiet title action against the Commission for the rights to coal on the land.¹⁰⁸ The Commissioners counterclaimed to quiet title to the coal based upon the reservations in the patents, and the surface owner moved for summary judgment.¹⁰⁹ The trial court granted summary judgment for the surface owner because coal was not a “constituent or component” of the oil or gas specifically reserved, and no extrinsic evidence of intent to construe to reservation contrarily was allowed because the reservations were held to be unambiguous.¹¹⁰ On appeal, the Commissioners argued that the subject matter of “oil, gas, and other minerals” is ambiguous and should be subject to interpretation with extrinsic evidence.¹¹¹ Although the exact meaning of the phrase “oil, gas, and other minerals” may be ambiguous, the court held that the phrase unambiguously did not include coal.¹¹² Coal was categorically not included in the phrase “oil, gas, and other minerals” because it was not a “component or constituent” of the specifically named oil or gas.¹¹³ The court held that although coal is a hydrocarbon, as are oil and gas, the dissimilarities of coal’s extraction and solid nature sufficiently disassociated it with oil and

104. *Id.*

105. *Id.* at 103.

106. 753 P.2d 1334.

107. *Id.* at 1335.

108. *Id.*

109. *Id.*

110. *Id.*

111. *Id.* at 1336.

112. *Id.*

113. *Id.* at 1337.

gas such that their grant with “other minerals” did not implicitly include coal.¹¹⁴ Since coal was not implied in the reservation of the “oil, gas, and other minerals,” the court affirmed the summary judgment for the surface owner.¹¹⁵

A related issue also came up in *Panhandle Co-op. Royalty Co. v. Cunningham*.¹¹⁶ In *Cunningham*, mineral owners deeded an undivided half interest in “all of the oil, gas, and other minerals in and under, and that may be produced from the following described lands . . .” to three companies.¹¹⁷ The mineral owners also granted the companies the rights to collect royalties and rentals subject to the current oil and gas lease on the land, as well as bonuses paid for any future leases.¹¹⁸ The companies then executed a lease to a corporation that allowed it to prospect for, produce, and market copper, silver, and other metal ores.¹¹⁹ The mineral owners filed a quiet title action against the companies and the lessee for ownership of the metal ores that the lessee was obtaining.¹²⁰ The mineral owners claimed that the previous deed to the companies was only meant to include hydrocarbons such as oil and gas, and that metallic minerals were out of its purview.¹²¹ The lessor companies claimed that they had extrinsic evidence that tended to show that the mineral owners had intended to grant rights to any and all minerals present in the land.¹²² The extrinsic evidence could not be considered unless the grant was ambiguous, however.¹²³ The Oklahoma Supreme Court reasoned that the addition of “and other minerals” to “all oil and gas” in the deed may have the effect of making the grant ambiguous because the court had held previously that the addition of “other minerals” could have the effect of covering substances of a kind similar to oil and gas, such as casinghead gas.¹²⁴ The court held that two of the deeds were not ambiguous, however, in light of all parts of the deed taken as a whole, so the extrinsic evidence could not be introduced to interpret them.¹²⁵ One of the deeds was considered ambiguous because it granted “an undivided one-

114. *Id.* at 1339.

115. *Id.*

116. 495 P.2d 108 (Okla. 1971).

117. *Id.* at 111.

118. *Id.*

119. *Id.*

120. *Id.*

121. *Id.* at 112.

122. *Id.*

123. *Id.*

124. *Id.* at 112–13.

125. *Id.* at 113.

half interest in all the mineral and mineral rights in the land first described” which did not have oil or gas within its context.¹²⁶ Because one of the companies’ deeds was ambiguous, the court reversed the judgment of the trial court and remanded the case for the parole evidence to be entered. The court affirmed the trial court’s findings on the unambiguous deeds and ruled that the deeds “granted only the right to prospect for, discover, produce and own, oil, gas and other minerals produced as oil or gas or produced as a component or constituent thereof, whether hydrocarbon or non-hydrocarbon.”¹²⁷

At least one recent Texas court has held that produced brine is a mineral that is included in the phrase “other minerals.”¹²⁸ In *Ambassador Oil Corp. v. Robertson*, a surface and royalty owner sought a declaration over his rights to the produced brine as well as an accounting for use of the brine outside of his lease and damages for brine sold to other parties.¹²⁹ The surface owner also sought an injunction enjoining the lessees from selling or using the produced brine without his consent.¹³⁰ The trial court found for the surface owner and the lessees appealed.¹³¹ During discovery, a superintendent of one of the lessee companies was deposed and testified that 7,675,373 barrels of brine had been produced from the unit that the surface and royalty owner had leased to.¹³² The owner had previously entered into a unitization agreement and it was agreed that the brine would be used for waterflooding their wells for the entire unit’s benefit.¹³³ In both the lease to the operators and the agreement with the other members of the unit, the phrase “oil, gas and other minerals” was used.¹³⁴ The appellate court construed the phrase to include produced brine in both leases.¹³⁵ Because the brine was treated as a mineral, the owners within the unitization agreement were entitled to damages for the value of the amount of produced brine that they could have used to waterflood their own wells, and also entitled to a royalty payment for any extra amount converted that

126. *Id.* at 115.

127. *Id.* at 116.

128. *Ambassador Oil Corp. v. Robertson*, 384 S.W.2d 752, 763 (Tex. App. 1964).

129. *Id.* at 754.

130. *Id.*

131. *Id.*

132. *Id.* at 761–62.

133. *Id.* at 756.

134. *Id.* at 763.

135. *Id.*

the owners did not need.¹³⁶ The other owners within the unitization agreement were not made parties to the lawsuit, however, so the case was reversed and remanded for their necessary joinder.¹³⁷

Another case from the Texas Supreme Court which determined that brine belonged to mineral owners and has yet to be explicitly overruled is *State v. Parker*.¹³⁸ In *Parker*, a landowner was granted the surface of land via patent from Texas. Later, an amendment to the Texas Constitution released to all surface patent owners “all mines and mineral substances” under their lands.¹³⁹ The state then sought to quiet title to the salt lake present on the land.¹⁴⁰ The Texas Supreme Court held that salt lakes and springs were included in the terms “mineral substances” and that salt lake belonged to the landowner because of the release in the Texas Constitution.¹⁴¹

The Oklahoma Supreme Court has also once concluded that produced brine is included in the mineral estate.¹⁴² In *Eike v. Amoco Prod. Co.*, a company executed brine leases from surface owners to extract and produce iodine.¹⁴³ Some of the land that the company had surface leases on also had mineral leases from other companies.¹⁴⁴ While producing the brine, the company discovered natural gas within the brine.¹⁴⁵ The company produced, used, and sold the gas from lands that were already under mineral leases, so the companies that owned the mineral leases on the same properties sued for trespass and conversion of their property.¹⁴⁶ The district court found that the brine and its solutes were part of the surface estate and were not conveyed with the terms “oil, gas, and other minerals.”¹⁴⁷ The Oklahoma Supreme Court, faced with the question of whether the brine was the property of the surface or mineral owners, reasoned that since the brine was created with and produced alongside oil and gas, the rule of *ejusdem generis* pointed toward the determination that brine belonged to mineral owners.¹⁴⁸ The court also considered the general relative abilities of surface

136. *Id.*

137. *Id.*

138. 61 Tex. 265 (1884).

139. *Id.* at 267–68.

140. *Id.* at 265.

141. *Id.* at 268.

142. 51 OKLA. B.J. 2686 (Nov. 12, 1980).

143. *Id.* at 2686–88.

144. *Id.* at 2688.

145. *Id.* at 2687.

146. *Id.* at 2687–89.

147. 54 OKLA. B.J. 361, 414 (1983).

148. 51 OKLA. B.J. at 2687–88.

owners and mineral owners to enjoy the use of the brine and noted that the brine was far more useful to a mineral owner.¹⁴⁹ With these considerations, the court concluded that produced brine and its components were the property of the mineral owner.¹⁵⁰ Upon a motion to reconsider, however, a plurality of the court reversed and held that the trial court's findings were entitled to deference because they were supported by the evidence and not contrary to law.¹⁵¹

The legal relationship between oil and brine was examined by the Pennsylvania Supreme Court in *Kier v. Peterson*.¹⁵² A lessor in *Kier* agreed to lease his land for the production of salt from brine wells.¹⁵³ The lessees drilled a successful well, but six years after production began, oil was discovered within the brine.¹⁵⁴ Since the oil was not viewed as valuable at the time, the oil was disposed of into a canal as a waste product.¹⁵⁵ The lessor claimed that the disposal of the oil was a trover of his property and brought suit against the lessees.¹⁵⁶ The Supreme Court of Pennsylvania noted that the discovery and production of oil from brine wells was generally imminent regardless of location around the world.¹⁵⁷ The court held that the oil was the property of the brine lessee, and opined that the lessee could allow the by-product oil to “run to waste or prepare it for the market.”¹⁵⁸

The Supreme Court of Appeals of West Virginia used a similar manner of determining what substances are included in general mineral grants.¹⁵⁹ In *Wood County*, the lessors leased their land to lessees for the production of “rock or carbon oil.”¹⁶⁰ Neither the royalty nor the granting clauses explicitly addressed natural gas.¹⁶¹ The lessees drilled a well and produced a substantial amount of natural gas with very little oil.¹⁶² The lessees then transported the gas to pumping stations off of the leased land to be used as

149. *Id.* at 2688.

150. *Id.*

151. 54 OKLA. B.J. at 414.

152. 41 Pa. 357 (1861).

153. *Id.* at 359.

154. *Id.* at 360.

155. *Id.*

156. *Id.* at 361.

157. *Id.*

158. *Id.* at 362.

159. *Wood County Petroleum Co. v. West Va. Transp. Co.*, 28 W.Va. 210 (1886).

160. *Id.* at 211.

161. *Id.* at 212.

162. *Id.*

fuel for the pumps.¹⁶³ The lessors demanded payment for the natural gas, and sued when the lessees refused.¹⁶⁴ At trial, the court awarded damages for the value of the gas used by the lessees.¹⁶⁵ On appeal, the lessees claimed that they were the rightful owners of the gas and that the trial court had committed error when it determined otherwise.¹⁶⁶ The Supreme Court of Appeals agreed, observing that natural gas is commonly incidental to production of oil and ruled that the grant implicitly included the substances that were incidentally produced with the named minerals in the granting clause.¹⁶⁷

Finally, a more recent decision from a California Court of Appeal very clearly analyzed the question of what is contained within a general grant of minerals.¹⁶⁸ In *Geothermal Kinetics*, a company whose business was harvesting geothermal energy from the earth was the owner of a general grant of minerals.¹⁶⁹ An oil company that owned the surface filed an action to quiet title to the steam produced by the geothermal company.¹⁷⁰ After the title was successfully quieted for the oil company, the geothermal company appealed.¹⁷¹ The appellate court made several notable observations about the steam, including: (1) the steam was heated brine that was created with the geological formation, unlike ground-based freshwater which is created and replenished by rainfall; (2) production of the steam did not substantially destroy the surface; and (3) the steam was generally not necessary or useful to surface owners for agricultural or residential purposes because of its toxicity.¹⁷² Considering these factors, the court held that the general grant of minerals included geothermal steam.¹⁷³

3. *Legal Differentiation of Freshwater and Brine*

The Kentucky Court of Appeals in 1953 faced the question of whether a grant of brine implicitly included freshwater.¹⁷⁴ In *Elkhorn*, a coal company

163. *Id.*

164. *Id.* at 212–13.

165. *Id.* at 214.

166. *Id.*

167. *Id.* at 215–20.

168. *Geothermal Kinetics, Inc. v. Union Oil Co.*, 75 Cal. App.3d 56 (Cal. Ct. App. 1977).

169. *Id.* at 58.

170. *Id.*

171. *Id.*

172. *Id.* at 60–64.

173. *Id.* at 63–64.

174. *Elkhorn Coal Corp. v. Yonts*, 262 S.W.2d 384 (Ky. App. 1953).

was leased, among other things, “all salt mineral waters” (brine).¹⁷⁵ The owner of the surface where the mineral lease was executed claimed that the company had damaged his water wells and sued.¹⁷⁶ After a judgment of \$2000 for the surface owner, the company appealed and claimed that the lower court erred when it determined that the company did not own the water after it was granted “all salt mineral waters.”¹⁷⁷ The court of appeals, although it reversed the judgment on other grounds, ruled that the grant of brine did not implicate a grant of freshwater.¹⁷⁸

B. Secondary Source

Dean Eugene Kuntz commented upon the issue of brine ownership in his revision of Thornton’s *On Oil and Gas*.¹⁷⁹ Kuntz’s treatise states that mineral owners also own waters that are “sufficiently saturated with minerals to have intrinsic value.”¹⁸⁰ The treatise also states that a general grant of minerals should include all substances in the earth that are presently valuable or that may become valuable, except those that unreasonably interfere with the enjoyment of the surface.¹⁸¹ According to Kuntz, the proper test for determining what substances belong to a mineral owner versus what belongs to a surface owner is a “manner of enjoyment” test.¹⁸² The manner of enjoyment test is an analysis of whether a mineral substance is reasonably necessary to the enjoyment of the surface estate.¹⁸³ If the substance is generally of no use to the enjoyment of the surface estate and is only valuable to the mineral estate, then it is the property of the mineral owner according to this test.¹⁸⁴

C. Statutory Authority

One state, Arkansas, has legislatively specifically determined the ownership of produced brine.¹⁸⁵ The Arkansas statute defines the term “mineral” and states that general grants in leases included in the term is “salt water whose naturally dissolved components or solutes are used as a

175. *Id.* at 384.

176. *Id.*

177. *Id.*

178. *Id.* at 384-5.

179. EUGENE KUNTZ, A TREATISE ON THE LAW OF OIL AND GAS, § 50.2, 279 (1990).

180. *Id.*

181. *Id.* § 13.3, at 384.

182. *Id.*

183. *Id.*

184. *Id.*

185. ARK. CODE ANN. § 15-56-301 (2018).

source of raw materials for bromine and other products derived therefrom in bromine production.”¹⁸⁶ The statute could possibly read as categorically adding salt water to the term “mineral” while describing the nature of brine within to the term. It could also be read as adding to the term “mineral” only salt water which is destined to be utilized for bromine and bromine-derivative production. The Eighth Circuit, interpreting this Arkansas statute, once held unequivocally that the brine is a mineral.¹⁸⁷ Whichever the interpretation, the statute admirably attempts to put the properties of brine to beneficial use, albeit limited in the second interpretation.

Another statute from North Dakota also bears upon the meaning of “all other minerals.”¹⁸⁸ The statute states that a grant of “all other minerals” is limited to only “those minerals specifically named in the lease and their compounds and byproducts.”¹⁸⁹ Although this law may cause the waste of minerals not specifically named such as brine, its merit lies in its enhancement of the predictability in property ownership regarding leases of unnamed minerals.

III. Potential Uses for Produced Water

A. Hydraulic Fracturing

Hydraulic fracturing has become an indispensable part of the development of oil and gas wells across the United States.¹⁹⁰ Fracturing is used to create cracks along tight formations such as shale so that oil and gas can flow economically through the fractures from the reservoir to the well.¹⁹¹ The fluid used to create the fractures is primarily water but contains various solvents and proppants, depending on the needs of the well.¹⁹² As stated earlier, the fluid can be mixed with gel (glycol) to become a more viscous liquid, or can be mixed with slick materials such as acids, distillates, and sodium or potassium carbonates depending on the needs of the well.¹⁹³ An enormous amount of water is necessary to hydraulically

186. *Id.*

187. *Young v. Ethyl Corp.*, 581 F.2d 715, 718 (1978).

188. N.D. CENT. CODE § 47-10-24 (2017).

189. *Id.*

190. JOHN S. LOWE, ET AL., *OIL AND GAS LAW*, 42–44 (6th ed. 2013).

191. *Id.* at 42.

192. *Id.*

193. *Id.* at 44.

fracture a well, so the burden it places on natural freshwater resources is significant.¹⁹⁴

B. Waterflooding

Waterflooding is a very common method of secondary recovery.¹⁹⁵ Using this method, an operator forces fluid into an oil reservoir which increases the reservoir pressure and drives oil toward a drilled well.¹⁹⁶ Waterflooding only has a limited result, however, and often takes a substantial amount of time to take effect.¹⁹⁷

C. Purification

Brine water tends to have a very high concentration of dissolved solids.¹⁹⁸ Produced brine often has a concentration of over 100,000 mg/l of dissolved solids, whereas seawater usually contains a concentration of only about 33,000 mg/l of dissolved solids.¹⁹⁹ Currently, there are purification plants in Israel and California that are designed to filter seawater into potable water for humans.²⁰⁰ No plants yet exist, however, that are designed to filter produced brine into pure potable water because of its extreme salinity and the cost of thorough filtration.²⁰¹ The demonstrable need for clean water across the nation makes the development of such filtration by capable oil and gas companies a very attractive option.²⁰²

IV. Analyses

A. Legal Analysis

Produced brine is not currently viewed legally as part of the mineral estate by Texas, but recent developments in the law and public policy

194. THE ACADEMY OF MEDICINE, ENGINEERING AND SCIENCE OF TEXAS, *supra* note 3, at 116–17.

195. Lowe, *supra* note 190, at 45.

196. *Id.*

197. *Id.*

198. THE ACADEMY OF MEDICINE, ENGINEERING AND SCIENCE OF TEXAS, *supra* note 3, at 125.

199. *Id.*

200. Rowan Jacobsen, *How a New Source of Water is Helping Reduce Conflict in the Middle East*, ENSIA (July 19, 2016), <https://ensia.com/features/water-desalination-middle-east/>.

201. THE ACADEMY OF MEDICINE, ENGINEERING AND SCIENCE OF TEXAS, *supra* note 3, at 125-26.

202. *Id.*

concerns weigh heavily in favor of a change in the status quo. The Oklahoma view on brine ownership is inconclusive but law from recent decisions leans toward the mineral owner. The tests that California uses to determine what minerals are owned by a mineral owner also strongly favor produced brine ownership vested in the mineral owner. Holdings from Pennsylvania and West Virginia courts also favor brine ownership vested in mineral owners because of its incidence to the production of oil and gas. Arkansas has taken the position that produced brine which is used for bromine production belongs to a mineral owner but has not explicitly negated the possibility of holding that produced brine belongs to a mineral owner. On the contrary, a federal circuit court has held that brine is a mineral according to Arkansas law.

Although the rulings in *Robinson*, *Vogel*, and *Holt* may possibly be dispositive in Texas and Oklahoma with the question of whether groundwater and other relatives belong in a conveyance of “other minerals,” it is very possible that the courts will soon shift on this issue. The caselaw that has developed since those cases, although most of it has been peripheral to the issue of brine ownership and not on point, has provided the requisite legal rationale for a finding that brine belongs in the mineral estate. Oklahoma, with its ruling in *Cunningham*, has paved the way for such a finding. The *Cunningham* court ruled that a grant of “other minerals” includes only those that are oil, gas, or a component or constituent thereof regardless of whether the mineral is a hydrocarbon.²⁰³ Brine can certainly be viewed as a constituent of oil and gas because in many oil or gas wells it is by far the most voluminous fluid that is produced from the operations alongside the oil or gas.²⁰⁴ Since produced brine is a constituent of oil and gas, Oklahoma courts should find that the brine is a part of the mineral estate.

The courts in Texas also have the requisite caselaw to find that produced brine is a part of the mineral estate. The *Moser* court inclusively ruled that a conveyance of “other minerals” is to be construed as conveying all valuable minerals within the “ordinary and natural” meaning of the word “minerals.”²⁰⁵ Produced brine, while it can be a nuisance in some circumstances, is a valuable mineral that has many productive economic uses to oil and gas companies. Because it is a valuable mineral within the ordinary and natural meaning of the word “mineral” and the Texas Supreme

203. *Panhandle Co-op Royalty Co. v. Cunningham*, 495 p.2d 108, 113 (Okla. 1971).

204. THE ACADEMY OF MEDICINE, ENGINEERING AND SCIENCE OF TEXAS, *supra* note 3, at 125.

205. *Moser v. United States Steel Corp.* 676 s.w.2d 99, 102 (Tex. 1984).

Court has set precedent for interpreting the “ordinary and natural” meaning broadly, produced brine can be found by Texas courts as a part of the mineral estate that is conveyed through a general grant of minerals. The caveat to such a finding, however, is the *Moser* rule that since the brine is not typically specifically named in mineral deeds or leases, the mineral owner will be liable for any destruction to the surface while obtaining the brine.²⁰⁶ The application of this rule to produced brine could cause a lessee to bear liability for damages caused to the surface, which could be catastrophic given the dangerous character of the brine.

In California, the holding that brine steam is conveyed by a general grant of minerals is very probative that produced brine is also included. The California court facing the issue used a multifactor test considering the general intent of the parties to the conveyance as well as characteristics of the steam. The very same analysis used again would certainly conclude that brine is included in a general grant of minerals in an oil and gas lease or deed.

The Pennsylvania Supreme Court and West Virginia Supreme Court of Appeals, when faced with the question of what is included in general mineral grants, both concluded that unnamed substances that are produced incidentally to named substances are included within the grant. With these holdings, despite their age, it should be safe to conclude that since brine is produced incidentally to oil and gas, brine is conveyed in these states with a grant of oil or gas.

B. Public Policy Analysis

Despite the health and environmental risks associated with handling produced brine, public policy concerns weigh very heavily in favor of the beneficial use of the brine. The law tends to favor beneficial uses of resources and the abhorrence of waste. An example of this is the common law doctrine of adverse possession. The current standard procedure for produced brine is to use it for oil and gas operations only on the leased land where it came from to increase yield unless the brine is unfit for the needs of that lease, and once it cannot be so used, to inject the brine underground where it will more than likely stay indefinitely. This status quo is maintained because lessees do not exert ownership over the produced brine and do not use it to its full economic potential. Since surface owners generally have neither the means nor the desire to further utilize the toxic brine, its value to the public is lost when it is injected. Not only is the value

206. *Id.* at 103.

lost, but if the well casing leaks where the brine is injected, the brine may contaminate nearby sources of freshwater.

Oil and gas lessees, on the other hand, are generally in a better position to make beneficial use of the brine. Oil and gas companies are much more likely to have the funds available to purify the brine into usable water. Purification of the brine is the preferred method of use supported by public policy because it can not only reduce oil and gas companies' dependence on regional freshwater sources to supply their needs, but may also be used to supplement the water supply in arid areas such as west Texas that need it.²⁰⁷ Purification can also draw out the elements present in produced brines that have industrial value, such as bromine, magnesium, lithium, zinc, and so on.²⁰⁸ Purification also neutralizes the threat to public health and the environment that natural produced brine poses.²⁰⁹ The main caveat to purification is the often cost-prohibitive expense of purifying the brine, which is generally nearly three times more concentrated with dissolved solids than seawater and is frequently contaminated with oil if it is originally produced with oil.²¹⁰ If oil and gas companies are allowed to exert ownership over the water, however, the companies will be enabled and incentivized to help meet the water needs of the local and perhaps even the national economy, especially in dry areas that often suffer from droughts such as areas in California, Nevada, Arizona, Texas, and so on. Even if the brine cannot be purified enough for human consumption as seawater has been, it is conceivable that it can be used for agricultural purposes and decrease water demand in that field. Another barrier to purification is the increased liability of handling the toxic brine. As mentioned before, midstream operations with the brine pose a danger of spillage and leakage, the effects of which can range from corrupting surface freshwater sources to substantial erosion of topsoil. Although the effects of spillage and leakage are significant, the chances of their occurrence are small, so the costs to the public associated with oil and gas companies handling the brine are outweighed by the benefits accrued from purified water and the increased availability of important industrial elements from domestic sources.

207. THE ACADEMY OF MEDICINE, ENGINEERING AND SCIENCE OF TEXAS, *supra* note 3, at 115-17.

208. Dancy, *supra* note 15, at 17-18.

209. *Id.*

210. THE ACADEMY OF MEDICINE, ENGINEERING AND SCIENCE OF TEXAS, *supra* note 3, at 125-26.

Even if purification proves to be cost-prohibitive at present, there are other positive uses for the brine water. Oil and gas companies, even if they do not have ownership of the produced brine, have at least the right to reasonable use of the brine on the leased land where it is produced for the purpose of developing the leased mineral estate.²¹¹ This limitation on only using the brine for developing the mineral estate where it is found substantially inhibits an oil and gas company's capability to reduce its need of regional freshwater because produced brine found in some regions is significantly more concentrated with dissolved solids than brine found in other areas.²¹² As stated before, brine that has a very high salt concentration is unfit for hydraulic fracturing operations that require more viscous gelled fluid, so other water sources must be used for the mixture.²¹³ If oil and gas companies own and use the less-concentrated brines found on some leased lands or can filter the brine and use or sell it to develop other leased lands, the burden on the regional freshwater supply will be lessened to a degree commensurate with the increased brine usage for hydraulic fracturing or waterflooding.

C. Legal Effects

If produced brine is owned by oil and gas lessees, then it is possible that production of the brine will have significant legal effects on an oil and gas lease. For example, the brine's production may cause the lease to shift into the secondary term where the lease is held by production of minerals in paying quantities.²¹⁴ Since the brine is a mineral, the production of it may be able to hold a lease in the secondary term if it can be produced in paying quantities. This will only occur if a royalty is established based upon either the market value of the brine at the well or the revenue realized from its sale.²¹⁵ The market value valuation method would be the most viable since the brine may not cause any revenue to be realized if it is utilized to save

211. *See generally* Getty Oil Co. v. Jones, 470 S.W.2d 618 (Tex. 1971); Flying Diamond Corp. v. Rust, 551 P.2d 509 (Utah 1976); Hunt Oil Co. v. Kerbaugh, 283 N.W.2d 131 (N.D. 1979).

212. THE ACADEMY OF MEDICINE, ENGINEERING AND SCIENCE OF TEXAS, *supra* note 3, at 125.

213. *Id.*

214. *See* Kidd v. Hoggett, 331 S.W.2d 515 (Tex. Civ. App. 1959); Clifton v. Koontz, 325 S.W.2d 684 (Tex. 1959); Hoff v. Girdler Corp., 104 Colo. 56, 88 P.2d 100 (1939). *See also*, Stanolind Oil & Gas Co. v. Barnhill, 107 S.W.2d 746 (Tex. Civ. App. 1937); Pack v. Santa Fe Minerals, 869 P.2d 323 (Okla. 1994).

215. *See generally* Piney Woods Country Life Sch. v. Shell Oil Co., 726 F.2d 225 (5th Cir. 1984).

resources through hydraulic fracturing or waterflooding of other off-lease wells that the company owns rather than being sold for profit. The realized revenue method may be preferable in situations where the oil and gas lessee intends to purify the brine and sell the elements filtered from it, especially in areas where purified water is scarce. The implied covenant to market may have the effect in some jurisdictions of requiring an oil and gas company to place the brine in a marketable condition before calculating the value of the royalty.²¹⁶

Even if produced brine is found to be a part of the mineral estate conveyed in a lease, some oil and gas companies may still choose to dispose of the brine because of the risks associated with handling and transporting it. If the brine is subsequently deposited into deep wells on the leased property where it originated from, ownership of the brine may be abandoned after a period of time and the ownership may revert to the surface owner. Also, if the brine is not disposed of properly it may give rise to liability for trespass and nuisance if the brine causes damage to the property. These concerns of an increased possibility of liability further encourage mineral owners to beneficially use the brine, whereas if surface owners also own the brine there is no incentive for beneficial use and its utility more often than not is lost. Not only is brine's utility generally lost when its destiny is left to a surface owner's discretion, but the commonly inevitable reinsertion of the brine into the earth may cause earthquakes that are capable of destroying property.²¹⁷ If a surface owner also owned the injected brine which may cause damage to property owned by others, the surface owner may be subjected to a share in tort liability via the comparative responsibility doctrine.

D. Proposed Test for Unnamed Minerals in a Mineral Conveyance

The Texas Supreme Court's decision in *Robinson* reflected a justifiable fear that the implicit inclusion of produced brine into a mineral conveyance could swallow up ownership of water generally, which can be very valuable to surface estate owners. Since the law abhors forfeiture, the outcome seemed sensible to the Texas court which was aware of what surface owners could lose if freshwater became a part of the mineral conveyance. The Texas court was convinced that the differences between the brine and freshwater were so minimal and legally insignificant that a decision over

216. See generally *Piney Woods*, 726 F.2d 225; *Garman v. Conoco, Inc.*, 886 P.2d 652 (Colo. 1994); *Libby v. De Baca*, 51 N.M. 95 (1947).

217. THE ACADEMY OF MEDICINE, ENGINEERING AND SCIENCE OF TEXAS, *supra* note 3, at 120.

the ownership of one would affect the other. The Texas court's fear was misplaced, however, because of the aforementioned material differences in uses and character of brine and freshwater. Because of the drastic differences, a legal test could easily be crafted to include produced brine into a mineral estate but decline to extend the ownership to freshwater.

In the past, courts across the nation have used various tests to determine what is included in conveyances of unnamed "minerals" in oil and gas leases and deeds. The tests used by courts tend to reflect policy determinations as to whether mineral owners and lessees should be allowed to own certain unnamed minerals, as well as determinations of the intent and understandings of the parties to a mineral conveyance. One such test is the *Acker* test which held that a general conveyance of minerals conveys all valuable minerals to the mineral owner, only limited by the necessity of a mineral to each estate.²¹⁸ Another is the *Reed* test which held that conveyances of "minerals" did not include unnamed substances that could not be produced without destruction of the surface.²¹⁹ The most recent test out of Texas was the *Moser* test which held that conveyances of unnamed "minerals" in a conveyance included only the minerals within the natural and ordinary meaning of the word "minerals".²²⁰ From Oklahoma, a test arose in *Cunningham* which included in a mineral lease all unnamed minerals that are a "constituent or component" of the named minerals in the lease.²²¹ Many of the aforementioned tests, however, fall short of providing reasonable certainty of which substances are implicitly included or excluded in a grant of "minerals" in each state where they come from. According to Professor Carol Rose's article, *Crystals and Mud in Property Law*, clearly defined rules pertaining to property promote predictability in the market and tend to support commerce, whereas poorly defined rules tend to discourage commerce but give courts discretion to come to more equitable results.²²² With these observations, it is clear that the best test for a determination of mineral ownership is not judicially crafted, but legislatively enacted such as in Arkansas.²²³ In states where there is no judicially enacted definition of "minerals" for the purpose of determining what is conveyed in a mineral deed or lease, courts should use factors such as: (1) whether the mineral at issue is generally more valuable and useful to

218. *Acker v. Guinn*, 464 S.W.2d 348 (Tex. 1971).

219. *Reed v. Wylie*, 597 S.W.2d 743 (Tex. 1980).

220. *Moser v. United States Steel Corp.* 676 S.W.2d 99, 102 (Tex. 1984).

221. *Panhandle Co-op. Royalty Co. v. Cunningham*, 495 P.2d 108, 113 (Okla 1971).

222. Carol M. Rose, *Crystals and Mud in Property Law*, 40 STAN. L. REV. 577 (1988).

223. ARK. CODE ANN. § 15-56-301 (2018).

an owner of minerals or of the surface; (2) whether production of the unnamed mineral will tend to substantially hinder the use and enjoyment of the surface; (3) whether a reasonable person of ordinary intelligence would understand that a deed or lease of the unnamed mineral includes or excludes the mineral at the time of the conveyance; and (4) whether the unnamed mineral is traditionally understood by other members of the industry to be included in a grant of “minerals.” After a weighing of these factors, a court encountering the issue should establish a formalistic ruling of whether the unnamed mineral is categorically included in a conveyance of “all/other minerals” as a matter of law so that any ambiguity in ownership is settled. The purpose of the initial factor weighing test is to give courts leeway to come to just results as necessary, but the conclusory categorical determination is meant to create predictability in ownership in certain minerals and promote commerce. Once a conclusion has been made pertaining to a particular unnamed mineral, the factor test should not be reused for that mineral within the same jurisdiction to re-weigh the equities. To apply the test to produced brine: (1) brine is more valuable and useful to a mineral owner than a surface owner as evinced by the current standard procedure of injecting it deep into the ground as opposed to the aforementioned beneficial uses mineral owners could put it to; (2) its production already currently occurs with all oil and gas operations and does not hinder use and enjoyment of the surface unless mishandled; (3) brine is a mineral and contains a substantial amount of salts that are also minerals within the common usage of the word and a conveying instrument with the term would put a reasonable grantor on notice that it is also being conveyed; and (4) brine is generally understood as a mineral but grantees of “other minerals” often do not exert ownership other than reasonable use. With these considerations, it is clear that the factors weigh in favor of a declaration that grants of unnamed “minerals” in oil and gas leases or deeds include produced brine. If the test is applied to freshwater, it categorically belongs to surface owners even after a conveyance of “all minerals” because (1) freshwater is valuable to both a mineral and surface owner, but is often necessary for the use of the surface for residential or agricultural purposes; (2) deprivation of freshwater from a surface owner can substantially hinder use and enjoyment of the surface, particularly in rural areas; (3) although freshwater is a mineral and contains some dissolved salts, it is not usually sought after or produced for profit in mineral recovery operations so the term “all minerals” in a grant would not put a reasonable person on notice that a conveyance of such includes freshwater; and (4) numerous leases of freshwater exist in which companies obtain rights to freshwater

from surface owners, so members of the mineral industry very likely have an understanding that freshwater belongs to the surface owner. This test helps ensure that no unintended forfeiture of useful and necessary substances occurs to surface owners, and also enables fuller resource development by mineral owners.

V. Conclusion

Produced brine is a mineral substance that should be used to acquire and develop community resources. The brine's extreme salinity and toxicity generally make it unfit for a surface estate owner to beneficially utilize it for domestic or agricultural purposes as is. Developers of mineral estates that produce the brine are generally in a significantly better position to use the brine in a beneficial manner that serves their communities' water and energy needs. The law in numerous states across the nation favor a ruling that produced brine belongs to mineral owners. Combined with concerns of public policy, state courts, legislatures, and agencies should be strongly inclined toward adopting such a rule to foster the needs of their communities, particularly in areas where water is in very short supply.