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Texas's Water Future: Legal, Business, Environmental, and Regulatory Concerns

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TEXAS'S WATER FUTURE: LEGAL, BUSINESS, ENVIRONMENTAL, AND REGULATORY CONCERNS

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ABSTRACT

Around the world freshwater is increasingly scarce, and Texas is no different. Texas continuously operates at a shortage, where freshwater supply cannot meet demand. Projections show that this deficit will increase over the next decade, which would cause billions of dollars in losses for the Texas economy. But Texas is in a unique position to correct its water problems and take corrective measures to avoid such losses. Innovations around hydraulic fracturing in the oil and gas industry, namely recyclable "produced water" and the burgeoning "water midstream" sector will play an important role in remediating Texas' freshwater scarcity concern. Furthermore, the technological advancements in recyclable produced water, combined with an effective business model and operational infrastructure of the water midstream sector, would generate a consistent source of freshwater for industrial, manufacturing, and agricultural uses that will mitigate the strain on natural freshwater sources.

Private actors continue to fund and build facilities to gather, recycle, and distribute produced water; but there are barriers to expansion of these systems. While the private sector has a foundational blueprint to utilize recyclable produced water, there are business, legal, environmental, and regulatory concerns that must be addressed by the Texas government to pioneer a sustainable water future that will greatly benefit Texas's economy and residents. The Texas government must adopt a proactive approach to this unique freshwater source and develop new water management systems.

INTRODUCTION

Raymond Carlson said that "[n]ature's whims can be circumvented, if man is wise and looks toward the future."[1] Water shortage issues are nothing new to Texas, but these issues heightened in recent years. The state's population increases put additional strain on Texas aquifers, which supply the majority

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1. Raymond Carlson, Ariz. Highways, Feb. 1947, at 2.

of water for Texas citizens.[2] To make matters worse, recent droughts mean that the aquifers replenish at a rate that cannot keep pace with the increase in demand.[3] This net water deficit, where usage outpaces replenishment, depletes Texas aquifers at unsustainable rates.[4] As demand continues to exceed supply, water transitions from an available resource to a valuable commodity, validating the credence that "water is the new oil."[5] Ironically, the Texas oil and gas industry has begun to treat water as the new oil because of the industry's increasing water needs and Texas's water uncertainties. Three important areas for Texas to prepare for the tumultuous future of water are to utilize effective reuse of produced water, to develop water transportation and management systems, and to restructure the groundwater regulatory system. All three of these areas implicate business, environmental, and legal issues that the private sector and the Texas government must address to formulate a responsible and effective plan for the future of Texas water. But proactive government actions need to create long-term water stability for Texas, ease environmental concerns, and bolster the state's economy.[6] Necessity drives innovation and action, and water solutions are at the point of necessity in Texas.

I. TEXAS WATER SITUATION: SUPPLY CANNOT MEET DEMAND

According to current projections by the Texas Water Development Board, Texas's freshwater supply will reach a twenty percent shortage versus demand by 2030; and statewide water shortages will increase each year beyond 2030.[7]

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2. *See, e.g.*, Danielle Prokup, *PSB: El Paso Water Utility Seeks $441 Million in Additional Revenue Bonds; Issues Drought Emergency*, El Paso Matters (July 14, 2022), https://elpasomatters.org/2022/07/14/el-paso-water-seeks-441-million-revenue-bonds-prepares-for-possible-2023-drought/[https://perma.cc/NH8Y-DHJX]; *Groundwater*, Tex. Water Development Board, https://www.twdb.texas.gov/groundwater/ [https://perma.cc/46DE-VJ99] (last visited Jan. 28, 2023) [hereinafter *Groundwater*, TWDB].

3. *See 2022 Texas State Water Plan* (illustration), Tex. Water Development Board, https://texasstatewaterplan.org/statewide [https://perma.cc/8GCD-F4K3] (last visited Jan. 29, 2023).

4. *See id.*

5. Vanessa C. Perez, *Liquid Business*, 47 Fla. St. U. L. Rev. 201, 221 (2019).

6. Carlos Rubinstein & Ron Simmons, *Opinion: Texas Needs Private Investment to Vastly Enhance its Water Supplies*, Austin American Statesman (June 10, 2022, 7:00 AM), https://www.statesman.com/story/opinion/2022/06/10/opinion-texas-needs-private-investment-vastly-enhance-its-water-supplies/7555574001/ [https://perma.cc/5QYB-APPY] ("[A] severe drought could [have] cause[d] $110 billion in economic damages in 2020, increasing to $153 billion per year by 2070.").

7. Tex. Water Development Board, *supra* note 3.

Solutions to address water shortages of this magnitude require years of planning and building more than 2,400 recommended water management projects and budgeting billions of dollars; without solutions, water shortages could cause Texas economic damages between $110 billion to $153 billion *per year* from 2020 to 2070.[8] Consistent increases by Texas's largest freshwater consumers—the agriculture industry, municipalities, and the industrial sector—account for approximately ninety percent of the total freshwater usage in Texas, compounding water shortage concerns.[9] Supply and demand issues of water are unique because water supplies cannot scale up in reaction to rising demand, whereas typical consumer products are able to increase supply to meet demand.[10] Therefore, increased water demand depletes the water supply at a faster rate, expediting water supply shortages.[11] Since nature dictates water supplies, the most controllable solution for humans is to curb water demand.[12]

A. Texas Water Law: Surface Water and Groundwater

There are two freshwater sources: surface water and groundwater, and Texas water law divides ownership of surface water from groundwater.[13]

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8. Rubinstein & Simmons, *supra* note 6.

9. *Texas Water Use Estimates Summary for 2020*, TEX. WATER DEVELOPMENT BOARD (Sept. 20, 2022), https://www.twdb.texas.gov/waterplanning/waterusesurvey/estimates/doc/2020TexasWaterUseEstimatesSummary.pdf [https://perma.cc/79P3-M7ZC]; *Demand Projections by Category* (illustration), *in Water Demand Projections for Texas 2020-2070*, TEX. WATER DEVELOPMENT BOARD (Mar. 28, 2019), https://www.twdb.texas.gov/waterplanning/data/projections/2022/demandproj.asp [https://perma.cc/9SJ8-4BXW].

10. *See The Hydrological Cycle: Water is Neither Created Nor Destroyed, It is Merely Transformed*, QATIUM, https://qatium.com/blog/water-is-neither-created-nor-destroyed-only-transformed/ [https://perma.cc/V8PB-WUU8] (last visited Feb. 9, 2023); *cf.* Jason Fernando, *Law of Supply and Demand in Economics: How Stuff Works*, INVESTOPEDIA (Mar 13, 2023), https://www.investopedia.com/terms/l/law-of-supply-demand.asp [https://perma.cc/D8VM-6F7P] (discussing how the law of supply and demand works).

11. *See, e.g.*, Kate Galbraith, *Panhandling for Water*, TEX. TRIBUNE (June 17, 2010), https://www.texastribune.org/2010/06/17/how-bad-is-the-ogallala-aquifers-decline-in-texas/ [https://perma.cc/78PQ-W34R] (Ogallala Aquifer, which supplies forty percent of Texas's water use, is pumped at a rate six times greater than its recharge rate).

12. *See Solutions to Address Water Scarcity in the U.S.*, NATURE CONSERVANCY (Mar 31, 2022), https://www.nature.org/en-us/what-we-do/our-priorities/provide-food-and-water-sustainably/food-and-water-stories/solutions-address-water-scarcity-us/ [https://perma.cc/FG7T-5JMN].

13. TEX. WATER CODE §§ 11.021(a), 36.002.

Surface water, such as rivers, streams, and lakes, is owned by the State of Texas.[14] Whereas, groundwater, such as aquifers and other underground water sources, located below the surface of a landowner's land is owned by the landowner as real property.[15] Thus, an individual landowner has the right to drill for and produce the groundwater beneath the surface of his land.[16] Groundwater is the primary water source in Texas, providing approximately fifty-five percent of the water used in the state.[17] In some regions, such as areas of West Texas, groundwater supplies approximately eighty percent of the area's water.[18] Reliance on groundwater makes depletion of this water source a serious concern for the entire state, and El Paso even declared a state of emergency due to the city's water shortages in 2022.[19]

B. The Mineral Estate and the Surface Estate in Texas

Texas law defines two separate and severable estates: the mineral estate and the surface estate.[20] The surface estate owns groundwater, and the mineral estate owns oil and gas; and since these estates are severable, often the surface estate and the mineral estate have different owners.[21] An oil and gas producer only needs a lease from the mineral estate owner in order to produce oil and gas; and in Texas, the mineral estate is dominant to the surface estate, so the mineral estate has the legal right to use the surface estate for development of the mineral estate's oil and gas.[22] The surface estate must allow the oil and gas producer to use the surface land for their operations, without any financial benefit to the surface estate owner from this use of their land or from any oil and gas production.[23] But, oil and gas producers may eventually need to enter

14. *Id.* § 11.021(a).

15. *Id.* § 36.002.

16. *Id.* § 36.002(b)(1).

17. *Groundwater*, TWDB, *supra* note 3.

18. Zoe Kurland, *In Rural West Texas, the Demand for Well Water is Growing*, MARKETPLACE (Dec. 14, 2021), https://www.marketplace.org/2021/12/14/rural-west-texas-well-water-demand-is-growing/ [https://perma.cc/N6QK-BQKP].

19. Prokup, *supra* note 2.

20. *Exploration & Surface Ownership*, RAILROAD COMM'N OF TEX., https://www.rrc.texas.gov/about-us/faqs/oil-gas-faq/oil-gas-exploration-and-surface-ownership/ [https://perma.cc/B3K4-U7VD] (last visited Aug. 30, 2023).

21. *Id.*; TEX. WATER CODE § 36.002.

22. RAILROAD COMM'N OF TEX., *supra* note 20.

23. *Id.*

into an agreement with the surface estate owner due to the production of water in hydraulic fracturing operations.[24]

II. HYDRAULIC FRACTURING: THE SOURCE OF PRODUCED WATER

Hydraulic fracturing injects freshwater into the ground; however, the product from this process is not only oil and gas, but also *additional* high-salinity water, resulting in a net gain of water.[25] This high-salinity water byproduct and Texas oil production are projected to generate between 165 and 690 trillion gallons of produced water in 2019, with similar annual-volume projections over the coming decades.[26] The high-salinity water produced is considered wastewater that requires either disposal or treatment.[27] Realizing the wastewaters potential, some companies began "rapidly deploying innovative technologies" to repurpose the produced water.[28] Currently, the Texas oil and gas industry reuses only ten percent of the aggregate produced water production.[29] But in recent years, oil and gas companies have placed more emphasis on research and development to reuse produced water, recognizing reuse as "both cost-effective and environmentally beneficial."[30]

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24. Tex. Water Code § 36.002(b)(1); *See Water Reuse Could Be Key for Future of Hydraulic Fracturing*, UT News (Feb. 20, 2020), https://news.utexas.edu/2020/02/20/water-reuse-could-be-key-for-future-of-hydraulic-fracturing/ [https://perma.cc/9C5B-R9DX].

25. UT News, *supra* note 25.

26. Brian Walzel, *Innovations in Water Management Technology*, Hart Energy (Mar. 16, 2020, 11:00 AM), https://www.hartenergy.com/ep/exclusives/innovations-water-management-technology-186075 [https://perma.cc/5SRU-HTTR] (projecting roughly 4.5 million barrels (200 million gallons) of produced water generated per day in the Permian Basin, annualized to 690 trillion gallons); *Beneficial Use of Produced Water in Texas: Challenges, Opportunities and the Path Forward*, Tex. Produced Water Consortium, at 1, 12 (2022), https://www.depts.ttu.edu/research/tx-water-consortium/downloads/22-TXPWC-Report-Texas-Legislature.pdf [https://perma.cc/8QRW-MPJ6] (projecting 3.9 billion barrels per day of produced water generated in Texas Permian and Delaware Basins in 2019, annualized to 165 trillion gallons) [hereinafter TPWC Report].

27. Frank Nieto, *The Rise of Water in the Midstream*, Hart Energy (Mar. 24, 2020), https://www.hartenergy.com/exclusives/rise-water-midstream-186180 [https://perma.cc/2LSZ-GXA3].

28. Walzel, *supra* note 26.

29. *Id.*

30. *Bringing Balance to E&P Water Demands*, Hart Energy (Mar. 2, 2020, 4:30 AM), https://www.hartenergy.com/exclusives/bringing-balance-water-demands-186176 [https://perma.cc/3CVC-BHQ3] (quoting Rob Bruant, Director at B3 Insights); Walzel, *supra* note 26.

III. OWNERSHIP OF PRODUCED WATER

A core legal question arises as to whether produced water has the same status as typical groundwater in terms of ownership. Texas law grants the surface estate the right to drill and to produce groundwater via a well.[31] Similarly, produced water emanates from underground formations and is obtained through a wellbore, albeit an oil and gas wellbore, not a water well.[32] Conversely, produced water is high-salinity water that originates at depths far deeper than typical groundwater formations, which are relatively close to the land surface, and thus owned by the surface estate.[33] The produced water accompanies the production of oil and gas, which is owned by the mineral estate.[34] Again, Texas law definitively states that salinity and depth of underground water sources bear "no consequence upon ownership."[35] Further, the Texas Supreme Court, r determined that high-salinity produced water from a deep formation, even an oil and gas-bearing formation, was another form of groundwater.[36] Yet, oil and gas production companies and water recyclers unaware of State law, might still operate under the impression that groundwater ownership in Texas might mean that produced water was not owned by a recycler and could not be resold to third parties unless the recycler also owned the surface estate.[37]

A. Questions about Produced Water in Texas Law

In 2013, the Texas legislature passed Chapter 122 of the Texas Natural Resources Code to clarify apprehensions of oil and gas producers and produced water recyclers; it was an effort by the Texas legislature to encourage more widespread reuse of produced water in the oil and gas industry.[38] Chapter 122 mandates that when a person takes possession of "fluid oil and gas waste," produced water in this case, and treats it for a "subsequent beneficial use," the produced water becomes this person's property and is transferable

31. Tex. Water Code § 36.002(b)(1).

32. Gabriel Collins, *Oilfield Produced Water Ownership in Texas: Balancing Surface Owner's Rights and Mineral Owner's Commercial Objectives*, Center for Energy Studies1, 6 (Feb. 2017), https://www.bakerinstitute.org/research/oilfield-produced-water-ownership-texas-balancing-surface-owners-rights-and-mineral-owners-commercia [https://perma.cc/QS4N-UEV2].

33. *See id.* at 6–7.

34. *See id.* at 7; Railroad Comm'n of Tex., *supra* note 20.

35. Collins, *supra* note 32, at 6 (quoting Robinson v. Robbins Petroleum Corp., Inc., 501 S.W.2d 865, 867 (Tex. 1973)).

36. *Id.* at 7.

37. *Id.*

38. *Id.* at 7, 8.

to third parties for disposal or for use in treated or untreated form.[39] Thus, the third-party recipient acquires clear title to the treated water.[40] Chapter 122 successfully clarifies produced water ownership for third-party recipients, and even insulates these third parties from tort liability for injuries caused by releases of treated water post-transfer.[41] But the 2013 version of Chapter 122 failed to address whether an oil and gas producer who *sells* produced water, or otherwise transfers it *for value*, to a third party owes compensation to the surface estate owner.[42] Therefore, Chapter 122 allowed an oil and gas producer to transfer title freely, irrespective of prescribing how revenues should be shared between the involved parties and if the transfer of produced water for value benefited the oil and gas producer.[43]In 2019, the Texas legislature amended Chapter 122 to clarify the surface estate owner's rights to share in any revenues from for-value produced water transfers, another effort by the Texas legislature to encourage reuse of produced water.[44] Under the 2019 amendments to Chapter 122, oil and gas producers have title to produced water and have the right to transfer title to it, unless the oil and gas lease or other contractual agreement between the surface estate owner and the oil and gas producer shares revenues with the surface estate owner.[45] Thus, Chapter 122 effectively grants ownership of produced water to oil and gas producers, overriding the surface estate's ownership of underlying water.[46] This uncompensated transfer of private property rights may be an unconstitutional taking and become a source of litigation from surface estate owners.[47] Chapter 122 never mentions "water," rather it only refers to "fluid oil and gas waste."[48] However, the Texas Supreme Court set precedent in *Robinson* that all waters underlying the surface estate were property of the surface estate, and that salinity and depth

39. *Id.* at 7 (citing Tex. Nat. Res. Code § 122.002(1)).

40. *Id.*

41. Collins, *supra* note 32, at 7.

42. *Id.*

43. *Id.*

44. Julie Anderson, *That's a Wrap*, Permian Basin Petroleum Ass'n Magazine (June 4, 2019), https://pboilandgasmagazine.com/thats-a-wrap/ [https://perma.cc/AZU4-RYY9].

45. Tex. Nat. Res. Code § 122.002.002(1).

46. *Should Landowners Have a Seat at the Water Midstream Table?*, Produced Water Society (July 9, 2021), https://web.archive.org/web/20210927133124/https://producedwatersociety.com/should-landowners-have-a-seat-at-the-water-midstream-table/ [https://perma.cc/28M9-388L].

47. *Id.*

48. § 122.002.

of the water source were of "no consequence upon ownership."[49] Therefore, produced water has two conflicting definitions—the Texas Supreme Court defines it as "water," yet the Texas legislature defines it as "fluid oil and gas waste."[50] This key difference seemingly creates a "slippery slope" in Chapter 122, because it permits the Texas legislature "to condemn various slices of private property for the benefit of private economic interests."[51]

B. Answers about the Produced Water in New Mexico Law

By contrast, New Mexico legislature passed the New Mexico Produced Water Act in 2019 to clarify ownership rights and regulatory authority of produced water in the state.[52] The Act vests ownership of produced water in the entity with possession of the water.[53] New Mexico water laws differ from Texas laws because New Mexico follows the prior appropriation doctrine, known as first-in-time, first-in-right for rights to water usage, and the New Mexico Office of the State Engineer controls groundwater-use permits throughout the state.[54] But the Act separates the water rights from produced water with the "absolute, clear intent" to classify produced water as a non-water substance, clarifying ownership rights.[55] TheAct also ensures that the state's hazardous waste laws, which arguably applied prior the Act, do not apply to produced water.[56] Further, the Act contemplates reuse of produced water so that reuse is not considered an appropriation of water, which would reattach water rights to treated produced water.[57] Finally, the Act vests authority over produced water

49. Collins, *supra* note 32, at 6 (quoting Robinson v. Robbins Petroleum Corp., Inc., 501 S.W.2d 865, 867 (Tex. 1973)).

50. Collins, *supra* note 32, at 6–7; *cf.* § 122.002 (referring to produced water as "fluid oil and gas waste").

51. Produced Water Soc'y, *supra* note 46 (quoting Gabriel Collins).

52. Sarah M. Stevenson, *New Mexico Produced Water Act*, Modrall Sperling Lawyers: News Blog (Sept. 6, 2019), https://www.modrall.com/2019/09/09/new-mexico-produced-water-act/ [https://perma.cc/VKM3-9QJR].

53. *Id.*; N.M. Stat. Ann. § 70-13-4(A)(1) (2019).

54. *Groundwater in the West: New Mexico*, Stanford: Water in the West, https://groundwater.stanford.edu/dashboard/new-mexico.html#chapter-4 [https://perma.cc/BR4P-WCE9] (last visited Jan. 28, 2023).

55. Brett Walton, *New Mexico Oil Production is Soaring. Now What to do with the Wastewater?*, Circle of Blue (Mar. 20, 2019) (quoting New Mexico State Rep. Nathan Small, original sponsor of the legislation), https://www.circleofblue.org/2019/world/new-mexico-oil-production-is-soaring-now-what-to-do-with-the-wastewater/ [https://perma.cc/KX8L-2Y26].

56. Stevenson, *supra* note 52.

57. *Id.*; *see also* Walton, *supra* note 55.

in the New Mexico Oil Conservation District, not the Office of the State Engineer, which reinforces produced water as a separate substance from typical groundwater.[58] The Act provides clear guidance for oil and gas producers in New Mexico for ownership and regulatory authority of produced water for its entire lifecycle, from original generation to final reuse; and the Act lays a foundation for the future of reusable produced water by mandating that producers use reusable produced water, instead of freshwater, for their operations when possible.[59] Whereas, Texas needs to address similar considerations with more clarity to prepare for the future of produced water.

C. Disposal of Produced Water: A Growing Concern

Produced water is toxic to the environment because it is extremely high in salinity, and contains toxic chemicals and minerals.[60] Therefore, the untreated produced water that comes to surface from an oil and gas well cannot be released into the environment because it can contaminate the soil, prevent anything from growing on the land for years, and harm wildlife.[61] Thus, oil and gas producers must transport produced water from well sites to disposal facilities, via trucks and pipelines.[62] These disposal facilities inject the produced water into subsurface formations so that the produced water never enters the environment.[63] But each disposal facility has a limited volume capacity, dictated by the subsurface formation receiving the injection; once the formation reaches its maximum capacity, then produced water can no longer be disposed there.[64] These disposal facilities must receive a permit regulated by the Texas Railroad Commission ("Texas RRC") to operate.[65] In recent years, the number of permit

58. N.M. Stat. Ann. § 70-13-3 (2019); Stevenson, *supra* note 52; *see* Walton, *supra* note 55.

59. Stevenson, *supra* note 52; Walton, *supra* note 56.

60. Galbraith, *supra* note 11.

61. *Produced Water: Why Oil & Gas is Now in the Water Business, Too*, Veolia (Nov.7,2019),https://blog.veolianorthamerica.com/produced-water-management-oil-gas-water-business [https://perma.cc/Z2S9-WJDP] [hereinafter Veolia].

62. Nieto, *supra* note 27.

63. Veolia, *supra* note 61.

64. Blythe Lyons et al., *Sustainable Produced Water Policy, Regulatory Framework, and Management in the Texas Oil and Natural Gas Industry: 2019 and Beyond*, Tex. Alliance of Energy Producers, at 20 (Sept. 16, 2019), https://acrobat.adobe.com/link/track?uri=urn%3Aaaid%3Ascds%3AUS%3A2c7b5154-f581-47dc-9c19-314d82c8de05&viewer%21megaVerb=group-discover [https://perma.cc/PR83-5WLV].

65. *Id.* at 9–10.

applications for new disposal facilities has been at an all-time high, leading to objections from competitors calling to reject new permits and causing months-long permit reviews by the Texas RRC.[66] Further, the Texas RRC is stringent in granting permits for new disposal facilities, regulating disposal facilities, and creating additional requirements for disposal operations.[67] The reason behind these new policies stems from an environmental concern and criticism surrounding produced water disposal, namely the connection between disposal and increased seismic activity in these areas.[68]

In 2021, Texas recorded a state record 209 earthquakes of 3.0 magnitude or higher—more than double the ninety-eight recorded in 2020 and almost eight-times the number recorded in 2017.[69] The record-setting seismic activity is largely concentrated in West Texas's Permian Basin.[70] This spike is "almost certainly a consequence" of produced water disposal because "the cumulative volumes [of water] increase the pressure, and this is the force that triggers the fault to slip."[71] These seismic concerns caused the Texas RRC to suspend all produced water injection operations for thirty-three disposal facilities in one area of the Permian Basin and to classify two other areas in the Permian Basin as "areas of concern."[72] Further, the Texas RRC instructed companies to work together to formulate a plan to limit seismic activity in the Permian Basin.[73] An executive of Chevron Corporation declared that seismic activity from produced water injections is one of the industry's "biggest challenges in the Permian Basin" in the future.[74] A primary environmental concern is that seismic activity will cause damage to the subsurface protections that prevent oil and gas fluids and produced water from leeching into the groundwater supply, polluting this key water source.[75] The ultimate result of these environmental concerns is that disposal capacity cannot keep pace with the continuous produced water generation. Therefore, disposal is becoming more

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66. *Id.* at 21.

67. *Id.* at 22.

68. *Id.*

69. Erin Douglas, *Earthquakes in Texas Doubled in 2021. Scientists Cite Years of Oil Companies Injecting Sludgy Water Underground*, Tex. Tribune (Feb. 8, 2022), https://www.texastribune.org/2022/02/08/west-texas-earthquakes-fracking/ [https://perma.cc/6WTD-PYWJ] [hereinafter Douglas, *Earthquakes*].

70. *Id.*

71. *Id.* (quoting Alexandros Savvaidis, a research scientist at the Bureau of Economic Geology at UT-Austin).

72. *Id.*

73. *Id.*

74. *Id.* (quoting Ryder Booth, Chevron Vice President of North American Exploration and Production).

75. *See* Douglas, *supra* note 69.

expensive and less readily available for oil and gas producers, making reuse a more economical and reliable alternative to handle produced water.[76]

D. The Legal Trend Toward the End of Disposal

Disposal problems may become dire for Texas oil and gas producers. In 2016, New Mexico enacted a law to prohibit new disposal injection-wells in the state's primary disposal formation.[77] As a result, approximately thirty-four percent of produced water generated in New Mexico's Delaware Basin, the U.S.'s largest producer of oil and produced water, is trucked and piped to Texas for disposal.[78] Therefore, an extra 27.6 trillion gallons of New Mexico produced water is disposed of in Texas per year, in addition to the 165 to 690 trillion gallons per year from Texas Permian Basin production, of which seventy to ninety percent on aggregate requires disposal.[79]

A potential legal concern for the Texas oil and gas industry is applicable federal legislation. The Clean Water Act, enacted in 1972, provides federal jurisdiction over Waters of the United States to the Environmental Protection Agency ("EPA"), this broad and "controversial" authority has been expanded through various federal court decisions.[80] There is no current movement to include produced water under this definition; however, if the definition were expanded to include produced water, then there would be significant complications and constraints on reusable produced water applications due to the stringent EPA regulations.[81] Currently, the primary concern for produced water is the Biden administration's 2022 Clean Air Act ("Act"). The Act would likely classify produced water as "hazardous waste," heightening disposal requirements and decreasing the number of eligible disposal facilities in the United States from 180,000 to fewer than 200.[82] These constraints on produced water disposal would curtail U.S. oil and gas production to such an extreme that it

76. Lyons et al., *supra* note 64, at 15, 21.

77. Patrick Patton, *Texas is Giving Away Revenue and Taking New Mexico's Waste*, Dallas Morning News (Jan. 21, 2023), https://www.dallasnews.com/opinion/commentary/2023/01/21/texas-is-giving-away-revenue-and-taking-new-mexicos-waste/ [https://perma.cc/F2MS-Y4UB].

78. *Id.*

79. *Id.*; Walzel, *supra* note 26; TPWC Report, *supra* note 26, at 12.

80. Lyons, *supra* note 64, at 25.

81. *Id.*

82. Avery R. Franklin, *Oil Field-Produced Water in Energy Act Could Undermine Energy Transition*, Plant Eng'g (June 21, 2021), https://www.oilandgaseng.com/articles/oil-field-produced-water-provision-in-energy-act-could-undermine-energy-transition/ [https://perma.cc/VVW3-SJY9].

"would destabilize global energy markets . . . within weeks of enactment."[83] The potential repercussions of the Act provide motivation for oil and gas companies and the Texas government to expedite development of reuse infrastructure.[84] If the Act is enacted by the federal government, then the Texas government will lose autonomy over produced water disposal within the state and will be forced to follow the EPA's standards for disposal of hazardous waste.[85] Even if the Act does not ultimately result in produced water being classified as hazardous waste, the Act, together with the new laws in New Mexico and Texas RRC restrictions, highlights the serious environmental concerns associated with produced water and a trend toward further restrictions on disposal at both the state and federal levels. Under these circumstances, reuse could be the *only* option in the future.

E. The Importance of Produced Water and Ownership Consequences

Produced water is a hurdle to the future of oil and gas production in Texas and all major production states, and its ownership is important to surface estate owners, oil and gas production companies, and produced-water management companies.[86] All of these parties are effected by the central problem of produced water—what to do with it once it comes to surface in production?[87] Currently, disposal is the primary method to handle produced water, and is a cost on the balance sheet for oil and gas producers; therefore, ownership is not an issue to surface estate owners.[88] But it seems likely that reuse will become the primary, if not only, method to handle produced water in the future; consequently, oil and gas producers will receive compensation for the produced water generated from their wells.[89] If and when produced water becomes a for-value commodity, the surface estate owners, who are excluded from the financial benefits of oil and gas production of the mineral estate, will want to share revenues from produced water so that these owners receive some level of financial benefit for operations that occur on their land.[90] Ownership of

83. *Id.* (quoting Gabriel Collins, Fellow in Energy & Envtl. Reg. Aff. at the Baker Inst.).

84. *See id.*

85. *See id.*; *see also* Patton, *supra* note 77; Lyons et al., *supra* note 64, at 22.

86. *Water Reuse Could Be Key for Future of Hydraulic Fracturing*, *supra* note 224.

87. *Id.*; *Should Landowners Have a Seat at the Water Midstream Table?*, *supra* note 46.

88. *Should Landowners Have a Seat at the Water Midstream Table?*, *supra* note 46; Lyons et al., *supra* note 64, at 21.

89. *See* Lyons, *supra* note 64, at 21; Collins, *supra* note 32, at 12–13.

90. Collins, *supra* note 32, at 12–13.

produced water by the surface estate is essential for their legal right to share in the revenues from produced water generated by wells on their property.[91]

IV. REUSE OF PRODUCED WATER

Reuse and recycle of produced water have the potential to "inject millions of acre-feet" into Texas water supplies.[92] Currently, several private companies operate produced water reuse facilities in the Permian Basin, and companies continue to build new facilities to increase commercial reuse capacity.[93] These facilities provide a proof of concept that "the technology [for reuse] is here" and private investors are ready to fund new reuse facilities.[94] Reuse is a process that separates chemicals, minerals, salts, and other impurities from the water.[95] The two final products are the treated produced water and the compressed solids.[96] The compressed waste material is dumped at a landfill, and the treated produced water is sold to oil and gas producers.[97] While the treated produced water is far from pure, it is sufficient for use in hydraulic fracturing operations.[98] Several companies, including some of the largest oil and gas producers in Texas and New Mexico, have committed to employ reusable produced water, either exclusively or as a significant percentage, to replace freshwater as the water source for their hydraulic fracturing operations.[99]

Oil and gas companies benefit from reuse of produced water. Across the entire oil and gas industry in Texas, water management spending on transport, treatment, storage, and disposal increased twelve percent per year from 2017

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91. *Id.*

92. Blake Wright, *New Consortium Explores Produced Water Issues in Texas*, J. of Petroleum Tech. (July 13, 2021) (quoting Charles Perry, Chairman of Tex. Senate Committee of Water, Agric., & Rural Aff.), https://jpt.spe.org/new-consortium-explores-produced-water-issues-in-texas [https://perma.cc/2MKV-6NM6] [hereinafter Blake Wright].

93. *Breakwater Breaks Ground on Water Recycling Facility*, WaterWorld (Nov. 15, 2021), https://www.waterworld.com/drinking-water/potable-water-quality/press-release/14213971/breakwater-breaks-ground-on-water-recycling-facility [https://perma.cc/WS4V-LTSG]; *The Rise of Recycling in the Permian*, Produced Water Soc'y (July 9, 2021), https://producedwatersociety.com/the-rise-of-recycling-in-the-permian/ [https://perma.cc/26PM-W5DB].

94. Lyons et al., *supra* note 64, at 19.

95. *Id.* at 13.

96. Douglas, *supra* note 69.

97. *Id.*

98. Lyons et al., *supra* note 64, at 13.

99. *The Rise of Recycling in the Permian*, *supra* note 93.

to 2019.[100] From 2019 to 2028, water management spending associated with hydraulic fracturing is projected to average $17 billion per year.[101] Costs for freshwater supply and produced water disposal continue to increase due to declining water supply and disposal capacity.[102] In contrast, costs for reusable produced water supply have decreased, as advances in reuse of produced water make it a more efficient process, and construction of more reuse facilities and pipelines to connect these facilities to individual wellsite locations decrease transportation costs.[103] Even at equivalent costs for freshwater and reusable produced water, reusable produced water is an advantageous option for oil and gas companies because it is a more readily available water supply with a downward cost trend; whereas, freshwater supplies are increasingly unreliable and expensive.[104] Moreover, reusable produced water "often led to better results" when used as the water supply in hydraulic fracturing operations, compared to use of freshwater or brackish water.[105] Finally, reuse of produced water addresses primary environmental concerns about hydraulic fracturing by eliminating freshwater usage from the process and by stopping the controversial disposal of produced water.[106]

A. Public Relations: Addressing Environmental Concerns of Hydraulic Fracturing

Undoubtedly, hydraulic fracturing has a stigma which has risen to become a key issue for political campaign platforms - whether a candidate endorses fracking or looks to ban it.[107] The term "fracking" became such a lightning-rod that the oil and gas industry tried to rebrand hydraulic fracturing to distance

100. *Bringing Balance to E&P Water Demands*, *supra* note 30.

101. *Id.*

102. Lyons et al., *supra* note 64, at 19–20.

103. *Id.* at 20–21.

104. *Id.* at 20, 26.

105. *Id.* at 26.

106. Deborah Gordon & Katherine Garner, *Texas's Oil and Water Tightrope*, Carnegie Endowment for Int'l Peace (Mar. 11, 2014), https://carnegieendowment.org/2014/03/11/texas-s-oil-and-water-tightrope-pub-54879 [https://perma.cc/G7FK-94DT].

107. Liz Hampton, *U.S. Oil Majors Pitch More Campaign Cash to Democrats as Frack Battle Looms*, Reuters (Oct. 16, 2020), https://www.reuters.com/article/us-usa-election-oil-donors/u-s-oil-majors-pitch-more-campaign-cash-to-democrats-as-frack-battle-looms-idUSKBN27116P [https://perma.cc/2EP5-HZ8W].

the process from the term "fracking."[108] Yet, a rebrand does nothing to address environmental concerns. Tangible progress in reuse and recycle of produced water would directly address two primary environmental concerns: freshwater usage and disposal impacts.[109] Reuse is tangible action that compares the industry's water usage to other industries and rebuffs causal links between the industry's hydraulic fracturing and disposal operations and increased seismic activity in these areas.[110] Deflecting blame does little to silence critics, but elimination of freshwater usage and of disposal methods provides a strong message for the industry to repair its public image.

B. Texas Government Encouraging Reuse of Produced Water

The Texas government acknowledged the potential of produced water and created the Texas Produced Water Consortium to study the economic impact and technology necessary to reuse produced water.[111] The consortium will outline a model for the economical and efficient use of produced water to reduce the freshwater footprint in Texas, particularly in drought-stricken areas that rely on the Ogallala aquifer.[112] Ultimately, the goal of the consortium is to research the viability of reusing produced water beyond the oil and gas industry.[113] This initial step by the Texas government shows that, beyond the private sector, the Governor and the legislature recognize the potential impact of produced water to alleviate the state's water supply issues.

C. Self-Sustaining Water Cycle in the Oil and Gas Industry

Over the coming decades, "enough water will come from the ground as a byproduct of oil production . . . to counter the need to use freshwater in hydraulic fracturing operations."[114] Effectively, reuse of produced water would create an isolated hydrologic water cycle for the oil and gas industry, eliminating the industry from the freshwater-demand equation. This result is especially significant because hydraulic fracturing occurs primarily in drought-prone regions that rely heavily on groundwater, so freshwater shortages are already

108. Ben Zimmer, *A Push to Make 'Fracking' Sound Better*, WALL ST. J. (Oct. 3, 2014), https://www.wsj.com/articles/can-the-word-fracking-lose-its-bad-reputation-1412358270 [https://perma.cc/83RB-NK2G].

109. Gordon & Garner, *supra* note 106.

110. *See* Lyons et al., *supra* note 64, at 21; Douglas, *supra* note 69.

111. Wright, *supra* note 92.

112. TPWC Report, *supra* note 112, at 78.

113. *Id.*

114. *Water Reuse Could Be Key for Future of Hydraulic Fracturing*, *supra* note 24.

a persistent concern and hydraulic fracturing exacerbates these concerns.[115] In Texas's Eagle Ford oil field, hydraulic fracturing comprised forty-five percent of the annual groundwater consumption across seven counties.[116] Prior to hydraulic fracturing operations in these seven counties, the oil and gas industry comprised approximately one percent of annual groundwater consumption.[117] These effects can be even more problematic in areas that disproportionately rely on groundwater, such as areas of West Texas, where a majority of oil and gas activities occur and groundwater is eighty percent of the total water supply.[118]

D. Expansion of the Applications for Reusable Produced Water

Reuse of produced water for hydraulic fracturing operations is not a complete and comprehensive solution due to the sheer volume of produced water generation. According to the Texas RRC Commissioner, even at peak efficiency in hydraulic fracturing operations to reuse produced water, only forty percent of the total volume of produced water will be needed in these operations.[119] Thus, there remains a sixty percent surplus of produced water that requires some other application.[120] An initial target for this excess is other operations in oil and gas production, primarily drilling new wells and secondary recovery in existing wells.[121] Another possibility is to release reusable produced water into the environment, given that the reusable produced water proves to be safe for the environment.[122] However, releasing reusable produced water into the environment might not be the most favorable option because it would not utilize reusable produced water as a water supply, and consequently would not ease demand on Texas's freshwater supply.

The ultimate target for reusable produced water should be application by the largest water-user—agriculture. The agricultural industry comprises eighty percent of the annual water usage in Texas, and the industry relies mainly on

115. Blake Wright, *supra* note 92; *see, e.g.*, Benton Arnett et al., *Water Use in the Eagle Ford Shale*, Bush School of Gov. & Pub. Serv., at 6 (Apr. 2014), https://core.ac.uk/download/pdf/147238917.pdf [https://perma.cc/TS9A-7C68].

116. Arnett et al., *supra* note 114, at 8.

117. *Id.*

118. Kurland, *supra* note 18.

119. Jim Wright, *Wright: Oil, Water, Earthquakes and Opportunities*, Texas RailRoad Commission (Jan. 31, 2022), https://www.rrc.texas.gov/news/013122-commissioner-wright-op-ed/ [https://perma.cc/7WZJ-2CN4].

120. *See id.*

121. *See id.*; Veolia, *supra* note 61.

122. Veolia, *supra* note 61.

groundwater, which accounts for eighty percent of the total usage.[123] Moreover, reusable produced water makes logistical sense for agricultural uses because the vast majority of produced water is generated in West Texas, which is a major agricultural hub and region that overwhelmingly relies on groundwater as the water supply.[124] Charles Perry, Chairman of the Texas Senate Committee on Water, Agriculture, and Rural Affairs emphasized the overall importance of reusable produced water, especially in West Texas, where "[w]ater is a finite resource, and produced water has the potential to inject millions of acre-feet into an area of the state that exists in persistent drought."[125] Already, researchers are conducting projects for irrigation of non-consumable crops with reusable produced water.[126] Produced water will generate sufficient water supplies to substantially supplement, if not eliminate, use of freshwater by the agricultural industry.[127] By eliminating, or at least significantly supplementing, freshwater usage by the agricultural industry and the oil and gas industry, over fifty percent of freshwater supplies would become allocable for municipal users and others.[128] This difference makes up the twenty percent freshwater usage deficit and frees up a freshwater surplus, preparing Texas for any future water demand and supply issues.[129] Currently, Texas conforms to the conventional water development strategies of building artificial reservoirs and damming rivers; however, these strategies "do not attempt to account for effects of climate change" that cause unreliable and insufficient water supplies.[130] While most states in the U.S. are limited to conventional water development methods, Texas is uniquely positioned to unlock the unprecedented, reliable, and prolific water source that is produced water.[131]

Moreover, reusable produced water makes financial sense for the Texas government because of the substantial investment from the private sector. Applications of reusable produced water outside of oil and gas operations

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123. Gordon & Garner, *supra* note 106.

124. *Id.*

125. Wright, *supra* note 92 (quoting Charles Perry).

126. Lyons et al., *supra* note 64, at 17 (citing RRC pilot project to irrigate a cotton crop with reused produced water).

127. Walzel, *supra* note 26; *Texas Water Use Estimates for 2020*, *supra* note 9.

128. *See Texas Water Use Estimates for 2020*, *supra* note 9.

129. *2022 Texas State Water Plan*, *supra* note 3.

130. Erin Douglas, *Texas' Plan to Provide Water for a Growing Population Virtually Ignores Climate Change*, Tex. Tribune (Oct. 31, 2022), https://www.texastribune.org/2022/10/31/texas-water-plan-reservoirs-climate-change/ [https://perma.cc/V3L2-F8GW].

131. *Water Reuse Could Be Key for Future of Hydraulic Fracturing*, *supra* note 224; Lyons et al., *supra* note 64, at 9.

require expensive, additional processes; although, private companies are already developing various alternative processes to make reusable produced water suitable for these uses and economically feasible for reuse companies.[132] In 2022, the global produced water management industry was valued at over $4 billion, with projected year-over-year growth, exemplifying the excitement of private investors in this industry.[133] Private investment substantially lowers the financial burden on the Texas government to develop this new water supply that will benefit the entire Texas economy by securing a reliable water source.[134]

V. WATER TRANSPORTATION SYSTEMS ARE A FOUNDATIONAL SOLUTION

As water becomes an increasingly valuable natural resource, everyone from international water companies to startups and financiers recognize the financial potential in water.[135] Texas is positioned to capitalize on investor interest, since Texas water law grants private ownership rights for groundwater.[136] For example, T. Boone Pickens, the famous oil tycoon, formed a water company to buy the groundwater rights in a portion of the Ogallala Aquifer in the Texas panhandle; Pickens's company later sold these rights for over $100 million.[137] Yet, Pickens was unable to achieve his ultimate goal—building a network of water pipelines to connect the Ogallala Aquifer to the Dallas-Fort Worth metroplex.[138] Today, private water management and transportation companies are being formed around Texas, attempting to accomplish a modified version of Pickens's goal.[139] These private investments are necessary to build the expensive commercial-scale water transportation systems capable of creat-

132. Lyons et al., *supra* note 64, at 14–15.

133. *Produced Water Treatment Systems Market Outlook – 2022-2029*, Future Mkt. Insights, https://www.futuremarketinsights.com/reports/produced-water-treatment-market [https://perma.cc/3RZE-WS4Y] (last visited Feb. 1, 2023).

134. *See* Rubinstein & Simmons, *supra* note 6.

135. Perez, *supra* note 5, at 222.

136. Tex. Water Code § 36.002 (2015).

137. Perez, *supra* note 5, at 216 (discussing T. Boone Pickens's purchase of water rights in portions of the Ogallala Aquifer).

138. *Id.*

139. *See, e.g.* Dale Smith et al., *Water Midstream Transactions: There's Floodin' Down in Texas*, Hart Energy (Apr. 29, 2020), https://www.hartenergy.com/exclusives/theres-floodin-down-texas-186797 [https://perma.cc/ZR6W-DG6X] (discussing investments into water midstream companies in the oil and gas industry); *Bringing Balance to E&P Water Demands*, *supra* note 30 (stating that "[o]ver the last two years, more than 30 water transfer projects in the Permian

ing a statewide water market to overcome "traditional water markets [that] are inherently local."[140] Transportation of water, from Texas regions with abundant water supplies to the state's regions that are prone to water shortages, would stabilize statewide water supplies through redistribution of the state's overall water sources, regardless of a source's physical location.[141]

A. Texas Oil & Gas Industry: The Blueprint for Water Transportation

The Texas oil and gas industry leads the efforts in private water transportation and management. The industry is a microcosm of Texas's overall water situation, as current oil and gas operations require more water than ever before and Texas water demands are at all-time highs.[142] Further, water supply varies drastically by region in Texas, and oil and gas companies operate in many areas of the state that do not have an abundance of excess water, therefore companies must overcome regional water scarcity issues, similar to the issues that Texas faces itself.[143]

Modern oil and gas recovery processes require exponentially more water supplies than conventional recovery methods, so oil and gas companies need billions of gallons of accessible water supplies.[144] Furthermore, these daily operations occur at hundreds of individual locations, scattered across thousands of square miles of desert landscape.[145] Over the last decade, private "water midstream" companies built vast networks of fully integrated pipeline systems to transport water across these areas in order to ensure a reliable and sustainable water supply for thousands of locations.[146] Yet, one industry execu-

Basin alone" and "water transfer projects have popped up across many U.S. shale basins as water is a key operational component").

140. Perez, *supra* note 54, at 216 (stating that man-made water transportation is more expensive to transport than gas, where transportation can be fifty percentof the wholesale cost of water, while the equivalent is 2.5% for natural gas); Rubinstein & Simmons, *supra* note 8 ("private financing, in concert with a public partner, is the most cost-effective solution to these [water supply] issues facing [Texas].").

141. *See* Joseph Schulman et al., *An "Interstate Water System" Could Fix the West's Water Woes*, Big Think (May 26, 2021), https://bigthink.com/the-present/an-interstate-water-system-could-fix-the-wests-water-woes/ [https://perma.cc/ALU4-X9L7].

142. *2022 Texas State Water Plan*, *supra* note 3; *see also* Lyons et al., *supra* note 64, at 5.

143. Wright, *supra* note 92.

144. *Water Reuse Could Be Key for Future of Hydraulic Fracturing*, *supra* note 24; Nieto, *supra* note 27.

145. Lyons et al., *supra* note 64, at 2.

146. Nieto, *supra* note 27.

tive estimates that, in West Texas alone, "$100 billion of water infrastructure will be needed over the next decade" to support the escalating water demands of the oil and gas industry in the region.[147] But water midstream industry projects annual revenue surpasses infrastructure costs by two to three times.[148] Thus, financiers, armed with billions of dollars in capital, continue to seek investment opportunities in water transportation and management, "set[ting] the stage for the rapid emergence" of the water midstream industry.[149] Investor enthusiasm for the water midstream industry and the water industry as a whole, and T. Boone Pickens's Ogallala-to-DFW pipeline concept illustrate that water transportation networks should be a cornerstone in the future of Texas water.

B. Texas has a Unique Opportunity for its Water Future

Texas must harness the private sector's interest in water transportation to benefit the state. According to the 2022 State Water Plan, the estimated capital costs to build the minimum recommended water management projects is $80 billion.[150] But if the state does not implement water management strategies, water shortages could cause over $100 billion in annual economic damages for the state.[151] This makes two things clear: (1) Texas is at serious economic risk due to current water supply issues and (2) Texas cannot fund the projects necessary to fix these issues, unless the state obtains private investment.

Public-private partnerships offer a potential solution. Under a public-private partnership, the Texas government enters a contract with private investors and contractors to build necessary projects in water transportation infrastructure.[152] The Texas government should enter public-private partnerships with water midstream companies for a variety of reasons. The success of water midstream companies to secure investments, to build water pipeline networks, and to deliver financial results that encourage further investment in their companies shows that operators in this water-transportation-and-management space have a proof of concept. The midstream model dates back to the natural gas midstream evolution in the 1980s and 1990s, which addressed the local limitations of natural gas at the time; the water midstream industry simply transferred this "well-worn template" to address the local limitations of water in the 2010s.[153] The Texas government needs to recognize this template, and the current inves-

147. *Id.* (quoting Darrell Bull, Chief Commercial Officer of H2O Midstream).

148. *Compare Bringing Balance to E&P Water Demands*, *supra* note 30, *with* Lyons et al., *supra* note 64, at 27.

149. Dale Smith et al., *supra* note 139.

150. Rubinstein & Simmons, *supra* note 8.

151. *Id.*

152. *Id.*

153. Nieto, *supra* note 27.

tor interest in water transportation and infrastructure, which goes beyond the oil and gas industry, because of the growing water scarcity problem in Texas.[154] There is no shortage of public entities that face water supply issues, so there are endless suitors that will need private funds to supplement the costs for water infrastructure, which is "far more expensive" than typical energy or gas infrastructure.[155] If Texas waits to obtain private investment, other public entities may secure all available private funds before Texas has a chance.

C. Water Transportation Network Ready for Produced Water

Water transportation remains the foundational piece that Texas must embrace to make reuse a logistically viable option, with pipelines to transport produced water to and from reuse facilities, storage facilities, and end consumers. Oil and gas companies point to inadequate transportation as a fundamental limitation to reuse of produced water and a key reason for the current ten percent reuse rate.[156] Even though disposal of produced water costs companies money, this option remains cheaper than transportation to a reuse facility because of a lack of transportation and reuse facilities.[157] Expansion of produced water pipeline networks is foundational to provide the requisite input and output capacity for produced water treatment facilities. Currently, there are two commercial produced water reuse facilities, with a total output capacity of 23 million gallons per day.[158] In comparison, there are thousands of disposal facilities located throughout high-activity areas that are available for companies.[159] Yet, in areas with capable transportation infrastructure, reuse may exceed fifty percent and highlight the importance of pipeline transportation for reuse.[160] The first step could be connecting existing disposal facilities so that these locations become gathering facilities for produced water. Companies that use these facilities will not need to change their transportation operations; the only difference is that these disposal facilities connect to reuse facilities rather than injecting produced water into the ground to dispose of it. These facilities already store produced water and are designed to manage the

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154. *See* Perez, *supra* note 5, at 212, 222, 228.

155. *Id.* at 216, 222–23; *see, e.g.*, John Heggie, *Why is America Running Out of Water?*, Nat'l Geographic (Aug. 12, 2020), https://www.nationalgeographic.com/science/article/partner-content-americas-looming-water-crisis [https://perma.cc/H3AL-6XR9] (citing water transportation proposals in California and Arizona, but these states lacked funds to execute the projects).

156. Nieto, *supra* note 27 (quoting Darrell Bull).

157. Lyons et al., *supra* note 64, at 20.

158. *Breakwater Breaks Ground on Water Recycling Facility*, *supra* note 93.

159. *Compare id.*, *with* Lyons et al., *supra* note 64, at 10.

160. Nieto, *supra* note 27 (quoting Darrell Bull).

product, so they only need to be repurposed for reuse transportation. Pipelines significantly lower the costs for oil and gas producers to transport produced water.[161] For example, in the Permian Basin, the average cost of truck transportation is $2.00 per barrel of water, but the average cost of pipeline transportation ranges between $0.30 to $0.75 per barrel of water.[162] Thus, pipelines that connect to reuse facilities are essential to cost-effective reuse. With more pipelines, there is more available capacity, which mitigates cost-variability across counties and lowers costs for transportation.[163] Additionally, this opens water-pipeline availability to more oil and gas producers because smaller producers could tie into high-capacity, extensive pipeline networks for reliable transportation of produced water.[164]

The second step would be building additional reuse facilities in order to increase processing capacity, service larger geographical areas, and reduce transportation distances.[165] Thus, reuse becomes the most convenient and cost-effective option to manage produced water.[166] Currently, produced water represents an operational cost for water midstream companies because they must pay to dispose of produced water at disposal facilities.[167] But as counties raise prices for freshwater used by oil and gas companies and produced water disposal becomes more expensive and more controversial, reuse becomes an increasingly attractive option and one that is ripe for private investment.[168] While the Texas RRC has restricted permits for new disposal facilities, the commission has also eased permit requirements for new reuse facilities.[169]

With the core water infrastructure in place, largely funded by private investors, Texas would only need to supplement water development.[170] Thus, Texas can build the requisite water infrastructure for the state, but at a significantly lower financial burden.[171] By obtaining a solution to water shortages, Texas mitigates the risk of $110 billion in economic damages and attracts businesses that need freshwater for their operations and cannot receive reliable

161. Lyons et al., *supra* note 64, at 20.

162. *Id.*

163. *See id.*

164. *Id.* (quoting Gabriel Collins).

165. *See Breakwater Breaks Ground on Water Recycling Facility*, *supra* note 93.

166. Lyons et al., *supra* note 64, at 20–21.

167. *Id.*

168. *See id.*; *see e.g.*, Arnett et al., *supra* note 116, at 17; Gordon & Garner, *supra* note 106.

169. Lyons et al., *supra* note 64, at 16, 21.

170. *See id.* at 30; Rubinstein & Simmons, *supra* note 85.

171. *See* Rubinstein & Simmons, *supra* note 8.

water supplies elsewhere.[172] Texas will "lead the nation in innovation" for the future of water, with preparation and experience to address water issues as they arise in the future; although, this outcome requires foresight and proactive action by the Texas government.[173]

VI. TEXAS MUST COMMIT, SERIOUSLY COMMIT

The private sector has already invested billions of dollars into water transportation, and the Texas government can take advantage of this interest in the water transportation sector. Due to the costs of water transportation projects, the Texas government cannot fund these projects alone, so private investment is necessary.[174] Fortunately, the private sector has already invested billions of dollars into water transportation; however, support from the Texas government should only increase private investment in water management and reuse projects, which are "gaining momentum" due to the "emphasis and considerable research" to use produced water outside of the oil and gas industry.[175] Public investment moves slowly, and may be altogether unlikely, until water supply issues create a crisis that forces a response from the Texas government.

A. Lack of Financial Support from the Texas Government

In 2019, the Texas government provided tepid endorsement of water transportation and reuse projects through proposals for tax incentives for reuse projects and "earmarked" funds for oil field infrastructure improvements.[176] But the Texas legislature needed years to study these issues before finalizing any commitments, which drew criticism from reuse and recycle companies that stated "the technology [for reuse] is here;" so "the time is now to solidify the role of Texas as a leader in the recycling field."[177]

As of 2022, the Texas government's creation of the research consortium has been the only tangible commitment to reuse of produced water and water transportation. New Mexico showed that a state government can proactively create a legislative framework to encourage safe and economic expansion of water transportation infrastructure and reuse of produced water.[178] Texas should follow suit. The research consortium report called for the Texas gov-

172. *Id.*

173. Wright, *supra* note 92 (quoting Charles Perry).

174. Rubinstein & Simmons, *supra* note 8.

175. *Bringing Balance to E&P Water Demands*, *supra* note 30 (quoting Rob Bruant, Director at B3 Insights).

176. Lyons et al., *supra* note 664, at 19.

177. *Id.*

178. Walton, *supra* note 55.

ernment to provide "crucial" funds for reuse pilot projects, as an indication of "the state's continued dedication to identifying and developing new water sources."[179] Serious commitment, beyond a research consortium report and basic recognition of these issues, through *actual* government bonds and funds allocated for water transportation projects, tax incentives for reuse of produced water, and delegation of statutory authority to a state agency to oversee these projects, is necessary for Texas to "lead the nation in innovation" and to prepare the state with sustainable solutions for the uncertain future of water supplies.[180] Produced water presents a unique opportunity to create a new water supply, and Texas needs to capitalize on this opportunity.[181]

B. Ownership Questions: The Consequences for Water Transportation Development

Ownership of produced water applies to water transportation management too, because of the chain of transfers of title. First, title transfers from the original owner to the oil and gas producer, to the water transportation company, then to the reuse facility company.[182] Second, the final reusable produced water transfers title from the reuse facility company to the oil and gas producer that acquires the treated product.[183] Once the produced water transfers title from the original owner, the original owner no longer has claim to the commodity that is produced water.[184] Therefore, the status of produced water's value is "shifting away from an exclusive focus on the *service* of disposing produced water to the economic value inherent in the *water itself*."[185] Further, the legal liabilities and risks transfer with produced water to each party that acquires title.[186] Chapter 122 helps advance the reuse of produced water by insulating the parties from tort liability due to spills of produced water. This is because prior to the 2019 amendments, the liability associated with produced water transportation caused many oil and gas producers to default to disposal of produced water, even when reuse transportation was available and cheaper than disposal.[187]

179. TPWC Report, *supra* note 26, at 17.

180. Rubinstein & Simmons, *supra* note 6; Wright, *supra* note 92 (quoting Charles Perry).

181. *See* Wright, *supra* note 92.

182. *See* Collins, *supra* note 32, at 10.

183. *See id.*

184. *Id.*

185. *Id.*

186. *Id.*

187. *Id.* at 7; Lyons, supra note 64, at 21.

However, Chapter 122 leaves gaps in ownership, non-tortious liability, and requisite compensation as to each party in the chain of title.[188] The ambiguities extend to the *exact parties* that have legal title to the produced water and the legal definition of produced water itself.[189] Is it water, oilfield waste, or a different substance altogether? By remaining silent on these questions, the Texas legislature grants the parties freedom to contract in produced water transactions, but this freedom places the onus on common law to govern these transactions, leaving unanswered questions for the parties.[190] Common law governance, especially in the burgeoning sphere of for-value produced water transactions—which lacks existing case law—does not provide immediate guidance. New guidance develops slowly over time and contains substantive gaps that must be filled in by future court decisions. Moreover, there is fundamental tension between the Texas Supreme Court and the Texas legislature because the Texas Supreme Court classifies produced water as groundwater, owned by the surface estate, whereas the Texas legislature classifies produced water as oilfield waste, owned by the mineral estate.[191] Under this core difference, Texas common law governance would come into direct conflict with Texas statutory governance.[192] This glaring lack of clarity in the pertinent law will deter parties from entering transactions, and changes to the law, through new court decisions, would likely cause "produced water recycling [to] come to a halt and w[ould] be difficult to restart."[193] This legal conflict is not conducive to expedite the development of water transportation systems or new reuse facilities, which are keys to the reuse of produced water.

The Texas legislature needs to encourage expansion of water transportation pipelines because an established pipeline network will encourage companies to reuse produced water and will lay the foundation for expansion into other sectors that need water supplies. A pipeline network that has capacity to connect wellsites to produced water reuse facilities will make reusable water a readily available and convenient option for oil and gas companies. Moreover, reusable produced water resold as a hydraulic fracturing water supply, will generate revenue for water midstream companies and become the

188. Collins, *supra* note 32, at 8.

189. *Id.* at 7; Tex. Nat. Res. Code § 122.002 (2013).

190. Collins, *supra* note 32, at 8.

191. Charles Sartain & Stephen Cooney, *Produced Water in Texas . . . Who Owns It?*, Gray Reed LLP (Feb. 13, 2020), https://www.energyandthelaw.com/2020/02/13/produced-water-in-texas-who-owns-it/ [https://perma.cc/E5AJ-BAFA].

192. *Id.*

193. Mella McEwen, *Increased Oil Patch Activity Can Magnify Legal Issues*, Midland Rep.-Telegram (Mar. 14, 2020), https://www.mrt.com/business/oil/article/Increased-oil-patch-activity-can-magnify-legal-15132073.php [https://perma.cc/SRU3-VCXL] (quoting Ben Sebree).

most cost-effective option for their oil-and-gas-company clients.[194] The Texas government would generate hundreds of millions of dollars in annual tax revenues.[195]

C. New Groundwater Regulation Structure: The Logical Solution

Regardless of the future of reusable produced water and water transportation systems on a statewide level, these two nascent industries exemplify the new concept of water as a valuable commodity, one that has piqued the interest of private investors.[196] Inadvertently, Texas is at the forefront of the water-commodity evolution due to the state's prolific oil and gas industry. With this evolution of water, the state needs to evolve its regulatory structure to parallel a new future of water. New Mexico, faced with a comparable produced-water situation, updated its laws to grant the state's oil and gas regulatory agency with the same regulatory authority over produced water as the agency has over oil and gas production.[197] Furthermore, New Mexico has a statewide agency that regulates all groundwater in the state, and grants permits for private individuals to access this water source.[198] Similarly, Wyoming regulates groundwater through a statewide agency with the sole purpose of regulating all of the state's groundwater.[199] While Texas water laws will not allow regulation of groundwater to this extreme, Texas can follow New Mexico's lead to restructure regulatory authority over the state's water sources.

Texas regulates groundwater usage through local Groundwater Conservation Districts ("GCDs"). There are ninety-eight GCDs, managing approximately seventy percent of Texas's groundwater.[200] Overall, GCDs have three legislatively-mandated duties: 1) permitting non-exempt water wells, 2) developing a comprehensive management plan for the district, and 3) adopting necessary rules to implement the GCD's management plan.[201] But, each GCD governs only its district and operates on the local level, so each GCD has the

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194. Nieto, *supra* note 27.

195. Patton, *supra* note 77.

196. Perez, *supra* note 54, at 216; *Bringing Balance to E&P Water Demands*, *supra* note 30.

197. Stevenson, *supra* note 552.

198. *Stanford: Water in the West*, *supra* note 54.

199. *Ground Water*, Wyoming State Engineer's Office, https://seo.wyo.gov/ground-water [https://perma.cc/TW8B-RLAP] (last visited Mar. 18, 2023).

200. *Groundwater Conservation District Facts*, Texas Water Development Board, https://www.twdb.texas.gov/groundwater/conservation_districts/facts.asp [https://perma.cc/EH9F-DUZ8] (last visited Apr. 8, 2023).

201. *What is a Groundwater Conservation District (GCD)?*, Texas Commission on Environmental Quality, https://www.tceq.texas.gov/downloads/

authority and freedom to manage the district's groundwater however they see fit. As a result of this local GCD system, the state has limited oversight over groundwater because there is no statewide agency in place that can take universal action when necessary.

Texas should employ a statewide regulatory structure for its groundwater, similar to the state's oil and gas regulatory model. The Texas RRC is the sole state agency with "general and all-inclusive authorization" to regulate the oil and gas industry in Texas.[202] The Texas RRC operates on both the state level and the local level, where the RRC Commissioners provide statewide oversight of the oil and gas industry, and the ten regional districts provide local oversight.[203] The Texas RRC designates each district to correspond with a major reservoir area because the primary purpose of the Texas RRC and these district offices is to regulate the reservoirs and the activities that access these resources.[204] The Texas RRC adapts its district boundaries to fit the unalterable reservoir borders because "each field presents a separate problem," so each district must be able to tailor regulations to the unique characteristics of the reservoirs in the district.[205] The Texas RRC structure allows the Commissioners to make statewide regulatory decisions, and each district office implements these decisions within its district to best prevent waste of the reservoir's resources.[206]

On the contrary, Texas's water regulatory structure incorporates a multitude of separate state and local agencies: the Texas Water Development Board ("TWDB") and the Texas Commission on Environmental Quality ("TCEQ") operate at the state level, while the GCDs, counties, municipalities, and others operate at the local level.[207] For groundwater, the TWDB collects groundwater

groundwater/maps/gcd-text.pdf [https://perma.cc/G9AB-FGVR] (last visited Apr. 8, 2023).

202. R.R. Comm'n v. Shell Oil Co., 206 S.W.2d 235, 241 (Tex. 1947).

203. Jake W. Burton, *Preventing a Bone-Dry Future: Texas's Need for a Statewide Groundwater Conservation Authority*, Ctr. for Am. & Int'l L., at 3–4 (2021).

204. *Oil and Gas Division District Boundaries January 2020*, Railroad Commission of Texas, https://www.rrc.texas.gov/media/3bkhbut0/districts_color_8x11.pdf [https://perma.cc/QZ7J-DFN4] (last visited Feb. 2, 2023); *About Us*, Railroad Commission of Texas, https://www.rrc.texas.gov/about-us/ [https://perma.cc/DC4K-GNJF] (last visited Feb.2, 2023).

205. *Shell Oil Co.*, 206 S.W.2d at 242.

206. *See id.*

207. *About the Texas Water Development Board*, Texas Water Development Board, https://www.twdb.texas.gov/about/index.asp [https://perma.cc/97BM-MWFG] (last visited Feb. 1, 2023); *About Us*, Texas Commission on Environmental Quality, https://www.tceq.texas.gov/agency/mission.html [https://perma.cc/35SG-QP8N] (last visited Feb. 1, 2023); *Groundwater Conservation District Facts*, *supra* note 200; *Regional Water Planning in Texas*, Texas Water Development Board, https://www.twdb.texas.gov/publications/shells/

data, approves each GCD's district water plan, and oversees water development efforts by GCDs and the state.[208] Meanwhile, the TCEQ monitors the environmental effects and concerns of all Texas water supplies.[209] Likewise, municipalities and counties regulate water supplies and usages as well. But GCDs are the primary regulation and management authority for groundwater within its district, not the TWDB.[210] Altogether, this complex administrative system for Texas water creates "significant confusion as to who's doing what, when or how" because there is no singular state agency with authority to manage and oversee GCDs and to disseminate regulatory decisions.[211]

GCDs have the power to tax, to issue bonds, to create and enforce regulations, and to contract with engineers and consultants to help manage groundwater within their districts; consequently, each GCD acts as "mini-state" agency for its district.[212] Therefore, each GCD regulates independently of the other GCDs, without considerations of long-term, statewide groundwater sustainability.[213] Unlike the Texas RRC districts that adapted to the unalterable borders of the reservoirs, the GCDs boundary lines have no direct correlation to the borders of the aquifers that they regulate.[214] Rather, nearly all GCD boundaries conform to artificial surface borders, usually county lines.[215] GCDs likely match county lines because the governing board of each GCD is either elected or appointed by a locally elected official, so county elections

RegionalWaterPlanning.pdf?d=17076 [https://perma.cc/C4U7-27H8] (last visited Feb. 1, 2023).

208. *Groundwater Conservation Districts*, Texas Water Development Board, https://www.twdb.texas.gov/groundwater/conservation_districts/index.asp [https://perma.cc/CZL7-7VZC] (last visited Feb. 1, 2023).

209. *Texas Groundwater Protection Program*, Texas Commission on Environmental Quality, https://www.tceq.texas.gov/groundwater/groundwater-planning-assessment/prot_prog.html [https://perma.cc/LS3Z-94CP] (last visited Feb. 2, 2023).

210. Tex. Water Code § 36.057 (1995).

211. Burton, *supra* note 203, at 2 (quoting Larry Soward, former TCEQ Commissioner).

212. Tex. Water Code §§ 36.020, 36.101, 36.102 (1995).

213. Burton, *supra* note 203, at 3.

214. *Compare Major Aquifers*, Texas Water Development Board, https://www.twdb.texas.gov/groundwater/aquifer/major.asp [https://perma.cc/J8QJ-PFQ6] (last visited Feb. 1, 2023) (mapping the locations of Texas's major aquifers), *with Groundwater Conservation Districts of Texas*, Texas Water Development Board, https://www.twdb.texas.gov/mapping/doc/maps/GCDs_8x11.pdf [https://perma.cc/28FE-VHAU] (last visited Feb. 1, 2023) (mapping the locations of GCDs).

215. *Groundwater Conservation Districts of Texas*, *supra* note 215.

are the most logical method to elect GCD board members.[216] But this localization of GCDs is not practical for effective regulation of groundwater, and even results in some GCDs regulating the groundwater from only *part* of a common aquifer that underlies multiple GCDs.[217] This regulatory system also leads to conflicts between GCDs' district-specific groundwater plans when they manage a common aquifer, which causes similar disputes to those commonly seen between states that share a cross-border water source.[218] GCDs need to adapt their boundary lines so that GCD districts overlay an aquifer or groundwater source, not geographic county lines. Further, GCDs should not be elected officials subject to local pressures. The GCD board members should be appointed by the groundwater state agency so that groundwater experts manage these GCDs for maximum effectiveness. Wyoming has a similar system that accounts for local input through "Division Advisory Committees," an elected board of landowners in the division, that report to the statewide groundwater agency; thus, the agency considers each division's specific issues to craft the statewide groundwater regulation policy.[219] While Wyoming elects Division Advisory Committees, these committees do not dictate the division's groundwater regulatory policies; the singular state agency still regulates groundwater within each division to avoid interdivision policy conflicts.[220] This Wyoming regulatory scheme allows for both local input and universal regulation.

The Texas RRC structure of managing the state's oil and gas resources offers a blueprint for a more uniform regulatory structure for managing the state's groundwater resources with a clear delineation of authority.[221] Texas needs a statewide groundwater agency with "general and all-inclusive authorization" to disseminate regulations and to guide regional plans that act in conjunction with this central agency's statewide groundwater plan.[222] Under the central agency's oversight, each GCD operates as a district office that implements district plans, monitors the district's groundwater supplies and usages,

216. *See id.*; Tex. Water Code § 36.051 (1995).

217. Burton, *supra* note 203202, at 4.

218. *Id.* at 2; *see also* Ellen M. Gilmer & Jennifer Kay, *Water Waters at the Supreme Court: 'It's Only Going to Get Worse'*, Bloomberg L. (Sept. 17, 2020), https://news.bloomberglaw.com/environment-and-energy/water-wars-at-the-supreme-court-its-only-going-to-get-worse [https://perma.cc/V3DR-RLSK].

219. *Ground Water*, *supra* note 199; *Ground Water Control Areas and Advisory Boards*, Wyoming State Engineer's Office, https://seo.wyo.gov/groundwater/control-areas-and-advisory-boards [https://perma.cc/86KM-DBPM] (last visited Mar. 18, 2023).

220. *See Ground Water*, *supra* note 219; *Ground Water Control Areas and Advisory Boards*, *supra* note 219.

221. *See* Burton, *supra* note 203, at 3.

222. R.R. Comm'n v. Shell Oil Co., 206 S.W.2d 235, 241 (Tex. 1947).

and communicates local groundwater issues to the central agency.[223] This groundwater regulation structure allows a central agency to plan for long-term sustainability of the state's groundwater resources, while local GCDs monitor the specific concerns of their districts.[224] Moreover, the Texas Produced Water Consortium recommends statewide and regional planning efforts for the proper implementation of reusable produced water; therefore, a central regulatory agency could oversee these plans and district offices could execute them.[225]

Ironically, Texas courts set precedent that there is "no reason to treat groundwater differently" from oil and gas minerals, since "[g]roundwater and minerals both exist in subterranean reservoirs in which they are fugacious."[226] Yet, the regulatory structures employed by the state for groundwater and for oil and gas bear no resemblance to one another.[227] Since these fugacious resources are legal parallels, the similarities should extend to their regulatory structures too, since Texas courts resolve regulatory disagreements for groundwater and oil and gas. Therefore, a common regulatory structure would allow courts to draw on these regulatory similarities in their decisions, providing consistency and gap-filler mechanisms when necessary.

VII. CONCLUSION

Texas must decide whether it is serious about addressing its bleak water situation. On one hand, Texas could wait and see how private water transportation companies fare in their endeavors and continue to pursue conventional water development strategies. This conservative approach will place the financial burden primarily on the state, will lack innovation, and ultimately fail to address the core issue: reliable water supply. On the other hand, Texas could utilize innovative water companies and private water-investors that already exist within the state. Private water companies built a water transportation network that spans half of Texas, provided reliable water supplies for Texas's oil and gas industry, and secured billions of dollars in private investment for these projects. This is invaluable expertise in successful water development that addressed water needs in some of the state's most water deficient regions. Water transportation is key to address the core issue of reliable water supply because long-distance transportation makes water available across the state. No matter the location of the water supply, it can be transported to areas in need. Texas's oil and gas water midstream industry established the effectiveness of

223. Burton, *supra* note 203, at 4.

224. *Id.* at 5.

225. *See* TPWC Report, *supra* note 26, at 20.

226. Edwards Aquifer Auth. v. Day, 369 S.W.3d 814, 823 (Tex. 2012); Coyote Lake Ranch, LLC v. City of Lubbock, 498 S.W.3d 53, 63 (Tex. 2016).

227. *See* Burton, *supra* note 203, at 1, 5.

commercial-scale water transportation within a water-intensive industry, proving that water transportation can be logistically and financially viable.

Reusable produced water is the ultimate solution to create reliable water supplies. Reusable produced water is a reliable and prolific water supply that provides opportunity to overcome reliance on unreliable rainfall and generate water supplies that keep pace with demand increases in Texas. Again, private water companies in Texas provide a template to reuse produced water, and these companies continue to invest in reuse of produced water so that it becomes a cost-effective water supply for a broad spectrum of water-intensive industries. The combination of water transportation and reusable produced water will result in reliable and stable water supplies across Texas and will provide permanent and sustainable solutions to prevent water shortages in the future. Texas is uniquely equipped to solve its water future, as the state already has a successful template and investor enthusiasm in its water industry. The Texas government must commit to a sustainable water future by embracing innovative solutions and by engaging private stakeholders. The longer the Texas government waits to address this issue, the more likely it is to become a full-scale crisis, and fewer options will be viable solutions. The Texas government must act now.