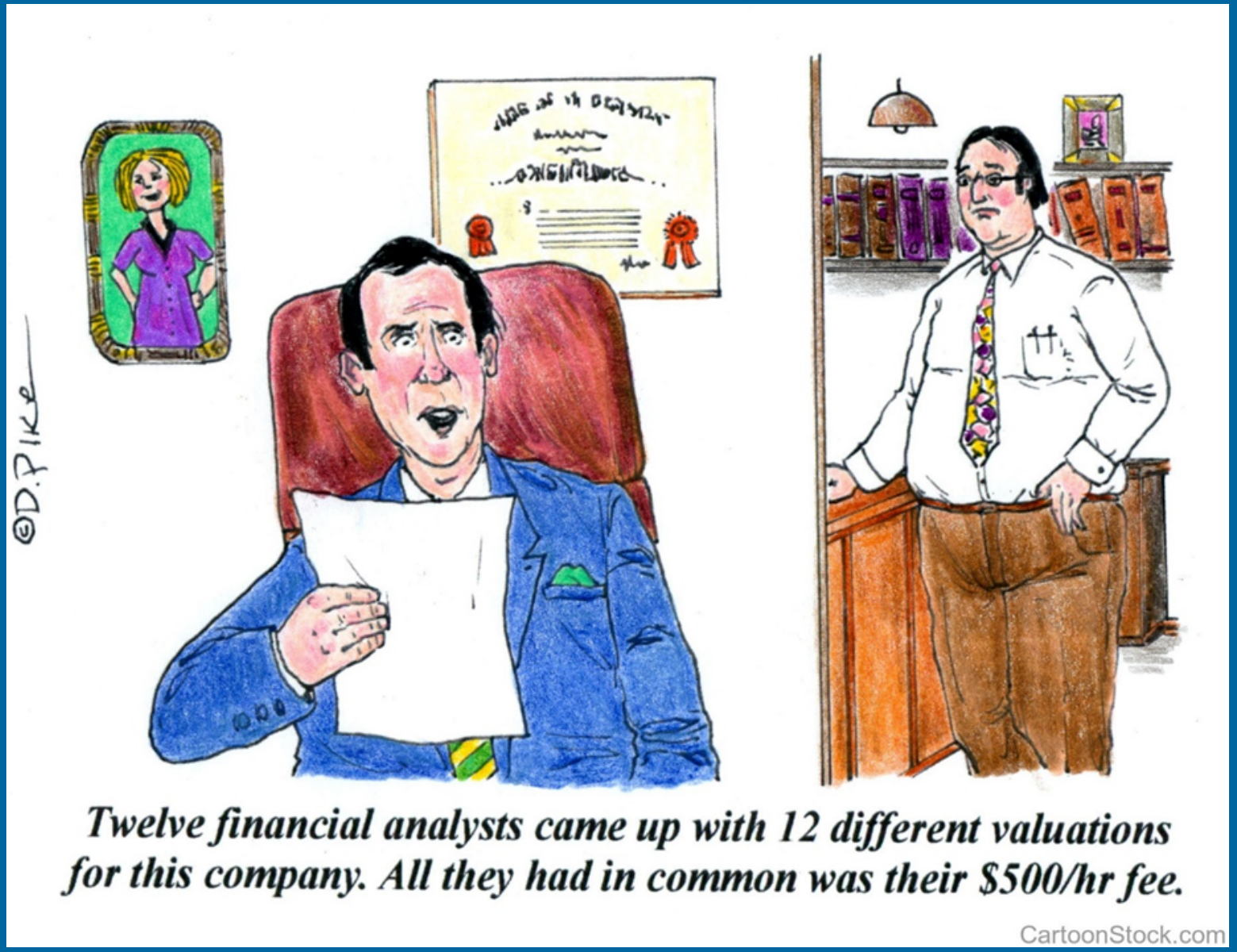
Valuing Groundwater: A Tricky Business

Gabriel Collins, J.D.
Baker Institute for Public Policy, Rice University
23 February 2018

Note ***The views and opinions expressed in this talk are mine alone and do not necessarily reflect the views and opinions of the Baker Institute for Public Policy or Rice University.***

Upgraded Version of Slides Presented at Event

Groundwater valuation is Eminently Doable



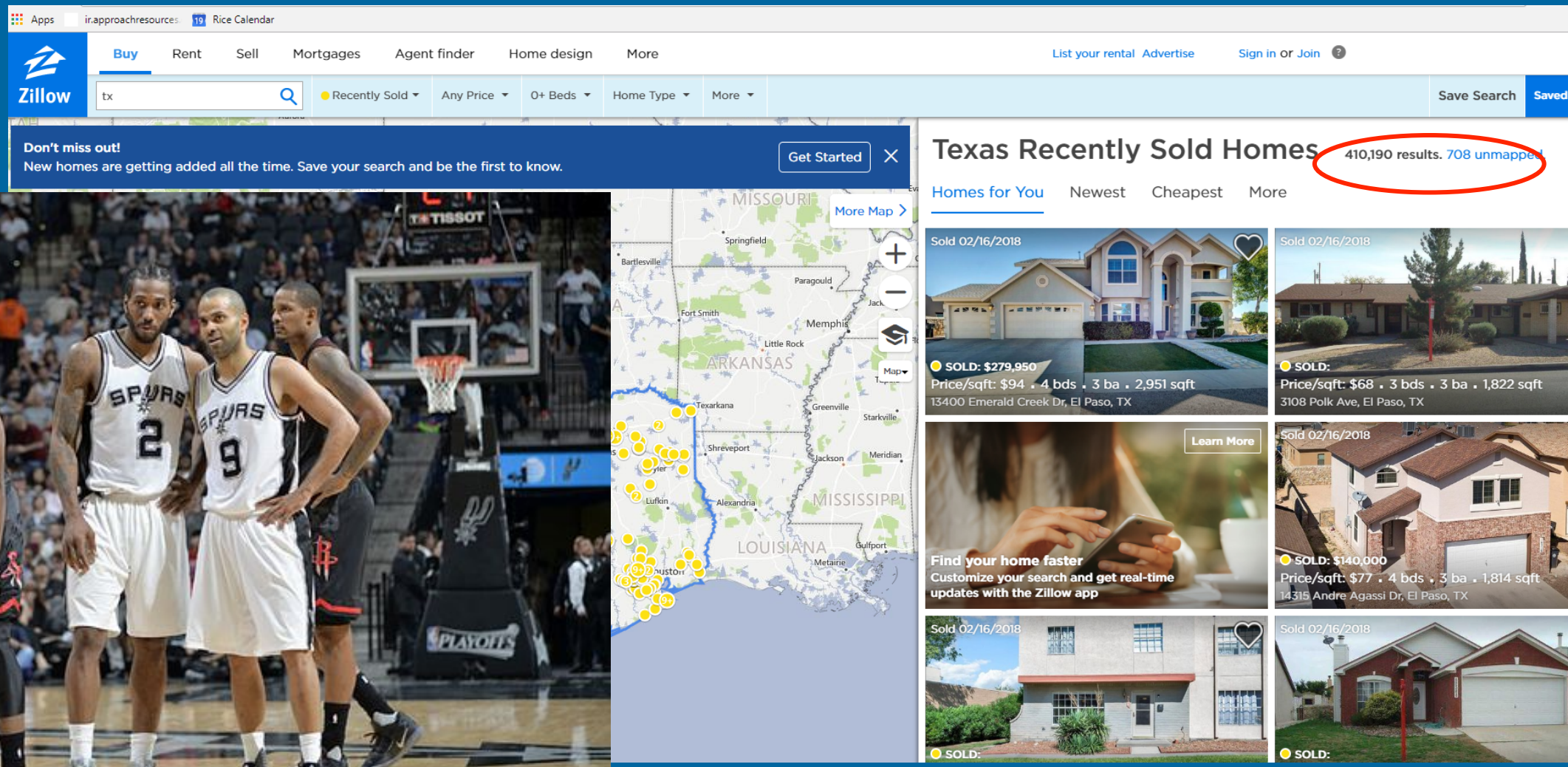
Source: CartoonStock, Doug Pike

This is not as bad as it might appear, contingent upon the responses to two key questions:

1. How widely did the estimates vary?
2. What methodologies and assumptions did the analysts use to reach their valuations?

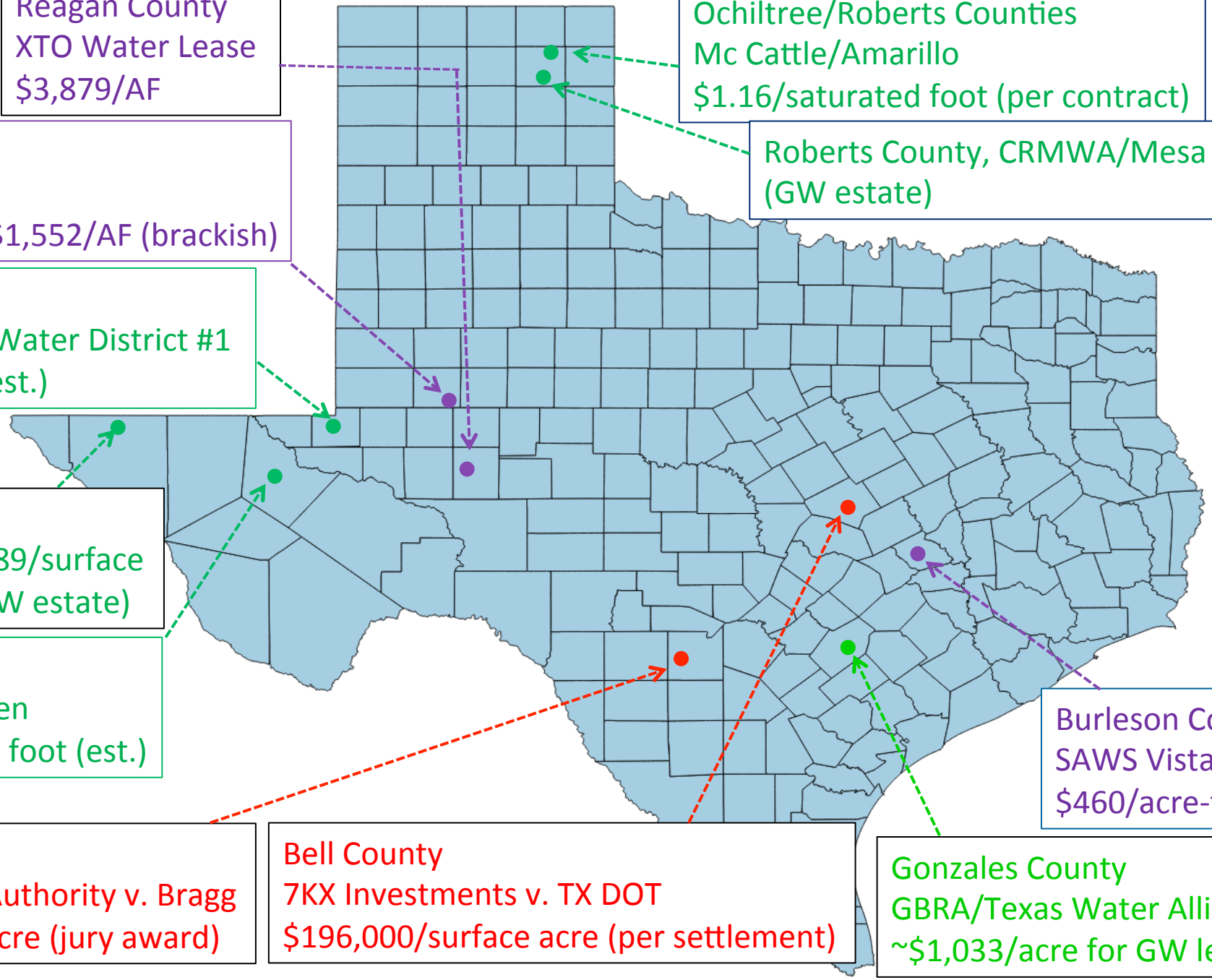
Whether we are valuing a business, and oil & gas property, or a groundwater asset, there is generally going to be a degree of subjectivity, fact-specific analysis, and professional judgment that each analyst applies.

Illiquid Assets Are Successfully Valued In Many Different Sectors



Source: HoopsHabit.com

But Water Prices Are All Over the Map in Texas



Reagan County
XTO Water Lease
$3,879/AF

Ochiltree/Roberts Counties
Mc Cattle/Amarillo
$1.16/saturated foot (per contract)

Roberts County, CRMWA/Mesa Water, $488/acre (GW estate)

Martin County
PXD Water Lease
$2,482/AF (potable)/ $1,552/AF (brackish)

Winkler County
Midland County Fresh Water District #1
$0.83/saturated foot (est.)

Hudspeth County
CL Ranch/El Paso, $1,889/surface acre (~$689/acre for GW estate)

Reeves County
Layne Christensen
$1.09/saturated foot (est.)

Burleson County
SAWS Vista Ridge
$460/acre-foot (per contract)

Medina County
Edwards Aquifer Authority v. Bragg
$25,000/surface acre (jury award)

Bell County
7KX Investments v. TX DOT
$196,000/surface acre (per settlement)

Gonzales County
GBRA/Texas Water Alliance
~$1,033/acre for GW leases

Valuation Methods

Use value

Comparable sales

Avoided cost

Residual value

Income capitalization

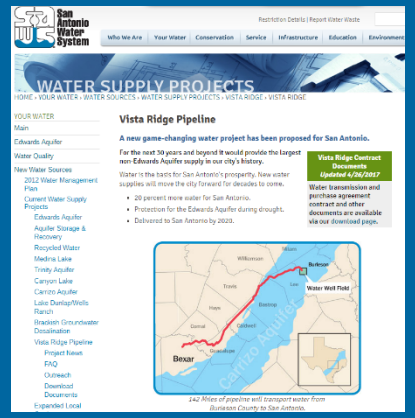
Market surveys

Land Value Method

Existence value

Conservation

Water as the final good.



Water as an intermediate input.

Comparable Transactions Method Historically Dominates

The State of Texas

Austin, Texas

GROUNDWATER LEASE
SL20170059

STATE OF TEXAS §
§ KNOW ALL MEN BY THESE PRESENTS:
COUNTY OF REEVES §

This Groundwater Lease (the "Lease") is granted by virtue of the authority granted in Chapter 51, TEX. NAT. RES. CODE ANN. 31 TEX. ADMIN. CODE Chapter 13 (Land Resources), et seq., and all other applicable statutes and rules, as the same may be amended from time to time, and is subject to all applicable regulations promulgated from time to time.

6.04. Fair Market Value Alternative. If Lessee (i) purchases the groundwater or (ii) enters into a contract for the disposition of groundwater from the Premises with an Affiliate or which is otherwise not negotiated on an arms-length basis, Lessor shall be entitled, at Lessor's election, to receive the fair market value of Lessor's Royalty Share of groundwater produced and saved from the Premises as reasonably established by Lessor. For purposes of the foregoing, it shall be presumed that Lessor has reasonably established the fair market value of the groundwater if Lessor identifies three or more contracts for the disposition of groundwater from properties having reasonably similar characteristics as the Premises and then averages the price paid under the identified group of contracts.

Making Sense of "Fair Market Value" a/k/a Comparable Transactions:

1. Level 1: "Quoted prices in active markets for identical assets or liabilities."
2. Level 2: "Inputs other than Level 1 that are observable, either directly or indirectly, such as **quoted prices for similar assets or liabilities**; quoted prices in markets that are not active; or other inputs that are observable or can be corroborated by observable market data for substantially the full term of the assets or liabilities," and
3. Level 3: "Unobservable inputs that are supported by little or no market activity and **that are significant to the fair value of the assets or liabilities**."

Forestar Group, Form 10-K, 2016. Pg. 70. Available from http://investor.forestargroup.com/phoenix.zhtml?c=216546&p=irol-sec&control_symbol=&control_symbol=

Ibid.
Ibid.

Attempting to Rationalize and Standardize Groundwater Valuation: Ten Key Variables

1. Location (relative to end users and competing water sources)
2. Existence of infrastructure
3. Infrastructure cost
4. Quality
5. Extraction & treatment costs
6. Political & regulatory barriers
7. Protection from drainage
8. Intended use of the water
9. Time sensitivity of the end use
10. Resource dependability/drought resistance

Proximity to Market and Pricing: I

1/6/2015

CONTRACT OF SALE
Groundwater Rights
(Mc Cattle Company and M&D McLain Family, LP)

THIS CONTRACT OF SALE ("Contract") is made and entered into by and between **Mc Cattle Company**, a Texas general partnership, and **M&D McLain Family, LP**, a Texas limited partnership, (hereinafter referred to as "Seller" whether one or more), and **City of Amarillo** ("Purchaser").

1/6/2015

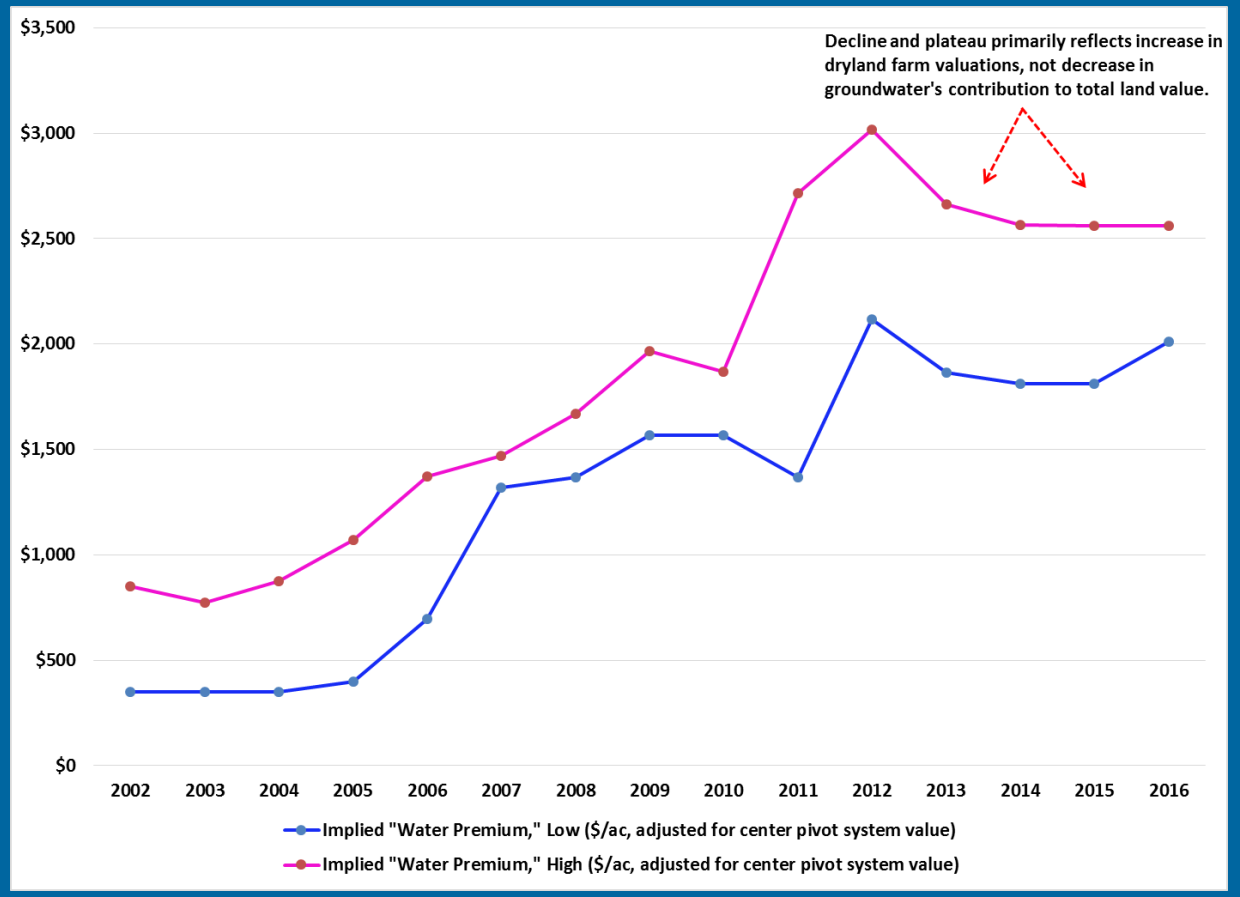
II.
Consideration

2.01 Purchase Price. The purchase price ("Purchase Price") to be paid by Purchaser to Seller for the sale and conveyance of the Groundwater Estate shall be as follows:

- $1.16 per average saturated foot of Groundwater per acre of Groundwater Rights being purchased out of the Real Property for acreage determined to have an average saturated thickness of 258 feet or greater;
- $300.00 per acre of Groundwater Rights being purchased out of the Real Property for acreage determined to have an average saturated thickness between 200 and 257 feet; and
- $250.00 per acre of Groundwater Rights being purchased out of the Real Property for acreage determined to have an average saturated thickness of less than 200 feet. (Pursuant to Section 5.04 a. below, Purchaser has the option to reject any acreage determined to have an average saturated thickness of less than 200 feet.)

The Purchase Price shall be payable to Seller in cash (in United States Dollars) at closing of the transaction contemplated hereby ("Closing") by cashier's check or wire transfer.

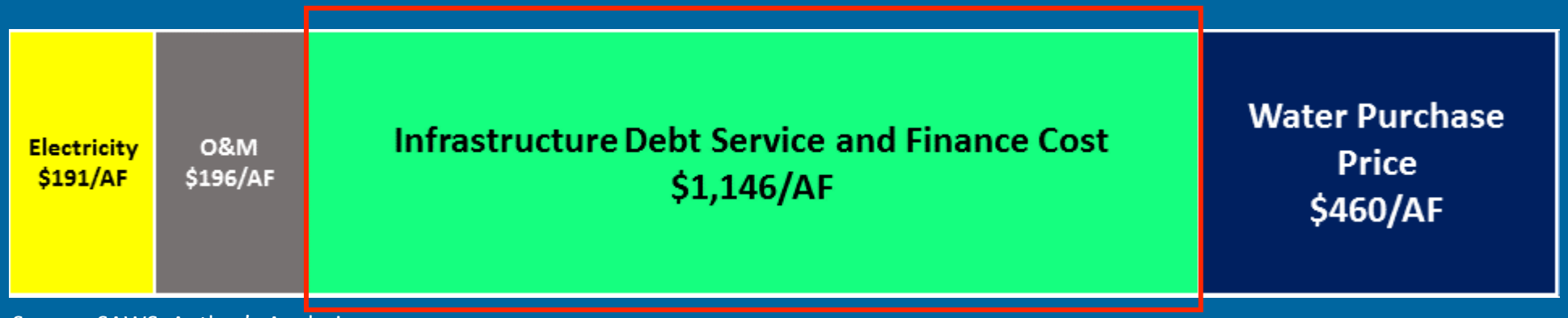
Implied Water Value in North Texas Panhandle Using Land Value Method, $/acre



Source: ASFMRA, Author's Analysis

Proximity to Market and Pricing: II

Infrastructure costs, which are a proxy for distance (primary) and scale (secondary driver) comprise a significant portion of the final delivered water cost.



Source: SAWS, Author's Analysis

Handling Water Quality Through Pricing

SCHEDULE 1

ROYALTY RATE

Buyer shall, in addition to the Cash Portion of Purchase Price, pay to Winkler Services a royalty for Groundwater produced, transported, used or sold from the Real Property by Buyer or its permitted assignees or successors, calculated and subject to further adjustment in accordance with the further terms of this Schedule 1, provided that such royalty shall not be subject to any reduction or offset for any costs, expenses or fees (including without limitation taxes or other governmental charges) incurred by Buyer, its permitted assignees or successors or any other person or entity.

Subject to the further terms of this Schedule 1, for each 1,000 gallons of Groundwater produced from the Real Property by Buyer or its permitted assigns or successors, Buyer shall pay Winkler Services a base royalty of $0.10. In addition to the base royalty, the Buyer will pay an additional royalty based on the quality of the Groundwater produced as described below -

All raw Groundwater produced from the Real Property having a total dissolved solids (TDS) content less than 700 milligrams per liter (mg/L) will have a graduated additional royalty based on the following:

700 mg/L > TDS => 600	Additional Royalty = $0.005/1,000 gallons produced
600 mg/L > TDS => 500	Additional Royalty = $0.010/1,000 gallons produced
500 mg/L > TDS => 400	Additional Royalty = $0.015/1,000 gallons produced
400 mg/L > TDS => 300	Additional Royalty = $0.020/1,000 gallons produced
300 mg/L > TDS	Additional Royalty = $0.025/1,000 gallons produced

All Groundwater produced from the Real Property having a maximum contaminant level of arsenic (MCL As) less than 0.070 milligrams per liter (mg/L) will have a graduated increase in royalty based on the following:

0.070 mg/L > MCL As => 0.060	Additional Royalty = $0.005/1,000 gallons produced
0.060 mg/L > MCL As => 0.050	Additional Royalty = $0.010/1,000 gallons produced
0.050 mg/L > MCL As => 0.040	Additional Royalty = $0.015/1,000 gallons produced
0.040 mg/L > MCL As => 0.030	Additional Royalty = $0.020/1,000 gallons produced
0.030 mg/L > MCL As	Additional Royalty = $0.025/1,000 gallons produced

Prior to January 1, 2018, the Royalty to be paid to Winkler Services shall be based on the actual volumes of Groundwater produced from the Real Property and calculated as set forth above on this Schedule 1. For the period of time commencing January 1, 2018 and continuing through December 31, 2027 (the "**Guaranteed Payment Period**"), however, the Royalty to be paid shall be the greater of (1) a Royalty based on the actual volumes and quality of water produced from the Real Property and calculated as set forth above on this Schedule 1, and (2) $146,000.00 ("**Royalty Floor**"). If the aggregate Royalty paid for Groundwater produced from the Real Property during any calendar year of the Guaranteed

“Above Ground” Risks Are The Most Significant Valuation Wild Card

From Forestar Group 2016 Form 10-K

Risks Related to our Other Operations

Our water interests may require **governmental permits**, the **consent of third parties** and/or completion of significant transportation infrastructure prior to commercialization, all of which are **dependent on the actions of others**. Many jurisdictions require governmental permits to withdraw and transport water for commercial uses, the granting of which may be subject to discretionary determinations by such jurisdictions regarding necessity. In addition, we do not own the executory rights related to our non-participating royalty interest, and as a result, third-party consent from the executor rights owner(s) would be required prior to production. The process to obtain permits can be lengthy, and governmental jurisdictions or third parties from whom we seek permits or consent may not provide the approvals we seek. We may be unable to secure buyers at commercially economic prices for water that we have a right to extract and transport, and transportation infrastructure across property not owned or controlled by us is required for transport of water prior to commercial use. Such infrastructure can require significant capital and may also require the consent of third parties. We may not have cost effective means to transport water from property we own, lease or manage to buyers. As a result, we may lose some or all of our investment in water assets, or our returns may be diminished.

Valuation Methods Often "Cross Pollinate" In Practice

RICE UNIVERSITY'S
BAKER INSTITUTE
FOR PUBLIC POLICY

ISSUE BRIEF 12.07.17

Valuation of Groundwater In Place at a Texas Frac Water Supplier

Gabriel Collins, J.D., Baker Botts Fellow in Energy & Environmental Regulatory Affairs, Center for Energy Studies

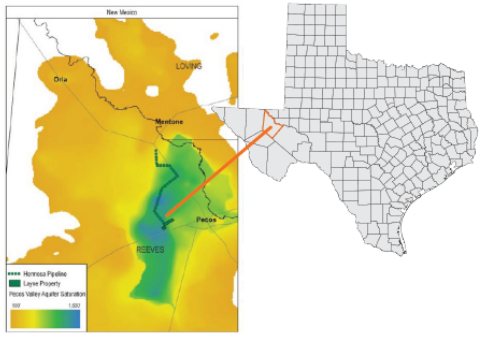
Texas law recognizes the existence of a distinct groundwater estate where water is owned as real private property while still in the ground. Groundwater's unique private property status in Texas creates incentives for business transactions, but it also potentially gives rise to damage claims by water owners who believe another party's actions have impaired their ability to access and/or use their groundwater. To either close deals or resolve disputes, parties and courts must be able to attach a credible economic value to water. In many cases, the water at issue may still be underground in the aquifer. Accordingly, the techniques in this issue brief demonstrate how input and investment costs can be combined with hydrological data to estimate the residual value paid for water—one potential way to value groundwater in place.

This brief analyzes a major Permian Basin oilfield water supply asset that recently came online. It leverages primary research and multiple publicly available data sets to establish what the groundwater estate purchased was likely worth *in place*. Layne Christensen Company, a major global water drilling services provider, disclosed in June 2017 that it had invested $18 million to create a set of infrastructure capable of delivering more than 100,000 barrels per day of frac water to customers in the Delaware Basin.[1] Layne's stated capital expenditure (CAPEX) included land acquisition costs.[2] The project is located on a former cotton farm approximately 1,000 acres in size just west of Pecos, Texas (Figure 1).

BREAKING DOWN THE TRANSACTION

Surface land in Texas includes the groundwater estate unless the groundwater has been sold separately, reserved by the seller, or otherwise split from the surface. This makes acquiring the surface tract, in effect, a purchase of both the "dirt" and the water beneath it. "Unbundling" the value of the surface alone can thus shed light on the likely value of the groundwater beneath.

FIGURE 1 — APPROXIMATE LOCATION OF LAYNE'S FRAC WATER SUPPLY ASSET



SOURCE Layne Water Midstream Presentation, Texas Department of Transportation

TABLE 1 — ESTIMATING THE LIKELY VALUE FOR THE GROUNDWATER ESTATE AT LAYNE'S HERMOSA OILFIELD WATER SUPPLY ASSET

Item	Units	Number	Unit Cost	Total
Wells (new drill)	–	2	$127,250	$254,500
Wells (refurbish)	–	4	$65,000	$260,000
Storage pond (built and lined) capacity	barrels	750,000	$1.25	$937,500
Pumps (200 HP)	–	4	$25,000	$100,000
Booster pumps on pipeline	–	3	$10,000	$30,000
22-inch high-density polyethylene pipeline	feet	107,000	$90.20	$9,651,400
Pipe fusion	joint welds	2,112	$150.00	$316,800
Trencher operation (Vermeer T1155)	feet	107,000	$7.50	$802,500
Right-of-way	miles	20	$71,680	$1,433,600
Riser stations for water offtake	–	13	$15,000	$195,000
Labor	days	90	$8,400	$756,000
Branch lines linking wells to central pits	feet	21,000	$12	$252,000
Electronics on wells	–	6	$10,000	$60,000
Electrification	–	1	$50,000	$50,000
Concrete	tonnes	500	$167	$83,250
Rebar	tonnes	16	$600	$9,494
Roads	miles	1.50	$50,000	$75,000
Total (excluding land)				**$15,267,044**

Total estimated CAPEX	**$18,000,000**
Total (excluding land)	– $15,267,044
Implied land cost (1,000 acre tract)	**$2,732,956**
Implied land value per acre	$2,733
Est. value of "farming only" farmland in Trans-Pecos region ($/acre)	– $750
Implied value premium for water ($/acre)	$1,983
Average saturated thickness under tract (feet)	[1,825]
Implied price paid for groundwater estate ($/available saturated foot per acre)	**$1.09**

SOURCES Company reports, author's interviews of relevant providers of goods and services

Collins, Gabriel. 2017. *Valuation of Groundwater In Place at a Texas Frac Water Supplier*. Issue brief no. 12.07.17. Rice University's Baker Institute for Public Policy, Houston, Texas.

Thank you!

Gabriel Collins, J.D.
Baker Institute for Public Policy, Rice University
gabe.collins@rice.edu