Waste or Wasted? Rethinking the Regulation of Coalbed Methane Byproduct Water in the Rocky Mountains: A Comparative Analysis of Approaches to CBM Produced Water Quantity Legal Issues in Utah, New Mexico, Colorado, Montana and Wyoming

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“If state ownership is to be anything but a delusion, if it is to be more than nominal, there must be the same authority and control over streams and over diversion of water as is now exercised by the general government over the occupation and settlement of public lands. No diversion or appropriation should be permitted, therefore, until . . . the beneficial character of the proposed use established. Such oversight and precaution is necessary for the proper protection of public interest . . . and in order that controversies growing out of extravagant and injurious claims may be avoided.”1

I. Introduction

Coalbed methane—the natural gas derived from water-saturated underground coal seams—has risen from relative obscurity in the early 1990s to the most talked about and hyped energy resource in the West. As of the mid-1980s coalbed methane (CBM) was widely regarded as a hazardous byproduct of coal mining—it was not considered a resource in and of itself. That, of course, has changed. The water pumped out of the aquifers necessary to liberate the natural gas from coal seams—much of it drinkable—will total in the trillions of gallons in the Rocky Mountain states of Utah, New Mexico, Colorado, Montana and Wyoming. Largely disposed of pursuant to historic statutes for oil and gas byproduct water that assumes the water to be “waste” given the typical low-quality conventional oil and gas brine water, these states are more accurately wasting this valuable and scarce resource in the West.

Touted as the hottest natural gas play by investment brokers in 1999,2 CBM production has flown off the charts, making that prediction in 1999 actually somewhat modest. As a nation, we now consume approximately 22 trillion cubic feet (TCF) each year.3 By 2020, the Department of Energy predicts our country will consume 34 TCF on an annual basis, close to a 60% increase.4 The Rocky Mountain region consists of over 240 TCF of technically recoverable natural gas reserves, comprised mostly of tight sands (160 TCF) and CBM (40 TCF).5 More recently, however, Rebecca Watson, Asst. Secretary of Interior for Land and Minerals Management, reported that as of 2000, the U.S. had 177 TCF of proven natural gas reserves, estimating that CBM comprises over 50% of that total.6 CBM now comprises 6% to 7.5% of the U.S. production of natural gas and is expected to rise significantly over the next decades to 7 TCF by 2010, or 25% or more of the predicted U.S. consumption.7

The San Juan Basin spanning from northwest New Mexico to southwest Colorado, is the nation’s leading producer of CBM.8 That is expected to change in the near future. Currently, the Bureau of Land Management is considering proposals to tap into 39 trillion cubic feet (TCF) of reserves in the Powder River Basin, spanning from northeast Wyoming into southeast Montana. The numbers are astronomical—at peak production, for example, the Wyoming PRB play is expected to top 3.6 billion cubic feet per day, and produce over 25 TCF for the life of the project. Equally off-the-charts are the environmental impacts to do so—Montana is projecting as many as 26,000 wells in the PRB, while estimates in Wyoming range from 51,000 to 80,000 to a “high scenario” of 139,000 wells. In short, nothing of this magnitude has ever been proposed, let alone studied, in the history of the Department of Interior when it comes to federal onshore oil and gas wells. In fact, the current total of all such wells is 59,000—nationwide.9 CBM wells in just one Basin in the West will more than double that.

These are not the only examples: CBM can be found virtually everywhere there is coal, and coal formations are prevalent in the Interior Rockies. Other major CBM plays to be discussed in this article include the Uinta Basin in Utah and Colorado (10 TCF of CBM reserves), the Piceance Basin in Colorado (99 TCF), the Raton Basin in Colorado and northeastern New Mexico (10 TCF), the San Juan Basin in New Mexico and Colorado (84 TCF) and the big unknown—the 314 TCF of in place CBM reserves in the Greater Green River Basin in southwest Wyoming and northern Colorado.10 One may not be surprised to learn that industry literally circled each one of these areas on a map of the western United
States as key areas of interest for oil gas exploration, in working with the Bureau of Land Management. Also not surprising is that each of one these areas is a key component of the Bush administration’s National Energy Policy and subject to fast-tracking, expediting and streamlining of leasing and drilling permit approvals. This article addresses these water quantity legal issues for CBM extraction in the five western states where CBM is now becoming the dominant oil and gas play: Utah, New Mexico, Colorado, Montana and Wyoming. Part II will provide a general summary of the groundwater regulatory approaches used by these states concerning CBM byproduct water. Part III will provide a brief overview of the CBM extraction process, focusing on the unique attribute that is garnering all of the attention due to the problems it causes: the massive dewatering of underground coal aquifers to allow the methane to freely vent to the surface. Part IV will focus on the regulation of CBM produced water in Utah, New Mexico and Colorado, where, perhaps due to much lower quality than elsewhere, the handling of CBM water aligns more closely to byproduct water codes that presume this water to be waste (and therefore, not put to any beneficial use). Next, Part VI will focus on Montana’s approach to this issue in the Powder River Basin. Part VII discusses Wyoming’s unique approach to this issue, with an emphasis on possible state constitutional and statutory violations. Indeed, the needed reform is equally applicable to Montana, and may very well be relevant to future plays in the other three states as CBM plays develop. Part VIII will conclude by calling for reform in Wyoming and Montana—again, given the much higher quality of the produced water in these states—in how they approach the water quantity issue to provide a better solution to CBM byproduct water so that the trillions of gallons of water are not ultimately wasted and denied from future generations.

II. Overview of CBM Water Quantity Issues and Regulatory Approaches

CBM production adds a new element to environmental hazards associated with natural gas drilling—to be sure, it has the roads, pipelines, powerlines, well pads, compressor facilities, central management facilities and other infrastructure associated with conventional natural gas wells—it also deals with the produced water that accompanies CBM extraction (discussed below in Part III). A couple of examples demonstrate the magnitude we are talking about—the Montana production for the PRB estimates at the high end 3 trillion gallons of water pumped from underground coal aquifers and disposed on the surface; Wyoming estimates up to 1.4 trillion gallons over the life of the project. Put simply, these numbers are staggering. And while industry and state and local governments have spent countless hours tallying up the dollars the CBM boom will bring in, to date, no one has bothered to put a price tag on the value of the wasted water.

Up until now, much of the CBM debate over the water impacts this development brings—what to do with all of this water once it reaches the surface—has largely dealt with the water quality issue. High in salinity and total dissolved solids, much of this water is of little value for long-term irrigation—in short, it’s most practical use is watering a few livestock. This ignores, however, that much of the water in place is suitable for drinking water, and is a resource many folks living in the areas of Wyoming and Montana are concerned about losing, especially in light of the fact that it can take up to hundreds of years before adequate recharge can take place. As such, its greatest value may be its reservation and storage underground, where future generations can bring it to the surface, treat it (depending on the intended use) and then put it to a beneficial use. Put simply, in the semi to arid West, water is gold and this point has never been more poignant than the summer of 2002, as the region enters its fifth straight season of drought, the worst in recent years:

It’s not even summer and we’re in bust times. Montana is a federal drought disaster area, and the governors of Colorado, Wyoming and Arizona have asked the Bush administration for the designation; Utah and Nevada are in states of water emergency. . . . Wildlife experts expect heavy death tolls, and farmers expect wilted crops. This reason alone calls into question the waste/disposal without consumptive use of billions of gallons of water in the West from the dewatering process that coincides with CBM production. In Wyoming, numerous aquifers that supply drinking water will not be adequately recharged for hundreds of years. Hardly any of this water is being beneficially used (save for watering a few livestock and very limited irrigation possibilities), and
given the quantity and quality we are dealing with, what is not used should be considered for injection back into the ground for future retrieval. In Wyoming and Montana, however, that is not being done, and the simplest answer as to why is that no one is requiring this of industry.

This article takes a focus that has not received the brunt of attention on the CBM water issue: water quantity legal issues. Of course, as we'll soon discover, every state's approach to the water quantity issue is invariably linked to the quality of this water. A shorter way of saying this is that where the water is of questionable (or very poor) quality, no one cares much if it is wasted.

Much of the produced legal literature on the CBM issue has focused on different issues associated with CBM production. Overlooked in the debate until this point are serious questions concerning how certain exemptions from permitting under the western ground water appropriation law fit—or more accurately does not fit—the CBM model. This is particularly true where the water—of the plays mentioned, primarily the Powder River Basin—has quality that varies significantly from the traditional brine associated with deep conventional gas wells.

As will be discussed, western groundwater law evolved on many tenets, but two are key here: one, as water is a precious resource in the semi to arid West, it should not be wasted; and two, given that groundwater should not be wasted, if diverted from the ground, it must be put to a “beneficial use.” Of course, and this should surprise no one, western groundwater law made special exceptions for byproduct water associated with the mining industry—primarily with fluid minerals (usually oil and gas). In other words, preventing “waste” and requiring the diverted groundwater to be put to a beneficial use were concepts not applied to this industry so as not to impede settlement of the West. This may have made sense with traditional (or conventional) oil and gas byproduct water from deep formations where the byproduct water is mostly unusable salty brine. In fact, most current CBM produced water in Colorado, Utah and New Mexico is of such questionable quality that it perhaps fits the waste exception model.

Things are different, though, in Wyoming and Montana where the water quality (in total dissolved solids at least) is much better. Until recently, Montana state law prohibited the waste of groundwater. Because much of the water cannot be used for irrigation and can only be used to water a few livestock, the rest (expected to be in the trillions of gallons) is evaporated or left to flow out of the state. This probably constituted waste under the old law. In 2001, however, the Montana legislature resolved this issue by declaring CBM water handling of this sort not to constitute waste.

Wyoming’s approach to CBM byproduct water is unique compared to the other states mentioned. It is the only state that requires the water to receive a beneficial use permit from the State Engineer at the point of diversion from the underground reservoir. As will be discussed, this model has problems because only a fraction of the water can itself be beneficially used—the rest is wasted in violation of Wyoming law. It should be noted that “beneficial use” in western water law has never been defined as using the byproduct water to allow gas or oil to flow to the surface—rather, the beneficial use must always be the use that the water itself is put to.

Of course, there is another option in Wyoming—to follow the byproduct water code section that, similar to Utah, New Mexico and Colorado, does not require any permit for the diversion of water when associated with oil and gas development. In Wyoming, as these states, this statutory provision considers this water “waste,” and after initial diversion, if someone wants to put it to beneficial use, only then is a State Engineer permit required. Perhaps this is a better approach in Wyoming: assume that all of the water is waste (which transfers jurisdiction of handling the water to the Wyoming Oil and Gas Conservation Commission), and then, where appropriate for irrigation, drinking or stock watering, put a small fraction of the water through the beneficial use permitting process. Of course, this model is problematic—although much of the water is not suitable for long term irrigation, it is much different than the type of oil and gas byproduct water contemplated when the Wyoming byproduct statute was passed. In other words, it should not, perhaps, be considered and treated as waste, when it could be stored for distant generations for potable drinking water or for future desalinization treatment to be put to other uses. The TDS, salinity and sodium content is about 1/10 that of deep, conventional oil and gas byproduct water for which the groundwater “waste” exceptions were most likely intended.
III. The coalbed methane extraction process

The CBM extraction process will be briefly described in this article. In general, CBM can be found anywhere there is coal, meaning that the potential resource is widespread throughout the United States. CBM is natural gas trapped in coal seams, formed over millions of years in the coalification process, whereby plant material was slowly converted to coal. The natural gas or methane is a byproduct of the process of decomposing organic material. The methane is adsorbed to coal particulates in underground coal seams that also serve as aquifers. The methane is held to these particulates by the water pressure; in short, the coal seams have to be “dewatered” to different degrees to depressurize the coal seam, and allow the methane to vent freely through the well bore, to be captured and transported to market.

The United States Geological Survey summarizes the dewatering process as follows:

The coalification process, whereby plant material is progressively converted to coal, generates large quantities of methane-rich gas, which are stored within the coal. The presence of this gas has been long-recognized due to explosions and outbursts associated with underground coal mining. Only recently has coal been recognized as a reservoir rock as well as a source rock, thus representing an enormous undeveloped “unconventional” energy resource. But production of coalbed methane is accompanied by significant environmental challenges, including prevention of unintended loss of methane to the atmosphere during underground mining, and disposal of large quantities of water, sometimes saline, that are unavoidably produced with the gas.

This dewatering process is at the heart of most of the environmental concerns at the center of the ongoing CBM debate. In Wyoming for example, each well is currently averaging 15,000 to 20,000 gallons of produced byproduct water per day. In essence, therefore, each CBM well should be properly viewed as two wells: a natural gas well and a water well. In fact, this unique feature of CBM production caused the Colorado Bureau of Land Management to describe the unconventional CBM resource extraction as “radically different,” than tradition conventional deep natural gas. This extraction process naturally lends CBM wells to being regulated under different approaches to appropriating, beneficially using and handling these massive volumes of water pursuant to western groundwater law.

IV. An overview of western groundwater law and oil and gas extraction

Groundwater provides for one-half of the drinking water sources in the United States, and worldwide, groundwater comprises 95% of all freshwater sources, excluding glaciers. In Utah, for example, groundwater is relied upon by approximately 63% of the population for consumptive use. Accordingly, western groundwater law is premised, much like surface water law, on avoiding waste of water resources in a region that is long on land and generally short on water.

Western groundwater law is primarily governed by the doctrine of prior appropriation. The central tenets of the prior appropriation system award priority water rights to first-in-time users who divert groundwater to a “beneficial use.” The prior appropriation doctrine is primarily in place to establish a system of determining senior rights when there are competing or conflicting uses; presumably requiring groundwater diversions to be put to a beneficial use addresses a non-conflict concern as well—when put to a beneficial use, water is assumed in western water law to not constitute waste of this all important resource. The prior appropriation system affords water rights to ensure protection of a user’s original means and amount of diversion and to establish a system to address allocation between competing users when shortages occur.

To bring some form of order to an appropriation system that naturally is vulnerable to the unpredictable nuances of underground hydrology, most western states, including Utah, New Mexico, Colorado, Montana and Wyoming, have developed a permit and adjudication system to groundwater rights. Upon the initial diversion of the groundwater, a permit is sought, usually from the state engineer, establishing the priority date, nature of beneficial use and amount of withdrawal.

In the settling of the West and, of concern here, mining for oil and gas reserves, an exception evolved from the above prior appropriation scheme. Until recently, byproduct water associated with oil and gas extraction was typically a very salty brine solution of little use. Accordingly, oil and gas “byproduct” water did not
involve the concept of preventing "waste"—it was considered waste already, and as a corollary, no one wanted this water, meaning no problems arose concerning "scarcity" and competing uses for it. Deep conventional oil and gas wells range from 3,000 to 20,000 feet in depth, and the associated byproduct water was readily exempted from the normal concepts of water rights, prior appropriation and beneficial use. On top of poor quality, a lot of conventional gas production produced relatively low quantities of water. As such, the primary focus was not on preserving and establishing a system to account for competing uses of this unwanted water, but rather, how to best dispose of this byproduct waste.

The U.S. Environmental Protection Agency reports that conventional oil and gas produced water is the largest volume waste generated in the United States—between 1985 and 1995, for example, byproduct water from oil and gas production ranged from 15 to 21 billion gallons per year. Total dissolved solids (TDS) are a fairly good barometer of water quality (apart from hard metals, arsenic, chemicals, etc.) and examples of traditional (conventional) oil and gas byproduct water are used here. EPA provided sample oil and gas well data from formations in Pennsylvania: 28 oil samples averaged 58,000 TDS (in mg/L or ppm) and 15 samples from produced gas brine ranged from 139,000 to 360,000 TDS. For comparison purposes, EPA has set a recommended (but not binding) drinking water limit on TDS at 500 ppm, although levels up to 2,000 TDS are considered borderline for human consumption for those not on salt-restricted diets. As a further comparison, seawater averages 35,000 ppm TDS and a bottle of Perrier is close to 500.

Bringing the conventional oil and gas byproduct water quality sampling closer to home, a random sampling of the following deep oil and gas wells now producing in Wyoming reveals the following:

<table>
<thead>
<tr>
<th>FORMATION</th>
<th>FIELD</th>
<th>WELL DEPTH (FT)</th>
<th>TDS (PPM)</th>
</tr>
</thead>
<tbody>
<tr>
<td>KF/KD</td>
<td>Bruff</td>
<td>12,322</td>
<td>3,859</td>
</tr>
<tr>
<td>Almond</td>
<td>Continental Divide</td>
<td>13,100</td>
<td>5,719</td>
</tr>
<tr>
<td>Frontier</td>
<td>Bruff</td>
<td>12,962</td>
<td>8,917</td>
</tr>
<tr>
<td>Fort Union</td>
<td>Muddy Ridge</td>
<td>12,750</td>
<td>15,563</td>
</tr>
<tr>
<td>Mesaverde</td>
<td>Red Desert</td>
<td>9,600</td>
<td>18,730</td>
</tr>
<tr>
<td>Frontier 2</td>
<td>Storm Shelter</td>
<td>11,151</td>
<td>21,114</td>
</tr>
<tr>
<td>Muddy-Dakota</td>
<td>Cherokee Creek</td>
<td>8,500</td>
<td>31,898</td>
</tr>
<tr>
<td>Madison</td>
<td>Whitney Canyon– Carter Creek</td>
<td>17,300</td>
<td>38,497</td>
</tr>
<tr>
<td>Fort Union</td>
<td>Muddy Ridge</td>
<td>7,523</td>
<td>58,659</td>
</tr>
<tr>
<td>Entrada</td>
<td>Brady</td>
<td>12,413</td>
<td>104,613</td>
</tr>
</tbody>
</table>

Coalbed Methane Development
Looking at some of the typical quality of this conventional oil and gas byproduct water, therefore, it becomes readily apparent that it was considered “waste” and not a part of (or excepted from) the western groundwater prior appropriation/beneficial use system. In short, no one in their right mind wanted the majority of this water.

Before the advent of coalbed methane, perhaps this exemption made sense. These assumptions justifying this exemption, however, largely evaporate when CBM enters the picture. In Montana and Wyoming, for example, massive quantities of water—to the tune of 15,000 to 20,000 gallons of water per day, per well, are pumped from the ground to liberate the methane. Moreover, almost all of the produced CBM water in these two states is potable, suitable for livestock watering, and in rare circumstances, appropriate for irrigation. For illustration purposes, a few examples of Wyoming and Montana produced CBM water are provided for comparison.

**Wyoming Conventional Oil Byproduct Water TDS**

<table>
<thead>
<tr>
<th>Formation</th>
<th>Field</th>
<th>Well Depth (ft)</th>
<th>TDS (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frontier</td>
<td>Borie</td>
<td>8,660</td>
<td>668</td>
</tr>
<tr>
<td>KFU</td>
<td>Wildcat Creek</td>
<td>6,805</td>
<td>3,729</td>
</tr>
<tr>
<td>KMD-KD</td>
<td>Graham Reservoir</td>
<td>16,161</td>
<td>6,978</td>
</tr>
<tr>
<td>Fort Union</td>
<td>Wild Rose</td>
<td>9,885</td>
<td>12,304</td>
</tr>
<tr>
<td>Minnelusa</td>
<td>Lance Creek</td>
<td>5,407</td>
<td>14,200</td>
</tr>
<tr>
<td>PML “B”</td>
<td>Wolf Draw</td>
<td>7,410</td>
<td>14,700</td>
</tr>
<tr>
<td>Teapot</td>
<td>Mikes Draw</td>
<td>7,600</td>
<td>17,000</td>
</tr>
<tr>
<td>PML “B”</td>
<td>Tanner</td>
<td>9,100</td>
<td>21,100</td>
</tr>
<tr>
<td>PML “A”</td>
<td>Dry Gulch</td>
<td>10,663</td>
<td>30,900</td>
</tr>
<tr>
<td>PML “B”</td>
<td>Ditto Lake</td>
<td>9,750</td>
<td>53,400</td>
</tr>
<tr>
<td>Nugget</td>
<td>Dry Piney</td>
<td>11,198</td>
<td>65,492</td>
</tr>
<tr>
<td>Nugget</td>
<td>Dry Piney</td>
<td>11,428</td>
<td>65,492</td>
</tr>
<tr>
<td>Nugget</td>
<td>Bronco</td>
<td>8,599</td>
<td>89,500</td>
</tr>
<tr>
<td>Nugget</td>
<td>Brady</td>
<td>11,935</td>
<td>92,944</td>
</tr>
</tbody>
</table>

**Wyoming PRB CBM Byproduct Water TDS**

<table>
<thead>
<tr>
<th>Drainage</th>
<th>Samples</th>
<th>Min. TDS (ppm)</th>
<th>Max. TDS (ppm)</th>
<th>Avg. TDS (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Upper Powder River</td>
<td>124</td>
<td>214</td>
<td>7,210</td>
<td>1,884</td>
</tr>
<tr>
<td>Middle Powder River</td>
<td>12</td>
<td>2,300</td>
<td>3,830</td>
<td>2,977</td>
</tr>
<tr>
<td>Little Powder River</td>
<td>147</td>
<td>495</td>
<td>8,810</td>
<td>1,170</td>
</tr>
<tr>
<td>Antelope Creek</td>
<td>1</td>
<td>698</td>
<td>698</td>
<td>698</td>
</tr>
<tr>
<td>Upper Cheyenne River</td>
<td>9</td>
<td>323</td>
<td>677</td>
<td>402</td>
</tr>
<tr>
<td>Upper Belle</td>
<td>189</td>
<td>2</td>
<td>1,790</td>
<td>770</td>
</tr>
<tr>
<td>Fourche River</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Avg. WY PRB CBM well depth: 200-600 feet*
*Avg. WY PRB CBM byproduct water TDS: 2,128 ppm*
The point here is simple: much of CBM produced water is drinkable, most all of it is suitable for stock watering and a small percentage can be used to irrigate. This water fits into neither the western prior appropriation groundwater model, nor the exception—not all of it can be beneficially used (meaning billions of gallons are wasted) and hardly any of it constitutes the “waste” water typically associated with conventional oil and gas byproduct brine. In short, the assumptions underlying treating all oil and gas byproduct water under the “waste” exception, do not hold water, so to speak, when considering much of western CBM production. A new approach fitting for this new extraction method needs to be developed.

V. Regulation of coalbed methane produced water in Utah, New Mexico and Colorado

Utah, New Mexico and Colorado are being discussed in one section largely because the current CBM production in the major fields share two things in common: low water quantity per well produced as a byproduct and, compared to Wyoming and Montana at least, the relatively low quality of this water. In general, each of these states has a groundwater code based on the prior appropriation doctrine—requiring beneficial use permits for each diversion. However, as will be discussed, each state also exempts oil and gas byproduct water from these provisions, with the jurisdiction of handling the produced water with the state oil and gas board. With TDS between 10,000 and 20,000, however, this water is much cleaner than that associated with the average conventional oil and gas well. That this water may be later treated and put to a beneficial use, or that future CBM plays in these states may enter areas with cleaner water, further calls into question whether CBM byproduct water should be simply discarded and treated as waste under these states’ water quantity regulatory systems. The water’s greatest value may be leaving it in a retrievable reservoir for future treatment, use and consumption.

A. Utah

1. Utah CBM Production

The major CBM play in Utah is the Uinta basin, located in the northeast portion of the state. The Uinta basin has 10 TCF of CBM, with the estimated recoverable reserves now at less than 2 TCF, an estimate that changes over time, that is usually related to ongoing drilling operations. Presently, there are approximately 646 producing CBM wells tapped into the Ferron sands, about 3,000 to 4,500 feet below ground. Water production averages 150 barrels (6,300) gallons per day, or 4.4 gallons per minute (gpm), although some wells produce water as high as 40 gpm. The cumulative water production through November of 2001 for the life of the existing wells is 5.8 billion gallons. Most if not all of the water is being injected into disposal aquifers (not meant for future retrieval) as TDS can range from 15,000 to 20,000 ppm, averaging 12,000 ppm. The Utah Bureau of Land Management Price Field Office managing the federal lands in this area has two environmental studies predicting 1,000 total CBM wells in Carbon and Emery counties over the next 10 years.
years. Assuming 1,000 total wells, the anticipated loss of groundwater calculates to 2 billion gallons per year.

2. UTAH OIL AND GAS BYPRODUCT WATER REGULATION

The Utah Constitution provides that, “All existing rights to the use of any of the waters in this state for any useful or beneficial purpose, are hereby recognized and confirmed.” This is the only mention of water in the state constitution, which stresses that water diversions are to be for beneficial purposes.

The Utah water code states that, “All waters in this state, whether above or under the ground are hereby declared to be the property of the public” and that “[b]eneficial use shall be the basis, the measure and the limit of all rights to the use of water.” Authority for the appropriation of all ground and surface water in Utah is vested in the state engineer, who has the power to prevent waste or loss of groundwater. In Utah, rights to groundwater can only be acquired through the water code and each appropriation “must be for some useful and beneficial purpose.” Any application to appropriate groundwater for mining development may be approved for a specific period of time from when the water is put to a beneficial use until the primary purpose of the application is achieved.

None of these provisions, however, are followed for oil and gas byproduct water in Utah. Instead, “the disposal of salt water and oil field wastes”—including water associated with natural gas development—is under the jurisdiction of the Utah Board and Division of Oil, Gas and Mining. The DOGM has implemented rules to handle the byproduct water to “regulate . . . the disposal of these wastes in a manner which protects the environment, limits liability to producers, and minimizes the volume of waste.” Methods of handling the water are lined pits, unlined pits (surface reservoirs) if the disposed water’s TDS are not higher than any groundwater that could be affected, unlined pits if all or a substantial portion of the water is being used for a beneficial purpose such as irrigation or livestock watering, unlined pits if the produced water is less than 5 barrels per day, or via Class II injection wells into disposal aquifers that do not contain suitable drinking water. Most CBM produced water is currently being disposed of via injection wells.

Accordingly, there is no inquiry or requirement as to whether the diverted groundwater itself is being beneficially used. Importantly, the Utah oil and gas code provision bypassing the water code requirements, passed in 1953, only contemplated conventional oil and gas development, and the associated brine. As no one wanted the water associated with that type of development, with its quality being so low that it was inconceivable to be put to a beneficial use, this exception to the Utah prior appropriation water code requirements probably made sense. With present CBM produced water TDS averaging 12,000 ppm, and (relatively) low water yields, this treatment perhaps makes sense today. Nonetheless, apparently no inquiry has been made as to whether a majority of this water could be injected for future retrieval purposes (with possible treatment first), and in the future, the water quality of new Utah CBM plays may vary to the point where the mid-20th century assumptions about the volume and quality of the produced water do not justify treatment of CBM byproduct water under this antiquated exception.

B. NEW MEXICO

1. NEW MEXICO CBM PRODUCTION

The big CBM play in New Mexico is its portion of the San Juan basin in the northwest corner of the state. Currently, the San Juan basin is the largest producing CBM field in the U.S., and with its 2,849 CBM wells, is currently producing approximately 547 BCF (or over 1/2 TCF) per year. Cumulatively, the Fruitland coal formation in this area has produced between 5 and 6 TCF of CBM. To date, data for 2,849 wells provides that 134.5 million barrels (or 5.6 billion gallons) of byproduct water have been produced, yielding an average of .3 gpm per well (making water production quantity very similar to deep conventional gas—this is about 11 barrels per day). The TDS in this water are generally higher than the Uinta basin, averaging 15,000 ppm.

With a total of 5,072 CBM wells expected in the New Mexico San Juan basin in the next 20 years, a fair estimate of total produced water is 10 billion gallons.
2. NEW MEXICO OIL AND GAS BYPRODUCT WATER REGULATION

The New Mexico constitution provides that, “All existing rights to the use of any waters in this state for any useful or beneficial purpose are hereby recognized and confirmed.”72 There is no specific constitutional provision applying to groundwater, although for all water, “Beneficial use shall be the basis, the measure and the limit of the right to the use.”73

The New Mexico water code makes it explicit that underground water is “declared to be public water[] and to belong to the public and to be subject to appropriation for beneficial use.”74 As in Utah, “Beneficial use is the basis, the measure and the limit to the right to use of the [groundwater].”75 If a person wishes to appropriate groundwater, he must submit a permit to the New Mexico state engineer, stating the beneficial purpose, the amount to be used and other particulars.76 Importantly, there is a public interest review provision before the state engineer can grant the permit application, he must find that the proposed diversion is not contrary to the conservation of water within the state and is also not detrimental to the public welfare of citizens in New Mexico.77 It is unlawful for any person (including corporations) to begin the drilling of a well for water from an underground source that has been determined to be reasonably ascertainable, without a valid, existing permit from the state engineer.78 In New Mexico, when there is drilling below 2,500 feet and the water is nonpotable (defined as 1,000 ppm TDS or higher) (both of which apply to CBM drilling), these areas are, by law, “nonascertainable” and not subject to permit requirements.79

Of course, even without the 2,500 and nonpotable exception for needing a state engineer permit, New Mexico, similar to Utah, places the regulatory jurisdiction of “the disposition of water produced . . . with the drilling . . . of oil or gas” with the state oil conservation division.80 In addition, New Mexico has a “Mine Dewatering Act,” as part of its water code, which states a legislative finding that the diversion of water to permit mineral production is in the public interest and the, “existing principles of prior appropriation, beneficial use and impairment of water rights, when applied to the diversion of water to mineral production, may cause severe economic hardship and impact to persons engaged in mineral production.”81 While “mine dewatering,” is defined to include the diversion and discharge of groundwater developed by mining activities by means of depressurizing wells,82 no reported case has explicitly held the Act applicable to oil and gas production. Although CBM production is technically a form of mining, and dewatering is explicitly involved to depressurize wells, the Mine Dewatering Act most likely does not apply to CBM production, but rather to traditional hard rock and gravel types of mining.83

As stated, oil and gas byproduct water in New Mexico falls under the control and jurisdiction of the Oil Conservation Division (NMOC). Operators must conduct their business in a manner that will prevent the contamination of fresh waters.84 After 1986, lined pits must be used for produced water and operators must abate pollution of groundwater having TDS of 10,000 ppm or less, so as to be protected as domestic, industrial or agricultural water supply.85 Currently, almost all CBM produced water is handled by disposal injection,86 which is strictly regulated by the NMOC.87 The Division has special rules applicable to the disposal of oil and gas wastes in San Juan county, generally proscribing unlined pits to protect fresh waters having less than 10,000 ppm TDS.88

New Mexico, similar to Utah, vests jurisdiction of oil and gas byproduct water with the state oil conservation division. In short, because of the high TDS values of this water, it is exempted from traditional groundwater appropriation requirements of beneficial use—in fact, the Mine Dewatering Act makes it implicit that such byproduct waters in and of themselves, are not a traditional “beneficial use.”89 Rather, these waters are considered and treated as waste. As some of this water is from reservoirs above 2,500 feet and may be potable, there is a present conflict as to whether the state engineer is unlawfully neglecting jurisdiction over some of this water. In addition, as future CBM plays in New Mexico develop—particularly in the Raton basin—it is arguable that treating and handling this water as waste does not fit the assumptions normally associated with deep conventional gas byproduct water and that CBM produced water of better quality should be regulated differently.

C. COLORADO

1. COLORADO CBM PRODUCTION

CBM production in Colorado is occurring in primarily two basins: the San Juan and Raton.90 The San Juan
basin is the most “prolific CBM basin in the world,” estimated to have 50 TCF in place and recoverable reserves at 6 TCF. Presently, there are approximately 1,200 wells producing in the basin, with an additional 960 wells planned in the foreseeable future. Average water production is initially 5.8 gpm with a lifetime average of 2.7 gpm. To date, CBM produced water has exceeded 36 billion gallons of water from 1998 through 2001, and water quality can vary from 20,000 ppm TDS in the southern portion of the basin to 500 ppm (potable) near the outcrops. If there is such a thing of an average TDS (given different depths, aquifer characteristics and aquifer recharge influences), it is around 10,000 ppm (with most drilling depths around 5,000 feet) and nearly all of the water is handled by disposal injection.

The other major producing basin in Colorado is the Raton. It currently has 821 producing wells, with an expected total of 1,293 in the next several years. Beyond that, BLM is predicting another 1,000 to 2,000 wells in the next 10 years to capture an estimated 6 TCF of recoverable CBM reserves. To date, 7.1 billion gallons of water have been produced, with TDS averaging 2,500 ppm.

2. COLORADO OIL AND GAS BYPRODUCT WATER REGULATION

The Colorado constitution only addresses water appropriation, beneficial use and priority provisions as they apply to “natural streams.” Groundwater is addressed in Colorado by the 1965 Ground Water Management Act. A critical initial determination in Colorado is whether the groundwater diversion is from a designated groundwater basin and whether the diversion is from a tributary or non-tributary source. In a designated groundwater basin, a person seeking to appropriate water must put it to a beneficial use and have an application approved by the Ground Water Commission. If outside a designated groundwater basin, and non-tributary, a permit from the state engineer is required. Non-tributary groundwater is not considered part of the “natural stream” that brings Colorado’s Constitution into play for “natural streams” or surface waters; in general, it is subject to regulation by the Colorado legislature according to surface ownership, well construction or adjudication and authorized withdrawals based upon supply and surface acreage ownership.

Of course, not to be inconsistent with her sister states, Colorado too exempts oil and gas byproduct water from state engineer regulation:

In the case of dewatering of geologic formations by removing non-tributary ground water to facilitate or permit mining of minerals:

(a) No well permit shall be required unless the non-tributary ground water being removed will be beneficially used; and

(b) . . . . The state engineer shall allow the rate of withdrawal stated by the applicant to be necessary to dewater the mine; except that, if the state engineer finds that the proposed dewatering will cause material injury to the vested water rights of others, the applicant may propose, and the permit shall contain, terms and conditions which will prevent such injury. The reduction of hydrostatic pressure level or water level alone does not constitute material injury.

Critical considerations here are that for the exception to apply, the groundwater basin must not be designated (this would seemingly invoke 37-90-107) and the groundwater source being non-tributary. Noteworthy is that no permit is required unless, after diversion, the water is to be put to beneficial use, suggesting that the initial diversion from the ground itself is not a beneficial use of the water.

CBM water production in Colorado—particularly where the tapped coal aquifer is depleting surface streams—certainly casts doubt about a decent percentage of the regulatory oversight. Presently, all CBM water is treated under the mine dewatering nontributary groundwater exception, which divests jurisdiction to the Colorado Oil and Gas Conservation Commission for handling. Regarding produced water, it is mandatory that the water be treated prior to placement in a pit (lined or unlined) to prevent crude oil and condensate contamination. The rules allow five types of byproduct water handling: (1) injection into a Class II Safe Drinking Water Act disposal well; (2) evaporation/percolation in a properly lined or unlined pit; (3) disposal at permitted commercial facilities; (4) roadspreading on leased roads (to control fugitive dust) when less than 5,000 ppm TDS (with approval by the surface owner); and (5) discharging into state waters with a Clean Water Act 402 permit.
Once out of the ground, one could obtain a beneficial use permit for the byproduct water. In sum, therefore, much like Utah and New Mexico, Colorado presumes this water to be waste and treats it as such. Problems persist with this permitting structure as CBM wells tapped into aquifers hydrologically linked to surface waters are most likely tributary groundwater sources to which the byproduct exception does not apply. That distinction, of course, would result in a major change concerning which state agency has control over permitting and regulating the byproduct water, and brings the prior appropriation and beneficial use requirements into play. Even if not tapped into tributary groundwater supplies, the exception for non-tributary groundwater and mine dewatering was most likely based on deep conventional oil and gas brine water—in parts of the San Juan basin where TDS approach 500 ppm TDS and the Raton basin where the average is 2,500 ppm TDS, the assumptions justifying the exception do not apply to water of this higher quality. Obviously, treating all CBM byproduct water in Colorado as “waste” under the COGCC rules is allowing potentially billions of gallons of water that could be used for a beneficial purpose—either now or in future times of scarcity—to be carelessly discarded and wasted.

VI. Regulation of Coalbed Methane Produced Water in Montana

A. Montana CBM Production

The major CBM interest in Montana at the present time is in its portion of the Powder River Basin. Currently, there are 247 producing wells in the Decker Field that over 20 months of production have yielded nearly 1.8 billion gallons of byproduct water. In the Montana PRB, estimates for recoverable CBM reserves range up to 17.7 TCF, with an expected 10,000 to 26,000 new CBM wells to be producing by 2020. Average water production for each of these wells could reach 10 gpm, with possibly 3 trillion gallons depleted over the lifetime of the 20 year project. The quality of this water to date ranges from 1,148 to 2,100 ppm TDS. Of particular concern is the permanent loss of water—the Upper Tongue watershed spanning 600,000 acres could lose 60% of its available groundwater; water level recovery (recharge) in all aquifers is likely to take “hundreds of years.” Groundwater resources (e.g., existing wells) could be affected within 14 miles of existing CBM fields and within the Montana PRB there are nearly 10,000 existing groundwater rights that could be affected. That groundwater quantity conflicts will occur is perhaps the only surety as this project moves forward.

B. Montana Oil and Gas Byproduct Water Regulation

Montana’s constitution regarding water rights states, “All surface, underground, flood, and atmospheric waters within the boundaries of the state are the property of the state for the use of its people and are subject to appropriation for beneficial uses as provided by law.” Of course, amended in 1972, Montana’s constitution has the resource protection trump card: “All persons are born free and have certain inalienable rights. They include the right to a clean and healthful environment.” Importantly, “The state and each person shall maintain and improve a clean and healthful environment in Montana for present and future generations.”

Similar to Utah, New Mexico, Colorado and Wyoming, Montana’s water code appears to have an oil and gas byproduct exception to its groundwater appropriation requirements. In Montana, however, that it not the major regulatory issue. Troublesome for the CBM industry was that the Montana groundwater code prohibited waste of this precious resource: “Waste and contamination of ground water prohibited. . . . No ground water may be wasted.” That all changed, however, in 2001 when this preventing waste provision was specifically amended to address CBM byproduct water quantity issues. As the Montana water code now reads, the “the management, discharge, or reinjection of ground water produced in association with a coal bed methane well in accordance with 85-2-521(2)(b) through (2)(d)” may not be construed as waste.
surface or surface waters subject to the section 402 of the Clean Water Act.\(^{128}\) This appears to be an answer to the problem, except that: (1) due to high sodium content, sodicity or the sodium adsorption ratio (SAR), of this water, most of it is not suitable for long-term irrigation;\(^{129}\) or discharging it into a waterway, or left to percolate in above-ground reservoirs, may lead to Clean Water Act violations;\(^{130}\) and just a fraction of the water can be used by livestock.\(^{131}\) In short, despite the 2001 amendment, the water, in fact, will be wasted—either by evaporation or to downstream surface waters. Accordingly, there is a strong case to be made that the “waste” exception for CBM produced water in Montana violates the of the inalienable constitutional right for Montana citizens to enjoy a clean and healthful environment—particularly for future generations given the lengthy aquifer recharge scenarios at play.

That is not the only problem facing CBM byproduct water regulation in Montana. The other key issue deals with the ramifications of designating a controlled groundwater area. The water code authorizes the designation of a controlled groundwater area when, pertinent here: (1) the groundwater withdrawals are in excess of recharge to the aquifer or aquifers within the ground water area; or (2) that excessive groundwater withdrawals are very likely to occur in the near future because of consistent and significant increases in withdrawals from within the groundwater area.\(^{132}\) In December of 1999, the Montana Department of Natural Resources and Conservation designated most of the entire Montana Powder River Basin as a control area, finding: (1) excessive groundwater withdrawals are very likely to occur in the near future in a water-scarce area; and (2) the public health, safety and welfare provision requires that these withdrawals be monitored to protect existing beneficial uses.\(^{133}\) The designation requires water well mitigation contracts, strict monitoring and data collection to assess impacts.\(^{134}\)

That seemingly solves the problem, except designating a groundwater control area in Montana brings us full circle: once designated, all operators need a permit to appropriate, and three conditions for that permit that are pertinent here are that there is water available, the operator protect existing uses and the proposed use of the water is a beneficial use.\(^{135}\) And, as stated, very little of the hundreds of billions of gallons of water produced each year will be beneficially used: irrigation is problematic for most of this water long-term, there are only so many cows in Montana and only so many roads to soak. Montana’s legislature has made it clear that the secondary effect of allowing CBM to vent to the surface is not a beneficial use of the water itself.\(^{136}\) It seems like every time Montana takes a step forward in addressing these problems, it comes full circle to still facing the problems it thought it had solved.

Summing up Montana’s approach to CBM byproduct water quantity—it’s a mess. Trillions of gallons of water that can water livestock and for most people is drinkable (for those not on salt-restricted diets), and certainly if treated, can be used for crop irrigation—will mostly be lost down gradient to the Powder River drainage, the Yellowstone River and ultimately the Gulf of Mexico. Sure, in 2001 the legislature declared that not to be waste, but that seems a target for a Montana constitutional challenge, particularly since aquifer recharge is admitted to take hundreds of years. Joint jurisdiction over the produced water with the Department of Natural Resources and the MBOGC makes sense as the DNC has admittedly more expertise with hydrogeologic issues and preserving existing water rights, but the inescapable CBM catch-22 there is that to appropriate this water, all of it must be put to a beneficial use. And put simply, it is not and cannot be used when all gushing out at once in the amounts of billions of gallons. In the end, most of this (relatively) moderate quality water will be lost for hundreds of years.

VII. Regulation of coalbed methane produced water in Wyoming

A. Wyoming CBM production

On the bright side for Montana is that its regulation of CBM byproduct water is not as problematic as Wyoming’s. Despite the problems in Montana, the legislature did act to specifically address the problem by amending the water code (while conveniently rewriting the “shall not waste” provision) and did act to designate the entire basin as a control area. In the meantime, Wyoming, presently with 9,100 producing wells, 13,250 wells drilled and coming on line, and an additional 6,549 wells permitted and waiting to be drilled, is forecasting 51,000 CBM wells to be operating and producing...
gas and water by 2010.\textsuperscript{137} The most frightening aspect about this projection is that it is actually conservative—BLM predicts under its “high scenario” as many as 80,000 total wells by 2010 and as many as 139,000 wells in total to extract Wyoming’s 25 TCF of recoverable CBM reserves.\textsuperscript{138}

To date, the cumulative produced water to the surface has been 53 billion gallons.\textsuperscript{139} In Wyoming, CBM wells discharge water at an average rate of 9.5 gpm over their productive life. When all 51,000 wells are producing, this will amount to nearly 700 million gallons drawn from aquifers and discharged each day, and 255 billion gallons produced and discharged each year at peak production. BLM predicts a total groundwater loss of 1.4 trillion gallons over the life of the project,\textsuperscript{140} but if calculated the way MT BLM did, the total loss of groundwater amounts to 5 trillion gallons.\textsuperscript{141} Either way, the lost water quantity is simply staggering. The two primary ways of handling the water in Wyoming include: dumping it on the ground, untreated and/or excavating up to 4,000 (new) surface reservoirs, with bore holes drilled in the bottom, as percolation/infiltration reservoirs (also called pits).\textsuperscript{142} Both methods lead to one result: the absolute waste of almost all of this water.

The quantity of this water ranges in TDS depending on sub-watershed in the Powder River Basin. In general, by the particular coal seams and targeted depth of wells in each sub-watershed, TDS vary from 402 to 698; 1,170; 1,884 and 2,977 ppm.\textsuperscript{143} Therefore, for most of these sub-watersheds that will see the bulk of production, the quality makes it drinkable and suitable for livestock irrigation. The problem is that when deluged with billions of gallons of water each year, there just are not enough cows and people to consumptively make use of the water before it ends up flowing into Montana or South Dakota. While the oil and gas industry and the state of Wyoming have spent countless hours tabulating the projected revenue from the produced natural gas, no one has bothered to put a price tag on the trillions of gallons of water that will be lost. Aquifers will take decades to recover to 75\% of capacity, with 95\% recharge, in BLM’s words, “over the next hundred years or so.”\textsuperscript{144} All existing wells within 10 to 12 miles of CBM development will be affected by aquifer drawdown (and with 51,000 wells, that means a significant portion of the 8 million acre Wyoming Powder River Basin), possibly affecting the 26,946 existing water wells in the area.\textsuperscript{145} As in Montana, the only sure bet as this project moves along is massive conflict between competing water users.\textsuperscript{146}

B. WYOMING OIL AND GAS BYPRODUCT WATER REGULATION

1. WYOMING STATE ENGINEER REGULATORY STRUCTURE

The Wyoming Constitution provides that, “Control of Water: Water being essential to industrial prosperity, of limited amount, and easy of diversion from its natural channels, its control must be in the state, which, in providing for its use, shall equally guard all the various interests involved.”\textsuperscript{147} It is unclear whether this provision applies to groundwater—the phrase “natural channels” may refer only to surface hydrology. The next provision applies to all waters of Wyoming: “Priority of appropriation for beneficial uses shall give the better right. No appropriation shall be denied except when such denial is demanded by the public interests.”\textsuperscript{148} Accordingly, it is arguable that the Wyoming state engineer has a constitutional duty to equally guard all of the various water interests affected by CBM dewatering, and certainly there is a public interest review requirement for these groundwater diversions.\textsuperscript{149} The concept of public interest review and the public trust—applicable to all states that hold all of the water in trust for its citizens—will be discussed in further detail below.

Wyoming’s groundwater code is based on the prior appropriation doctrine: “A water right is a right to use the water of the state, when such use has been acquired by the beneficial application of water under the laws of the state relating thereto, and in conformity with the rules and regulations dependent thereon. Beneficial use shall be the basis, the measure and limit of the right to use water at all times.”\textsuperscript{150} Jurisdiction over water use and rights is vested with the Wyoming state engineer, which requires a permit for groundwater diversions.\textsuperscript{151} Groundwater appropriation permits “shall be granted as a matter of course, if the proposed use is beneficial and, if the state engineer finds that the proposed means of diversion and construction are adequate.”\textsuperscript{152} However, the important constitutional concept of public interest review specifically applies to groundwater, “If the state engineer finds that to grant the application as a matter
of course, would not be in public’s water interest, then he may deny the application subject to review at the next meeting of the state board of control.”

Wyoming’s groundwater law follows a system of preferred uses. Importantly, in the current CBM context, it is noteworthy that underground water appropriations for stock or domestic use “shall have a preferred right over the rights for all other uses, regardless of their dates of priority.” Water rights have preference rights in the following order: (1) drinking water for man and animals; (2) municipal purposes; (3) steam engines and cooking, laundry and bathing; and (4) industrial purposes (which would include mine dewatering).

Wyoming, unlike any other western state, places CBM water quantity jurisdiction within the state engineer. This model does not fit CBM production for primarily one reason: just like in Montana, only a small percentage of this water can be beneficially used itself and, as a result, the rest is wasted. An interesting side note is that Wyoming did not need to follow this path; it too has the byproduct provision in the oil and gas statute vesting jurisdiction with the state oil and gas commission, which oversees the “[d]isposal of salt water . . . which [is] uniquely associated with exploration and production operations.” Rather, the state engineer assumed jurisdiction over the initial diversion from the ground, given that early wells produced so much water, without any gas, for long periods of time.

The state engineer rules for groundwater provide that permits are required for all diversions of water from an underground source. Importantly, “All three types of water rights are limited to the beneficial used being made. The state engineer may deny or modify an application for permit if he determines that the granting of an application would be injurious in some respect.” Of equal importance is the following duty of the Wyoming state engineer, “The ground waters of the State of Wyoming are the property of the state. The Wyoming state engineer is charged with the administration of the rights to use this ground water. It is his responsibility to provide for the orderly development of the resource and to protect it against waste and contamination.”

Obtaining a groundwater right in Wyoming is a two-step procedure: the permit approval process and then adjudication of the permit to perfect the right.

2. A BRIEF HISTORY OF CBM PRODUCED WATER REGULATION
The first drop of CBM produced water occurred in Wyoming in 1989. The “Application for Permit to Appropriate Ground Water Form” did not address CBM production; for that matter, in the “Use” category of the permit application, there has never been a box that described “oil and gas byproduct water” as a beneficial use. Rather, at the time of the first few CBM wells, under “use” there were the following categories: domestic, stock watering, irrigation, municipal, industrial and miscellaneous. As none of these uses fit CBM production (save a small fraction for stock watering), operators checked the “Miscellaneous” box, describing the beneficial use as, “Well produces water in conjunction with coalbed methane gas production.” By 1994, when CBM water production reached 520 million gallons annually, the same form was revised. “Miscellaneous” now read, “Any use of water not defined under previous definitions such as . . . mine dewatering, [and] mineral/oil exploration drilling.” Within a year, the form was revised again to create a new beneficial use category, “Coal Bed Methane—Water produced in production of coal bed methane gas.”

3. PROBLEMS ARISING WITH CBM WATER QUANTITY REGULATION
The resulting regulatory system for handling the quantity has resulted in a state agency shell game of sorts. The produced water is not injected back underground, instead, it is disposed of onto the surface. For discharges that reach surface of the waters of the U.S., the Wyoming Department of Environmental Quality has jurisdiction as Wyoming has section 402 primacy under the Clean Water Act. Beginning in early 2000, WDEQ was presented with “new” information, known to soil scientists since the 1950s, about the sodium content of this water and possible violations of Wyoming water quality standards in terms of impairment of agriculture uses of existing surface waters. At that time, due to CWA concerns, operators began to intensify efforts to build and excavate reservoirs or stock ponds to hold the water. Generally, the state engineer permits all of these reservoirs, and presently there are approximately 400 of them in the Powder River Basin to handle CBM produced water. As stated above,
that number is expected to climb by an additional 4,000 reservoirs in the next decade.

Quickly, however, there evolved a new set of problems, as several of these reservoirs were built in ephemeral drainages, requiring section 404 permits under the CWA. In addition, some Wyoming ranchers, many of which adapted to the little precipitation (but of very high quality) that flowed down these drainages during snow melt and infrequent storm events, found themselves with impeded water flows. In some cases, there was the difficult decision: receive little or no water due to the blocked drainage upstream (because of the CBM water impoundment) or receive released CBM reservoir water that some considered undesirable compared to the high quality run-off that occurred naturally. The shell game can be explained as follows: (1) the Wyoming state engineer was concerned with quantity from the well and reservoir construction; (2) the WDEQ was concerned with the quality of CBM water, but not existing water rights (which include a right to quantity and quality); and (3) the Wyoming Oil and Gas Conservation Commission (WOGCC) was concerned with well construction, location, spacing and safety. Currently, however, there are proactive steps by the Wyoming agencies to address some of these issues.

4. PROBLEMS ARISING WITH COMPETING USES—INTERFERENCE

Another set of problems emerged with water wells going dry that were tapped into the same (or nearby) aquifers as CBM wells. The Wyoming groundwater code provides for handling complaints of interference—generally, upon complaint of the operator of a stock or domestic well, the state engineer can order the interfering appropriator to cease or reduce withdrawals of water or furnish a new supply of water to the complainant. A complaint requires a filing fee of $100.00 and triggers a state engineer investigation.

Two problems persist for the affected landowner. First, “It is an express condition of each underground water permit that the right of the appropriator does not include the right to have the water level or artesian pressure at the appropriator’s point of diversion maintained at any level or pressure higher than that required for maximum beneficial use of the water in the source of supply.” Conflicts are certain given that and that many CBM wells are tapped into the same aquifers in which there are over 20,000 pre-existing groundwater rights and BLM’s admissions that the reduction in hydraulic head within coal aquifers in the PRB, “likely would reduce or eliminate artesian flow in water wells” and that “[a]rtesian flow in wells likely would not recover until hydraulic head in the coal aquifer recovers sufficiently following CBM development.” And, as noted, this recovery process will takes decades and possibly over a hundred years. Second, establishing “who’s at fault” in groundwater depletion scenarios is a difficult matter of proof, and if the state engineer cannot prove conclusively the interference, the landowner may be out of luck.

5. THE BENEFICIAL USE MODEL—PERSISTING PROBLEMS

The current model of treating each CBM water diversion as a beneficial use has a few problems. First, as in Montana, very little of the water itself is actually beneficially used. The Powder River Basin has a total of 500,000 cattle and sheep. One cow (or seven sheep) drinks about 14.5 gallons per day. At peak production of 51,000 wells at 9.5 gpm, this will amount to nearly 700 million gallons per day. At this rate, for this use alone to account for all of the produced water, the Powder River Basin would be overrun with over 45 million cows or 325 million sheep. True, the water is drinkable, but pre-CBM development, drinking water needs were met in the Basin, meaning that none of this water is likely to be used for drinking purposes. That leaves irrigation, which due to sodium and salinity issues, is problematic due to soil dispersion and long-term salt accumulation. As stated, a principal argument here is that, despite the state engineer forms, the beneficial use of the water is not the secondary effect of the gas being depressurized. If that were the case, the 1979 form the state engineer developed would have specifically listed oil and gas byproduct water as a beneficial use—it did not, because, like other states, this water, at that time, was treated as “waste” and not under the administration of the state engineer.

Secondly, vesting control over this water in the state engineer brings in constitutional questions such as equally guarding the various interests and denying diversions when in the public interest. To date, there has not been this public interest review. Lastly, given that little of this
water is in fact beneficially used, by allowing diversion in the amounts of billions of gallons per year of water that could be stored and eventually used by future generations, the state engineer is not preventing this water from being wasted.  

6. AN ALTERNATIVE MODEL: WYOMING’S OIL AND GAS BYPRODUCT WATER PROVISION
Interestingly, similar to the other states discussed herein, Wyoming does have a provision in its water code that addresses oil and gas byproduct water. In Wyoming, byproduct water is defined as, “water which has not been put to prior beneficial use, and which is a by-product of some non water-related economic activity. . . . By-product water includes, but is not limited to, water resulting from the operation of oil well separator systems or mining activities such as dewatering of mines.” In turn, the code deals with the issue of whether someone wants to put the water to a beneficial use after it is diverted from the ground, suggesting that the primary first diversion from the underground aquifer is itself, not beneficial. In Wyoming, traditional deep oil and gas byproduct water is treated in this fashion, with no beneficial use permit required by the state engineer. 

One way of comparing/contrasting the two models is to examine the different water handling controls if the byproduct water provision had been applied in Wyoming to CBM extraction. Important to remember throughout this discussion is the key distinction between the legal regulatory framework applying to first taking the water out of the ground (the initial diversion) and the much different question of how that water is handled once out of the ground. These are two completely separate regulatory issues. In Wyoming, for example, the following discussion concerning the second phase (how to handle the water once out of the ground) sheds light on, and calls into question, Wyoming’s justifications that the beneficial use model fits the initial diversion (first phase).

For example, if the byproduct provision and/or the oil and gas statute provision on oil and gas brine had been applied, as in other states, jurisdiction over handling the water would vest with the state oil and gas commission—the Wyoming Oil and Gas Conservation Commission. Indeed, for the surface reservoirs or pits, WOGCC has stricter standards in place than are currently being required by the Wyoming state engineer’s office. For example, all such pits must be designed to prevent leakage and contamination of any freshwater source, when they are located near “an area with a high potential for communication between the pit contents and surface water or shallow groundwater.” They must be lined when near “shallow groundwater” or “groundwater recharge areas.” As many of the proposed and existing CBM water retention pits fit these descriptions, the regulation of the pit aspect by WOGCC might mean tougher standards. And if lined, they would not fit their intended purpose of handling millions of gallons of byproduct water, because evaporation alone (as opposed to the current method of designing them to bleed into the water table) would be insufficient to handle the quantity of water. The result would be overflowing pits in a matter of months.

Besides these practical problems, treating CBM water as “byproduct” waste is not in the best interest of Wyoming citizens. WOGCC, even with its proposed rule-making, speaks primarily of how to dispose of the water, and to be praised, how to protect aquifers and surface waters. However, the fundamental problems persist under this model with the result that still no agency in Wyoming will be regulating the waste of the water resource or the preservation of the same for future use. Lined pits and proper siting of CBM byproduct reservoirs water may address some issues, but not the fundamental one discussed herein of preventing trillions of gallons of fairly decent quality water (depending on the intended use) from being wasted for decades or centuries. Accordingly, neither the state engineer’s beneficial use regulatory model, nor the handling of this water as oil and gas byproduct waste are appropriate models for the very different nature of CBM byproduct water in Wyoming.

7. THE PUBLIC INTEREST
What is certain, despite the regulatory uncertainties in Wyoming, is that there never has been a formal public interest review conducted by the state engineer. This failure is legally problematic given the following in Wyoming:

(1) The state constitution provides that the state shall equally guard all various water interests;

(2) The state constitution provides that water appropriations should be denied when against the public interest;
(3) The groundwater code specifically provides that appropriations not in the “public’s water interest” may be denied;\textsuperscript{190}

(4) The groundwater code further provides that the state engineer may condition permits based upon the public interest;\textsuperscript{191}

(5) The water of the state is held in trust for the public;\textsuperscript{192}

(6) The state engineer’s rules provide for denying a groundwater appropriation permit when not in the “public interest”; and

(7) The state engineer’s rules on groundwater require the agency to protect it against waste.\textsuperscript{193}

Despite all of these public interest duties and responsibilities, CBM produced water permitting evolved without formal rulemaking by the state engineer, public input or participation or a written record. Rather, the groundwater appropriation forms evolved by including CBM produced water as miscellaneous use to eventually having its own “box” to be checked on the permit form. Given the scarcity of the resource, the competing water rights involved, the quality of this water as compared to conventional oil and gas brine, and moreover, the quantities involved (hundreds of billions of gallons of water each year), the people of Wyoming deserve this public interest review. Equally important is that the law requires it.

In the case of \textit{Rissler & McMurry v. Environmental Quality Council},\textsuperscript{194} at issue was the designation of Bessemer Mountain as “very rare and uncommon” by the Wyoming Environmental Quality Council. The EQC made this determination after public notice and a hearing, but the decision was challenged for the lack of objective criteria on which such determinations would be made. In setting aside the designation as arbitrary and capricious, the Wyoming Supreme Court held:

[T]he EQC cannot classify lands within the state as “very rare or uncommon” without first establishing by regulation the criteria and factors which will set the standard for that classification. We are satisfied that, in the absence of such a regulatory standard, the phrase, ‘very rare or uncommon’ is too amorphous to permit judicial review of the action of the EQC. Consequently, any such classification is inherently arbitrary and capricious.\textsuperscript{195}

In the very same category is the vague concept regarding determining what is in the “public interest” (and for that matter, “beneficial use”) when it comes to groundwater diversions. In the present context, public interest rises to the constitutional level (as well as statutory and administrative rules), whereas the duty on the agency in \textit{Rissler & McMurry} was statutory. In addition, the facts in \textit{Rissler & McMurry} demonstrated public notice and hearing before the determination, something not done by the state engineer in deciding whether some or all of the CBM dewatering is in the public interest. Accordingly, the state engineer has conducted little if any formal public interest review, and is legally required (and has been) through a formal Administrative Procedure Act rulemaking, to develop, establish and apply public interest criteria, through public notice and involvement, before approving these permits. As they stand now, without \textit{any} such criteria in place, all state engineer CBM dewatering permits are arguably arbitrary and capricious.\textsuperscript{196}

8. \textbf{Wyoming summary}

Wyoming is unique in its permitting each CBM gas well as a beneficial use groundwater well. Many problems persist with the concepts of beneficial use, constitutional duties and with the fact that no agency in Wyoming is addressing the water quantity waste issue. Indeed, the multi-agency wrangling and in some cases abdication of responsibility, as illustrated herein, has led to a vicious cycle of mind-numbing circular reasoning in Wyoming that will assuredly provide an ample new market for Bayer and Tylenol to penetrate. Neither the current model of appropriation permits nor the alternative byproduct approach addresses the groundwater waste issue or the important issue concerning the preservation of this scarce resource. Equally troublesome are the lack of established criteria for the state engineer to conduct the required public interest review and the fact that no such review is taking place. The only sure thing moving forward with CBM production in Wyoming is more and tougher questions that will demand careful and well-considered regulatory answers.

\textbf{VIII. Conclusion}

Coalbed methane and the hundreds of trillion cubic feet of potential reserves in the Rocky Mountains is obviously one of the major, if not biggest threats, to the envi-
rionment and natural resources in this region. The Wyoming Powder River Basin alone projects 17,000 miles of new roads, 20,000 miles of new pipelines, 5,300 miles of new overhead powerlines and over 200,000 acres of surface disturbance by 2017. Beyond these traditional impacts associated with but one of the proposed CBM projects in the West are the impacts, both below and above ground concerning the trillions of gallons of water depleted from aquifers to allow the natural gas to vent to the surface to be captured.

While each state varies on handling the byproduct water, the basic premise of this Article is that the assumptions in each state that underlie treating this water as waste are based on statutes diverting jurisdiction to state oil and gas commissions, that contemplated the brine associated with conventional deep oil and gas drilling. In other words, the assumptions in place for treating byproduct water as “waste” never considered CBM development. These statutes were passed in Utah, New Mexico, Colorado, Montana and Wyoming in the 1950s and early 1960s, when the associated water was deep oil and gas produced brine water—with TDS in some cases at 100,000 ppm, or nearly triple that of seawater. CBM production did not start until the late 1980s, with the real boom occurring in the mid-1990s, long after these models were developed. CBM byproduct water across the West varies in quality; however, as illustrated, the quality in many cases makes it suitable for drinking, livestock watering, and if treated, for other uses. Put simply, these outdated models for handling oil and gas byproduct water do not fit CBM production and the associated byproduct water. In the process of handling and assuming all of this water to be “waste,” these states are in fact in the process of actually “wasting” a valuable resource. Wyoming’s problems include not only the wasting of this resource, but also issues germane to its unique approach in permitting each CBM well as a beneficial use water well with jurisdiction under the state engineer. All five states face potential legal problems with the concepts of public interest review and the public trust doctrine.

Without question, as our country makes the transition to renewable and alternative forms of energy, the natural gas from CBM production is an important fuel source in the interim. Industry and the states have adequately voiced the economic benefits of this extraction. What is missing from the debate, and hopefully articulated here, is that critically important water resources in the arid West are also at stake in this development. The challenge lying ahead is for each state to rethink how it deals with produced CBM water in a manner that best serves the purposes of western appropriation water law—protecting competing uses, preserving water for future generations and requiring water to be put to (or at least preserved for) beneficial uses so that this resource is not ultimately wasted and discarded.

Notes

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+ All materials cited herein are on file with the Author.

5. EIA, Rocky Mountains, supra note 4, at 1.

CBM is an “unconventional” extraction method for natural gas and growth of CBM plays in the U.S. in the 1990s was initially spurred by tax credits for such sources. See Darin and Beatie, infra note 16 at 10573, n. 58 (describing the role of IRS code Section 29 tax credits for wells drilled between 1980 and 1992, with the tax break for industry to expire in 2002). Under the new administration, section 29 tax credits are back on the table. The House energy bill, passed in July of 2001, and now in conference with the Senate energy bill, would extend the credit to new wells drilled before 2007 and continue the credit for old wells through 2007. See House Resolution 4, § 3306(a) (2001). If this provision becomes law, one can only expect CBM production to receive even more heightened focus. This massive subsidy is estimated to be approximately $20 billion in unneeded corporate welfare to an already thriving industry over the next decade. See Marianne Lavelle, High-Octane Help for the Not So Needy, U.S. News & World Rep., Feb. 26, 2001, at 46.

8. EIA, Rocky Mountains, supra note 4, at 1.


12. Oil and gas production on federal lands is now BLM’s “Number one priority.” Recently, BLM announced that to one western state BLM office that “when an oil and as lease parcel or when an APD [drilling permit request] comes in the door, that this work is their No. 1 priority.” See U.S. Dept. of Interior, Information Bulletin UT 2002-008 (Jan. 2002) (after BLM D.C. completed a review of the Utah BLM’s oil and gas programs, the Utah BLM office was strongly criticized for allowing Endangered Species Act consultation to delay leasing decisions and for slowing down leasing for oil and gas pending the inventories of nominated wilderness study areas). On May 18, 2001, President Bush signed Executive Order 13,212, providing that, “For energy-related projects, agencies shall expedite their review of permits or take other actions as necessary to accelerate the completion of such projects.” Exec. Order 13,212, 66 Fed Reg. 28,357, § 2 (2001). Since that time, the Dept. of Interior and BLM have taken measures to aggressively implement the National Energy Policy, including developing an energy office within BLM and requiring personnel to complete statements of adverse energy impacts when taking an action that could impede energy production. In addition, BLM developed a list of time sensitive land use plans (called resource management plans) to be placed on a “high priority” fast track for amendment to allow for significantly higher levels of oil, gas and particularly CBM development. See U.S. Dept. of Interior, Instruction Memorandum No. 2002-081, Time Sensitive Plans, National Planning Support Team and Action Plan for Time Sensitive Plans (Feb. 4, 2002) (listing 21 planning projects as time sensitive and high priority, including amending the land use plans for the BLM field offices administering public lands within the Wyoming and Montana Powder River Basin, San Juan Basin in New Mexico, Raton Basin in Colorado and Uinta Basin in Utah).

13. Also unique to CBM extraction are the energy requirements necessary to power not just booster compressors and larger compressor facilities, but also submersible water pumps in each CBM well to facilitate bringing the water to the surface. In Wyoming, this power is supplied from thousands of diesel generators, gas-fired generators and, currently, three proposed coal-fired power plants—all of this fossil fuel power generation, being used, ironically, to liberate yet another fossil fuel. To this date, no state or federal agency has conducted a cost benefit analysis concerning the net BTU gain when obtaining CBM by using all of these power sources.


stimulation practice of injecting fracturing fluids into coal seams to enhance recovery.

17. As new CBM plays are discovered in these regions, the water quality and quantity are surely subject to vary; therefore, as new CBM plays are discovered where the quality and quantity of the byproduct water approach that of Montana and Wyoming, the calls for state regulatory reform in this Article would apply equally to those situations.

18. This notion is supported by the fact that Utah, New Mexico, Colorado, Montana and Wyoming all have placed oil and gas produced water under the jurisdiction of the state oil and gas commissions—and not requiring a beneficial use permit for the point of first diversion (this holds true for all conventional oil and gas byproduct water in these states). In other words, if the “beneficial use” of the water was actually the secondary effect of allowing the gas or oil to be mined, then there would not be a need to except this water from the traditional requirements of receiving a beneficial use permit from the state engineer. The mere existence of the exception, therefore, strongly implies that the water itself is not being put to a beneficial use. These concepts are more thoroughly discussed infra.

19. For a more thorough discussion, see, e.g., Darin and Beatie, supra note 16, at 10572–10574 (notes 51–82).

20. See Hill, supra note 10, and accompanying text, for major CBM plays in the western United States.


22. U.S. Dept of the Interior, Colorado Bureau of Land Management, Notice to Lessees (NTL) 88-2, 1 (Dec 3, 1998). Recently, the Department of Interior Board of Land Appeals affirmed this principle, holding that underlying environmental studies for deep conventional gas were insufficient to allow leasing and production of CBM—due to its unique and different environmental impacts. Wyoming Outdoor Council, 156 IBLA 347 (2002). In general, deep, conventional gas averages 5 to 10 barrels of water per day (1 barrel equals 42 gallons) whereas, in Wyoming for example, CBM water production averages 500 barrels per day (per well) and can easily exceed, in some instances, 2,000 barrels per day. See, e.g., U.S. Dept. of Interior, Wyoming Bureau of Land Management, Draft Environmental Impact Statement— Jonah Field II Natural Gas Project 2-14 (July 1997) (average produced water from conventional natural gas field between 5 and 10 barrels per day); Darin and Beatie, supra note 16, at 10575 n. 90, 91 and accompanying text (average CBM production per well in Wyoming at 15 gallons per minute (equating to 514 barrels per day; with some wells at 85 gpm, or over 2,900 barrels per day). Due to these differences, CBM wells are in fact different than conventional gas wells, as they contain a separate handling and separation system to deal with the significantly different water quantities. In Wyoming, BLM recognized as early as 1990 that its land use plans for oil and gas did not account for or even mention (let alone study and analyze) these unique attributes of CBM production. See, e.g., U.S. Dept. of Interior, Wyoming Bureau of Land Management, Decision MM-7, Plan Change 2 1 (1990) (in discussing the Buffalo land use plan (RMP) covering the Powder River Basin, Program Leader Richard Zander stated, “RMP did not cover this non-traditional type of oil and gas activity.”); U.S. Dept. of Interior, Wyoming Bureau of Land Management, Coal Bed Methane Environmental Assessment 3 (March 1990) (“The Buffalo RMP did not address the removal of large quantities of water in its evaluation of oil and gas development.”).

23. Other regulatory issues not addressed herein are water quality issues and Clean Water Act discharge permits, re-injection of produced water pursuant to the Underground Injection Control program of the Safe Drinking Water Act, regulation of drilling operations by state oil and gas conservation commissions, and the federal leasing, project approval and permitting of CBM wells. Each one of those topics is an article unto itself—see generally, however, Darin and Beatie, supra note 16, at 10594–97 (CWA issues discussed in context of CBM development); 10597–98 (discussing the Safe Drinking Water Act). In addition, byproduct water typically associated with oil and gas production has been exempted from regulation under the Resource Conservation and Recovery Act, 42 U.S.C. §§ 6901–6991 (1984); see generally Richard Ottinger, Strengthening of the Resource Conservation and Recovery Act in 1984: The Original Loopholes, the Amendments, and the Political Factors Behind Their Passage, 3 Pace. Envtl. L. Rev. 1, 10–11, n. 49 (1985).
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excellent overviews of the prior appropriation doctrine as applied to western groundwater). Not discussed in this article is the possible application to reserved federal water rights, recently held by the Arizona Supreme Court to apply to groundwater. In areas such as the Powder River Basin in Wyoming and Montana, where the federal government has reserved millions of acres of mineral estate under homesteading laws, it has not been addressed whether the federal government has any implied reservation—and therefore control—over groundwater diversions with massive CBM dewatering of aquifers. See generally E. Brendan Shane, Water Rights and Gila River III: The Winters Doctrine Goes Underground, 4 U. Denver Water L. Rev. 397 (2001). In all five states discussed herein, it is presumed that the states have regulatory control over groundwater withdrawals involving public lands administered by the Bureau of Land Management. This, in fact, is most likely appropriate given that the government to have a reserved right, must own the surface in question, whereas in the Wyoming Powder River Basin, for example, nearly 4 million acres are private surface/federal mineral (split-estate). See U.S. Dept. of Interior, Wyoming Bureau of Land Management, Buffalo Resource Management Plan Draft Environmental Impact Statement 84 (1984).

29. See George W. Pring and Karen A. Tomh, License to Waste: Legal Barriers to Conservation and Efficient Use of Water in the West, 25 Rocky Mtn. Min. L. Inst. 25-1, 25-17-18 (1979) (“If water is not beneficially used, it is waste. There exists in all prior appropriation states either a duty not to commit waste or a duty to use water beneficially.”).

30. Aiken, supra note 27, at 510.

31. In New Mexico, for example, all groundwater is owned by the state in trust for its citizens, and one must seek a permit from the state engineer, demonstrating beneficial use, to obtain a water right. Robert A. McCleskey, Maybe Oil and Water Should Mix—At Least in Texas Law: An Analysis of Current Problems with Texas Groundwater Law and How Established Oil and Gas Law Could Provide Appropriate Solutions, 1 Tex. Wesleyan L. Rev. 207, 222 (1994). See generally Malone, supra note 24, at 12–14. Each of these five western states’ approaches to the permitting and adjudication of groundwater rights will be discussed in more detail.

32. See, e.g., A. Dan Tarlock, Law of Water Rights and Resources § 6.03[53] (5th ed. 1993) (byproduct water from secondary oil and gas recovery traditionally exempted from groundwater appropriation requirements);


34. EPA, Profile Oil and Gas, supra note 33, at 54–55.

35. C.F.R. § 143.3 (EPA’s National Secondary Drinking Water Regulations).

36. See, e.g., Jim Bauder, Montana State University Soil and Water Quality Specialist, Coalbed Methane Gas and Montana Water Quality 2 (2000) (TDS up to samples showing 1,727 ppm acceptable for human consumption for those not on salt-restricted diets).

37. USGS, CBM WATER, supra note 7, at 1. USGS further notes that drinking water is recommended to be no higher than 500 ppm TDS and the beneficial use for stock ponds is from 1,000 to 2,000 ppm TDS.


39. All data for these two charts was obtained on May 7, 2002, from the Wyoming Oil and Gas Conservation Commission’s website available at http://wogcc.state.wy.us.


41. Interview with Lance Cook, Wyoming State Geologist, June 14, 2002. Cook stated that as of June 2002 there are approximately 8,200 producing CBM wells in the Powder River Basin (with over 14,000 drilled) and almost all of the current producing wells are within the 200 to 600 foot depth. As the CBM play in the Basin spreads west and deeper formations are targeted, drilling depths can reach over 2,000 feet deep, in addition to the shallower wells.

42. BLM, WY PRB DEIS, supra note 15, at 3–4.


45. BLM, MT PRB DEIS, supra note 43, at 3–21.

46. Personal communication with David Tabet, Utah Geological Survey (April 1, 2002). [hereinafter, “Tabet communication”]. Two key formations are the Drunkards Wash and Blackhawk, with operators saying each 160-acre well site could produce 1.8 billion cubic feet (BCF) to 2.4 BCF, respectively. In 2000, the DOE Energy Information Administration listed proved CBM reserves for Utah and the Uinta basin at 1.59 TCF based on a total of 494 producing wells at the time. Id.

47. Tabet communication, supra note 46.

48. Interview with John Baza, Associate Director, Oil and Gas and Gil Hunt, Technical Services Manager, Utah Division of Oil, Gas and Mining (April 1, 2002). [hereinafter, “Baza interview”].

49. Baza interview, supra note 48.

50. Baza interview, supra note 48.

51. Interview with Floyd Johnson, Asst. Field Manager, Utah Bureau of Land Management Price Field Office (April 1, 2002).

52. As stated, estimated recoverable reserves in the Uinta basin are now less than 2 TCF at 1.59 TCF Tabet communication, supra note 46. However, as one learns when following CBM over time, the recoverable TCF number is a constantly moving target—it generally takes test wells and full plans of development with years of production to gather data on how much methane can be recovered based on existing technology and current economics. Other areas of future CBM interest in Utah include: Nelson formation coals in the eastern Uinta basin (of the Sego coalfield); the Dakota sandstone coals in southern Utah (of the Alton-Kolob coalfields); the Frontier and Adaville formation coals in northern Utah (in the western Henrys Fork coalfield); and the Straight Cliffs formation coals in southern Utah (of the Kaiparowits plateau coalfield). Id. The 1,000 CBM well figure for Utah, therefore,
may change radically over time. Therefore, as different coal formations are tapped, so too will produced CBM water quantity and quality.

53. Utah Const. of 1895, art. XVII, § 1.
56. Utah Code Ann. § 73-3-1. The requirements for obtaining a groundwater appropriation permit are in section 73-3-2 and the state engineer shall approve an application if: (a) there is in unappropriated water in the proposed source; (b) the proposed use will not impair existing rights or interfere with the more beneficial use of the water; (c) the proposed plan is physically and economically feasible; (d) the applicant has the financial ability to complete the proposed works; and (e) the application was filed in good faith and not for purposes of speculation or monopoly. Utah Code Ann. § 73-3-8(1).
57. Utah Code Ann. § 73-3-8(2).
59. Utah ADC R649-9-1.1, “Waste Management and Disposal; Oil and Gas.”
60. Utah ADC R649-9-3.1 and 2.
61. Utah ADC R649-9-3.4.2.
62. Utah ADC R649-9-3.4.3.
63. Utah ADC R649-9-3.4.4.
64. Utah ADC R649-5-2.1.
65. Baza interview, supra note 48.
66. EIA, Rocky Mountains, supra note 4, at 1. Currently, there are 2,849 producing CBM wells in New Mexico, all within the New Mexico BLM Farmington Field Office resource area. Interview with David Mankevich, New Mexico Bureau of Land Management Farmington Field Office (April 1, 2002) [hereinafter “Mankevich interview”]. But see Personal Communication with Steven Hayden, New Mexico Oil Conservation Division (April 3, 2002) [hereinafter, “Hayden communication”] (stating the active producing wells in this area totals 3,005). For the entire San Juan basin spanning into southwestern Colorado, there are 4,050 producing CBM wells at this time. Mankevich interview, supra note 66.
67. Hayden communication, supra note 66.
68. Hayden communication, supra note 66 (total cumulative water production from 1989 to 2002 at 134.5 million barrels).
69. Cook, supra note 38, at “Water Quality Comparisons”
70. Mankevich interview, supra note 66 (2,849 existing wells plus 2,223 expected in the next 20 years).
71. CBM production is also occurring in very small quantities in the Raton basin in northeast New Mexico; however, no data was obtainable concerning ongoing production, produced water or reasonably foreseeable development scenarios. Indeed, the New Mexico Raton basin CBM play will probably be comparable to the Raton basin CBM development ongoing across the border in Colorado. The Colorado Raton basin CBM play is discussed infra.
72. New Mexico Const. of 1911, art. XVI, § 1.
73. New Mexico Const. of 1911, art. XVI, § 3. The constitutional provision on waters of the state being owned by the public and subject to appropriation for beneficial use, applies only to surface waters. New Mexico Const. of 1911, art. XVI, § 2.
75. N.M. Stat. Ann. § 72-12-2. Traditional mine dewatering is not defined as a “beneficial use” in New Mexico. One author has pointed out the anomaly therefore that a mining company—much like a CBM company today—can waste water by dewatering a mine and dumping it down an arroyo (all legally and without the need for a permit), while if that same water is put to a beneficial use, the strict permit requirements must be met. See Barbara G. Stephenson and Albert E. Utton, The Challenge of Mine Dewatering to Western Water Law and the New Mexico Response, 15 Land and Water L. Rev. 445, 453–54 (1980). The article also provides a brief overview of groundwater appropriation regulatory systems in Wyoming, Colorado, Montana and Utah. Id. at 458–70.
79. N.M. Stat. Ann. § 72-12-25. According to the New Mexico Energy, Minerals and Natural Resources Department, some of the current New Mexico CBM production is above 2,500 feet (or is below 2,500 feet and can be potable). To date, the New Mexico state engineer has declined to exercise any jurisdiction over these groundwater diversions. Personal Communication with Stephen C. Ross, Asst. General Counsel, New Mexico MNRD (April 1, 2002). See also Bliss v. Dority, 225 P.2d 1007, 1011 (N.M. 1950) (state engineer has jurisdiction only on groundwater with reasonably ascertainable boundaries, and the state engineer is vested with the discretion to define those underground waters). The court also held that the New Mexico prior appropriation groundwater act was constitutional. Bliss, 225 P.2d at 1012. An interesting case on groundwater diversions for oil and gas is Mathers v. Texaco, 421 P.2d 771 (N.M. 1966). In Mathers, the Mexico Supreme Court discussed the requirements that all groundwater diverters—even those for oil—had to receive a state engineer beneficial use permit when appropriating from a declared underground basin. This suggests that all byproduct water should be permitted through the state engineer. A key distinction is that the water needing a beneficial use permit in Mathers was used in oil field flooding—it was not byproduct water. Mathers, 421 P.2d at 773. This suggests that for oil and gas production, water is only considered a “beneficial use” when it is being used to facilitate production subsequent to its initial diversion from the ground (as opposed to merely being pumped out of the ground as a byproduct of production). In the latter instance, western water law has treated this as byproduct waste and the water itself, not a beneficial use. As will be discussed infra this concept has important application to Wyoming’s treatment of CBM byproduct water.
83. See Personal Communication with Frank Chavez, Oil and Gas Inspector, District 3, New Mexico Oil Conservation Division (May 12, 2002) (stating that the NMOC has jurisdiction over “produced water” pursuant to its rules and regulations and the Mine Dewatering Act does not apply); see also Lawrence J. Wolfe and Jennifer G. Hager, Wyoming’s Groundwater Laws: Quantity and Quality Regulation, 24 U. Wy. L. Rev. 39, 65, 66 (1989) (discussing the Act as specifically to mines, and oil and gas byproduct water is discussed separately).
84. N.M. Reg. § 19.15.1.13.
85. N.M. Reg. § 19.15.1.18; 19. For surface reservoirs, those are strictly regulated as waste management facilities, subject to detailed plans demonstrating no contamination of water sources. N.M. Reg. § 19.15.9.711.
86. Mankevich interview, supra note 66.
87. N.M. Reg. § 19.15.9.701.A.1. All salt water disposal is required to be in a zone having TDS exceeding 10,000 ppm, meaning that this is disposal, and not retrieval injection. In other words, the water is permanently lost for whatever beneficial purposes it could serve in the future. N.M. Reg. § 19.15.9.701.E(2).
88. N.M. Reg. § 19.15.S.7.1(b); 5.9.1(a).
89. See Charles T. DuMars, New Mexico Water Law: An Overview and Discussion of Current Issues, 22 Nat. Res. J. 1045, 1045 (1982) (“The common theme to all [prior appropriation] states is that beneficial use means application of water to a lawful purpose which is use to the appropriator and at the same time is a use consistent with the general public interest in having water utilized to its maximum.”). DuMars further states that the requirement of putting water to a beneficial use is because “Water is a precious commodity and in scarce supply.” Id. at 1046.
90. The Colorado portion of the Uinta basin as well as the Piceance basin in Colorado have high CBM reserves, but little if any CBM production is now occurring in those areas. They are certainly targets for future development however.
92. Interview with Jim Powers, Colorado Bureau of Land Management, San Juan Field Office (April 1, 2002).
93. BLM, SUIT DEIS, supra note 91, at 4–98.
94. This data is available on the Colorado Oil and Gas Conservation Commission’s website, http://oil-gas.state.co.us/statistics.html.
95. BLM, SUIT DEIS, supra note 91, at 3–65
96. Interview with Helen Mary Johnson, Minerals Staff Chief, Colorado Bureau of Land Management, San Juan Field Office (May 9, 2002).
99. Morrissey communication, supra note 97.
100. Morrissey communication, supra note 97.
101. BLM, Raton Basin EA, supra note 98, at 37.
102. Colo. Const. of 1876, art. XVI §§ 5, 6.
104. Goss, 993 P.2d at 1182.
109. Scores of questions and concerns abound here, probably worthy of a separate article. First, Colo. Rev. Stat. § 37-90-107 speaks of appropriating water from a designated basin for a beneficial use—does that include mine dewatering for oil and gas? Second, 37-90-137(7) only speaks to tributary v. non-tributary—perhaps this exception applies to designated groundwater basins that are non-tributary. Third, the whole issue of tributary v. non-tributary—particularly as over some temporal scale, all surface and groundwater is invariably intertwined—is far from black and white. In the case of CBM, for example, where drilling may occur in depths of 1,000 to 2,000 feet, the coal aquifers may be defined as tributary—and therefore not allowing this exception. An important study on this issue was recently concluded in the San Juan basin Fruitland formation. The study researched the connection between massive dewatering of the Fruitland coal aquifers and the effect on surface waters, concluding:

CBM development will deplete a maximum of 140 ac-ft/yr of surface flows from the Animas, Pine and Florida rivers by the year 2050. A further depletion of 15 to 60 ac-ft/yr can be expected for the Piedra River, given the similar hydrogeologic characteristics and assuming the future level of CBM development in the area near the Piedra River will be the same as that experienced in La Plata County. As of 2001, approximately 65 ac-ft/yr are being depleted from surface waters. Depletions will continue to increase as long as CBM production occurs, although most of the impacts will occur within the next 30 to 50 years. [Dave Cox et al., San Juan Basin Ground Water Modeling Study: Ground Water—Surface Water Interactions Between Fruitland Coalbed Methane Development and Rivers 5 (Oct. 2001)]

This certainly raises the specter that CBM byproduct water may be in some instances so linked to surface hydrology as to constitute tributary groundwater. On this point, non-tributary groundwater is defined as, “groundwater, located outside the boundaries of any designated groundwater basins, the withdrawal of which will not, within one hundred years, deplete the flow of a natural stream, at an annual rate of greater than one-tenth of one percent of the annual rate of withdrawal.” Colo. Rev. Stat. § 37-90-103(10.5). “Tributary groundwater” means water in an unconsolidated alluvial aquifer of sand, gravel, and other sedimentary material and all other waters hydraulically connected thereto which can influence the rate or direction of movement of the water in that alluvial aquifer or natural stream. Colo. Rev. Stat. § 37-92-103(11) (emphasis added). For a thorough discussion of these concepts, see American Water Development Inc. v. City of Alamosa, 874 P.2d 352...
(Colo. 1994) (en banc). Tributary and non-tributary was once again at issue in Bayou Land Co. v. Talley, 924 P.2d 136 (Colo. 1996) (en banc). An interesting consideration in the CBM context is that the right to extract non-tributary groundwater not in a designated basin is incident to land ownership. Bayou Land Co., 924 P.2d at 145. In the mineral context, there is usually a conveyance of the mineral (here, oil and gas) rights, but not necessarily the surface interest, raising at least a question concerning an operator’s right to divert billions of gallons of groundwater attached to the surface estate.

110. Cox, supra note 109, at 5.

111. COGCC Rules, Exploration and Waste Management, § 907(7)(1).


116. ALL Consulting, supra note 114, at 7 n.2, n.3.

117. ALL Consulting, supra note 114, at 14, § 3.

118. BLM, MT PRB DEIS, supra note 43, at 4–36, 4–37 (emphasis added).


120. Mont. Const., art. IX, § 3(3).

121. Mont. Const., art. II, § 3.

122. Mont. Const., art. IX, § 1(1). These provisions were given teeth in the landmark case, Montana Environmental Information Center v. Dept. of Envtl. Quality, 988 P.2d 1236 (Mont. 1999). In MEIC, the Montana Supreme Court held that a 1995 amendment to the Montana Water Quality Act that exempted a class of water discharges from any nondegradation review, where the water discharges in question would have added arsenic to a receiving water above its baseline quality, violated the plaintiffs’ rights to a clean and healthful environment. MEIC, 988 P.2d at 1249.

123. Montana’s groundwater appropriation statute is similar to other western states. The permit, priority rights and beneficial use requirements can be found in Mont. Code. Ann. §§ 85-2-501-520.

124. See e.g., Mont. Code. Ann. § 82-11-111(2)(a) (first enacted in 1953) (jurisdiction over regulating disposal of oil and gas byproduct water is vested with the MBOGC). The mere fact that Utah, New Mexico, Colorado and Montana all leave this byproduct water to the handling of state oil and gas commissions underscores the point that the water itself is not considered a beneficial use—otherwise, the control over diverting the water would reside with the state engineer. In an interview with Tom Richmond, Administrator, Montana Board of Oil and Gas Conservation, it was confirmed that traditional oil and gas byproduct water is “under the prior jurisdiction of the MBOGC.” Interview with Tom Richmond, May 10, 2002. This is consistent with Montana’s administrative rules that place the control of this water with the Board. If the water is 15,000 ppm TDS or less, disposal may be disposed of “in any manner that does not degrade surface waters or groundwater or cause harm to soils.” Mont. ARM § 36.22.1226(1). If above that threshold, disposal must be pursuant to a Class II UIC injection well or board-approved lined or unlined pits. Id. at § 36.22.1226(2)(a), (3). Montana has strict regulations that apply to these above-ground reservoirs (pits) for high TDS produced water to protect the water table, requiring the pits to be lined with an impermeable layer. Id. at § 36.22.1227(1), (2)(b). Because of the more specific statutory 2001 amendment addressing CBM water, these provisions are considered not to apply in this context.

Richmond Interview.


128. Mont. Code. Ann. § 85-2-521(3)(a) (2001). In addition, “Prior to the development of a coalbed methane well that involves the production of ground water from an aquifer that is a source of supply for appropriation rights or permits to appropriate under this chapter, the developer of the coal bed methane well shall notify and offer a reasonable mitigation agreement to each appropriator of water who holds an appropriation right.” Mont. Code. Ann. § 85-2-521(3)(a) (2001). Noteworthy is that the Montana legislature, following traditional notions of water being required to be put to a useful purpose itself to fit under the groundwater prior appropriation doctrine, did not declare the liberation of the methane natural gas to be a beneficial use. If that had been the legislative finding (that liberating the methane was the beneficial use), then there would have been no need to declare the billions of gallons of byproduct water each year as no constituting “waste.”

129. This topic, like many others in this paper, is scientifically complex. See generally Larry Munn, Coalbed Methane Product Water Quality Issues (August 16, 2000); Larry Munn, Water on the Land in the PRB (August 22, 2000); Larry Munn, Coal Bed Methane Product Water and Wyoming Agriculture (Oct. 12, 2000); Jim Bauder, Montana State University Soil and Water Quality Specialist, Coal Bed Methane (CBM)—Manna, Mania or Maiming! (2000) (reporting an average SAR value of 34.8 for CBM discharge wells in Montana—40 times the SAR value of .79 in the Montana portion of the Tongue River; with total dissolved solids 4 times that of the Tongue River); Jim Bauder, Some Guidelines About CBM Discharge Water Use (2000) (concluding that almost without exception, CBM discharge water is unsuitable for crop irrigation); Robert Mitchell, MT BLM soils scientist, Limiting Effects to the Tongue River Watershed from CBM Discharge Waters, at 5 (2000) (recommending an upper limit for EC and SAR values of 1.2 dS/m and 3, respectively, “to ensure a healthy aquatic system [with] limited effects for crop irrigation.”). See also U.S. Dept. of Agriculture, Agricultural Handbook 60: Diagnosis and Improvement of Saline and Alkali Soils 71 (L.A. Richards ed., 1954). But see California Fertilizer Association, Western Fertilizer Handbook 41 (8th ed. 1995) (<.7 electrical conductivity (an alternative way of expressing the different measure of TDS) poses no restriction on use for irrigated crops; .7 to 3.0 poses a slight to
Because of likely Clean Water Act violations due to the TDS and SAR values of produced CBM water in Wyoming, EPA has ranked the current draft EIS an "EU-3"—the worst possible environmental ranking EPA can give. "EU" means that the project, as proposed, would yield unsatisfactory impacts from a human health and public welfare point of view; "3" requires the agency, here, BLM, to start again with a new draft EIS to explore the full range of alternatives and mitigation options it failed to do the first time around. One key impact concerned the SAR and TDS values of the produced water, which as discharged "would make the Tongue River and the Belle Fourche River unsuitable for irrigation." Likewise, there was no analysis as to how to mitigate this problem. Letter from Jack W. McGraw, Acting Regional Administrator, Environmental Protection Agency, Region VIII to Al Pierson, State Director, Wyoming Bureau of Land Management 2 (April 2002). See also Northern Plains Resource Council, Inc. v. Mont. Dept. of Envtl. Quality, In re: NPDES Permit No. MT-0030457 (Mont. Bd. of Envrl. Review, filed July 14, 2000) (appealing validity of NPDES permit issued by the Montana Department of Environmental Quality); Northern Plains Resource Council, Inc. v. Redstone Gas Partners, LLC, No. CV-00-110-M (D. Mont., amended complaint filed June 26, 2000) (action alleging violations of the Clean Water Act as defendants were discharging CBM wastewater without section 402 NPDES permits).

The average cow or heifer consumes approximately 14.5 gallons of water per day in the month of July. Paul Q Guyer, Water Requirements for Beef Cattle (G77-372-A), Institute of Agriculture and Natural Resources, University of Nebraska-Lincoln 2 (1977), available at http://www.ianr.unl.edu/pubs/beef/g372.htm. At peak production in Montana of over 300 million gallons per day (using 10 gpm for 26,000 wells), it is clear that only a few cows/sheep will beneficially use this water.

One proposed beneficial use of the discharged CBM water being advanced is that it can partially recharge near surface aquifers. This beneficial use theory seems circular in logic: the CBM dewatering process is what depletes the aquifers in the first place, so at best some of this water returning to an aquifer is recycling a portion of the water, not "beneficially" using it. In other words, it is a nonsequitur to advance that a small percentage of water is being beneficially used by replacing itself. Put yet another way—it is not plausible that taking the water out of the aquifer is a beneficial use in the first instance (as argued in Wyoming) and a portion of the water returning to the aquifer is also a beneficial use of the very same water. That accounting (or double-counting) rings bells of Enronomics.

Mont. Code. Ann. § 85-2-508; 2-311 (2001). The DNR recognized this fact in its December 1999 order, but because "water rights matters and hydrogeologic issues are not within the ordinary technical expertise and area of concern to the Board," DNR adopted joint jurisdiction with the Board by adopting its own rules for appropriations in the area, discussed above. In Re PRB Controlled Groundwater Area Order, supra note 133, at 3–4. Simultaneously, the MBOGC adopted its own rules for handling CBM exploration, concerning well spacing (generally one well per section or 640 acres), drilling and casing requirements, public notice requirement for spacing exemptions, provisions concerning providing notice to existing water right holders, water well mitigation agreements and other issues. See In the Matter of the Board's Own Motion for an Order Establishing Coal Bed Methane Operating Practices within the Powder River Basin Controlled Groundwater Area in Big Horn, Powder River, Rosebud, Treasure and Custer Counties, Montana, Montana Board of Oil and Gas Conservation (Order 99-99) (Dec. 9, 1999).

Strong support against the argument that the so-called "beneficial use" of CBM water is the secondary effect that dewatering allows the methane to vent to the surface comes from the Montana legislature itself. "Waste" of groundwater includes "the application of water to anything but a beneficial use." Mont. Code. Ann. § 85-2-102(19) (2001) (emphasis added). If the beneficial use was this secondary effect, the legislature would not needed to declare it non-waste. In turn, "beneficial use" is defined, among other things, as a "use of water for the benefit of the appropriator . . . including . . . mining." Mont. Code. Ann. § 85-2-102(2a) (2001). If "mining" meant byproduct water associated with oil and gas, as opposed to the probable meaning of using water to mine (e.g., using in mine tailing ponds or the water used to actually drill an oil or gas well), then it would be considered a beneficial use, and therefore, not "waste." In other words, there would have been no need to amend Montana's water code if the "CBM byproduct water is a beneficial use because it allows for gas production" theory was correct. Therefore, with the 2001 amendment specifically declaring CBM byproduct water not to be "waste," the legislature established that the consequence of massive dewatering—allowing the methane to be captured—is not, in and of itself, a beneficial use. The point here is not to highlight a case of circular reasoning; rather, the legal consequences are significant—taking away this theory of beneficial use for the byproduct water means that the Montana ground water control area statute is being violated, as very little of the water is actually being put to a beneficial use as defined by the Montana legislature.

Mont. Code Ann. §§ 85-2-506(2)(a)-(b) (2001) provides that there are 12,000 drilled CBM wells 39,000 new wells by 2010 for a total of 51,000. See BLM, WY PRB DEIS, supra note 15, at xvi. This in addition to 3,200 new oil wells in the basin to be drilled in the same time frame. Id.

BLM, WY PRB DEIS, supra note 15, at Appendix A-2 (re-forecasting once again the recoverable CBM reserves to be 28 TCF).
140. BLM, WY PRB DEIS, supra note 15, at 2–24.
141. See ALL Consulting, supra note 114, at 7 n.2. The math is: 9.5 gpm X 60 minutes/hour X 24 hours/day X 365 days/year X 20 years. This equals 5 trillion gallons.
142. BLM, WY PRB DEIS, supra note 15, at xxiii.
144. BLM, WY PRB DEIS, supra note 15, at 4–12.
146. As the Wyoming Powder River Basin CBM project is the largest CBM field contemplated in the United States, and by far the largest natural gas project ever considered for approval by the Department of Interior, it is the Wyoming focus of this article. Other major CBM plays in Wyoming include south central Wyoming, where there is currently an EIS underway to study 3,880 wells near the Atlantic Rim. See U.S. Dept. of Interior, Bureau of Land Management, Notice of Intent to Prepare an Environmental Impact Statement and Conduct Scoping for the Atlantic Rim Coalbed Methane Project, Carbon County, and to Amend the Great Divide Resource Management Plan, 66 Fed. Reg. 33975–76 (June 26, 2001). Water quality in that area can be gleaned from the Hanna Draw CBM project, where TDS range from 982 to 2,420 ppm averaging close to 1,000 ppm; these wells are tapped into the Hanna No. 2 coal seam at depths from 4,000 to 6,000 feet. U.S. Dept. of Interior, Wyoming Bureau of Land Management, Rawlins Field Office, Environmental Assessment for the Hanna Draw Coalbed Methane Exploration Project, Carbon County, Wyoming 89–91 (Jan. 2002). The big unknown for Wyoming at the present time is the Greater Green River Basin, which holds 314 TCF of CBM reserves. The Atlantic Rim project is proposed on the southeastern part of that basin and in the northeast portion, just miles from the Bridger-Teton National Forest is the Big Piney CBM project, which has 5 exploratory wells. See U.S. Dept. of Interior, Wyoming Bureau of Land Management, Pinedale Field Office, Environmental Assessment for Infinity Oil and Gas of Wyoming, Inc.’s Coalbed Methane Pilot Test Project 34–37 (Oct. 2000) (TDS ranging from 2,230 to 3,160 ppm at depths of 2,500 to 3,400 feet (targeting the Mesaverde coals)). That water is being disposed of by injection wells to a disposal aquifer at a depth of 3,300 feet. Id. at 20. After initial production, the operator now plans on expanding that particular project to full field development of 125 CBM wells. Rob Shaul, Company Drilling Pilot Coal Bed Methane Wells West of Big Piney, Pinedale Roundup, Nov. 1, 2001, at 1, 12. The economics are different in the Greater Green River Basin, as target depths average 3,000 feet, compared to CBM wells drilled to depths of 200 to 1,000 feet in the PRB. Depending on how much of the 314 TCF of CBM reserves in the Greater Green River Basin prove to be recoverable, the CBM play in southwestern Wyoming has the unthinkable possibility of literally dwarfing the current 51,000 well project proposed for the PRB’s 39 TCF of CBM reserves, 25 TCF of which are presently considered recoverable.
148. Wyo. Const. of 1889, art 8, § 3.
149. For an excellent overview of Wyoming groundwater law, see Wolfe and Hager, supra note 83. Wolfe and Hager note that due to minimal use of groundwater when Wyoming gained statehood, the state constitution may not have intended these provisions to apply. Id. at 42. This question remains an uncertainty.
158. Interview with Dick Stockdale, Wyoming Deputy State Engineer (May 8, 2002).
159. Wyoming State Engineer Rules, Ch. I, Wyoming Water Administration, § 5 (“A permit to drill a water well must be obtained from the State Engineer. Upon the completion of a well, beneficial use of the water, and preparation of a proper form, proofs are presented to the State Board of Control for adjudication. The statutes give authority to the State Engineer to resolve disputes involving interference between ground water appropriations or between surface water and ground water appropriations.”). See also Wyoming State Engineer Rules, Ch. I, Wyoming Water Administration, § 4.a. (“A Wyoming water right is a right to use the water of the state when it has been applied to a beneficial use as defined by law and its appropriation has been made in conformance with the applicable rules and regulations.”); Wyoming State Engineer Rules, Ch. I, Purpose of Standards, § 2.a (requiring permit from state engineer to appropriate groundwater).
161. Wyoming State Engineer Rules, Ch. I, Purpose of Standards, § 1.
162. First, a permit is submitted for appropriation pursuant to Wyo. Stat. Ann. § 41-3-905. Then, “as a matter of course,” when the proposed use is beneficial and the diversion is within the public interest, the state engineer approves the permit. Wyo. Stat. Ann. § 41-3-931. Then next step is formal adjudication, pursuant to Wyo. Stat. Ann. § 41-3-935(a), (b), involving a statement of completion of the well, submission of proof of appropriation and establishing beneficial use. The more detailed requirements and procedures are within the rules. See generally Wyoming State Engineer Rules, Ch. III, Instructions for Preparing Ground Water Forms, §§ 1-5; Wyoming State Engineer Rules, Ch. V, Map and Survey Requirements for Maps to Accompany Proof of Appropriation and Beneficial use of Ground Water, §§ 1-15; Wyoming State Engineer Rules, Ch. IV, Adjudication of Proofs, §§ 2-3 (permit application, statement of completion, proof of appropriation and beneficial use of ground water, public notice requirements before adjudication, final adjudication and certificate of appropriation for recording the adjudicated right in the appropriate county recorders office procedures); Wyoming State Engineer Rules, Ch. II, Procedures and General Instructions for Obtaining a Ground Water Right, §§ 1-14. The process is also well described by Wolfe and Hager, supra note 83, at 48–53.
Obtaining a water right has two separate parts—permit and adjudication. Wyoming’s Deputy State Engineer explained the permit process as three steps: (1) applying for a permit; (2) developing and submitting a statement of completion; and (3) submission of proof of appropriation and beneficial use. Stockdale interview, supra note 158. This allows for permit issuance, which provides the basis for adjudication. This second part (adjudication) involves: (1) submitting the proper form; (2) providing a map of the area; (3) a state engineer field inspection, including measuring static levels of the target aquifer; (4) public notification procedures with any opportunity for protest; (5) approval by the Board of Control; and (6) recordation of the water right certificate with the county recorder. The adjudication process serves to fix five things: priority date, location, quantity, type of use and point of use. Id. Virtually none of the CBM operators (all needing to have state engineer permits) have their rights adjudicated; however, once a permit has been properly approved, the Wyoming State Engineer considers a water right to attach, receiving full protection.

163. Wyoming State Engineer’s Office, Ground Water Production From Coal Bed Methane Wells 1 (Feb. 28, 2000).
164. Wyoming State Engineer’s Office, Form U.W. 5 (revised as of May 1979).
165. Wyoming State Engineer’s Office, Form U.W. 5 (revised as of March 1994).
166. Wyoming State Engineer’s Office, Form U.W. 5 (revised as of March 1995).
167. For a more detailed discussion of these issues under the CWA, see Darin and Beatie, supra note 16, at 10594–96.
168. This information was obtained from Jody Hopkins (now Pring), Senior Analyst, Surface Water Division, Wyoming State Engineer’s Office and is current as of October 2001. (The 400 reservoir figure was calculated by extracting the subset of permitted stock reservoirs after November of 1999—when the WSEO started seeing stock reservoir permits for CBM retention in larger numbers—from all permitted reservoirs for the PRB counties of Johnson, Campbell and Sheridan.) The state engineer permits reservoirs in Wyoming (in addition to other agencies for CBM produced water purposes). Most of the 400 existing reservoirs for CBM water are permitted as “stock reservoirs,” which must have a capacity of 20 acre-feet or less, with the dam fill height not to exceed 20 feet. See Wyoming State Engineer Rules, Ch. V “Reservoirs,” § 6.
169. See Swartz v. Beach, No. 02 CV 044B (D. Wyo. filed March 2002) (landowner complaint filed due to upstream reservoir blocking natural flow and releasing CBM water harmful to soils and vegetation, based on theories of nuisance, trespass, the Clean Water Act and constitutional takings).
170. These are just some of the issues. As mentioned above, the PRB in Wyoming is slated for at least another 4,000 reservoirs or pits—most of which will be unlined and with drilled bore holes into the bottom to facilitate infiltration. Not addressed by anyone at this point is whether these pits, which are designed to concentrate contaminants through evaporation, then bleed into the water table, require Safe Drinking Water Act permits (as they may well indeed be considered an “injection well,”) or a separate section 402 CWA permit at the bottom of the pit, as these drilled holes are a point source of pollution. There is strong evidence that there is a hydrologic between the water table into which these reservoirs intentionally leak and nearby surface waters. EPA, for example, notes that the reservoirs are designed for “optimum infiltration” and where surface reservoirs are located near or in stream channels, including ephemeral drainages, or in places close to the water table, they will have “a high probability of connection with surface waters.” Letter from Stephen S. Tuber, Director, Water Programs, EPA Region 8 to Gary Beach, Administrator, Water Quality Division, Wyoming Dept. of Environmental Quality, March 15, 2002, at 1–2.
171. Through 2001, industry has drilled approximately 45 replacement wells for affected landowners, either voluntary or pursuant to surface use agreements. In 2002, a few more have been drilled, making the cumulative total close to 50. Interview with Dick Stockdale, Wyoming Deputy State Engineer (June 10, 2002).
173. Wyo. Stat. Ann. § 41-3-911(b). See also Wyoming State Engineer Rules, Ch. I, General Information, § 17:

Any appropriator of either surface or ground water may file a written complaint alleging interference with his water right by a later priority ground water right. Complaints are to be filed with the State Engineer and must set out in detail the facts pertinent to the situation, Each complaint is to be accompanied by a fee of $100 to help defray the cost of the investigation. Upon receiving the complaint and fee, the State Engineer shall undertake an investigation to determine if the alleged interference does exist. Following the investigation, the State Engineer will issue a
report stating his findings and suggestions on various means of stopping, rectifying
or ameliorating the interference or damage.

To date, however, no one in Wyoming has filed an official interference com-
plaint along with the $100.00 filing fee. Stockdale interview, supra note 171.
Perhaps one reason to explain this is that industry has voluntarily agreed to drill or
re-drill approximately 45 replacement wells for affected landowners. Id.

174. Wyo. Stat. Ann. § 41-3-932. This provision is generally interpreted to mean
someone with a groundwater permit is not guaranteed any right to water level in
his well. The phrase, “higher than that required for maximum beneficial use,” how-
ever, implies a right to have the water at a level for the original appropriator’s ben-
eficial use (just not higher), and that a junior appropriator from the same source can
be denied groundwater withdrawals interfering with that use pursuant to Wyo. Stat.
Ann. § 41-3-911.

177. See Wolf and Hager, supra note 83, at 62-64 (discussing interference proce-
dures, and that after the state engineer’s investigation and findings, a dissatisfied
well owner can appeal, with the burden of proof on the landowner on reversing the
state engineer. As a general rule, however, “whoever has the burden of proof in
groundwater case, loses.” See also Willadsen v. Christopulos, 731 P.2d. 1181, 1184 (Wyo. 1987) (holding that senior groundwater right holders had to show state engineer’s “no interference” finding was erroneous by a “preponderance” of the evidence). An excellent discussion of the many legal and factual issues sur-
rounding groundwater right interference claims in the context of mine dewatering
is found in Joseph Novak, The Legal Dilemma in Dewatering Mines, 17 Rocky

178. In the present debate, it should be noted that EPA has developed effluent limi-
tation guidelines (ELGs) associated with oil and gas production. In general, apply-
ing best available control technologies to onshore operations: “there shall be no dis-
charge of water waste pollutants [including produced water] into navigable waters
from any source associated with production, field exploration, drilling, well comple-
tion or well treatment.” 40 C.F.R. § 435.32. A subpart of the ELGs, however,
applies to situations in which produced water has a use in agriculture or wildlife
watering. To fit this exception, however, only that amount that is “actually put to
such use during periods of discharge,” may be released to surface waters of the U.S.
See 40 C.F.R. §§ 435.50; 51(c). This underscores the point that even EPA, if allow-
ing a discharge of the byproduct water at all, limits it to actual beneficial use for
livestock and wildlife, suggesting the rest (and most of the water in the
Wyoming/Montana CBM example) would be wasted and not appropriate for dis-
charge to the surface waters. In 2001, EPA took the position that these ELGs for
onshore oil and gas, developed in 1995, were not intended for CBM byproduct
water, and initiated a new study to appropriate discharge conditions and parameters.
See EPA Region 8 “Best Professional Judgment” (BPJ) Determination of Effluent
Limitations That Represent Best Available Technology Economically Achievable
(BAT) for Coalbed Methane (CBM) Activities; Announcement of Meeting, 66 Fed.
Reg. 46,455 (Environmental Protection Agency, 2001).

179. The provisions regarding public interest review and preventing waste apply to
any model used—whether the beneficial use permitting system in place or the
“waste” byproduct exception currently not being used in Wyoming. In short, these
mandatory duties do not disappear when one regulatory regime is used in place of
another.

Similar to Montana, the Wyoming groundwater code provides for designation
of a groundwater control area. The board of control may designate a control area for
the following reasons:
(i) The use of underground water is approaching a use equal to the current recharge
rate;
(ii) Ground water levels are declining or have declined excessively;
(iii) Conflicts between users are occurring or are foreseeable; or
(iv) The waste of water is occurring or may occur;
Wyo. Stat. Ann. § 41-3-912(a). Arguably, given the above information in the cur-
rent draft EIS for 51,000 or more wells by 2010, and particularly given the admis-
sions concerning recharge rate, groundwater declines and likely conflicts, each one
of these four separate criteria has been or will be met in Wyoming’s PRB. Moreover,
whenever the state engineer has “information leading him to believe that any under-
ground water district or subdistrict should become a control area,” he “shall” report
to the board of control all information on the subject in order that the board may
act on the matter. Wyo. Stat. Ann. § 41-3-912(b). Despite this mandatory duty, it
appears that no such information has been provided to the board of control for the
the state engineer would have upon such a designation in order to preserve ground-
water resources, protect senior rights and provide for competing uses.

180. The Wyoming state engineer, however, did not apply the byproduct provision
to CBM water. This is explained due to the CBM production process, where, initial-
ly, the state engineer observed large amounts of water being diverted—for up to a
year—with no gas production. Without simultaneous gas production, and in order
to monitor groundwater depletion to protect existing rights, the state engineer,
from the onset, required a beneficial use permit. Stockdale interview, supra note
158.

Ann. § 41-121.2(1973)).
agrees with this notion and contends that “beneficial use” is achieved by the second-
ary effect of allowing the methane to be depressurized to vent for capture. Stockdale
interview, supra note 158. This interpretation is belied not only by the byproduct
water provision itself (by addressing how one might acquire a beneficial use permit
once the water is diverted, arguably the legislature intended that the initial diver-
sion itself was not a beneficial use), but also the definition of “byproduct” water. If
byproduct water is defined as not having been put to a prior beneficial use, and the
only possible event before being applied to the ground surface is the act of first
diverting it from its natural underground reservoir, by the statute, it has “not been
put to a prior beneficial use.” Wyo. Stat. Ann. § 41-3-903. In other words, the defi-
nition itself indicates that the initial act of diversion is itself not beneficial.

185. Wyoming Oil and Gas Conservation Commission Rules and Regulations, ch. 4, § (x).

186. Presently, WOGCC is amending its rules for placement of retention pits in ‘critical’ areas to address CBM water handling. Critical areas will include: locations within one-quarter mile of water supplies, areas where groundwater is less then 20 feet from the surface, locations within 500 feet of wetlands, ponds, lakes or perennial drainages within a floodplain. Wyoming Oil and Gas Conservation Commission, Proposed Rule Changes for May 14, 2002 Hearing, Ch. 1, § 2(j) (Docket 148-2002) (March 2002). Because of the potential for direct communication with shallow groundwater resources of the state, “application for approval of construction of percolation pits for containment and discharge of water produced in association with coalesced methane gas in the Powder River Basin must be accompanied by a review of the groundwater issues by the Department of Environmental Quality. With the DEQ’s concurrence, and if the proposed construction meets with requirements of the Commission’s rules, the application may be granted.” Id. at proposed ch. 4, § (r(v)). Importantly, all pits for CBM water proposed in a critical area will be required to be lined. If operators cannot demonstrate pits in shallow sands or aquifers will not adversely affect water resources of the state, as approved by WDEQ, then they will be denied approval. Id. as proposed ch. 4, § (w). While these proposed changes are taking steps to address some of the quantity problems, they certainly raise two obvious questions: first, WOGCC rules on water retention normally come into play when it, and not the state engineer, has jurisdiction over oil and gas water—suggesting that this water is not under the state engineer’s authority and not, therefore, a beneficial use; second, with all of the lining that will be required, industry will either have to drill tens of thousands of pits (infiltration being taken away) or find another way to handle the billions of gallons of water each year. At odds with the Wyoming state engineer’s assertion that it has jurisdiction over this water, in proceeding with this rulemaking, WOGCC is claiming authority pursuant to its jurisdiction over “Disposal of salt water . . . which [is] uniquely associated with exploration and production operations.” Wyo. Stat. Ann. § 30-5-10(d)(i)(D). The point here is that WOGCC’s assertion of jurisdiction over this water itself contradicts the position of the Wyoming state engineer, which claims this not to be oil and gas disposal water.

Further frustrating matters is that WDEQ and WOGCC are not sure who has regulatory authority over the produced water when stored in pits. See Letter from Dennis Hemmer, Director of Wyoming Department of Environmental Quality to Don Likwartz, Supervisor, Wyoming Oil and Gas Conservation Commission 1, Jan. 10, 2002, (in discussing detention ponds that will intentionally seep into the alluvial aquifer, Hemmer states, “We have had discussions about who should permit these ponds when they allow seepage from the bottom of the pond.”). Hemmer concluded, “it is my suggestion that your office should cover these facilities under your permit since they are produced water treatment ponds associated with Oil and Gas operation.” Id. This clearly indicates that two agencies, WDEQ and WOGCC, consider the water quality jurisdiction to fall under the WOGCC and its control over, “[disposal of salt water . . . which [is] uniquely associated with exploration and production operations.” This byproduct water, in turn, is regulated and assumed to be waste, which conflicts with the state engineer’s assertion that this water is being beneficially used. The water quantity regulatory issue in Wyoming therefore, is intertwined in a bureaucratic web of competing jurisdictional claims that undoubtedly cast a cloud of confusion over the entire matter. WDEQ even has completed a general permit for “off-channel” (in upland areas and not in or connected to natural drainages or alluvial aquifers) CBM reservoirs. See Wyoming Dept. of Envr. Quality, Authorization to Discharge Produced Water from CBM Coal Bed Methane Wells into Off-Channel Containment Units (April 19, 2002). While bi (WOGCC and WSEO) or even tri (WOGCC/WSEO/WDEQ) jurisdiction over surface retention pits is feasible—the whole competing jurisdictional issue undermines the state engineer’s position that this water is all being beneficially used. This is demonstrated by both WDEQ and WOGCC focusing on two things: disposal of the water and trying to prevent surface water contamination; in other words, all the focus on getting rid of this water casts serious doubt as to whether much of it is being beneficially used.

If the multi-tiered jurisdiction in Wyoming over the water once it is out of the ground seems confusing—keeping in mind that the state engineer’s office is the only agency with control over the initial diversion from the groundwater aquifer (the major focus of this article)—it is because it is confusing. Don Likwartz, Chairman of the WOGCC recently stated that jurisdiction of the produced water in above ground reservoirs (or retention pits) “doesn’t fit any of them [the jurisdiction of the WSEO, WDEQ or WOGCC], that is the problem.” Adam Rankin, New Water Permits for Methane Must Follow Murky Trail: Three State Agencies are Involved in Quicker Permitting Process, Gillette News-Record, May 13, 2002, at 1. Generally, WDEQ will only permit an off-channel reservoir (meaning not in a waterway—including ephemeral drains/drainages) when the operator can show the water from the pits will not enter surface waters (via infiltration), and importantly, only if beneficially used. If not for a beneficial use, then jurisdiction is with the WOGCC, to basically handle the water as waste. Id. Again, if the state engineer is not involved in permitting the latter reservoirs, as there is no beneficial use of the water, this seriously undermines the agency’s position that the water, itself, upon initial diversion from the ground, is being beneficially used.

187. See also Wolfe and Hager, supra note 83, at 64–66 (observing that the basic principle of western water law is that water not be wasted, noting that Wyoming statutes are silent on whether mine dewatering is itself a beneficial use of the water. The authors specifically questioned whether a permit from the state engineer is
needed for mine dewatering and, written in 1989 when the first CBM wells were permitted, further noted that there was confusion over whether to obtain a state engineer or WOGCC permit for the byproduct water, or both).

188. Wyo. Const. of 1889, art 1, § 31.
189. Wyo. Const. of 1889, art 8, § 3.
195. Rissler & McMurry, 856 P.2d at 453.
196. For an excellent overview of the requirements of public interest review and water rights, see Douglas L. Grant, Public Interest Review of Water Right Allocation and Transfer in the West: Recognition of Public Values, 19 Ariz. St. L.J. 681, 685, 689 (1987) (noting that “public interest” is undefined in Wyoming and that states with similar statutes include factors such as effects on game and fish, public health, recreational opportunities and access to navigable waters when considering the impact of a proposed appropriation on the public interest).

Of course, any discussion of public interest review necessarily brings in the closely related concept of the state of Wyoming holding and administering this water in the public trust. States like Wyoming that own the water do so in trust for her citizens—this is the public trust doctrine. In 1983, California extended the doctrine to include water in the landmark case of National Audubon Soc’y v. Superior Court of Alpine County, 658 P.2d 709 (Cal. 1983). Importantly, extending the public trust doctrine to water rights and consumption allows a challenge to water use based on environmental concerns. Under this doctrine, a state has an “affirmative duty . . . to protect the people’s common heritage of streams, lakes and marshlands.” National Audubon, 658 P.2d at 724. If adopted in Wyoming and extended to groundwater diversions, given the massive extraction in the trillions of gallons of water expected in the CBM extraction process, the public trust doctrine may serve as a key protection for the Powder River Basin’s existing water resources. For an overview of the public trust doctrine as applied to water, see Roderick E. Walston, The Public Trust and Water Rights: National Audubon Society v. Superior Court, 22 Land and Water L.Rev. 701 (1987); Charles F. Wilkinson, Aldo Leopold and Western Water Law: Thinking Perpendicular to the Prior Appropriation Doctrine, 24 Land and Water L.Rev. 1, 35–36 (1989).

197. BLM, WY PRB DEIS, supra note 15, at xxiii.