MODULE 1: Current Legal, Regulatory, and Operational Frameworks of Produced Water Management

MODULE 1

Current Legal, Regulatory, and Operational Frameworks of Produced Water Management

MODULE SUMMARY

This module explores the use of water in the oil and gas industry from a national overview perspective and describes the regulatory frameworks surrounding management of produced water. Essential points about regulatory management of produced water include the following:

Water is critical to oil and gas production.
Water plays an integral role in oil and gas production, including use for drilling fluids, fracturing fluids, and water flooding. Produced water is generated from producing wells and must be managed. Historically, more than 90 percent of produced water is injected underground for disposal or to help produce more oil.

States regulate oil and gas activity.
The entire oil and gas exploration and production process is regulated in many ways by different agencies, with most oil and gas regulation occurring at the state level. The principal purpose of these regulations is to protect the environment. While some produced water management activities are subject to regulatory standards, others are subject to operational standards set by operators or end users. There are more than 30 states with oil and gas production, and each state has its own regulations. Even within individual states, more than one agency may regulate the management of produced water, as shown in Table 1-3.

Water rights and responsibilities vary from state to state.
Produced water is groundwater and is subject to individual state water rights laws. Each state has a different set of laws governing the management and allocation of surface and groundwater. Views on reuse of produced water vary depending on which state is involved, as shown in Table 1-4.

It is important to identify how and when ownership changes occur and to understand that these changes in ownership may differ based on local or state regulations or laws. Understanding the role of water rights, mineral rights, and surface ownership in the exploration and production of oil and gas is critical in addressing how and when there is compensation for or liability related to the beneficial use of produced water.

Produced water reuse requires careful thought.
Reuse of produced water is possible and may be cost effective in the right situations. When specific reuse projects are being considered, oil and gas companies and end users must work together. Regulators can look for ways to allow reuse projects to move forward but should ensure that these practices can be done with proper environmental and public health protection.

Expanding reuse opportunities may require regulatory or legislative solutions to several issues, including ownership of produced water, transfer of ownership, and determination of liability if there is a spill or other environmental damage.

Background

Water is closely intertwined with oil and gas production, including water supplied to support operations and byproducts (produced water) from the production process. Determining how to find source water and manage produced water efficiently and cost effectively is an important component of producing oil and gas.

Nearly every aspect of produced water—including management practices, construction standards, and operational requirements—is regulated by federal, state, or local agencies. Federal laws and regulations govern the disposal of produced water through surface discharges or injection in underground wells.

Oil and gas companies are required to obtain numerous permits, licenses, and certificates, conduct monitoring and reporting to the agencies, and operate in compliance with the regulations. Produced water can be managed within an individual lease area or over a larger field that incorporates many wells and leases. Depending on the size of fields or plays, more than one oil and gas company may be involved, and geographic boundaries can include more than one county, river basin, or state.

Following are examples of regulatory involvement throughout the oil and gas water cycle.

- **Sourcing, including ownership of water.** State water rights laws or regulations determine who has legal rights to water sources. Many states require permits to withdraw water from surface or groundwater sources. Under drought conditions, permits may be delayed or denied temporarily, or allocations may be reduced. If water is obtained from a municipal drinking water supplier, municipal wastewater treatment facility, or other alternate source, contracts or some other legal mechanisms are utilized.
- **Transportation of water.** Trucks used to haul water must obtain permits and licenses. When pipelines are used, they typically are long, linear structures that may cross over areas owned by multiple landowners, requiring multiple easements to be purchased or leased. Where pipelines intersect roadways, streams, railways, or other existing structures, additional permits and approvals are typically needed.
- **Storage of water.** In some states, permits are required to build and operate storage pits which are subject to construction criteria, including surface water and groundwater contamination prevention. When tanks are used, they typically are authorized as part of the Application for Permit to Drill or by rule. Although most states do not have specific design and construction requirements for tanks, secondary containment requirements are required in almost all cases. Spill prevention, control, and countermeasure (SPCC) plans may be required. Additionally, stormwater management permits may be required for the storage at the well site.
- **Hydraulic fracturing**. Hydraulic fracturing is typically regulated under state oil and gas programs. Reporting of information relating to pressures, volumes, depths, duration, materials, etc., must be made for each hydraulic fracturing job. In many states, companies conducting fracturing jobs must keep information available, submit information to the state regulatory agency, or enter data on water and chemical usage into the National Hydraulic Fracturing Chemical Registry (FracFocus). Transportation and storage of chemicals used in fracturing fluids may be regulated by federal, state, and local agencies.
- **Disposition of produced water**. Produced water disposed by discharge directly to surface water must be authorized by a National Pollutant Discharge Elimination System (NPDES) permit and/or a state discharge permit. Produced water sent to a municipal wastewater treatment facility must follow NPDES regulations for pretreatment and meet any additional standards imposed by the wastewater treatment facility. Currently, this is only allowed when produced water is pretreated at a centralized treatment facility or is generated through conventional oil and gas activities. Produced water sent to a centralized treatment facility must meet any standards established by the treatment

facility, and the centralized treatment facility must meet standards established in its NPDES or state discharge permit. Wells used to inject produced water for enhanced recovery must be permitted under the Underground Injection Control (UIC) program as Class II-R UIC wells. Produced water sent to Class II disposal wells may be subject to state tracking regulations. The disposal wells themselves must be permitted as Class II-D UIC wells. If water is placed in pits and disposed of by evaporation, there may be construction, operational, and air quality permits required.

- **Beneficial use of produced water.** Beneficial use within the oil and gas industry is typically not subjected to additional regulations other than tracking the flow and disposition of the produced water. Existing beneficial uses of water in applications outside of the oil and gas industry may be subject to permits. For example, several states allow for and regulate the spreading of produced water on roads during winter months for snow and ice control. In Ohio, for example, minimum state standards for produced water spreading are established, but spreading must be authorized by resolution of the local authority that has jurisdiction over road maintenance. Local authorities can adopt standards that are more stringent than the state standards and may rescind authorization. Use of produced water for irrigation or industrial use may be subject to state regulations. As beneficial use of produced water is considered for more applications such as crop irrigation, stream augmentation, industrial cooling towers, etc., it is likely that additional regulations will be adopted.

This module describes the major federal laws and regulations affecting produced water, specifically the NDPES and UIC programs, as well as the cooperative relationship between federal and state governments to administer these laws and regulations. In addition, it discusses regulations at the state level that cover produced water reuse practices. Some states have such regulations, but most do not. States often differ in their regulatory approaches, reflecting geologic or other physical differences among states. This module is not intended to be a comprehensive compilation of state produced water management regulations. Rather, it is designed to provide the reader a sense of the scope of regulatory, operational, and legal standards that apply to produced water in regions of the United States.

WASTEWATER TREATMENT FACILITIES

Most communities operate facilities to treat sewage, with such names as municipal sewage plant, wastewater treatment plant, publicly owned treatment works (POTWs), water resource recovery plant, and water reclamation facility. In this report, the term "wastewater treatment plant" is used in most instances. In a few situations, the term POTW is used because it is noted as such in related documents. Readers should understand that these are the same type of facility.

There are also industrial wastewater treatment facilities and centralized treatment facilities that treat produced water prior to disposal, discharge, or reuse. These often employ different types of treatment equipment than traditional municipal wastewater facilities because they are designed to treat industrial wastewater.

The U.S. Legal/Regulatory System

The federal legal/regulatory system in the United States consists of three tiers. The interrelationships of these tiers can be seen in the example of regulation governing the discharge of produced water to rivers, lakes, and streams. At **Tier 1**, Congress passed the Federal Water Pollution Control Act, later known as the Clean Water Act (CWA), which created the National Pollutant Discharge Elimination System (NPDES) program to regulate any discharge of wastewater to water bodies that are waters of the United States. As the designated federal agency, the EPA established comprehensive regulations (**Tier 2**) for implementing the NPDES program. NPDES water quality permits (**Tier 3**) are either issued by the EPA itself (in Massachusetts, New Hampshire, New Mexico, the District of Columbia, and U.S. territories, as well as on federal and tribal trust lands) or by states that have been delegated by EPA to issue their own permits, including for produced water discharges.[11]

11 USEPA, Map of NPDES Program Authorizations (July 2015), https://www.epa.gov/sites/production/files/2015-10/documents/state_npdes_program_status.pdf.

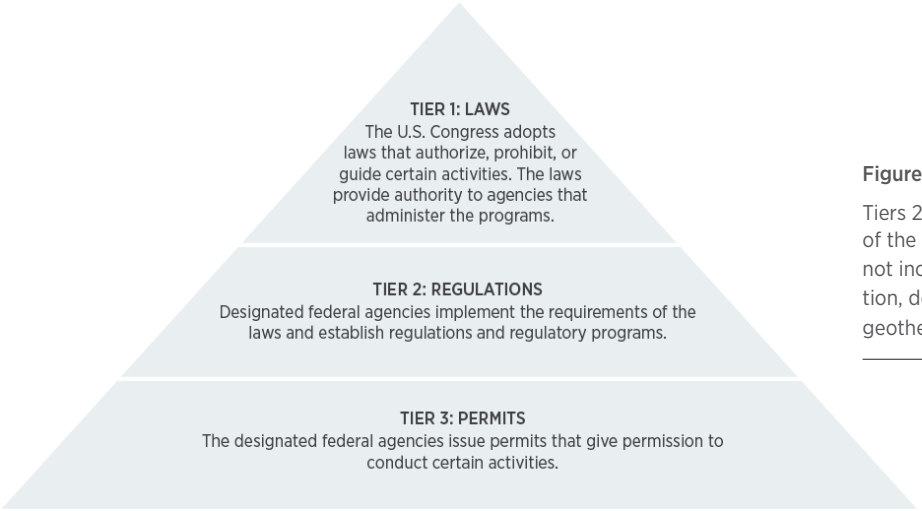

Figure 1-1. U.S. Federal Legal/Regulatory System

Tiers 2 and 3 are dependent on the basic authority of the CWA. NPDES delegation in some states does not include activities associated with the exploration, development, or production of oil or gas or geothermal resources.

Federal Laws and Regulatory Programs

Two federal regulatory programs are historically associated with management of produced water:

- **The National Pollutant Discharge Elimination System (NPDES) program.** Through the Clean Water Act (CWA), the U.S. Congress directs the EPA to create an NPDES permitting, compliance, and enforcement program that regulates discharges of produced water to rivers, lakes, and streams. The CWA also allows the EPA to delegate authority to states and tribes that demonstrate financial, managerial, and technical competency. States customize the NPDES program based on state specific laws, hydrology, weather conditions, and other factors. When states are authorized to operate the program, typically it is renamed to identify the state and include any state specific requirements. For example, the NPDES program in Oklahoma is the Oklahoma Pollutant Discharge Elimination System program (OPDES). In this report, "NPDES permits" includes those permits issued by a state under the delegated authority.
- **The Underground Injection Control (UIC) program**. Through the Safe Drinking Water Act (SDWA), Congress directs the EPA to develop the UIC program to regulate disposal in injection wells and provides for its delegation to states under agreements with the EPA. Most oil and gas producing states have received the authority to implement UIC

Table 1-1. Comparison of ELGs for the Oil and Gas Extraction Industry

Subcategory	Parameter	Limits on Produced Water Discharges
Onshore	n/a	Zero discharge
Stripper Wells[a]	n/a	No nationwide federal discharge standards
Agricultural and Wildlife Water Use[b]	oil and grease	35 mg/L
Coastal	oil and grease	Zero discharge except for Cook Inlet, AK, which has the same limits as offshore wells
Offshore	oil and grease	29 mg/L monthly or 30-day average 42 mg/L daily maximum

a Applies to wells producing less than 10 bbl./day of crude oil. There is no comparable subcategory for small gas wells.

b Applies to onshore facilities located in the continental United States and west of the 98th meridian for which the produced water has a use in agriculture or wildlife propagation when discharged into waters of the United States. The term "use in agricultural or wildlife propagation" means the produced water is of good enough quality to be used for wildlife or livestock watering or other agricultural uses and is actually put to such use during periods of discharge.

Class II programs. In the few states where the agencies have not received authority to administer those programs, the programs are administered by the regional office of the EPA.

Delegated NPDES and UIC programs operate independently but are subject to federal oversight.

Overview of the NPDES Program

The NPDES program requires that any discharge of wastewater to waters of the United States be authorized by a permit. Permits can either be individual permits to authorize and establish regulatory controls from a single facility or general permits for multiple facilities with similar operations and discharges.

The permit specifies both narrative and numerical limits on one or more constituents in the discharged wastewater to protect the designated beneficial uses of the receiving water body. Permit limits are determined using technology-based standards and water-quality-based standards. The most protective value becomes the permit limit. In the case of permit renewals, the anti-degradation provision of Water Quality Standards may apply.

The permit writer first calculates technology-based limits, considering such factors as the constituents in the discharge, the types of treatment commonly used for the type of wastewater, and the cost of treatment. For many major industrial categories, the EPA has already done much of this work and has published national minimum discharge standards that must be met unless more restrictive state standards or water quality standards exist. These national discharge standards are known as effluent limitations guidelines (ELGs). The ELGs for the oil and gas extraction industry are published in the Code of Federal Regulations (CFR) at 40 CFR Part 435 and are shown in Table 1-1.

Further definition of the limits shown in Table 1-1 are as follows:

- Although onshore wells are subject to a national zero discharge requirement for produced water, there are several exceptions to this regulation. For example, EPA declined to establish a national discharge standard for stripper wells. Permit writers in states or EPA regional offices have discretion to allow these discharges.
- Particular limits apply to wells located west of the 98th meridian (Figure 1-2) with produced water that "is of good enough quality to be used for wildlife or livestock watering or other agricultural uses and that the produced water

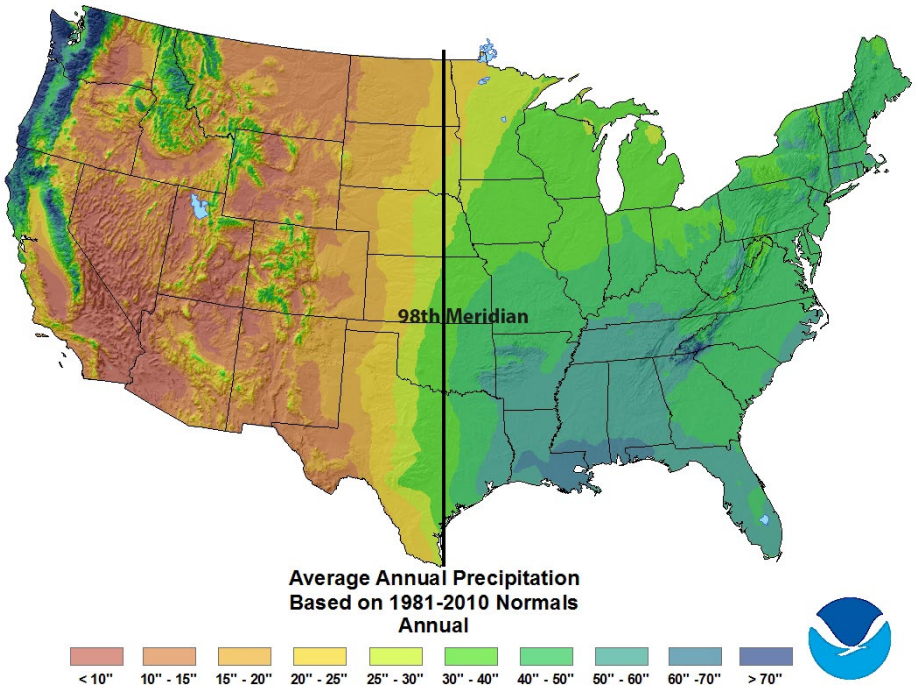

Figure 1-2. Map Showing 98th Meridian Overlain on Annual Precipitation Map
Source: Modified from National Oceanographic and Atmospheric Administration https://www.ncdc.noaa.gov/climateatlas/

The 98th meridian extends from near the eastern edge of the Dakotas through central Nebraska, Kansas, Oklahoma, and Texas.

is actually put to such use during periods of discharge."[12] Permit writers must follow the minimum oil and grease limit of 35 mg/L but can also place limits on other parameters.

- Coalbed methane (CBM) generates a lot of produced water. In many CBM fields, the water is too salty to discharge. In other places, the salinity is lower (e.g., Powder River Basin in Wyoming) or the available dilution in the local rivers is very high (e.g., Black Warrior Basin in Alabama). CBM produced waters are not subject to the oil and gas ELG.
- Most produced water east of the 98th meridian cannot be discharged directly from an oil and gas well site. It can be treated offsite in a centralized wastewater treatment facility and then discharged if the facility has been issued an NPDES (or state equivalent) permit. In a few instances, centralized facilities in cities have obtained permission to discharge treated water to the municipal sanitary sewer where it will receive additional treatment at the city's wastewater treatment facility.

Although technology-based limits and ELGs serve as a baseline for the effluent limits included in a permit, the technology-based controls may not ensure that all designated beneficial uses of the surface water will be protected. In these cases, the permit writer must include additional, more stringent water-quality-based effluent limits in NPDES permits. These limits may be numeric[13] or narrative (e.g., "no toxic substances in toxic quantities"). The process for establishing the limits considers the designated beneficial use of the water body; the amount of the pollutant in the effluent, toxicity, and assimilative capacity; and, where appropriate, dilution in the receiving water (including discharge conditions and water column properties).

Appendix 1-A describes the NPDES permitting process undertaken by an oil and gas company in Arkansas for a centralized produced water treatment facility.

UNDERGROUND SOURCES OF DRINKING WATER (USDW)

The code of Federal Regulations at 40 CFR 144.3 defines a USDW as an aquifer or part of an aquifer which:

- Supplies any public water system, or contains a sufficient quantity of groundwater to supply a public water system and currently supplies drinking water for human consumption or contains fewer than 10,000 milligrams/liter of Total Dissolved Solids (TDS); and
- Is not an exempted aquifer as defined in 40 CFR Section 146.4 as part or all of an aquifer which meets the definition of a USDW, but which has been exempted according to the criteria in 40 CFR Section 146.4.

Overview of the UIC Program

The UIC program is designed to protect underground sources of drinking water (USDWs). This protection is provided through the regulation of injection wells. An injection well is defined as any bored, drilled, or driven shaft or a dug hole, where the depth is greater than the largest surface dimension that is used to inject fluids underground. Underground injection is grouped into six classes of injection wells (Table 1-2).

Wells used for injecting produced water are Class II wells. When fluids are injected into a hydrocarbon-bearing formation to help produce additional oil (water flood, steam flood) the injection wells are Class II-R, enhanced recovery wells. Produced water can also be injected solely for disposal. In this case, the water is typically injected into a formation below the USDW other than the producing formation. These wells are known as Class II-D disposal wells. A third group of Class II wells are used to inject fluids associated with hydrocarbon storage wells (Class II-S). These are not directly related to produced water and are not discussed further here.

12 Specialized Definitions 40 CFR 435.51, *Code of Federal Regulations*, Title 40 (2003), https://www.govinfo.gov/content/pkg/CFR-2003-title40-vol27/pdf/CFR-2003-title40-vol27-sec435-51.pdf.

13 Most states have published water quality standards for many pollutants that can be used to calculate water quality-based limits. These are enforceable regulations. Where state standards are not available, permit writers can look at EPA's published numeric water quality criteria for more than 100 pollutants. These criteria are technical recommendations but are not enforceable unless they are specified in a permit.

Table 1-2. Classification of UIC Wells
Sources: USEPA and State Primacy Agencies

Underground Injection Control Well Classification Chart

Well Class	Purpose	Active Wells*
I	Injection of hazardous, non-hazardous, and municipal wastes below the lowermost USDW	817
II	Injection of fluids associated with the production of oil and natural gas resources for disposal or enhanced oil and gas recovery	180,344
III	Injection of fluids for the extraction of minerals	29,617
IV	Injection of hazardous or radioactive wastes into or above a USDW**	127
V	Injection into wells not included in the other well classes but generally used to inject non-hazardous waste	650,000 to 1.5 Mil.
VI	Injection of supercritical carbon dioxide for storage	2***

* All numbers estimated from state agency surveys and a USEPA inventory published for Federal Fiscal Year 2017.
** Class IV wells are banned except where used for remediation of USDWs
*** Existing commercial wells with permits issued under the Class VI program

Following are key elements of Class II UIC permits.

- **Well location**. This can include conditions such as depth, wellhead location, and setback distances.
- **Construction requirements.** This can include details like the size and setting depths for different layers of casing, cementing requirements, and other well hardware.
- **Area of Review evaluation.** This element includes an evaluation of the area surrounding the proposed injection well to identify any pathways for the injected fluids to migrate from the targeted injection zone.
- **Operations.** This typically includes restrictions on parameters like pressure, flow rate, and daily injected volume.
- **Monitoring and reporting to the permitting agency.** This element includes routine and periodic logging and mechanical integrity testing to ensure that wells are not leaking. Other types of monitoring and reporting may be required, including operating restrictions.
- **Closure requirements.** This element includes requirements for plugging and abandonment.

Over 90 percent of produced water generated in the United States is injected into underground geologic formations through injection wells permitted under the UIC Class II program. Under sections 1422 and 1425 of the Safe Drinking Water Act (SDWA), the EPA may delegate primary enforcement authority (primacy) to states, territories, and tribes for the UIC program. To date 43 states, territories, and tribes have obtained primacy for portions of the UIC program. Of these, 25 states and 2 tribes have obtained primacy over the Class II UIC program in areas where oil and gas exploration and production occur.

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The E&P Waste Exemption

EPA made an important regulatory determination in 1988 that clarified that oil and gas exploration and production (E&P) wastes, including produced water, would not be subject to Subtitle C (the hazardous waste section) of the Resource Conservation and Recovery Act (RCRA).[14] This determination was important in allowing the oil and gas industry to manage produced water in ways that made sense and were cost-effective. The determination stated in part, "USEPA's review… found that imposition of Subtitle C regulations for all oil and gas wastes could subject billions of barrels of waste to regulation under Subtitle C as hazardous wastes and would cause a severe economic impact on the industry and on oil

14 USEPA, "Regulatory Determination for Oil and Gas and Geothermal Exploration, Development and Production Wastes," Federal Register 53, no. 129 (July 6, 1988): 25447, https://archive.epa.gov/epawaste/nonhaz/industrial/special/web/pdf/og88wp.pdf.

and gas production in the U.S." The determination also stated that "EPA found most existing State regulations are generally adequate for protecting human health and the environment." Each state can set up its own regulatory programs for this waste if they do not interfere with existing authorities such as the NPDES and UIC programs.

Additionally, states routinely evaluate their existing regulatory programs through such efforts as the State Oil and Gas Regulatory Exchange (the Exchange) and the State Review of Oil and Natural Gas Environment Regulations (STRONGER) processes. These reviews help states update their programs to remain current with technological, legal, and other changes.

The extent to which the RCRA exemption expands to include produced water, its treatment, and treatment residuals in the context of new reuse scenarios outside of oil and gas operations presents a question worth considering.

The RCRA exemption applies to wastes, including produced water, that are "intrinsically derived from the primary field operations." The extent to which the exemption expands to include produced water, its treatment, and treatment residuals in the context of new reuse scenarios outside of oil and gas operations presents a question worth considering. This is an area of evolving understanding and there are currently no clear answers, primarily because the exemption has not been tested in practice and questions, to date, remain theoretical. As options to treat and reuse produced water expand, it is likely that more attention may be paid to this subject to bring further clarity.

Regulatory Roles of State Governments

With a few exceptions, oil and gas activities relating to management of oil field wastes, including produced water, are regulated at the state level rather than directly by federal agencies or regulations. When states receive primacy to administer the NPDES or UIC programs, the state regulations do not need to be identical to the federal regulations but must include conditions that offer at least the same level of protection. States can customize regulatory programs to reflect state-specific practices and laws. They can be more restrictive than federal regulations and can include regulations for activities not covered by federal regulations. This creates a scenario in which each of the approximately 31 oil and gas producing states has flexibility to regulate oil and gas operations and management of E&P wastes, including produced water, in similar but slightly different ways. For example, as of January 2018, the Texas Commission on Environmental Quality (TCEQ) had NPDES authority for most types of discharges, but not for oil and gas industry produced water. That authority remains with EPA Region 6. The Texas Railroad Commission (RRC) manages oil and gas produced water through delegated UIC Primacy for Class II wells.

Most produced water regulatory programs are assigned to oil and gas agencies or state environmental protection agencies. However, in some cases, public health agencies, state engineers, or regional water planning commissions such as the Susquehanna River Basin Commission and the Delaware River Basin Commission may play some role in regulating produced water. State wastewater programs may also cover discharges to state waters, including non-federal surface waters, groundwater, and land application. Some states have prohibitions on moving water from one river basin to another. As new produced water reuse projects are considered, the topic of inter-basin transfer of water may become important. Additionally, some states have developed wellhead or source water protection programs that apply to all potential sources of pollution. These states may have requirements for setbacks or other requirements on a case-by-case basis.

Evolution of State Regulatory Programs

After regulating produced water for many decades, states have developed similar, but somewhat different, regulations and requirements. Differences in regulations between states reflect factors such as geography, geology, and hydrology; climate; state statutory authority and state court interpretations; infrastructure; and historical practices.

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State agencies that regulate produced water participate in national organizations like GWPC, the Interstate Oil and Gas Compact Commission (IOGCC), and others. Through these organizations they become aware of the types of regulatory revisions and updates being made by their fellow states. Over time, states tend to make their regulatory programs more comprehensive.[15]

With the introduction of new technologies, entry into new resources areas, or the use of technologies in innovative ways, state regulatory agencies must evaluate and respond to changes in oil and gas operations to provide additional environmental and public health protection. For example, some state agencies have responded to the rapid growth of hydraulic fracturing, which has resulted in significant changes in truck traffic, industrial activity, job opportunities, leasing revenue, and water demand.

Although most oil and gas development activities are conducted safely, in some instances poor well construction, spills, leaks, accidents, and other events have resulted in produced water releases to the environment or have impacted drinking water. State agencies respond to these events by developing or modifying regulatory controls to mitigate and minimize the impacts. Each state establishes priorities on which activities are most deserving of additional controls based on state-specific concerns. Sometimes regulatory updates are done as single large efforts, while in others several rounds of incremental revision takes place.

State agencies have taken various actions to reduce or eliminate seismic impacts. Both industry and the regulatory agencies learned a great deal in a short time about earthquakes, their possible causes, and methods for mitigation.

Local residents, environmental groups, and the media have raised concerns about real or perceived risks regarding produced water management. They may contact agencies at the state and federal level and request additional controls. Although state agencies have the lead role in overseeing and regulating most oil and gas activities, federal agencies may also have a role. Solutions are often worked out on a case-by-case basis.

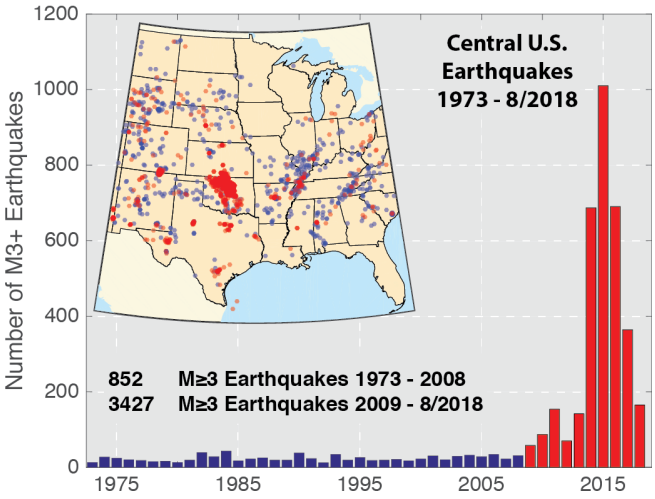

Figure 1-3. The Number of Earthquakes M 3.0 and Greater in the Central United States, 1973–8/2018

Source: USGS 2018, https://earthquake.usgs.gov/research/induced/overview.php

Although numerous disposal wells had been in operation in states like Oklahoma, Texas, Arkansas, and Ohio for decades without significant seismic impacts, a few years ago the frequency and magnitude of earthquakes increased noticeably in some areas. Figure 1-3 illustrates this increase in seismicity. Many of these earthquakes seemed to be associated with injection wells used to dispose of produced water from unconventional oil and gas development.

An example of unanticipated events that have led to a new regulatory response is an increase in seismic activity (earthquakes) associated with produced water disposal wells in parts of the country. Although numerous disposal wells had been in operation in states like Oklahoma, Texas, Arkansas, and Ohio for decades without significant seismic impacts, a few years ago the frequency and magnitude of earthquakes increased noticeably in some areas. Figure 1-3 illustrates this increase in seismicity. Many of these earthquakes seemed to be associated with injection wells used to dispose of produced water from unconventional oil and gas development. State agencies have taken various actions to reduce or eliminate seismic impacts. Both industry and the regulatory agencies learned a great deal in a short time about earthquakes, their possible causes, and methods for mitigation. GWPC took a leadership role in initiating discussions on induced seismicity related to hydraulic fracturing

15 Ground Water Protection Council, *State Oil and Natural Gas Regulations Designed to Protect Water Resources, Third Edition* (November 2017), http://www.gwpc.org/sites/default/files/State%20Regulations%20Report%202017%20Final.pdf.

Table 1-3. Regulatory Management of Produced Water by Method and Agency in Six States

State	Underground Injection Control (Class II)	Land Application	Water Discharge via NPDES	Recycling
New Mexico	NMOCD	NMDOT[1]	USEPA[2]	NMOCD
North Dakota	NDIC	NDDoH[3]	NDDoH	NDSWC
Oklahoma	OCC	OCC/ ODEQ[4]	ODEQ	
Pennsylvania	USEPA		PADEP	
Texas	TRRC	TRRC	USEPA[5]	TRRC
Wyoming	WOGCC	WOGCC[6]	WDEQ	WDEQ

Agency Acronyms
NDDoH—North Dakota Department of Health
NDIC—North Dakota Industrial Commission
NDSWC—North Dakota State Water Commission
NMDOT—New Mexico Department of Transportation
NMED—New Mexico Environment Department
NMOCD—New Mexico Oil Conservation Division
OCC—Oklahoma Corporation Commission, Oil and Gas Division
ODEQ—Oklahoma Department of Environmental Quality
PADEP—Pennsylvania Department of Environmental Protection
TCEQ—Texas Commission on Environmental Quality
TRRC—Railroad Commission of Texas
USEPA—United States Environmental Protection Agency
WOGCC—Wyoming Oil and Gas Conservation Commission
WDEQ—Wyoming Department of Environmental Quality Agency Specific Provisions

1 The NMDOT may have jurisdiction over the use of produced water for road de-icing, http://www.emnrd.state.nm.us/OCD/education.html#OGProd4.
2 The NMED conducts compliance evaluation inspections on behalf of USEPA and reviews federal permits through certification.
3 The NDDoH has guidelines regarding use of certain produced water in dust and ice control. (NDDoH, supra Note 11)
4 The OCC regulates land application of produced water.
5 The TCEQ is not authorized to issue permits for activities associated with the exploration, development, or production of oil or gas or geothermal resources.
6 One-time land spreading on the well site is regulated by WOGCC. Other road spreading, land-spreading and land-farming operations are regulated by WDEQ and require a permit (Chapter 3 Permit Requirements for Treatment of CBM, Oil or Gas Produced Water, Wyoming Department of Environmental Quality, 7-8).

and disposal wells in 2013. As part of a joint effort with the IOGCC, the GWPC, in concert with state regulatory agencies, formed an induced seismicity work group. In 2015, this workgroup developed a primer on *Technical and Regulatory Considerations Informing Risk Management and Mitigation*, which was updated in 2017.

Examples of State Produced Water Regulations and Rights in 2017

For this report, the GWPC contracted with the Louisiana State University School of Law to evaluate how selected states regulate produced water, focusing on regulatory frameworks concerning methods of produced water management, agencies responsible for regulating these methods, and produced water ownership and liability. The states—New Mexico, North Dakota, Oklahoma, Pennsylvania, Texas, and Wyoming—were chosen based on their representativeness of a region; the geologic variability of production areas within the state; geographic, climatologic, and water need diversity; and the availability of geologic, hydrologic and water quality data. The results of this legal research are summarized below.

Regulatory Frameworks for Produced Water Management

As shown in Table 1-3, even within individual states, more than one agency may regulate the management of produced water. While underground injection control often falls under the jurisdiction of a state oil and gas agency, board, or commission, other management options such as NPDES discharge are typically regulated by either a state environmental quality agency, health agency or, in some cases, the EPA.

Such shared regulatory control may complicate produced water reuse outside of the oil and gas industry, requiring new levels of coordination between state agencies and even across state and federal agencies. This is particularly true when regulatory requirements differ substantially between multiple states that exert regulatory authority. For example, a project involving application on roadways for deicing of produced water produced in Permian basin operations would

require coordination between regulating agencies in New Mexico and Texas: the NMDOT in New Mexico and the TRRC in Texas. Some agencies that may be involved in new produced water reuse options may not normally coordinate their regulatory management activities, and developing the appropriate MOUs or MOAs, etc., can take time.

Frameworks for Produced Water Rights, Ownership, and Liability

In the United States, designation and distribution of water rights are done separately by each state and in some cases tribes, interstate agencies, and compacts. While there are some general trends, each state has slightly different rules. Understanding these varying state rules and requirements is important to the oil and gas industry in obtaining water to use for drilling and fracturing fluids and in managing produced water. Table 1-4 shows the various groundwater rights doctrines and produced water ownership and liability provisions that apply in six states. Appendix 1-B provides more information on surface and groundwater rights.

Although individual state laws vary, two general doctrines apply to surface water rights: prior appropriation and reasonable use.

- Under the **prior appropriation** doctrine, the first user of the water for a beneficial reuse such as agricultural or industrial use is considered to have a right to continued use of the water. Subsequent users may utilize water from the same source but may not impinge on the original user's right to use the water.
- Under the **reasonable use** doctrine, riparian users of a water source may use water provided it does not impinge on the use of the water by other riparian users. A riparian user is defined as someone situated along the path of the water.

With respect to groundwater, states generally follow one of five common law "rules" for groundwater rights: the Absolute Dominion rule (the Absolute Ownership rule or English rule) (11 states), the Reasonable Use rule (the American rule or Rule of Reasonableness) (17 states), the Correlative Rights doctrine (five states), the Restatement (Second) of Torts rule (the Beneficial Purpose doctrine) (two states) and the Prior Appropriation doctrine (First in Time, First in Right seniority system) (13 states). However, states increasingly supplement or alter common law rules with state statutes ("regulated riparianism").

- Under the Absolute Dominion Rule (also known as the Absolute Ownership Rule), a landowner has a right to take for use or sale all the water that he can capture from below his land, regardless of the effect on wells of adjacent owners.
- The Reasonable Use Rule limits a landowner's use to beneficial uses having a reasonable relationship to the use of his overlying land.[16] As long as the use of the water is reasonable, the landowner can withdraw all the water, even to the detriment of others, without liability.
- The Correlative Rights doctrine is based on the Reasonable Use rule, but does not prohibit off-site uses and uses a proportionality rule. A landowner must limit use of groundwater to prevent interference with use of the water by adjacent landowners. The Correlative Rights doctrine does not envision an absolute right of access to groundwater or an unlimited right to pump.[17] Rather, this doctrine maintains that the authority to allocate water is held by the courts.[18] A major feature of the Correlative Rights doctrine, however, is the concept that adjoining lands can be served by a single aquifer.[19] Therefore, the judicial power to allocate water protects both the public's interest and the interests of private users.[20]

16 "Ground Water: Louisiana's Quasi-Fictional and Truly Fugacious Mineral," 44 *La. L. Rev.*, 1123, 1133 (1984).

17 Id.

18 Id.

19 Id.

20 Id.

Table 1-4. Produced Water Ownership and Liability Findings in Six States

Disclaimer: This table should not be considered a legal opinion regarding the ownership of or liability for produced water under all circumstances. It is merely a compilation of general research conducted on behalf of the GWPC.

State	Groundwater Rights Doctrine	Produced Water Ownership		Produced Water Liability	
		Operator	Landowner	Operator	Other Persons
New Mexico	Prior appropriation		X[6]	X	X
North Dakota	Prior appropriation		X[1]	X[2]	X
Oklahoma	Reasonable use	X[3]		X	
Pennsylvania	Reasonable use	[5]	[5]	X	
Texas	Absolute Ownership Rule		X	X	X[4]
Wyoming	Prior appropriation		X[1]	X	

Specific provisions that may apply to or modify the information contained in Table 1-4 include the following:

1 Water is not owned but pore space is the property of the surface rights owner.

2 Operator is immunized from liability if transferred to a commercial oilfield special waste recycling facility.

3 Produced water ownership in Oklahoma resides with the oil and gas operator except that landowners have "domestic use" of water flowing across the property. (Mack Oil Co. v. Laurence, 389 P.2d 955 (Okla. 1964)).

4 Texas limits tort liability for sellers or transferors of recycled produced water. 3 Tex. Nat. Res. Code Ann. § 122.003(a) (2015) ("Responsibility in Tort").

5 The Pennsylvania legislature has not explicitly defined who owns produced water. As a result, produced water is likely owned by either the landowner or the oil and gas operator. However, use of groundwater off of the premises is considered unreasonable and unlawful per se if other users' rights are interfered with. Pamela Bishop, PADEP, A Short Review of Pennsylvania Water Law, 4 (2006); R. Timothy Weston & Joel R. Burcat, Legal Aspects of Pennsylvania Water Management, in Water Resources in Pennsylvania: Availability, Quality and Management 219, 220 (Shyamal K. Majumdar et al. eds., 1990).

6 In New Mexico the term "possession" is often used because actual water ownership is by contract only.

- The Restatement of Torts rule (the Beneficial Purpose doctrine) merges the English concept of nonliability with the American standard of Reasonable Use. "The result merges prior groundwater law into a standard intended to more equitably meet growing demands on water resources."[21]
- Under the Prior Appropriation doctrine, the first landowner to beneficially use or to divert water from a water source is granted priority of right. The quantity of groundwater a senior appropriator may withdraw may be limited based on reasonableness and beneficial purposes is used in several western states.[22]

Produced water ownership is not clearly defined and may present challenges. However, ownership varies in each state. For example, in New Mexico, there is no water right associated with produced water at the point of production. Later, if the water is used and mixed with water that has defined rights, this can change. In contrast, produced water ownership in Colorado is differentiated as being either tributary or non-tributary.

In the United States, designation and distribution of water rights are done separately by each state and in some cases tribes, interstate agencies, and compacts.

Typically, the company bringing the produced water to the surface has been responsible for its disposal. However, as produced water moves from waste to resource and potentially final disposal, ownership of the water may change.

21 Juliane Matthews, "A Modern Approach to Groundwater Allocation Disputes: Cline v. American Aggregates Corporation," 7 *J. Energy L. & Pol'y*, 361 (1986).

22 Id.

It is important to identify how and when ownership changes occur and to understand that these changes in ownership may differ based on local or state regulations or laws. Understanding the role of water rights, mineral rights, and surface ownership in the exploration and production of oil and gas is critical in addressing the how and when there is compensation for or liability of the beneficial use of produced water.

When produced water is used within the industry for a beneficial use, liability remains with the companies. If companies provide produced water (treated or untreated) to external entities for a beneficial use, which party (company or end user) holds the liability can be less clear. For example, if an oil or gas company treats its produced water, then gives or sells the water to a rancher, the company may later be sued by the rancher if a ranch employee or a farm animal suffers ill effects.

If oil and gas companies transfer ownership of produced water to another party, the oil and gas companies assume that at least partial if not complete liability is also transferred. But this is not necessarily the case. In 2013, Texas Governor Rick Perry signed HB 2767, which partially addressed this issue. HB 2767 allowed the ownership of produced water for the purpose of treatment and reuse to be transferred from the generator (the oil and gas producer) to a person who treats for use or disposes of the produced water (a treater) and from the treater to another person who reuses the treated produced water for beneficial reuse or disposal. HB 2767 also provided some limitation for tort liability for the "treater" who later sells/gives the treated produced water to another person for use "in connection with the drilling for or production of oil or gas." The limit on liability is specific to "a consequence of the subsequent use of that treated product by the person to whom the treated product is transferred or by another person." HB 2767 does not transfer all liability, including liability to comply with TRRC regulations. In cases where produced water is sold or provided free of cost to another party, a contract may specify the party responsible for treating and monitoring the produced water, the party with ultimate responsibility for the produced water, and the point at which contractually that responsibility changes, but generally the contract will not affect a regulator's determination of liability to the state.

If a surface owner or mineral right holder expects payment for the produced water generated from oil and gas E&P, the expectation of transfer of full or partial liability if any spills or damage occurs likely exists. Additionally, entities that receive produced water for beneficial use must understand and accept the potential legal liabilities. The issues of water rights and liability were presented to a Congressional committee more than a decade ago.[23] Congress has not taken any action. Any progress on resolving these issues will likely come from state action taken to increase the likelihood of beneficially reusing produced water.

It is important to identify how and when ownership changes occur and to understand that these changes in ownership may differ based on local or state regulations or laws. Understanding the role of water rights, mineral rights, and surface ownership in the exploration and production of oil and gas is critical in addressing the how and when there is compensation for or liability of the beneficial use of produced water.

To facilitate produced water use, states may need to make statutory or regulatory changes. Texas was one of the first states to formally recognize the potential opportunities for beneficial use of produced water. For example, the TRRC, the oil and gas agency in Texas, amended its commercial and non-commercial recycling rules effective April 15, 2013[24] to remove barriers. Major rule changes encourage further conservation, reuse, and recycling of solids and liquids produced by oil and gas operators that would otherwise be considered waste. Appendix 1-C is a presentation prepared by the TRRC that describes the changes that were made. Similarly, New Mexico promulgated recycling rules to protect fresh water

23 John Veil, *Testimony*, Hearing before the U.S. House of Representatives Committee on Science and Technology, Subcommittee on Energy and Environment, regarding "Research to Improve Water-Use Efficiency and Conservation: Technologies and Practice" (Washington, DC: October 30, 2007), http://www.veilenvironmental.com/publications/pw/testimony_veil_final.pdf.

24 Texas Administrative Code, Title 16, Part 1, Chapter 3, Rule 3.8 (16 TAC § 3.8) relating to Water Protection, and 16 TAC Chapter 4, Subchapter B, relating to Commercial Recycling.

and encourage recycling of produced water. These rules became effective on March 31, 2015. Appendix 1-D details the history of the process used by New Mexico to develop its recycling rule.

Operational Standards for Produced Water Management

Not all produced water activities are subject to regulatory controls. However, they may be subject to operational standards established by the end user to meet such needs as protection of infrastructure and facilities.

For example, the quality of produced water needed as make-up water for new fracturing fluids is not subject to EPA or state water quality standards. Rather, the operator sets operational standards for specific chemical constituents to protect pumps, valves, and piping from excessive corrosion and prevent scaling, biofilm growth, and accelerated crosslinking of polymers. Companies want to ensure that the quality of water used to fracture a well is compatible with the goal of achieving the greatest possible oil and gas production.

Similarly, fluids injected into Class II disposal wells do not need to meet any regulatory standards in terms of how clean the water must be. However, the water must be a Class II fluid under the provisions of the EPA 1988 regulatory determination and cannot be altered in such a way as to make it subject to RCRA requirements. The injected water is given adequate treatment to avoid damage to the injection well and the receiving formation. The actual treatment is chosen by the operator.

In some states, when produced water is treated and used for crop irrigation, the farmer or rancher may determine the water quality standards needed to protect crops and soil structure. In other states, such as Oklahoma, specific land application standards are required by regulation. Guidelines on irrigation water quality are often available from agricultural agencies, conservation agencies or districts but these may be recommendations, not enforceable standards. These standards relate to land application of produced water rather than discharge of produced water.

Best Practices and Guidance for Produced Water Management

Companies, individually and through industry associations, have documented various best practices for managing produced water. For some activities, highly technical standards (e.g., tank construction guidelines) are available from organizations like the American Society for Testing and Materials (ASTM) and the American Petroleum Institute (API). In other cases, design and operational best practices have been developed by government agencies such as the Bureau of Land Management and other organizations.

There are a variety of resources available to the public on produced water, its regulation, best practices, etc., some of which are listed in Appendix 1-E. Also see Appendix 1-F for an example of regulatory changes in the management of produced water in the Marcellus Shale play in Pennsylvania circa 2009.

Produced Water as Part of the State Water Planning Process

As states begin evaluating long-term water needs, water planning plays an important role. More states and regions are experiencing water shortages due to drought, population shifts, and increased usage. Water plans are used to evaluate the quality, quantity, and geographic location of water versus where the water is needed. These plans may be broad in nature and cover an entire state, a watershed, or some combination.

States have various statutory, regulatory, and recommendations for water planning. Only three of the six states reviewed in the legal research referenced previously include produced water as a component in their state water plans. One possible reason for its exclusion is that produced water has not traditionally been considered a potential source of water. As treatment technology advances, populations grow, and water scarcity becomes more pronounced, the view of produced water may change over time and result in a broader look at produced water as a resource that could add to a state's water balance sheet.

Oklahoma, which has developed a comprehensive water plan for the entire state based on 13 geographic regions, considered produced water in the water planning process. The comprehensive water plan and the 13 regional reports can be viewed on the Oklahoma

Water Resources Board (OWRB) website using the following links:

- https://www.owrb.ok.gov/supply/ocwp/pdf_ocwp/WaterPlanUpdate/draftreports/OCWP%20Executive%20Rpt%20FINAL.pdf
- https://www.owrb.ok.gov/supply/ocwp/ocwp.php#regionalreports

These planning regions can use their report as a starting point to develop their own more localized water plans. The water plan(s) can be used to assess water quality or quantity or to meet some other established goal. In the case of Oklahoma, a goal was established by the legislature in a bill that became known as Water for 2060 Act.[25] This legislative action created a goal for the state to use no more fresh water in 2060 than in 2010. To achieve this goal, all water sources were considered, including brackish groundwater, produced water, and the reuse of reclaimed water from municipal or industrial processes, along with conservation methods.

In another example, the State of Kansas has completed regional water plans and included goals for effectively using produced water. In the Red Hills Regional Advisory Committee report, two of the four water goals were related to produced water and recycling in the production of oil and gas. Goal #3 is to "Reduce the amount of freshwater used in oil and gas completion operations by 4% annually" and Goal #4 is to "Work with oil and gas industry, beginning in 2040, to have 10,000 barrels a day of fresh water to be recycled from oil production for regional use in the Red Hills." More information can be found at https://kwo.ks.gov/docs/default-source/regional-advisory-committees/red-hills-rac/red-hills-rac-action-plan.pdf?sfvrsn=2.

In California, the State Water Resources Control Board (SWRCB or State Board) and the nine Regional Water Quality Control Boards (RWQCBs or Regional Boards) are responsible for the protection and, where possible, the enhancement of the quality of California's waters. The SWRCB sets statewide policy and, together with the RWQCBs, implements state and federal laws and regulations. Each of the nine Regional Boards adopts a Water Quality Control Plan, or Basin Plan, which recognizes and reflects regional differences in existing water quality, the beneficial uses of the region's ground and surface waters, and local water quality conditions and problems.[26] California's Porter-Cologne Water Quality Control Act (1969), which became Division Seven ("Water Quality") of the State Water Code, establishes the responsibilities and authorities of the nine RWQCBs (previously called Water Pollution Control Boards) and the SWRCB. The Porter Cologne Act names these Boards "... the principal State agencies with primary responsibility for the coordination and control of water quality" (Section 13001). Each Regional Board is directed to "... formulate and adopt water quality control plans for all areas within the region." A water quality control plan for the waters of an area is defined as having three components: beneficial uses which are to be protected, water quality objectives which protect those uses, and an implementation plan which accomplishes those objectives."[27] Although the current regional water plans in California do not specifically address produced water as a component of the water system for purposes of water resource planning, the regional boards process requests for produced water beneficial use and have developed a fact sheet related to the use of recycled produced water for crop irrigation.[28]

25 *Oklahoma Water for 2060 Act*; Enrolled House Bill 3055 by Steele, Lockhart and Raon of the House and Fields of the Senate; Codified in the Oklahoma State Statutes as Section 1088.11 of Title 82.

26 California Water Boards, Santa Ana Region, "The Water Quality Control Plan (Basin Plan) for the Santa Ana River Basin," (February 2008), https://www.waterboards.ca.gov/santaana/water_issues/programs/basin_plan/docs/chapter1.pdf.

27 Central Coast Regional Water Quality Control Board, "Water Quality Control Plan for the Central Coastal Basin, September 2017 Edition," California Environmental Protection Agency (September 2017), https://www.waterboards.ca.gov/centralcoast/publications_forms/publications/basin_plan/docs2017/2017_basin_plan_r3_complete.pdf.

28 California State Water Resources Control Board, "Fact Sheet: Frequently Asked Questions About Recycled Oilfield Water for Crop Irrigation" (April 5, 2016), https://www.waterboards.ca.gov/publications_forms/publications/factsheets/docs/prod_water_for_crop_irrigation.pdf.

Historically, produced water has been viewed as a waste product. With broader understanding of water volumes and the types of treatment available, produced water may become a potential resource and an integrated part of a water plan in the future. Water planning can assist states or regions in identifying where the produced water is located, the current and projected amount of produced water in the area, and the projected need for water. The ability to treat produced water to the level necessary for other uses may leave more potable water for other more restrictive uses and could be a factor in a water plan. The availability of additional water can bolster plans for economic development, increased or maintained recreation, and a more sustainable drinking water supply.

Produced water currently has limited use because of actual and perceived risk, cost of transportation, treatment and distribution, and location of the produced water versus where the water is needed, among other factors. As water becomes scarcer, the benefits of produced water use may outweigh the costs of managing, treating, storing, and transporting the water and more opportunities for produced water use may occur. Research and investigation into risks and opportunities for produced water reuse will be necessary to inform decision making, as discussed further in Module 3 of this report. Additional regulations to protect public health and the environment may apply or be developed in response to increased beneficial reuse outside the oil and gas industry.