Review of the Legal and Regulatory Requirements Applicable to a Small-Scale Hydro-Energy Storage System in an Agricultural Setting

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1. Introduction

The legal team was asked to review the legal and regulatory requirements applicable to implementation, in Colorado, of a small-scale hydro-energy storage system that would be used in an agricultural setting, primarily to provide energy for irrigation. To compile the information in this chapter, we reviewed both state (Colorado) and federal statutes and regulations, legal texts and other legal documents, and conducted interviews with staff and officials whose regulatory responsibilities are relevant to this system.[1] The following reflects the results of our research.

Section two explains the scope of our work, assumptions made, and general remarks about limitations. Sections three and four address the bulk of the regulatory and legal analysis. In Colorado, water law is fairly complex and specialized. The Hydro-Energy Storage (hydro-ES) system involves water rights, water use, well permitting, reinjection and water quality issues. Therefore, hydro-ES would fall under the purview of several state entities and the Federal Environmental Protection Agency (US EPA). Based on the legal issues involved, the analysis is divided into two sections. Section three addresses the bulk of the state laws and regulations applicable to implementation of the system and also includes information regarding enforcement, provisions relevant to well permits and special provisions for temporary use. Section four addresses water quality issues associated with the drainage of water back into the underground source and implicates federal laws and regulations. Section five concludes the chapter with a summary of the most significant factors relevant to siting of the hydro-ES system. Our research addresses the regulatory framework applicable for implementation of a permanent system in order to assess the viability of addressing agricultural energy needs with a renewable resource. Our research also addresses any provisions for temporary or short-term permitting that might be relevant for the testing phase of this project.

2. Scope of Work

This analysis is based on a hydro-ES system with the following parameters:

- The lower water body will be an underground water source.
- The upper water body, or impoundment, will be on the surface (e.g., a pond or reservoir).
- Water will move between the two bodies through a well and the pump-turbine apparatus will be installed at the lower end of the well.[2]

[1] Interviews were followed up with legal research and, in most cases, the information in this chapter is based on the legal research.

[2] This apparatus is a pump-turbine coupled with an electrical motor-generator installed as a single unit as described in an earlier chapter of the Interim Report.

- The upper water body/impoundment must be large enough to hold water for two purposes: 1) to meet irrigation needs during a period when wind/sun is not available; and 2) the additional water to flow down through the turbine to produce the energy necessary to pump the irrigation water from the impoundment onto the fields.[3]

- The system will be implemented on an existing agricultural concern that has an existing well and water rights to support irrigation.

- The hydro-power portion of the system is designed to work in conjunction with an energy system that uses a renewable source (e.g., solar or wind).[4] That is, the hydro-power is not the primary source of power for energy generation in this system. It addresses the intermittence problem associated with solar and wind generation systems so that they are more viable alternatives to utility supplied energy.

It is important to recognize that the applicable legal/regulatory requirements will be site specific and can vary substantially depending on the location of the well. For example, the type of underground water source will determine which regulatory entity or entities have jurisdiction and the particular regulations that will apply. Also, the existing water right associated with the specific implementation/testing site as well as the other water rights and uses attached to that particular underground source will impact the analysis. The research was approached in a general manner, making note of differences relevant to different site characteristics. To the extent we could, we addressed differences applicable to different siting scenarios and noted the type of sites with the least prohibitive regulations. However, it was not within our resources to address every potential siting possibility. As the engineering team narrows its focus on a particular site, for testing and/or implementation, it is anticipated that additional legal research will be required to analyze the specific regulatory framework applicable.

It is also important to note that the use of water for hydro-ES using an underground to surface water design is a novel approach for meeting the energy requirements of agricultural concerns. This approach was not contemplated when the legal and regulatory framework to address and protect water quality and usage in Colorado was developed. Therefore, the application of current statutes and regulations can be awkward at best and in some cases there is no definitive answer for issues regarding implementation. In terms of permitting the application, Colorado water law has been adaptive over the years and is founded on the common goal of extending water's

[3] Evaporation during impoundment would also have to be considered.

[4] The analysis here is limited to the legal and regulatory framework associated with the pumped hydro portion of the system. Issues associated with implementing the solar or wind generation associated with this system are not addressed here. This system may also be powered by standard utility power; the user can derive economic benefits from this system by storing energy during "off peak" demand hours and releasing energy on demand, thus avoiding the cost of expensive "on peak" electricity charges.

benefit to as many useful purposes as our customs and values as a people grow to recognize. *Colorado Water Law Benchbook*, at vii First Ed. (Carrie L. Ciliberto ed., CLE in Colo., Inc. Supp. 2007) [hereinafter *Benchbook*]. However, one must also consider water availability in a state with a dry climate that suffers drought conditions regularly and water sources that are in many cases over-subscribed,[5] and how water limitations and regulatory requirements on a case by case basis will impact cost effectiveness.

The Statutory and Regulatory Framework

There are a number of state entities, offices and officials involved with the regulation of water rights to underground sources and the wells used to extract water from underground sources. In Colorado there are specific regulations addressing wells in addition to those that address water rights and uses, and water rights are regulated based on the designation of the ground water at issue. Further, both water extraction and water return (reinjection in this case) have distinct requirements, and the U.S. EPA is implicated when water return is implemented through a well. In addition, in some cases, temporary permitting requirements exist which are relevant in regard to planning a test phase for this system.

In conducting this research, the legal team pursued the following objectives:

- Provide a basic understanding of the relevant water law in Colorado;
- Provide some insight as to the regulatory framework applicable to the implementation of this novel system with an eye towards the viability of such a system within that framework;
- Provide guidance in the choice of a site for a hydro-ES system; and
- Identify any potential temporary permitting process that could be applicable to the testing phase of this project.

3. The State Statutory and Regulatory Requirements

The key issues in regard to using water from an underground source for hydro-ES can be summarized with three questions: 1) will any part of the system be considered a "new use" of an existing water right and, if so, what are the implications of a change of use; 2) will additional water rights, in terms of amount of water, be necessary; and 3) will a commitment to return water to the underground source be required, (in addition to that

[5] The majority of stream systems in Colorado's eastern slope qualified as overappropriated in the 1890's. *Benchbook* at 2-6.

returned as part of the system to produce power).[6] There are four primary legal classifications of ground water[7] in Colorado: 1) tributary; 2) nontributary; 3) designated; and 4) Denver Basin. The answers to the three key questions will depend on the classification of the water at issue because the relevant regulatory scheme and agencies with oversight authority will depend on this classification. Further, the "answers" are not always clear. It becomes obvious when trying to apply the laws and regulations to this system that harnessing the energy from water moving down through a well is not a use contemplated in the development of the regulatory schemes, nor was storage of water for this purpose.

a. The Basics of the Relevant Colorado Water Law: The Four Types of Ground Water

The primary principle of Colorado water law is the doctrine of prior appropriation which is often summarized by the phrase "first in time, first in right." Colo. Const. Art. XVI, §§ 5 and 6; Colo. Rev. Stat. ("C.R.S.") § 37-92-102(1); *see* Michael F. Browning, *A Summary of Colorado Water Law*, 21 Colo. Law. 63 (1992); *Benchbook* at 1-2. In its most basic sense, an appropriation is water put to a beneficial use. C.R.S. § 37-92-103(3). Beneficial use is "the use of that amount of water that is reasonable and appropriate under reasonably efficient practices to accomplish without waste the purpose for which the appropriation is lawfully made." C.R.S. § 37-92-103(4). The earlier appropriator, or user of the water, has a better right against all subsequent users. *Benchbook* at 1-2. In times of short supply water is allocated pursuant to this priority. Under the Colorado Water Resources and Power Development Authority Act, Colorado recognizes power generation as a beneficial use. C.R.S. § 37-95-103(2); *Bd. of Cty Comm'rs v. Crystal Creek Homeowners' Assoc.*, 14 P.3d 325, 337 (Colo. 2000).

However, ground water, which is the type of water implicated in hydro-ES, may or may not be subject to appropriation as set forth in the Colorado Constitution. The governing law depends upon the legal classification of the ground water, (i.e., tributary, nontributary, designated basin, or Denver Basin

i) Tributary v. Nontributary. Generally, the two types of ground water are 'tributary' and 'nontributary.' These terms are both legal classifications and physical descriptors, (i.e., they describe physical attributes of ground water). All ground water has the physical attributes of one or the other, however, only water that is not classified as a designated

[6] The water quality of water returned or drained back into the underground source is also a key issue and is addressed separately in section 4.

[7] "Underground water" and "ground water" are used interchangeably in this chapter and mean any water not visible on the surface of the ground under natural conditions. *See*, C.R.S. §37-90-103(19).

basin (discussed below) is legally classified as 'tributary' or 'nontributary.' In this chapter, these terms are used as legal classifications unless otherwise noted.

Tributary ground water is considered "water of every natural stream" as the phrase is used in the Colorado Constitution and is thus subject to appropriation. *See* C.R.S. § 37-82-101. The basis for this classification is the hydrological connection of this ground water to surface water. Legally, it is generally treated the same as surface water (e.g., rivers and streams). The provisions of the Water Right Determination and Administration Act of 1969, as modified since original enactment, govern the use of natural stream water within the state, including tributary ground water. Thus, tributary ground water is subject to the prior appropriation scheme.

There is a presumption that all ground water is tributary. *Stonewall Estates v. CF & I Steel Corp.*, 592 P.2d 1318, 1320 (Colo. 1979). Thus, one must prove to the court that ground water is nontributary in order to receive that designation. If so designated, nontributary ground water is subject to a different set of rules. However, it is difficult to prove that ground water is not tributary to a stream.

While tributary water is annually replenished, nontributary water is "subject to eventual depletion." Brett Heckman, *Principles & Law of Colorado's Nontributary Ground Water*, 62 D.U. L. REV. 809, 814 (1985). This distinction, in large part, leads to the different schemes that address withdrawal of water. Use of water that is not tributary to a natural surface stream is not subject to prior appropriation. C.R.S. § 37-90-102(2). "Nontributary ground water" is defined as water located outside of a designated ground water basin (discussed below) that, upon withdrawal, will not in 100 years cause a depletion of the flow of a natural stream at a rate more than one-tenth of one percent of the annual rate at which the water was withdrawn. C.R.S. § 37-90-103(10.5). The determination of whether ground water is nontributary is made at the time of permit application. *Id.* Essentially, the idea is that nontributary ground water is not hydrologically connected to any water considered tributary. Browning, *supra* at 65. Further, nontributary ground water legally exists only outside the boundaries of a designated ground water basin. Allocations of nontributary ground water are made pursuant to statute and are based upon ownership of the overlying land. *Id.*[8]

Because tributary aquifer ground water is water contained in an aquifer that is directly connected to the local stream system, generally, the water table in such an aquifer is relatively shallow. On the other hand, deep aquifer ground water is not so directly connected to the surface stream system (i.e., nontributary ground water is more likely to be deep aquifer ground water). Thus, typically, a site using nontributary ground water will better meet the needs (i.e., head requirement) for the Hydro-ES system. Further, there are other advantages associated with the nontributary regulatory scheme, such as the

[8] A variation on nontributary ground water regulation comes into play when discussing Denver Basin aquifers. *See* C.R.S. § 37-90-103(10.5); *Benchbook*, at § 3.2.3.

manner in which water rights are allocated and the accounting mechanism for water use. This is addressed below.

ii) Designated Basins and the Denver Basin. The location of the well is important because the Colorado Ground Water Commission ("CGWC") designates certain areas of the state as Designated Ground Water Basins ("Designated Basins") pursuant to C.R.S. Section 37-90-106. *See* Colo. Dept. of Natural Resources, Div. of Water Resources, Guide to Colo. Well Permits, Water Rights, and Water Admin. 5 (Mar. 2006). Attached as Attachment A is a map of designated ground water basins. [9] The vast majority of designated basins are located in the eastern half of Colorado. The classifications as "designated basin" or "Denver aquifer" are purely legal constructs. There is a presumption that designated basins are hydrologically not connected with any surface water source, that physically they are nontributary. However, notwithstanding the physical attributes of the underground water source, designated water is not legally classified as nontributary or tributary. For purposes of regulation and administration it is in a separate classification.[10]

Designated ground water is governed by the Colorado Ground Water Management Act ("GWMA"), C.R.S. §§ 37-90-101 to -143. It is managed under a modified system of appropriation. C.R.S. § 37-90-102(1). Designated ground water is defined as ground water that is located within the boundaries of a Designated Basin and "which in its natural course would not be available to and required for the fulfillment of decreed surface rights," or which is not adjacent to a continuously flowing natural stream and withdrawals of which have "constituted the principal water usage for at least fifteen years preceding the date of the first hearing on the proposed designation of the basin." C.R.S. § 37-90-103(6)(a). The CGWC determines the boundaries of Designated Basins and has the sole jurisdiction to appropriate designated ground water. C.R.S. § 37-90-106 (enabling statute); *State ex rel. Danielson v. Vickroy*, 627 P.2d 752 (Colo. 1981) (exclusive jurisdiction); see also, State of Colo., Dept. of Natural Resources, Div. of Water Resources, Guide to Colo. Well Permits, Water Rights, and Water Admin., Mar. 2006; C.R.S. § 37-90-107(8) (well permitting). The CGWC can define how each specific source within designated borders should be allocated and administered.

Denver Basin ground water is ground water within specific aquifers contained in a large part of the state called the Denver Basin. *Benchbook* at 3-4. Some of the aquifers in the Denver Basin are designated ground water. Designated Denver Basin ground water is

[9] This map is produced by the Office of the State Engineer and is available at http://www.water.state.co.us/images/DesBasins.pdf. For additional information regarding the locations of the Designated Basins, see http://water.state.co.us/groundwater/basins.asp and http://water.state.co.us/cgwc/DB-GWMgmtDist.htm.

[10] If it is proven that part of a designated basin is hydrologically connected to surface water, that water will be removed from the scheme regulating designated ground water and be subject to the scheme pertaining to tributary water.

bedrock aquifer and allocated based on overlying land ownership. Other designated ground water, alluvial, is allocated based on availability. *Benchbook* at 3-4, 4-3.

The permitting process in designated basins is significantly more involved. In addition, water on the eastern slope, where designated basins are primarily located, is considered largely over-appropriated. *See* footnote 5, *supra*. Further, the irrigation techniques used in eastern Colorado are largely surface or ditch and the types of wells used, when they are used, are estimated to be in the range of only 50 feet deep.[11] For these reasons, we narrowed our analysis in the remaining sections to ground water that is not designated.

b. The Three Primary Issues: Change is Use, Additional Water Rights and Replacement Water

Because hydro-ES will be putting water to a different use, a change of water right (a.k.a. "change of use") must be undertaken for both tributary and nontributary ground water. A change of water right is "a change in the type, place, or time of use, a change in the point of diversion," as well as variations on the point of diversion, means of diversion, and variations of direct application and storage. C.R.S. § 37-92-103(5). An application for a change of water right must be pursued through the water court. The details to be included in such an application are listed in C.R.S. §37-92-302(2).

Changes of water rights, whose purpose is to continue an appropriation in effect under its priority date for another type of use, place of use, or through a different point of diversion, are limited to their historic beneficial consumptive use measured over a representative period of time and cannot be decreed if they will cause injury to other water rights. This is considered a fundamental principle of Colorado water law. *Benchbook* at ix.

A change of use does not affect the priority of a water right. However, in times of shortage, the State Constitution designates the priority of water usage for tributary water; Section 6 of Article XVI sets forth the right to appropriate and preferences of uses:

> …Priority of appropriation shall give the better right as between those using the water for the same purpose; but when the waters of any natural stream are not sufficient for the service of all those desiring the use of the same, those using the water or domestic purposes shall have the preference over those claiming for any other purpose, and those using the water for agricultural purposes shall have preference over those using the same for manufacturing purposes.

No other purpose is mentioned or given special priority in the Constitution. In times of short supply, the water officials must administer water rights in the order of their decreed and Constitutional priority. Therefore, if some of the water used for hydro-ES is not designated

[11] This is addressed in the engineering section of the Interim Report.

as agricultural (which may include the water necessary to impound for drainage/energy production and any associated evaporation), this water will not enjoy Article XVI protection in times of shortage.

Direct flow rights are typically quantified in terms of flow. When application for change of use is made a historical flow right will typically be turned into a volumetric water right. Volumetric quantifications are based on analysis of historical use and other factors. *See Benchbook* at 2-17.

Although the right to effectuate a change may not be denied by statue and the law expressly favors changes, the change will be approved only if it "will not injuriously affect the owner of or persons entitled to use water under a vested water right or a decreed constitutional water right." C.R.S. § 37-92-305(3). A change to a water right also cannot cause injury to a vested instream flow right or adversely affect the decreed minimum flow for the right. *Benchbook* at 2-16. In this regard return flows would be considered. That is, water from irrigation that seeps back into a water source used by others or even runoff may be considered another party's water right. *Benchbook* at 2-6. So for example, if the agricultural concern fallows a portion of the property for a change of use that will cover evaporation or storage for non-irrigation water requirements of the hydro-ES system, return flow of the prior use would be a consideration in whether to approve the change of use or permit conditions that may be required. Examples of terms and conditions to prevent injuries to other water rights from change proceedings include: 1) relinquishment of part of the decreed amount if necessary to prevent enlargement of historical consumptive use or diminishment of return flows; 2) a season of diversion if necessary to track historical patterns; and 3) any other condition necessary to protect vested rights of other users. C.R.S. § 37-92-305(4); *Benchbook* at 2-16.

Where tributary ground water is being used and the well does not have an associated right sufficient for the desired use, the well will be taking water out-of-priority (because it is too junior in the system). Here, a plan for augmentation must by applied for through the water court. C.R.S. § 37-92-301; *see Empire Lodge Homeowner's Assoc. v. Moyer*, 39 P.3d 1139, 1153 (Colo. 2001). A plan for augmentation prevents injury to senior water rights holders by replacing the water withdrawn in time, place, amount and quality. *Benchbook*, §§ 2.3.2, 3.2.1, 14.6.3. The augmentation plan is designed to protect existing uses of water by replacing the water permitted for a new use. *See Benchbook*, § 14.1.6.

As defined by statute:

> "Plan for augmentation" means a detailed program, which may be either temporary or perpetual in duration, to increase the supply of water available for beneficial use in a division or portion thereof by the development of new or alternate means or points of diversion, by a pooling of water resources, by water exchange projects, by providing substitute supplies of water, by the development of new sources of water, or by any other appropriate means. "Plan for augmentation" does not include the

> salvage of tributary waters by the eradication of phreatophytes, nor does it include the use of tributary water collected from land surfaces that have been made impermeable, thereby increasing the runoff but not adding to the existing supply of tributary water.

§ 37-92-103(9), C.R.S. *See also*, *Benchbook* § 2.3.2.

Nontributary ground water is treated somewhat differently in that the amount of water that can be withdrawn under the permit is the amount determined by the court decree of rights. C.R.S. § 37-90-137(4)(d). This is further discussed below.

Determinations of water rights, changes to water rights, and plans for augmentation of tributary ground water are subject to the WRDA, C.R.S. §§ 37-92-101 to -602, and are thus within the authority of the water referee within a water division. C.R.S. § 37-92-301. Applications for any of these things must be made to the water court. C.R.S. § 37-92-302. Determination of rights for nontributary ground water is also under the jurisdiction of the water judge for the particular district in which the well is located. C.R.S. § 37-92-203(1); *see State Engr. v. Smith Cattle, Inc.*, 780 P.2d 546, 550 n.4 (Colo. 1989). However, while nontributary ground water rights are determined pursuant to the WRDA in C.R.S. Sections 37-92-302 to -305, determinations of such rights must be in accordance with the permit requirements and limitations of C.R.S. section 37-90-107(4) and (5) of the Colorado Ground Water Management Act ("GWMA"). C.R.S. § 37-90-137(6). Essentially, these rights are determined through the same court process as for tributary waters but are subject to specific requirements that relate to underground waters.

It is assumed in this analysis that a permitted well already exists. As a result, the well may already have an augmentation plan associated with it if it does not have rights sufficiently senior so as to not be out-of-priority. An augmentation plan decree includes an identification of the beneficial uses that the plan is augmenting. *Empire Lodge*, 39 P.3d at 1150–51. It likely follows then that where the augmented beneficial uses change, some sort of notification, application, or amendment needs to be made to the water court. It is possible to have more than one plan for augmentation on a well at one time. *Id.* Having a separate plan preserves the original use in case the new use ceases sometime in the future. *Id.* Therefore, the water right holder may opt not to change an existing augmentation plan and to instead develop a new and separate plan. Email from Dick Wolfe, Assistant State Eng'r, July 1, 2007 (on file with authors).

Nontributary water does not have the same difficulties of replacing out-of-priority depletions because it is not governed by prior appropriation. As a result, it is considered "developed water" (the phrase normally refers to water imported from another basin) and can be used and reused by the appropriator. *Benchbook*, *supra* at § 3.2.3. Instead of by prior appropriation, it is allotted based on overlying land ownership. *Id.* Permitted withdrawal is based on an arbitrary determination that the aquifer life is 100 years and one percent of the total amount in the aquifer under the owner's property is allowed to be withdrawn each year. *Id.* Another benefit to having and using nontributary ground

water is that the landowner can "bank" his supply of ground water, saving any unused allotment for use in future years. *Id.*

Another question that arises is whether a storage right must be obtained for the surface impoundment. Because hydro-ES will be utilizing the water by storing in the surface impoundment for later use rather than putting it directly to use (such as for irrigation), it may be that a storage right is necessary. *City & County of Denver v. N. Colo. Water Conservancy Dist.*, 27 P.2d 992, 999 (1954). However, if the plan for augmentation or the change of water right, or both, clearly describe the process to be used and clearly accounts for all losses (like evaporation and seepage), one likely does not need to file for a storage right. Email, Wolfe, *supra*.

When returning water to the underground source, the quality of the water being "reinjected" must also meet some legal requirements, addressed in section 4 below. These requirements are not insignificant and the outcome will be largely impacted by the type of impoundment.

c. Well Permitting

We presume in this analysis that the agricultural concern implementing this system already has a permitted well that includes the right to pump water from the underground source for the necessary irrigation. Well permits are required for the construction of a new well. *See* C.R.S. § 37-90-137 (referring to well permits in the context of construction of new wells). Changes of use, then, would refer only to the water right, and remain the province of the water courts in an adjudication for the change of a water right. However, if the equipment in a well is changed, such as that required for the hydro-ES system, it appears that, a new well permit must be obtained.

The Water Well Construction Rules provide:

> 6.2 Permit Requirement - A permit issued by the State Engineer is required prior to constructing a new well and prior to the repair, replacement, or modification of an existing well. See Sections 37-90-105(3)(a)(I), 37-90-108(1)(a), 37-90-137(1), 37-90-138(3), and 37-92-602(3)(a) C.R.S.).
>
> 6.2.1 The State Engineer requires that a new well permit be obtained prior to:
>
> a. changing the producing interval of an existing well,
>
> b. installing certain dewatering systems as specified by the State Engineer,
>
> c. installing pumping equipment that will withdraw ground water for beneficial use, or
>
> d. installing pumping equipment having a sustained production rate in excess of the permitted production rate.

> The extraction of casing or pumping equipment for the purpose of repair or replacement does not require a new permit if the interval of perforated casing is not altered and the production rate does not exceed the rate specified on the existing valid well permit.

C.C.R. 402-2-6.2 and 6.2.1.[12] It is likely that more than one of the four different contexts in which a new well permit is required will exist for the hydro-ES equipment.

Further, there may be well construction requirements, pursuant to federal laws and regulations applicable to reinjection of water into underground sources. Again, the hydro-ES system is not specifically contemplated by the Safe Drinking Water Act (SDWA). However, when aquifer recharge and ASR wells inject water into an aquifer, it is important that they be constructed of materials that cannot rust, so that rust materials are not injected into the aquifer. Power, 1992 and Pyne, 1995. The relevant SDWA provisions and associated regulations are addressed below.

d. Enforcement

The available enforcement measures may introduce additional costs to the system. With respect to wells and ground water, the State Engineer has enforcement authority (along with the CGWC) of the regulations under the GWMA. C.R.S. § 37-90-110; *Jackson v. Colorado*, 294 F.Supp. 1065 (D. Colo. 1968). For the administration and enforcement of the GWMA, the State Engineer can impose certain physical construction requirements for wells, such as valves for flow control; go upon public or private land for inspection of wells, related components, and measuring devices; order cessation of the use of a well while a defect is fixed; commence actions to enjoin illegal activities or join proceedings that implicate the depletion of ground water resources. *Id.* More broadly, the State Engineer is empowered to "take such action as may be required to enforce compliance with any regulation, control, or order promulgated pursuant to the provisions of this article." C.R.S. § 37-90-110(f); *see also* C.R.S. § 37-90-138(2).

Under the WRDA for waters governed by prior appropriation, the State Engineer and division engineers have near exclusive jurisdiction over the administration, distribution, and regulation of the waters of the state. C.R.S. § 37-92-501(1). To this end, they may issue orders to water rights owners and users to curtail non-beneficial use, to release illegally or improperly stored water, to install and maintain metering devices, and to report readings of metering devices, among other things. C.R.S. § 37-92-502(2)-(5)(a). They may also order those supplying energy to pump ground water to provide records of the energy used. C.R.S. § 37-92-502(5)(b). In addition, they have the authority and the duty to go upon private lands for related inspections. C.R.S. § 37-92-502(6).

When there is noncompliance with any orders by the State Engineer or division engineer, they may, through the attorney general, seek an injunction against the person violating

[12] A*vailable at* http://www.sos.state.co.us/CCR/Welcome.do.

the order. C.R.S. § 37-92-503(1)(a). There are also fines involved for improper diversion of ground water, failure to report or falsification of required data, and for willful interference or destruction of measuring devices. C.R.S. § 37-92-503(6).

e. Test Site: Special Provisions for Temporary Use or Change of Use

For tributary waters which are subject to prior appropriation and thus are governed by the Water Rights and Determination Act of 1969 (WRDA), C.R.S. sections 37-92-101 to -602, obtaining approval to perform a one-time pumped hydro test is governed by C.R.S. section 37-92-308(5). [13] This provision allows for a new out-of-priority diversion and a change of water right to be approved by the state engineer if the depletions associated with the change are temporary and will not exceed five years. *Id.* These plans (for a water use involving a new out-of-priority diversion or change of water right) are called "substitute supply plans." *See id.* It is possible that both a plan for augmentation (for the out-of-priority diversion) and a change of water right will need to occur for this to go forward. Phone conversation, Wolfe, *supra*. However, there are conditions for the applicant to meet.

(1) An application must be filed: Form GWS-45, *available at* http://water.state.co.us/pubs/forms/gws-45.pdf.
(2) The applicant must notify the parties listed on the relevant notification list.
(3) The notified parties are given thirty days to comment on the plan, including claims of injury.
(4) The state engineer considers all comments, determines sufficient time, place, and amount replacements will take place and will prevent injury to other rights, including water quality.
(5) A plan under this rule cannot be approved for longer than one year, but may be renewed yearly for up to five years.

C.R.S. § 27-92-308(5)(a)(I)–(IV); *see* Policy 2003-2 Implementation of Section 37-92-308, C.R.S. (2003) Regarding Substitute Water Supply Plans, ¶ 15 and Attachment, *available at* http://water.state.co.us/pubs/policies/policy2003-2.pdf (contains detailed descriptions of permit requirements). On average, applications of this nature can take 60 to 90 days from the filing of the application to the issuance of the temporary permit. Phone conversation, Dick Wolfe, Assistant State Eng'r, May 17, 2007. This process can be shortened slightly by proactively contacting each of the potentially affected parties that are notified in the process. One can seek to speed up their response process by asking them to comment sooner or make a statement that they do not plan to comment. Engineers or lawyers experienced with the process generally complete such applications and assist with the process, although a lawyer is likely not necessary for this unless a party submits a comment objecting to the proposal or raises other concerns.

[13] A*vailable at* http://198.187.128.12/colorado/lpext.dll?f=templates&fn=fs-main.htm&2.0.

4. Water Quality: Draining Water Back into the Underground Source

The drainage of water from the surface impoundment down to the underground source, or aquifer, implicates laws and regulations regarding water quality. There are both federal and state laws and regulations that apply. Class V injection well requirements under the federal Safe Drinking Water Act (SDWA) will apply. The Underground Injection Control (UIC) program is implemented directly by Regions 8 of the U.S. Environmental Protection Agency (US EPA) in Colorado. Although a permit is not required, there are informational requirements, and these requirements are not necessarily negligible. In addition, the state water courts, in adjudicating augmentation plans, have adopted a standard that protects water rights of other users that includes both quality and quantity of water, (i.e., "shall be of a quality and quantity so as to meet the requirements for which the water of the senior appropriator has normally been used."). Finally, the WQCC has adopted basic standards for ground water. For those waters not currently covered by a site-specific standard, the rule is to protect the existing quality of ground water. *Benchbook* at 8-5. The Water Quality Control Division (WQCD), is the division of the Colorado Department of Public Health and Environment (CDPHE) that carries out discharge permitting and enforcement, however, EPA Class V injection wells are exempt from Division permitting. 5 CCR 1002-61.141(1)(b)(iiv). A full discussion of these water quality standards follows.

a. US EPA and Class V Injection Well Requirements.

Underground injection is the technology of placing fluids underground through wells.[14] Because of ground water contamination occurrences in the 1960-1970s as a result of underground injection, Congress passed the Safe Drinking Water Act (SDWA) in 1974 which required the US EPA to establish a system of regulations for injection activities. 42 U.S.C. §§ 300h to 300h-8 (Part C of the SDWA). The regulations are designed to establish minimum requirements for controlling all injection activities and provide mechanisms for implementation and authorization of enforcement authority and also provide protection for underground sources of drinking water. *Id.*

Historically, the SDWA has applied to water returned to an underground source through aquifer recharge or aquifer storage recovery (ASR) wells. However, based on the definition of "well" and the lack of any applicable exclusion, it appears that this Act would apply to the hydro-ES system contemplated here as a Class V well. The Underground Injection Control (UIC) program defines a well as any bored, drilled or

[14] While underground rock formations may appear to be solid, most formations contain voids or pores that allow fluids to fill or move through the pores. Man-made or produced fluids can move into the pores of rocks through the use pumps and existing gravity.

driven shaft or a dug hole, where the depth is greater than the largest surface dimension that is used to discharge fluids underground. See 40 C.F.R. §144.1(g)(1)(ii).

The general provisions of Part 144 of the UIC regulations state that the "SDWA provides that all underground injections …are unlawful and subject to penalties unless authorized by a permit or a rule." 40 C.F.R. §144.1(e). The regulations apply to "any dug hole or well that is deeper than its largest surface dimension, where the principal function of the hole is emplacement of fluids." 40 C.F.R. §144.1(g)(1)(ii) (defining regulated wells). This definition covers a variety of injection practices from sophisticated wells that inject more than two miles underground to many types of on-site drainage systems, such as septic systems, cesspools and storm water wells that discharge to a few feet underground. *See* 42 U.S.C. §300h. The regulations could have, but did not, state that for the regulations to be applicable, an underground source of drinking water (USDW) had to be present. Under the section that lists wells specifically excluded from regulation, there is no exclusion for wells located in an area where no USDW exists. *See* 40 C.F.R. Section 144(g)(2). The decision to deliberately subject all underground injection wells to regulation is repeated in Subpart B, General Program Requirements of Part 144: "Any underground injection, except into a well authorized by rule or except as authorized by permit … is prohibited." 50 C.F.R. §144.11.

Wells are classified into five categories in Part 146 of the regulations, which contains the criteria and standards for the injection control program. 40 C.F.R. § 146.5. Drainage from the hydro-ES system falls under Class V:[15]

> **Class V:** This category includes any well that is not included in the above categories. Including, but not limited to: air conditioning return flow wells, cesspools, drainage wells, recharge wells, salt water intrusion barrier wells, septic system for a multiple dwelling, subsidence control wells, and spent brine disposal wells among others. There is no need to have proximity to USDW, as it is not specified. 40 C.F.R. § 146.5(b)(5).

In Colorado, USEPA Region 8 directly implements the UIC program for Class V injection wells. However, Colorado also has additional jurisdiction over aquifer recharge and ASR wells through permitting of extraction and use of waters artificially recharged. Ground water Law Sourcebook of the Western United States, available at http://www.colorado.edu/Law/centers/nrlc/publications/.

Injections of fluids without regulation could potentially contaminate ground water and drinking water sources. Because the contamination of ground water would be very difficult to remediate, it is important to ensure that contaminants do not enter the ground water in the first place. Under 40 CFR §144.12(a), owners or operators of all injection wells, including aquifer recharge and ASR wells, are prohibited from engaging in any injection

[15] A description of the other classes, Class I-IV can be found at 40 C.F.R. §146.5(b)(1)-(4).

activity that allows the movement of fluids containing any contaminant into USDW's, "if the presence of that contaminant may cause a violation of any primary drinking water regulation…or may otherwise adversely affect the health of persons." 40 CFR § 144.12(a).

To comply the owner or operator of a Class V well is required to submit basic inventory information and is required to operate the well such that a USDW is not endangered. 40 CFR § 144.12(a). In addition, the US EPA under section 144.27 may require the owner or operator to submit additional information deemed necessary to protect USDW's. If an owner or operator fails to submit the information required under sections 144.26 and 144.27, they would be prohibited from using their wells. Depending on the type of well and the additional data that the Region 8 Director requests using his/her discretionary authority, the information required to legally reinject water will not necessarily be negligible. Copies of Regulation 144.26 and 144.27 are attached, as well as, the information required by the Region 8 Director for Class V injection wells used for aquifer recharge or ASR[16]. See Attachment B.

For wells not in compliance with Section 144.12(a), Sections 144.12(c) and (d) provide mandatory and discretionary actions to be taken by the UIC Program Director. The Director must choose between requiring an individual permit, ordering well closure or taking an enforcement action. Of great interest to this project is that because ASR and aquifer recharge wells are authorized by rule, they do not have to obtain a permit unless required to do so by the UIC Program Director under 40 CFR §144.25. Authorization by rule is terminated on the date of a permit issued or upon closure of the well. 40 CFR §144.25.

b. State Water Quality Standards

On the state level, water quality in Colorado is regulated through a 'dual system.' *City of Thornton v. Bijou Irr. Co.*, 926 P.2d 1, 92 (1996). The water courts and the Water Quality Control Commission (WQCC) created by the Water Quality Control Act (WQCA) both have authority with respect to water quality, but their authorities do not overlap. Additionally, the State Engineer is the relevant agency in the hydro-ES setting which both implements the WQCC's regulations and also has some of its own authority with respect to water quality. This dual system limits both water courts and the WQCC in their authorities with respect to water quality issues. This result unfortunately leaves some gap where issues may not be addressable by either the court or the agency. *See Concerning the Application for Plan for Augmentation of the City and County of Denver*, 44 P.3d 1019 (Colo. 2002) [hereinafter *Denver Application*].

The WQCA was enacted in response to the federal Clean Water Act. The WQCA created the WQCC, which has general authority to regulate Colorado water quality issues. §§ 25-

[16] The *Site Information Request Fact Sheet Class V Underground Injection Control: Aquifer Recharge and Aquifer Storage and Recovery Wells* included in this attachment is available at the US EPA Region 8 website, www.epa.gov/region8/water/uic/FSASR.pdf.

8-201, -202, C.R.S.; *see Denver Application*, 44 P.3d at 1029. Water quality regulations by the WQCC that affect water rights are not prohibited as long as they do not cause material injury or impairment to the rights. *City of Thornton*, 926 P.2d at 92. Thus, the regulations cannot compromise appropriative rights. The Water Quality Control Division, (WQCD), a division of the Colorado Department of Public Health and Environment (CDPHE), carries out the WQCC's regulations. However, in the context of reinjection, or drainage, of water in the hydro-ES system, the WQCD's role is likely limited to an advisory capacity, as discussed below.

The WQCA designates the State Engineer as an implementing agency with responsibility for implementing the WQCC's standards and regulations. C.R.S. § 25-8-202(7) ("SB 89-181"). Where activities under the jurisdiction of the State Engineer result in discharges subject to the Act, the WQCC develops the water quality standards and classifications, but the State Engineer implements them in their own programs after consulting with the WQCC and the WQCD. C.R.S. § 25-8-202(7).[17] Although the WQCD has the sole responsibility for issuing and enforcing permits for point source discharges, EPA Class V injection wells are exempt from WQCD permitting. 5 CFR 1002-61.14(1)(b)(iiv).

The WQCC has adopted the Basic Standards for Ground Water to establish statewide water quality standards for radioactive materials and organic chemicals in ground water. This regulation also establishes site-specific ground water quality classifications and standards for particular areas, primarily to protect water quality in municipal well fields. Finally, this regulation creates an interim narrative standard to protect the existing quality of ground water until site-specific classifications and standards can be established. *Benchbook* at 8-5. Water sources under consideration for hydro-ES will likely be under the standard to protect existing quality.

The WQCC is limited to addressing water quality impacts that result from discharge of pollutants as opposed to diversion (withdrawals). *Colorado Wild, Inc. v. U.S. Forest Serv.*, 122 F.Supp.2d 1190, 1192 (D. Colo. 2000). As a result, the WQCA is specifically focused upon regulating the discharge of pollution, and the conclusion has been drawn that water quality standards apply only to discharges of pollution, not withdrawals or

[17] In order to further the working relationship between the three entities, the WQCC, the WQCD, the State Engineer, and the Department of Natural Resources, entered into a Memorandum of Agreement ("MOA") to formalize the previous informal cooperative working relationships between the agencies and to provide procedures for communication, exchange of information, and resolution of problems. Memorandum of Agreement for the Implementation of SB 181 Amendments to the Colo. Water Quality Control Act (25-8-101, *et seq*), Aug. 30, 1990, *available at* http://www.cdphe.state.co.us/op/wqcc/SB181/moaseo.pdf. As a result the State Engineer and the WQCD work closely together on issues, especially those that do not clearly fall under a particular law or regulation. *See also*, SB 89-181 (requiring same).

appropriations of water. *Id.* at 1193. Therefore, it is not clear how the Basic Standards would be applied, or how compliance would be enforced in the hydro-ES setting.

The second 'system' in Colorado's dual system governing water quality is the court system. While the majority of water quality issues are delegated to the WQCC, *Denver Application*, 44 P.3d 1019, water courts still retain exclusive authority with respect to the determination and administration of water rights, C.R.S. § 25-8-104(1). Thus, water courts still have the control to assess injury to water rights in augmentation plan proceedings. *Denver Application*, 44 P.3d at 1029. Typically, the water courts' primary area of focus with respect to injury is generally water quantity as it affects other appropriations. *Bijou*, 926 P.2d at 92. However, water quality has been protected "to the extent necessary to preserve the water's sustainability for the uses of appropriators." *Denver Application*, 44 P.3d at 1028. Thus, if the change in quality of the water does not affect the use that the downstream appropriators are entitled to, then there is no pollution and no injury with respect to the augmentation plan or reinjection of water. *Id.*

In its decrees, the water court can delegate authority to the State Engineer to make quality determinations of the substituted water that are consistent with the statutes and regulations governing water quality. *City of Thornton v. Bijou Irr. Co.*, 926 P.2d 1, 97 (1996). Thus, by statute, the State Engineer must assure that "[a]ny substituted water shall be of a quality and continuity to meet the requirements of use to which the senior appropriation has normally been put." C.R.S. § 37-80-120(3).

Again, Hydro-ES is not a use contemplated by the regulatory scheme. However, water return is contemplated through augmentation plans and the standards applied in those adjudications are instructive. Augmentation plans are approved by the water court "if such change, contract, or plan will not injuriously affect the owner of or persons entitled to use water." C.R.S. § 37-92-305(3). "Any substituted water shall be of a quality and quantity so as to meet the requirements for which the water of the senior appropriator has normally been used." C.R.S. § 37-92-305(5). Thus, "when no unappropriated water is available, augmentation plans permit junior water right holders to divert water out-of-priority while ensuring the protection of senior water right holders." *Denver Application*.

This leaves the question of how a water court would determine whether the quality of the planned augmentation will be sufficient so as not to harm potentially affected senior appropriators. Water court findings appear to be based heavily upon the factual determinations of each case. This would include assessing the downstream uses and the quality necessary to maintain those uses. And there could potentially be significant research and engineering reports about the movement of the water underground in the specific situation.

The Colorado Supreme Court recently addressed water quality in the similar situation of recharging water for the purposes of storage. *Bd. of County Comm'rs v. Park County Sportsmen's Ranch, LLP*, 45 P.3d 693, 717 (Colo. 2002). Injected water is considered augmentation water when it is used to replace out-of-priority depletions, but it is stored

water when impounded and reserved solely for the party that placed the water there. *Id.* (Kourlis, J., specially concurring and dissenting in part). Despite this difference, both uses involve "basic tenets of Colorado water law." *Id.* at 704. Based upon these tenets, the Court in *Board of County Commissioners* determined that an applicant to store water through artificial recharge would have to meet certain specified conditions. *Id.* at 705. One of the criteria the court specified is that the applicant "must not injure water use rights, either surface or underground, as a result of recharging the aquifer and storing water in it." Quality, as discussed above, is contemplated in the court's injury determination. It would seem to follow that in the case of recharge for augmentation, or drainage, the same quality assessment would need to be performed.[18]

c. Meeting the Standards

The key issue will be what changes occur to the water while it is impounded and whether it will introduce "pollutants" into the underground source when it is drained, or reinjected, back down. This in turn will depend on a number of factors, for example: the length of time the water remains stagnant in the impoundment; composition of material the impoundment is made of; the height of the barrier and whether it permits runoff to enter; whether the surface of the impoundment is closed or open; what kind of airborne pollutants are in the area; and if the water is filtered before reinjection. The type of impoundment will also affect the amount of water necessary to implement the hydro-ES system, (i.e., the evaporation rate). Unlined surface ponds inevitably lose water to under ground seepage and exposed surface area evaporation. The amount of seepage is a function of the soil type and can be relatively high in coarse or sandy soils found on the eastern plains. *Benchbook* at 6-7. Therefore, the cost of compliance with water quality standards would need to be assessed on a case by case basis.

5. Conclusions

Some generalities can be made about site preferences for the hydro-ES system. Designated basins, for a number of reasons, will probably not be advantageous sites for implementation of the system. These reasons include: the depth of wells associated with designated basins are typically too shallow for the necessary head; these are typically over-appropriated water sources; and there is a more involved permitting process. Between tributary and nontributary sources, nontributary sources appear to be more advantageous because of the manner in which water rights are allocated and the

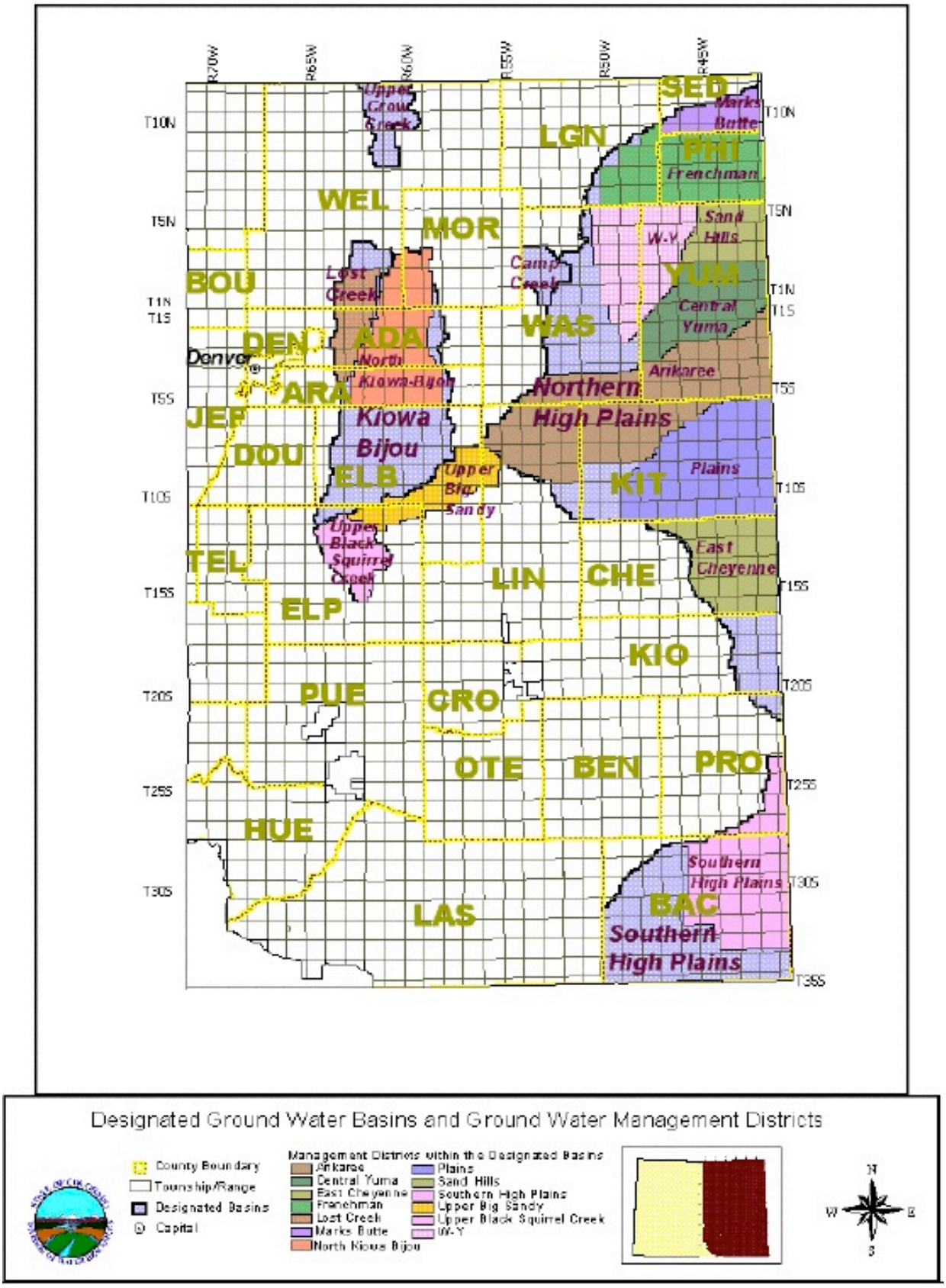
[18] While case law primarily deals with augmentation water returned to the stream, *see Denver Application*, 44 P.3d 1019, C.R.S. section 37-92-305(5) does not appear to contemplate different treatment for tributary ground water and tributary surface water. Furthermore, a purpose of the WRDA was to treat all tributary waters, both surface and ground water, under the same prior appropriation system. *See C.R.S.* § 37-92-102(1)(a).

accounting mechanism for water uses. In addition, wells for nontributary water sources will usually be deeper. However, for testing purposes, substitute supply plans (SSP) are an option for tributary water sources. The SSP provides an expedited permitting process for temporary projects that meet certain criteria.

However, as pointed out in this chapter, these conclusions are generalities and much of the final assessment will depend on the specific characteristics of a particular site, especially in regard to water quality issues. As the engineering team becomes more certain about a specific site for testing and/or implementation of the system, additional legal research will, in all likelihood, be necessary.

Finally, throughout the chapter an attempt was made to include the policies and rationales behind various regulations, laws and standards. This information is intended to provide a framework for the consideration of potential changes to the current regulations and laws to accommodate this novel approach to energy generation.

Attachment A



Attachment B1

C

➞§ 144.26 Inventory requirements.

The owner or operator of an injection well which is authorized by rule under this subpart shall submit inventory information to the Director. Such an owner or operator is prohibited from injecting into the well upon failure to submit inventory information for the well within the time frame specified in paragraph (d) of this section.

(a) Contents. As part of the inventory, the Director shall require and the owner/operator shall provide at least the following information:

(1) Facility name and location;

(2) Name and address of legal contact;

(3) Ownership of facility;

(4) Nature and type of injection wells; and

(5) Operating status of injection wells.

Note: This information is requested on national form "Inventory of Injection Wells," OMB No. 158-R0170.

(b) Additional contents. For EPA administered programs only, the owner or operator of a well listed in paragraph (b)(1) of this section shall provide the information listed in paragraph (b)(2) of this section.

(1) This section applies to the following wells:

(i) Class II enhanced recovery wells;

(ii) Class IV wells;

(iii) The following Class V wells:

(A) Sand or other backfill wells [§ 146.5(e)(8)];

(B) Radioactive waste disposal wells that are not Class I wells (40 CFR 146.5 (e)(11))

(C) Geothermal energy recovery wells [§ 146.5(e)(12)];

(D) Brine return flow wells [§ 146.5(e)(14)];

(E) Wells used in experimental technologies [§ 146.5(e)(15)];

(F) Municipal and industrial disposal wells other than Class I; and

(G) Any other Class V wells at the discretion of the Regional Administrator.

(2) The owner or operator of a well listed in paragraph (b)(1) shall provide a listing of all wells owned or operated setting forth the following information for each well. (A single description of wells at a single facility with substantially the same characteristics is acceptable).

(i) For Class II only, the field name(s);

(ii) Location of each well or project given by Township, Range, Section, and Quarter-Section, or by latitude and longitude to the nearest second, according to the conventional practice in the State;

(iii) Date of completion of each well;

(iv) Identification and depth of the formation(s) into which each well is injecting;

(v) Total depth of each well;

(vi) Casing and cementing record, tubing size, and depth of packer;

(vii) Nature of the injected fluids;

(viii) Average and maximum injection pressure at the wellhead;

(ix) Average and maximum injection rate; and

(x) Date of the last mechanical integrity test, if any.

(c) Notice. Upon approval of the UIC Program in a State, the Director shall notify owners or operators of injection wells of their duty to submit inventory information. The method of notification selected by the Director must assure that the owners or operators will be made aware of the inventory requirement.

(d) Deadlines.

(1) The owner or operator of an injection well shall submit inventory information no later than one year after the date of approval or effective date of the UIC program for the State. The Director need not require inventory information from any facility with interim status under RCRA.

(2) For EPA administered programs the information need not be submitted if a complete permit application is submitted within one year of the effective data of the UIC program. The owner or operator of Class IV well shall submit inventory information no later than 60 days after the effective date of the program.

Attachment B2

➞§ 144.27 Requiring other information.

(a) For EPA administered programs only, in addition to the inventory requirements of § 144.26, the Regional Administrator may require the owner or operator of any well authorized by rule under this subpart to submit information as deemed necessary by the Regional Administrator to determine whether a well may be endangering an underground source of drinking water in violation of § 144.12 of this Part.

(b) Such information requirements may include, but are not limited to:

(1) Performance of ground-water monitoring and the periodic submission of reports of such monitoring;

(2) An analysis of injected fluids, including periodic submission of such analyses; and

(3) A description of the geologic strata through and into which injection is taking place.

(c) Any request for information under this section shall be made in writing, and include a brief statement of the reasons for requiring the information. An owner or operator shall submit the information within the time period(s) provided in the notice.

(d) An owner or operator of an injection well authorized by rule under this subpart is prohibited from injecting into the well upon failure of the owner or operator to comply with a request for information within the time period(s) specified by the Director pursuant to paragraph (c) of this section. An owner or operator of a well prohibited from injection under this section shall not resume injection except under a permit issued pursuant to §§ 144.25, 144.31, 144.33 or 144.34.

Attachment B3

EPA Site Information Request Fact Sheet
Class V Underground Injection Control

Aquifer Recharge and Aquifer Storage and Recovery Wells

The Underground Injection Control (UIC) Program, created under the authority of the Safe Drinking Water Act (SDWA), is a preventative program aimed at protecting existing and future underground sources of drinking water (USDWs). Shallow wells or disposal systems that discharge fluids into the subsurface are known as Class V wells and can be authorized to inject by rule or permit. Class V wells that have the potential for ground water contamination or degradation are usually permitted. Those that do not have a potential to contribute to contamination or degradation of ground water are usually rule authorized, once inventory information has been submitted according to the requirements of 40 CFR 144.26. In addition to the inventory requirements, EPA may, under the authority of 144.27, require the owner or operator of any well authorized by rule to submit additional information to determine if injection activity could endanger a USDW.

Aquifer recharge and Aquifer Storage and Recovery (ASR) wells are Class V wells used to inject water into an aquifer for subsequent use. An aquifer recharge well is used only for injection to replenish the water in an aquifer; an ASR well is used for injection to store water in the aquifer, then to recover the stored water from the same well for a beneficial use.

The following information is needed to evaluate the impact a Class V injection well used for aquifer recharge or ASR will have on the local hydrogeologic system, potential for USDW contamination, and whether a **permit** for this operation, rather than a **rule authorization**, should be required.

Please provide the following information to EPA:

- ☐ Property owner of facility including a physical and mailing address; phone and fax numbers.
- ☐ Operator of facility including a physical an mailing address; phone and fax numbers.
- ☐ Responsible party for the operation, maintenance, and closure of the injection system including a physical and mailing address; phone and fax numbers.
- ☐ Contact persons representing any other regulatory agencies that have an interest in the site; include a physical and mailing address and phone number.
- ☐ Describe the project plan, including
  - ☐ source of injectate,
  - ☐ injection procedures, injection rate, volume and pressure
  - ☐ intended receiving formation,
  - ☐ hydrologeology of the area.
  - ☐ overlying and underlying aquifers that could be impacted,
  - ☐ the effect of injection activities on these aquifers,
  - ☐ public and private wells within 1 mile of the project area,
  - ☐ whether wells are completed in the intended receiving formation, and
  - ☐ the effect of injection activities on these wells.