GENERAL ADMINISTRATION GUIDELINES FOR RESERVOIRS[1]

Colorado Division of Water Resources

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[1] This document was originally prepared under the direction of Hal Simpson, former State Engineer, and further revised under the direction of Dick Wolfe, State Engineer. Several staff members of the Colorado Division of Water Resources, from both the Denver office and the division offices, were instrumental in its development, which also included legal oversight from the Attorney General's Office.

Purpose

These Reservoir Operating Guidelines are a basic practical guide for the staff of the Division of Water Resources ("DWR"), including division engineers, water commissioners and others charged with administering the state's many reservoirs. They reflect the "institutional knowledge" of DWR personnel and the general practice across the state, summarizing DWR's understanding of the statutes, court cases, and administrative rules, policies, and practices related to the storage of water. These Guidelines are intended to provide present and future staff with an understanding of the basic concepts, giving them a common starting point for the many difficult decisions that they must make on a daily basis. We also hope that these Guidelines will be useful to reservoir operators, engineers, attorneys, policy makers and anyone else who seeks a better understanding of general reservoir operations in the State of Colorado.

These Guidelines should not be relied upon for administrative or legal authority, and they are not intended to be or to function as rules or regulations governing the storage of water. Although these guidelines present fundamental examples of reservoir operations, they do not, and could not, cover all of the historic exceptions that exist for specific reservoirs. Given the significant variation in the decrees granting storage rights, in the physical setting and hydrology of the various reservoirs, and in historical administrative practices, nothing in this document should be construed as definitive with regard to any particular reservoir or storage right. Moreover, DWR does not intend for these Guidelines to change the vested rights of any water user. As changes in the law, altered circumstances, and unforeseen situations arise, DWR will periodically update these Guidelines so that they remain as accurate as possible.

Introduction

Storage of water continues to be a critical component of water supply in Colorado. While State Records show needs of agriculture ─ the largest use of water in the state ─ remain fairly constant, water needs for municipal, industrial, environmental and recreational purposes continue to increase. Moreover the administration of interstate compacts, agreements, and treaties, along with the federal government's claims for reserved water rights, are all becoming increasingly important in allocating the remaining waters of Colorado.

The most senior water rights on Colorado streams are direct flow rights, first developed by the earliest settlers in the mid-19th century. Water for direct flow usage was usually plentiful during spring and early summer runoff, but began to diminish in late summer and early fall until it could no longer be diverted. In the most developed areas, such as the South Platte River basin, competition for water led to curtailment of junior rights during the summer and even during the spring in drier years after only several decades of settlement. The seasonal as well as annual fluctuations in water availability, combined with the increasing demand by junior appropriators, led irrigators to capture and store for later use some of the vast quantity of the annual spring runoff from the Rocky Mountain snowmelt. The right to store water was affirmed by the Colorado legislature in 1879 and has become an integral part of the state's water supply.[2]

The task of administering the state's water has been given to the State Engineer, who is appointed by the governor as the Director of DWR, also known as the State

[2] Corbridge, James N. Jr. and Teresa A. Rice. 1999. *Vranesh's Colorado Water Law. Revised Edition.* University Press of Colorado, Niwot, CO. p 53.

Engineer's Office (SEO). The State Engineer appoints division engineers who, in turn, manage local water commissioners, all of whom are charged with administering and distributing the waters of the state, including the determination of the way a water user exercises a storage priority.

General Administration Principles

One Fill Rule

Water may either be stored under a water right under the priority system or in some situations contractually – for instance a user may be able to store reusable water in a reservoir. The one fill rule concerns the storage of water under the priority system. Under Colorado law, a water user may store water whenever the water is physically available, its water right is in-priority, and the decree for the water right has not been filled. Under Colorado Supreme Court decisions, a user is entitled to only one filling of a reservoir water right in any one year unless a user has a water right that provides for a refill and/or additional storage or free river conditions exist (i.e. no downstream shortage of water to meet the demands of all users for their decreed water rights).

In creating this rule, courts did not define a storage year. Given that irrigation reservoirs typically begin filling in the fall, after irrigation has been completed, the SEO, starting with State Engineer M.C. Hinderlider[3] in 1936, adopted a "seasonal year" of November 1 to October 31. The Colorado Supreme Court has recognized this seasonal year for irrigation reservoirs. This is the presumed seasonal year for a majority of reservoirs unless the decree specifies a different date. Subsequently, different

[3] Letter from M.C. Hinderlider, State Engineer, to all Division Engineers and Water Commissioners dated May 11, 1936. Please see Appendix for document.

seasonal years have been adopted by some municipal water suppliers at a set date in the spring, usually April 1 prior to spring runoff when their reservoirs are generally near their lowest point. While this date can vary between municipal suppliers, it cannot be changed once established.

Under the one-fill rule, a reservoir user may only use a storage right to "call" for water during the seasonal year if the decree for the storage right has not yet been filled during that year. (When a user with a decree is short water to meet their decreed demand, the water commissioner will place a "call" or "curtail" users such that no user junior to the "call" in a reach of river may divert in that reach of river.) If the storage right has been filled, the reservoir owner must wait until the beginning of the next seasonal year to place a call for additional water. For example, if a reservoir with a seasonal year beginning November 1 has received the full amount of water it is entitled to under its storage right by June 1, then the user must wait until the next November 1 to begin filling again under that right. In addition, any diversions prior to November 1 will be curtailed if there is a call on the river, whether junior or senior to the storage right.

The reservoir owner could, however, divert water under free river conditions. Alternatively, the reservoir owner could store under a junior priority (either a refill right or separate storage right) or store foreign water. For purposes of this document, the term "foreign water" refers to all water located in a given reservoir except priority storage water associated with the particular reservoir and water stored under free river. Examples of foreign water include: historical consumptive use credits from changed water rights, transbasin water, nontributary water, priority (or free river) water stored by

another structure and relocated to the subject reservoir, recaptured return flows from fully consumable water such as lawn irrigation return flows, etc.

Carryover

Generally, any water remaining in a reservoir at the end of the seasonal year is called "carryover water," and is credited to the next year's fill. This will limit the amount of new water to be put into storage during next year's seasonal year. For example, if a reservoir's decreed and physical capacity is 100,000 acre-feet and at the end of seasonal year 1 it contains 60,000 acre-feet, then the carryover would be 60,000 acre-feet for the next year, seasonal year 2. In this situation, the Division Engineer or Water Commissioner would limit the amount the owner could divert and store in seasonal year 2 to 40,000 acre-feet because the 100,000 acre-foot water right is filled once the 40,000 acre-feet is stored. The 40,000 acre-foot limit would exist even if the owner released water from storage during seasonal year 2 and created additional capacity. In this situation, this additional capacity can only be refilled under free river conditions since no other storage rights exist.

Moving from a reservoir with a single storage right to the next simplest case where a single owner has a senior storage right and a junior enlargement for the same uses, the Division Engineer may account for reservoir storage using the principle of "first in, first out" so long as the decrees do not have contrary provisions. [4] For instance, suppose an irrigation reservoir owner has a senior right for 5,000 acre-feet and a more junior right for 9,000 acre-feet to fill a 14,000 acre-foot reservoir. In year 1, the reservoir

[4] State Engineer's "Written Instruction and Order 2007-02: Instruction and Order Concerning the Administration of Storage Rights by Seniors First" signed May 31, 2007 by Hal D. Simpson (http://water.state.co.us/DWRIPub/Documents/wio2007-02.pdf).

starts empty, is completely filled under the two rights, and releases 7,500 acre-feet during the irrigation season leaving 6,500 acre-feet in the reservoir. Under the “first in, first out” methodology, the reservoir owner may fill 5,000 acre-feet under the senior fill right and the remaining 2,500 acre-feet under the junior right in year 2.

In more complex situations, where multiple owners, types of uses or places of use are involved, the user(s) must keep separate accounts of the various water rights. A basis for keeping separate accounts must first be established by the owner(s) and approved by the Division Engineer. If separate accounts for each water right are tracked then water stored under a junior right would only be carried over into the junior right’s account. In complex situations, all carryover is credited to the most senior storage right in the reservoir at the start of the subsequent year if separate accounts for each priority are not tracked.

Similarly, any foreign water that is stored in a reservoir that is remaining in the reservoir at the end of the season is assumed to be priority water and credited to the most senior storage right unless this water is tracked separately by the reservoir owner. Therefore, detailed accounting of all the different types of priority and foreign water stored in a reservoir is important to avoid limiting the amount of water that can be stored under the most senior storage right.

If the water right for a reservoir allows water stored in priority to be relocated in another structure, the amount of priority water that was relocated to another structure still remaining in that structure at the end of the season counts against the storage right it was originally stored under. This is done to assure that a user does not use a senior right to fill more than one reservoir. For example, assume that municipal reservoir A

has a right for 1,000 acre-feet which is stored in priority during year 1. Also assume during year 1 that 400 acre-feet of the water stored in reservoir A is released and relocated in reservoir B and the remaining 600 acre-feet is released to municipal use. In this case, reservoir A would be entitled to store 600 acre-feet in year 2 not 1,000 acre-feet. The user would only be able to fill the remaining 400 acre-feet in reservoir A in the seasonal fill year subsequent to its release from reservoir B for use. Further, there may also be limits placed on how much the user may store in reservoir B depending on the situation.

Decreed versus Physical Capacity

Given the large investment required for reservoir construction, a potential reservoir owner generally receives a decree for a conditional water right to store an amount of water prior to construction. Upon completion of the reservoir, the actual physical capacity of the reservoir may be different from the decreed capacity. This raises the question of whether the physical capacity or the decreed capacity controls the administration of the amount of water that can be stored. If the physical capacity is less than the decreed capacity, then the allowed amount of fill will be based upon the physical capacity rather than the decreed capacity. For example, when a reservoir is physically full at 50,000 acre-feet and has a decreed capacity of 60,000 acre-feet then the reservoir has reached its one fill and cannot come back in later in the season when space becomes available to fill the additional 10,000 acre-feet. The difference between the decreed capacity and the lower physical capacity is subject to abandonment (or if conditional, to cancellation for failure to prove diligence) unless the reservoir owner

shows intent to make subsequent modifications to enlarge the reservoir to the originally decreed capacity.

When physical capacity is greater than decreed capacity, a fill is based upon the decreed capacity. To use the additional capacity, the reservoir owner must adjudicate a new water right for the difference, use other foreign water legally available for storage in the reservoir, or hope to fill the difference under free river conditions.

Storage Under a Conditional Water Storage Right

Pursuant to 37-92-103(4)(a), beneficial use includes the impoundment of water for storage for any purpose for which an appropriation is lawfully made. As such, a decreed conditional water storage right can be made absolute for all decreed purposes to the extent of the volume of the appropriation that has been captured, possessed, and controlled at the decreed storage structure. CRS 37-92-301(4)(e).

For a newly constructed reservoir, to which a conditional water storage right has previously been decreed, the owner of said reservoir and water storage right simply has to show how much water can be and has been stored in the reservoir. However, in order to store water under a conditional water right in a reservoir with absolute water right(s) already decreed to it for the same purpose(s), separate accounting of each of the water rights must be maintained so that the water right owner(s) can show if and when the conditional water right was stored in what amount. Absent such evidence, the conditional water right cannot be made absolute. As with a storage structure decreed with only absolute water rights, senior water rights shall be considered as having been stored first. For example, consider a reservoir that has a decreed right for 1,000 acre-feet of storage for municipal uses that has been made absolute and the reservoir has

recently received a decree for a junior refill right of 1,000 acre-feet for municipal uses. The reservoir may store under the junior conditional right, and make that right absolute, but only to the extent that the reservoir owner can show that the junior water was stored after the entire 1,000 acre-feet was stored under the senior right, and limited to the amount that the senior right was released for its decreed beneficial use. Any amount of the senior right that was released for a use other than its beneficial use would remain in the reservoir as a paper fill, as further described in the Paper Fill, Including Bookover section below. In this example, if the reservoir releases 100 acre-feet of water stored under the senior right for municipal uses and another 100 acre-feet for the non-decreed use of enhancing stream flows, the reservoir would be considered to be filled with 800 acre-feet of physical water and paper filled with another 100 acre-feet under the senior right. The reservoir could store and make absolute only 100 acre-feet under its conditional junior storage right.

Storable Inflow

Storable inflow is the amount of water that is physically and legally available for storage in a reservoir under a particular water right. After the beginning of the seasonal year, all storable inflow must be accounted against the storage right in order to protect other water users, whether or not the reservoir owner actually stores the water. This assures junior water right users that they will be able to divert water in the amount and time that they could have if the senior storage right had filled with all water available to it under its storage priority. For example, if a reservoir operator with a decree to store 20,000 acre-feet of water chooses to bypass 5,000 acre-feet of water that they would otherwise have been able to store in-priority, the Division Engineer considers the

bypassed water “storable inflow.” Accordingly, the Division Engineer would credit the bypassed water toward the fill of the reservoir and would consider the storage right to be filled when the reservoir physically contains 15,000 acre-feet of water stored under the storage right.

Storable inflow also includes any out of priority storage by upstream junior storage rights (further discussed in the Out of priority Upstream Storage Statute section below). To track the amount of storable water that has not actually been stored, for whatever reason, the Division Engineer uses what is known as a “paper fill.” A paper fill is an accounting mechanism whereby storable inflow is charged against a storage water right either because the reservoir owner elected not to physically divert or store water under that right or a junior upstream reservoir diverted the storable inflow out of priority. A detailed discussion of paper fill, along with some of the exceptions to the general principle of storable inflow, can be found in the Paper Fill Including Bookover section below.

Generally, a storage right is filled when carryover storage under that water right plus storable inflow, whether actually diverted or only a paper fill, equals the decreed amount of the storage water right or the total physical capacity of the reservoir (which may be restricted due to dam safety or flood control concerns), whichever is less. A reservoir user may continue to physically store water under a fill right even if it has gone out of priority and is called out if it comes back into priority and has not already been filled. In this case, storage is limited to the volume unfilled by the storage right when the reservoir went out of priority. Even if there is capacity to store, the Division Engineer will not allow the reservoir operator to continue to store water beyond that point, unless

free river conditions occur, the reservoir has supplemental storage rights that come into priority (such as a refill right or junior storage rights), or the reservoir owner is storing foreign water. Water users may divert beyond the measure of their decrees during free river conditions because this does not infringe upon the rights of other water users.

The water level in a reservoir does not have to be rising or increasing in order for storage to occur and new water can be placed into storage in a reservoir at the same time as previously stored water is being released.

Refill Rights

Some reservoirs operate under decrees that provide for refill rights. A refill right typically has a later priority than the original storage right. However, if the reservoir owner applied for a refill right in the original application, the owner may have been given a right to store under the same priority of the original appropriation after the reservoir achieves its first fill and capacity becomes available. Available capacity for a refill right in a reservoir is created by evaporative and seepage losses in addition to actual storage releases. Storage that is held as the subject reservoir's water right at another location is not included in the available refill capacity of the subject reservoir. While this space cannot be filled under a refill right until the storage held at the other location has been released and put to use, the subject reservoir could be filled under a separate junior storage right for the subject reservoir, under free river conditions or with foreign water.

In the case of a conditional refill right, the owner of the reservoir and water storage right must show how much water has been stored as a refill in order to make all or a portion of the right absolute.

Paper Fill, Including Bookover

As discussed above, a paper fill is an accounting mechanism whereby storable inflow is charged against a storage water right either because the reservoir owner elected not to physically divert or store water under that right or a junior upstream reservoir diverted the storable inflow out of priority. A paper fill may also be used in the accounting for a reservoir if it releases water stored in priority without using the water for its decreed beneficial use. Some examples of paper fill are described below, followed by a discussion of some of the exceptions to the general rule. These are not meant to be exhaustive on this issue, but should provide an understanding of the most typical situations.

Examples of where a paper fill would be used:

1. A reservoir may have multiple rights. For example, it may have a senior storage right and a junior storage right for additional decreed uses. If water is stored under the junior right before the senior right is filled, then a paper fill for the amount stored and credited under the junior right will also be charged against the senior storage water right, to the extent that it remains unfilled. Once the senior right is filled (either physically or on paper), the junior right may continue to store under its own priority unless it is (or until it becomes) filled.
2. A paper fill is charged against a water storage right when a reservoir cannot be filled to its decreed capacity because of a flood control limitation on storage (unless flood control is a decreed beneficial use) or because of a State Engineer storage restriction on the dam.

3. A paper fill is charged if sedimentation has occurred limiting the reservoir's physical capacity.
4. A paper fill is charged when actual storage in the reservoir includes foreign water that limits the capacity of the reservoir to fill under a senior priority unless the owner of the senior priority books over the foreign water in the reservoir to the senior right at the rate that the senior right would have filled the space taken up by the foreign water.
5. A paper fill is charged for any exchange on natural flow into the reservoir for foreign water. For example, assume an on-stream reservoir user exchanges 20 cfs of foreign water into the reservoir by making release of a substitute supply downstream at the same time the user is entitled to fill the reservoir in priority. In this example, the reservoir would be paper filled for the 20 cfs or approximately 40 acre-feet each day the exchange occurred.

   In examples 1 – 5 above, the paper fill remains throughout the entire fill season. At the end of the fill season, the physical amount of water is booked over to the senior right and the paper fill is removed.

6. A reservoir will be considered to be paper filled beyond the fill season in the amount of water that is released for a use that is not a decreed beneficial use. For example, consider a reservoir decreed for only municipal uses that has filled to its capacity of 1,000 acre-feet. The reservoir releases 100 acre-feet to enhance instream flows or to the incidental benefit of any other water user on the

river, which release becomes waters of the state and is allocated according to priority of water rights on the river. The reservoir would remain physically full in the amount of 900 acre-feet and paper full in an additional amount of 100 acre-feet.

Additionally, this requirement that a reservoir remains paper full also applies to releases of storage rights that have been made absolute only by virtue of their storage, as allowed by 37-92-301(4)(e). For example, consider a reservoir decreed for 1,000 acre-feet of storage for municipal uses under a senior storage right and for an additional 1,000 acre-feet of storage for municipal uses under a junior refill right. The senior right has 500 acre-feet of storage that has been made absolute and 500 acre-feet of storage remains conditional. The entire junior refill right is condtional. In one year, the reservoir fills to 1,000 acre-feet and makes the conditional 500 acre-feet of the senior right absolute, as allowed by 37-92-301(4)(e). With no immediate use for that 500 acre-feet of stored water that was made absolute, the reservoir releases it and then fills again under the junior right. The reservoir will be considered physically full in the amount of 500 acre-feet and paper full under the senior right in an additional amount of the released 500 acre-feet until such time as an amount of storage water greater than the 500 acre-feet previously made absolute is put to a decreed beneficial use. This applies to refill rights as well. That is, when rather than a conditional junior right, the right is a conditional *refill* right.

In this example 6, the paper fill remains not only throughout the entire fill season but through subsequent seasons until such time as the reservoir can physically fill the paper fill amount under free river or futile call conditions.

For on-stream reservoirs, if there is no diversion and storage, a paper fill is charged at the rate of storable inflow to the reservoir. For off-stream reservoirs, the paper fill of the senior right is charged at the rate at which the user could have legally and physically filled under the senior right. For example assume the following:

a. there is 400 cfs stream flow at the headgate of the feeder ditch for off-stream reservoir A
b. reservoir A is empty
c. reservoir A has a fill right for 300 cfs that is in priority
d. the capacity of the ditch to fill reservoir A is 250 cfs
e. the reservoir operator is diverting 200 cfs

Under these conditions, the reservoir would be paper filled at the rate of 50 cfs or approximately 100 acre-feet per day. If an off-stream reservoir is physically full due to storage of foreign water, for example, the rate of paper fill does not occur instantaneously but at a rate that is available at the reservoir from the decreed source of supply. However, if the user does not track the necessary information, then the reservoir is paper filled immediately.

Examples of where the Division Engineer has the discretion to not impose a paper fill:

There are times when water will not be counted as storable inflow and used to paper fill a reservoir. Examples of when water will not be counted as storable inflow and used to paper fill a reservoir are when the owner of the water right releases water or bypasses storable inflow for any of the following reasons:

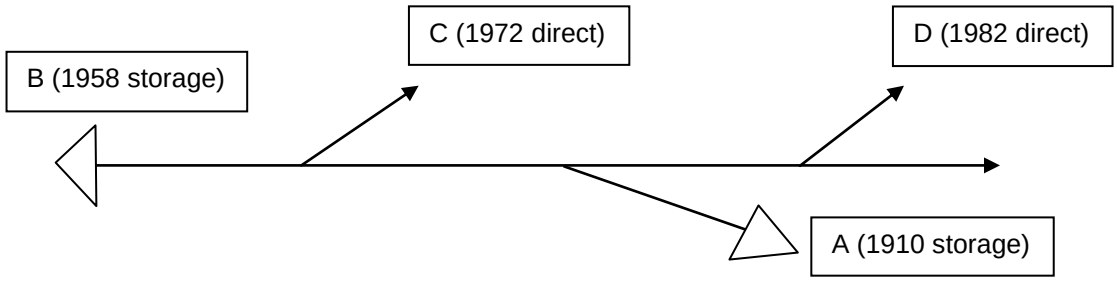
1. the reservoir is under an order from the State Engineer due to a storage restriction,
2. there is a legitimate need to dredge the reservoir,
3. there is a legitimate need to repair and maintain feeder ditches,
4. there is a legitimate need to perform maintenance on outlet works,
5. when winter icing prevents the reservoir operator from impounding and controlling the inflow,
6. there is a legitimate need to bypass water of poor quality,
7. to accommodate other necessary activities at the discretion of the Division Engineer, with consideration of the severity of the need.

In each of these situations, upon approval of the Division Engineer the reservoir will not be subject to a paper fill. In addition to the examples above, "paper fill" is also used in applying the out-of-priority storage statute, as discussed in the following section.

Out of priority Upstream Storage Statute

As early as 1924, State Engineer Hinderlider allowed upstream reservoirs to fill "as early as possible and depend, to some extent, on the return flow to complete the filling of the reservoirs farther down the river." [5] In 1969, the General Assembly codified this longstanding practice in what is now C.R.S. § 37-80-120. Presently, on the South Platte, out of priority upstream storage may occur against a storage water right only in accordance with a plan approved by the Division Engineer. [6] To date, no one has been given approval of such a plan. While other Divisions have not adopted a formal process, some of the considerations that would be taken into account prior to allowing out of priority storage are spelled out in the example below.

Assume structures A and B are reservoirs (owned and operated by different entities) with storage rights and structures C and D are ditches with direct flow rights. All structures are situated on the river as shown below:



In our example, Reservoir A has a decreed and physical capacity of 1,000 acre-feet and has the senior right (1910) on the river, and Reservoir B has a decreed and physical capacity of 200 acre-feet and a 1958 right. Assume that as of March 1, Reservoir A has

[5] Letter from M.C. Hinderlider, State Engineer, to W.B. Gaumer, President, Farmers Reservoir & Irrigation Co. dated November 17, 1924. Please see Appendix for document.

[6] Letters from James R. Hall, Division Engineer, to Division 1 Water Users dated October 6, 2005 and July 27, 2006 regarding South Platte Non-Irrigation Season Administration. Please see Appendix for documents.

diverted 820 acre-feet into storage, and that Reservoir B has been allowed (by approval of the Division Engineer) to divert 200 acre-feet into storage even though its right is junior to Reservoir A's right and Reservoir A has not yet filled (i.e. Reservoir B has stored 200 acre-feet out of priority). If the transit losses to Reservoir A from Reservoir B are 20 acre-feet, then Reservoir A is paper filled to 1,000 acre-feet and no longer able to place a call. At this point, Ditch C would be in priority and thus could divert water and make a call if necessary. Likewise, Ditch D would be entitled to make a call curtailing the diversion of Reservoir A.

Reservoir A would only be allowed to divert additional water to storage under free river conditions. As for Reservoir B, it could continue to divert water under its 1958 water right while at the same time releasing the out of priority water stored and delivering it past Ditch C to Reservoir A even if ditches C or D placed a call. This water then replaces Reservoir A's paper fill with actual water and decreases the risk to Reservoir B that it will be required to release its water to Reservoir A later in the season when it is no longer able to store water under its 1958 priority. In a situation where more than one reservoir is storing out of priority upstream of Reservoir A, all upstream out of priority storage must be aggregated to determine when Reservoir A is paper full.

Administration of the upstream storage statute is further complicated by the requirement to account for any seasonal transit loss changes within the reach from the junior to the senior reservoir and within the feeder ditches of the senior reservoir between the time of out of priority storage and the time the water is released to the senior reservoir. The junior reservoir storing out of priority is responsible for payment of

any increase in transit losses should the senior reservoir not fill assuring the senior reservoir receives the full amount to which they were paper filled.

Due to these complexities required to assure non-injury when storing out of priority, upstream out of priority storage is typically not allowed. In some cases, however, out of priority upstream storage is unavoidable. For example, winter conditions may prevent access to some small high mountain reservoirs for real time operation and may prevent real time measurement of winter inflows due to inaccurate measurements caused by ice cover.

Evaporation

Reservoirs are categorized based on their location from a natural stream as either on-channel or off-channel. When a reservoir is constructed on a natural stream bed (on-channel) it causes an increase in losses to the stream system due to the increase in free water surface area of the stream. When an on-channel reservoir is in-priority and filling, the operator does not have to pay back the stream for this increased loss. However when the reservoir is not filling in priority, the operator is required to release stored water to offset the amount of this increased loss to assure that the total natural flow is passed through the reservoir as if the reservoir did not exist. Usually, the release for this loss is accomplished by lowering the reservoir stage to correspond to the calculated net depletion amount. If daily administration is not practical because of the limited size of a reservoir surface, releases for this loss are often aggregated and made on a monthly rather than daily basis. If more than one water right is in a reservoir or the reservoir contains foreign water, the reservoir owner may specify which type(s) of water to release to account for evaporation.

When predicting the amount of future evaporation to be covered by an on-channel reservoir, the average gross evaporation (free water surface) must be calculated based upon average evaporation atlases in NOAA Technical Report NWS 33[7] and the maximum surface area of the reservoir (unless otherwise decreed). The total gross evaporation estimate from NOAA shall be distributed to all months. The monthly distribution for elevations below 6500 feet msl is: Jan-3.0%, Feb-3.5%, Mar-5.5%, Apr-9.0%, May-12.0%, Jun-14.5%, Jul-15.0%, Aug-13.5%, Sep-10.0%, Oct-7.0%, Nov-4.0%, and Dec-3.0%. The monthly distribution for elevations above 6500 feet msl is: Jan-1.0%, Feb-3.0%, Mar-6.0%, Apr-9.0%, May-12.5%, Jun-15.5%, Jul-16.0%, Aug-13.0%, Sep-11.0%, Oct-7.5%, Nov-4.0%, and Dec-1.5%.[8]

When determining the actual evaporation based on the actual surface area of the reservoir, more site-specific information, if available, may be used or may be required depending upon decree conditions, size of reservoir, impact of reservoir evaporation on other users, and/or availability of data. Any site-specific estimate is subject to evaluation and must be approved by the Division Engineer before use. During times when site-specific instrumentation goes down, NOAA values must be used until the instrumentation is operating again. NOAA values must also be used if site-specific instrumentation is inaccurate, has not been approved by the Division Engineer, or does not exist.

For months during which the surface is completely covered with ice during the entire month, the gross evaporation may be calculated as zero for that month, without

[7] Farnsworth, Richard K., Edwin S. Thompson, and Eugene L. Peck. 1982. *Evaporation Atlas for the Contiguous 48 United States.* NOAA Technical Release NWS 33. U.S. Department of Commerce, National Oceanic and Atmospheric Administration, National Weather Service.

[8] State Engineer's "Policy 2003-2: Implementation of Section 37-92-308, C.R.S. (2003) Regarding Substitute Water Supply Plans" signed August 12, 2003 by Hal D. Simpson http://water.state.co.us/DWRIPub/Documents/policy2003-2.pdf

redistributing that month's percentage into the remaining months of the year. The applicant may prorate the estimated evaporation for months during which the surface is covered with ice over a portion of the surface and/or during a portion of the month. The user must provide evidence of ice cover for that month. For projection purposes only, the ice cover period may be estimated as that period during which the mean air temperature is below 32 degrees Fahrenheit. The Division Engineer, however, will assess actual losses based on actual conditions.

The gross amount of evaporation can be offset for on-stream reservoirs by any evaporation from previously existing free water surfaces, effective precipitation that would have been consumed by any native vegetation, and/or groundwater consumption due to any native phreatophytes. Essentially, statute allows on-stream reservoir owners the right to reduce their required evaporation releases for any natural depletion to the stream that would have occurred if the reservoir were not in existence (37-84-117 (5) C.R.S.). An analysis of the pre-existing conditions must be performed to determine what reduction to the gross amount of evaporation will be allowed. In addition, a user may be required to keep track of actual site-specific precipitation in determining the reduction to the gross amount of evaporation for large reservoirs. Typically, the SEO has assumed for a native site (without phreatophytes) with a deep ground water table that 70% of the total precipitation is either consumed or goes to soil moisture storage.[9]

Seepage

As soon as water stored in a reservoir or in the process of being delivered by a ditch seeps through the bottom or sides of the structure, it is considered waters of the

[9] Wolfe, Dick and Richard L. Stenzel. 1995. "Evaporation." *Evapotranspiration and Irrigation Efficiency.* Proceedings of the 1995 Seminar held in Arvada, CO on October 10-11, 1995. Please see Appendix for document.

state subject to the prior appropriation doctrine. This applies to water that cannot be "re-used" as well as fully-consumable water that is no longer under the dominion and control of the user. A reservoir owner may not recapture seepage water from a reservoir as part of the original storage right unless specifically allowed by decree and may not recapture fully consumable water without dominion and control accounting approved by the division engineer. An appropriator of seepage water cannot require or demand that the seepage continue as the reservoir or ditch owner is generally allowed to make improvements that may eliminate or reduce the seepage.

Absent a specific decreed appropriation to the contrary, water flowing from the toe drain of a dam associated with a reservoir is considered "seepage". Toe drain outlets must drain freely without restriction to protect the dam and must be discharged without use and separate from the measured release from the reservoir. Structures oriented such that the toe drain flow cannot be separated from the measured reservoir release must quantify the toe drain flow in a manner approved by the division engineer and must subtract the toe drain flow from the measured, comingled release. Toe drain flow from on-stream reservoir dams may be counted as an "accretion to the stream flow resulting from the existence of a reservoir" that is used to offset evaporative losses in accordance with §37-84-117 (5), C.R.S. provided the user relinquishes all dominion and control over the released toe drain flow.

Volumetric versus Gage Height Decrees

The amount of storage water could be defined in a decree as a specific volume or up to a specific gage height in the reservoir. A "volumetric" decree is filled once the total volume of water as measured into the reservoir (plus any carryover and paper fill

volume) reaches the decreed amount or physical amount, whichever is less. A “gage height” decree is filled once the level in the reservoir (plus any paper fill amount) reaches the decreed gage height. The difference between gage height and volumetric decrees is that while filling under these two types of rights, evaporation and seepage does not count against the gage height decree but does count against the volumetric decree. (Seepage may or may not count against an on-stream volumetric decree depending on how the inflow is determined.) Once a gage height decree is filled, however, it is then treated just like storage under a volumetric decree for an off-channel reservoir where the storage in the reservoir suffers evaporative and seepage losses. Absent a refill right, foreign water or free river conditions the additional space created by these losses cannot be replaced.

It is important to have a good stage-capacity curve even for reservoirs with gage height decrees. If the reservoir is curtailed due to a call prior to being filled, the stage-capacity curve can be used to determine how much water the reservoir still has under its water right should it come back into priority. If the gage-height decree comes back into priority, it can continue to fill up to the volume associated with the difference between the gage height when it was curtailed and the completely full gage height.

The following is an example of a gage-height decree for Julesburg Reservoir decreed in civil action no. 944:

> It is therefore Adjudged and Decreed, that the said Julesburg reservoir be allowed to have stored in it from the South Platte river by means of the Harmony ditch No. 1, as enlarged and extended as a feeder to said reservoir, and for the benefit of the party or parties aforesaid under and by virtue of said appropriation by construction No. 1, so much water as is necessary to fill said reservoir to a depth of forty-seven (47) feet above the bottom of the lower discharge conduit from said reservoir, being an estimated capacity of one billion two hundred and twenty-seven million

> four hundred and forty-five thousand cubic feet, which appropriation of water for said storage purposes and other beneficial uses took effect on and dates from the 12th day of February, 1904.

The gage height of 47 feet above the bottom of the lower discharge conduit dictates when this reservoir has reached its one fill under this right despite the decree giving an estimated volume associated with this gage height.

Transit (Conveyance) Losses

Transit losses are losses to the stream due to seepage, stream evaporation, or plant consumption. The General Assembly requires the State Engineer to determine and charge transit losses (also referred to as “conveyance losses”) for the delivery of water released from storage. Transit losses vary depending upon channel size, elevation, stream gradient, vegetation, bank storage, time of year, location, distance, and other factors.

Exchanges

In an exchange, water is generally provided at one point on a stream so that it may be diverted out of priority at another point upstream. Reservoirs may be part of exchanges. Some examples of possible exchanges that involve reservoirs include:

- release from a downstream reservoir in exchange for diversion into an upstream reservoir
- release of reusable effluent from a downstream treatment plant in exchange for diversion into an upstream reservoir
- release from a downstream reservoir in exchange for diversions into an upstream ditch

- consumptive use credits from a downstream changed direct right are left in the stream to replace water diverted in an upstream reservoir

As with all exchanges, the exchange must be approved by the Water Commissioner or Division Engineer and the release downstream timed so that the flow will be the same as if the upstream diversion had not taken place. Further, when a water right holder releases water allowing an upstream diversion by exchange, the diverted water takes on the "character" of the released water. For example, the water stored in a reservoir in exchange for the release of reusable water from a treatment plant would "take on the character" of the reusable effluent and the water released from the treatment plant becomes the same character as the water that was physically stored in the reservoir (either natural stream or delivery water).

Temporary Detention (72-Hour Rule)

Direct water rights may be temporarily detained for up to 72 hours in order to allow more efficient or effective beneficial use of the water. Examples of such detention would be ponds used to receive delivery of a direct flow irrigation water right that is then applied by a sprinkler or temporarily detained and slugged out through a ditch (operational, head stabilization, equalization or flow regulating ponds), or the use of forebays or regulating structures associated with municipal operations. A specific storage right generally will not be required as long as the water is held for less than 72 hours and the detention is for purposes of allowing for more efficient or effective beneficial use of the direct water right. Absent a storage right, free river conditions, or the use of a *Post Wildland Fire Facilitiy*, as addressed by SB15-212 (section 37-92-602(8), C.R.S.), all water, including storm water, must be released within 72 hours.

Ponds that intercept ground water are subject to additional limitations and all dams associated with the construction of ponds must comply with all requirements of the State of Colorado's Dam Safety Rules and Regulations.

If storm water is not diverted or captured in priority, by exchange or under a substitute water supply plan or decreed plan for augmentation, Colorado Water Law requires it to be released. The State Engineer's current policy requires that all detained water be released to the stream system within a maximum of 72 hours after detainment.

Surcharge Storage

Surcharge storage means the volume of water that may be impounded but not retained within a reservoir between the normal spillway and the crest of the dam. This surcharge is not considered part of the reservoir fill under the water right. The reason for this is that the reservoir operator does not control water in surcharge and by definition in CRS 37-92-103(10.8) storage is the impoundment, possession, and control of water by means of a dam. Unless free river conditions exist or an exchange is made to "recolor" (or change the character of) this water, surcharge storage must be released within 72 hours. Operation of the reservoir outlet works may be required in order to release the surcharge within 72 hours.

Adequate Measurements

In cases where the reservoir right is limited to gage height, it is important that a staff gage that is easily readable be installed in the reservoir. A stage-capacity table (a table that reflects the capacity or volume of storage in the reservoir based on the stage or elevation of the water in the reservoir) has also usually been developed in conjunction with obtaining an absolute right for the reservoir. As long as the decree for

the reservoir covers complete filling of the reservoir and no other water is stored in the reservoir when the reservoir reaches the full level as measured on the elevation/staff gage, then the reservoir is considered full under that right. See additional information above in the Volumetric versus Gage Height Decrees section.

Measuring inflow with a decree specifying a staff gage height is more difficult when releases are being made at the same time that water is being stored. In this situation, a reservoir operator may be required to measure via gages all inflow to and outflow from the reservoir to determine the storage under the right. Alternatively, the Division Engineer or Water Commissioner may allow the use of a "computed inflow." In computing inflow, reservoir operators measure the outflow and the change in storage (as measured by the staff gage) over the same period of time and account for net surface water evaporative losses. This method accounts for all inflow, including underflow, unmeasured tributaries, and precipitation on the reservoir's surface.

In cases where the amount of storage allowed is limited to a volume and not a specific gage height (volumetric decrees), an accurate measure of all inflow is generally necessary. This is done by use of a flume or a weir with a continuous recorder. For volumetric decrees, losses due to evaporation or seepage from the reservoir cannot be made up under the storage right.

Recording is often midnight to midnight, but historical and pragmatic practice may allow recording to be 8am to 8am or another 24-hour period. Reservoir operators must report this recorded information as required by the Division Engineer. Reporting requirements may vary depending on the time of year.

Accounting Principles

Accounting requirements differ depending on the administrative requirements of a reservoir. In simple situations, no independent accounting from the user would be required when the reservoir can be administered without such accounting. The reservoir is simply considered full when it reaches its decreed limit after accounting for carryover. For more detail see section Decree versus Physical Capacity above (as described separately in this document). In these cases, the only record is often the Water Commissioner's record of diversions and storage contents.

Accounting does become necessary when a reservoir goes into and out of priority prior to being filled or the user is releasing water prior to being filled. As described earlier, accounting is also required if there is more than one storage decree associated with a reservoir (especially if the decrees are for different purposes) or foreign water is stored in a reservoir. In the case of more than one storage decree for different uses or places of use, the user may keep track of each type of water in the reservoir independently. If the user does not provide accounting, all carryover is charged to the senior most right as discussed earlier (except when the first-in first-out principal is applied) and takes on the character of the senior right.

In some cases, a reservoir has been designated as an alternate place of storage for another storage right. In this case, the user must keep track of the different types of water in the reservoir. If a particular right is stored in more than one reservoir (either as an alternate place of storage or relocated to other reservoirs), then the user must account for storage under this right in all reservoirs so as to document compliance with the decree(s).

Administrative Accounts (Owe-The-River Account)

It is sometimes necessary to use water balance type accounting when it is difficult to directly measure all of the inflow into an on-stream reservoir. With water balance accounting, the inflow is determined by measuring outflow (including releases and evaporation) and change in storage during the day. The determination of inflow is a day in arrears because of the dependence on change in storage information. An administrative account is used to keep track of "errors" in release amounts because of not knowing the inflow until a day late. For example, assume the following:

a. Reservoir A is on stream and cannot store because it is out of priority.
b. The users are releasing 10 cfs (approximately 20 acre-feet/day) from storage in the reservoir for use.
c. The Division Engineer or Water Commissioner is releasing an additional 5 cfs (approximately10 acre-feet/day) as that is the assumed natural inflow to the reservoir.
d. The net evaporation from reservoir A is 1 cfs (approximately 2 acre-feet/day).
e. The reservoir declines approximately 20 acre-feet between day 1 and day

On day 2, the Division Engineer/Water Commissioner and/or user will use water balance accounting to determine that the actual inflow between day 1 and day 2 was approximately 12 acre-feet (Inflow = Releases (30) + Evaporation (2) + Change In Storage (-20)) or 6 cfs rather than the estimated 5 cfs. In this case, an administrative account or "owe the river account" would be approximately 2 acre-feet. The Division Engineer/Water Commissioner would adjust the release on day 2 to attempt to continue

to release natural inflow plus release the 2 acre-feet in the “owe-the-river” account. The same steps would be taken each day to adjust for either too high or too low an estimate of the actual inflow each day and to keep the administrative account as near to zero over time as possible.

Enforcement Principles

Installation of Measurement Device or Reporting Orders

Generally, the Division Engineer or Water Commissioner verbally directs reservoir users concerning the measurement devices and reporting necessary to administer reservoir rights. In accordance with 37-92-502 (5) (a), C.R.S., the State Engineer and the Division Engineers also have formal authority to order any owner or user of a water right to install and maintain at such owner's or user's expense necessary meters, gauges, or other measuring devices and to report at reasonable times to the appropriate Division Engineer the readings of such meters, gauges, or other measuring devices. Users are subject to liability for impacts to other users from improper storage and subject to paying legal fees and costs of the State in enforcement efforts associated with measuring devices and reporting.

Storage Release Orders

In most situations, the Water Commissioner or Division Engineer informally directs a user to release water stored improperly or directs the user to provide information on why they should be able to retain water when it appears they have stored out of priority. However, if necessary, the Division Engineer can formally order the release of any water that the Division Engineer finds to have been illegally or improperly

stored in accordance with 37-92-502 (3), C.R.S. The Division Engineer is directed to deliver this water to users who are entitled to the same and to insure that the release will not cause damage. Users are subject to liability for impacts to other users from improper storage and subject to paying legal fees and costs of the State in such circumstances. In addition to other orders discussed in these guidelines, the Division Engineer may order removal of any obstruction in a river if it impacts water rights.

ADDITIONAL INFORMATION

Dam Safety Restriction and Breach Orders

The State Engineer's staff inspects reservoirs within the state to determine their safe storage level. When necessary, the State Engineer will issue a restriction order to limit the user from storing above this safe storage level (see Rule 4.2.29 of the Dam Safety Rules). The Division Engineer will order the release of water in the reservoir if it exceeds the restricted level.

A breach order is an order issued by the State Engineer, or his designee, to remove all or part of a dam to the level of the natural ground, so it is incapable of impounding water and creating a hazard (see Rule 4.2.3 of the Dam Safety Rules).

Dead/Active Storage

Active storage is that volume of water capable of being released from the reservoir by means of gravity through an outlet of the reservoir. Dead storage is that amount of water that cannot be released without pumping because of the location and elevation of the lowest outlet from the reservoir. A user may be required to pump dead storage water out of a reservoir into the stream to replace evaporation losses or out of priority inflows into the reservoir. The SEO may oppose the use of small ponds with dead storage as an augmentation source in an augmentation plan due to the unreliability and inadequacy of these structures.

Underground Storage

Placing water into underground storage has a number of advantages that achieve the legislature's objective to maximize the beneficial use of all of the State's waters. For example, water stored underground is not lost to evaporation; the water can be used as an emergency supply in the event of disruption to surface water systems; storing water in an aquifer raises the water table and can reduce energy demand and energy costs otherwise needed for well pumping; and storing water underground helps to reduce committing additional surface land to additional large reservoirs, conveyance systems, and stream modifications.

Underground reservoirs are not reservoirs within the meaning of C.R.S. 37-87-101(2) except to the extent such reservoirs are filled by other than natural means with water to which the person filling such aquifer has a conditional or decreed right. Recharge water rights are not considered storage. Underground reservoirs also include porosity storage reservoirs which are defined as underground storage vessels in an alluvial deposit over an aquiclude that is formed by separating a volume of that alluvial deposit by surrounding it by a man-made substantially impermeable barrier so that the volume is hydrologically separate from the original surrounding deposit.

Subgrade Storage

Subgrade storage includes any water stored below the natural land surface elevation such that it must be accessed by means other than gravity drainage. This includes rock quarries in low permeability material, but generally is associated with placing a very low permeability lining around a mined-out gravel pit or other excavation

into high permeability material. The purpose of the very low permeability liner is to isolate the water placed into the excavation from the surrounding ground water, thus impounding, possessing, and controlling the water, rather than letting it flow away with the surrounding ground water and become unavailable for future use.

The very low permeability liner must be approved in accordance with the August 1999 State Engineer Guidelines for Lining Criteria for Gravel Pits (please see Appendix for document). The Liner Guidelines contain a procedure for testing the constructed liner, two allowable liner leakage standards, a mass balance accounting procedure for lined excavations, and provisions to address a liner failure that may occur during operation of the reservoir.

The testing procedure set forth in the Liner Guidelines requires that the liner be demonstrated to meet leakage standards. Typically this is done by holding the lined excavation essentially dry; measuring the volume of water removed from the lined excavation; and calculating the volume of any precipitation entering the lined excavation based on the surface area and a simple on-site rain gage correlated to official weather stations in the area. If the lined excavation is not held essentially dry during the test, the volume of evaporation from the free water surface must also be calculated based on the surface area over the course of the test and data from official weather stations in the area. The differences between the known inflows and the known outflows plus any changes in storage are assumed to be ground water leakage by the liner. If this volume does not meet the leakage standards in the Liner Guidelines then the excavation is determined to be a well and water storage is not allowed.

It should be noted that the Liner Guidelines contain a similar testing procedure as discussed above for locations of high permeability material where a slurry wall has been installed to isolate an area from the local ground water but where no excavation has yet occurred. The procedure here requires piezometers located inside and outside of the slurry wall to monitor water levels on both sides of the wall. Water is then pumped from inside the wall to establish a steady-state head gradient across the wall for the 90 day test. The minimum acceptable head gradient prior to starting the test is ten (10) vertical feet or to bedrock if bedrock is located less than ten feet below the local water table. The same leakage standards used for an excavated area are also used in this instance.

The mass balance accounting procedure set forth in the Liner Guidelines is straightforward and requires any out of priority inflow from any source, including ground water, to be returned to the stream or fully augmented. The Liner Guidelines provision to address a liner failure that may occur during operation of the reservoir requires that if, in two consecutive months, the accounting shows the unregulated ground water inflows exceed the Guideline Standards, the reservoir operator and the State Engineer's Office will consult on the probable cause(s) and possible solution(s) to the excessive inflows. Specific operational requirements and time lines for agreement and repair are also set forth in the Liner Guidelines. The ultimate result of a previously approved liner failing to meet the Guideline Standards during actual operation is a prohibition of storage in the reservoir with a requirement that all out of priority inflows be pumped to the stream or fully augmented pursuant to an augmentation plan or a substitute water supply plan.

Rock quarries in low permeability material that seek to store water are tested in accordance with the Liner Guidelines discussed above as applied to lined excavations

into high permeability material where the excavation intercepts ground water. They are also subject to the same two tiered accounting approach discussed above.

Types of Dams

Colorado laws governing dams and reservoirs were enacted for the protection of lives and property due to potential hazards associated with the storage of water in the reservoir behind a dam. The owner of the dam is responsible for the safe storage of water impounded in the reservoir. There are specific construction and administration requirements depending on the category of a dam. The categories are as follows: jurisdictional size dams, non-jurisdictional size dams, livestock water tanks (LSWT), erosion control dams (ECD) and exempt structures such as mill tailing impoundments (see complete list of these structures in Section 37-87-114(5) C.R.S.). Laws that are contained in the Colorado Revised Statutes establish specific requirements for each type of dam. Jurisdictional and non-jurisdictional size dams, exempt structures, and ECDs are governed by Sections 37-87-101 thru 125, C.R.S. and the Rules and Regulations for Dam Safety and Dam Construction. LSWTs are regulated by Sections 35-49-101 thru 116, C.R.S. The owner of a dam and/or irrigation ditch has responsibilities, and the Division Engineer in charge of each Water Division has additional related authorities, under the following statutes: C.R.S 37-84 inclusive and 37-92 inclusive.

Constructing a dam to create a reservoir does not assure the owner the right to store water. Likewise, having a water right does not constitute an approval to construct the dam. A water right must be obtained through the Water Court. Approval for construction of a dam must be obtained from the State Engineer.

Jurisdictional versus Non-jurisdictional

A jurisdictional dam is one that has a statutory height of greater than 10 feet in height to the spillway crest from the lowest point in the natural stream channel or natural ground surface, or creates a reservoir with more than 100 acre-feet of water, or covers a surface area of more than 20 acres at the high waterline. Plans and specifications for jurisdictional dams must be approved by the State Engineer before construction. The "Rules and Regulations for Dam Safety and Dam Construction" can be accessed from the following website link: http://water.state.co.us/DWRIPub/Documents/ds_rules07.pdf. Additionally, you can obtain a publication from this office free of charge titled, "Guide to Construction and Administration of Dams in Colorado" (or you can download it at the following link: http://water.state.co.us/DWRIPub/Documents/damguide.pdf), which is helpful in providing general information regarding dams, livestock water tanks, and erosion control dams.

A flood control dam is a special purpose dam which is normally dry and has an un-gated outlet structure which will drain the water impounded during the flood. The jurisdictional size and classification of the dam are determined assuming the reservoir is full to the emergency spillway (see Rule 4.2.5.7 of the Dam Safety Rules).

Non-Jurisdictional size dams are smaller in size than jurisdictional size dams. Plans and specifications are not required for construction, however, filing of a Notice of Intent to Construct a Non-Jurisdictional Water Impoundment Structure is required. The form may be obtained from the Office of the State Engineer in Denver, from any Water Division office, or from the DWR website http://www.water.state.co.us/DWRDocs/Forms/Pages/DamForms.aspx, and must be

filed 45 days prior to construction. No fee is required to file the Notice of Intent form. The Division Engineer may require an outlet pipe with a regulating gate to be installed in the bottom of the dam to allow releases to prevent injury to existing water rights. Because any dam, regardless of size, has the potential to cause damage downstream if it should fail, the owner is advised to consult a person familiar with dam construction to ensure the dam is constructed properly. The Notice of Intent form shall be submitted to the Division Engineer of the Water Division in which the dam is to be located. Addresses of the seven division offices are available online at http://www.water.state.co.us/org/contacts.asp.

Livestock Water Tanks

Livestock water tanks are covered under the "Livestock Water Tank Act of Colorado" Sections 35-49-101 to 35-49-116, C.R.S. (Also see Rule 17.4 of the Dam Safety Rules.) A LSWT requires a permit from the State Engineer. A LSWT is a dam constructed to capture run-off water on rangeland to provide water for livestock. They may only be constructed on normally dry water courses, and may also be used for recreation, but not for irrigation. A normally dry water course or stream is considered dry 80% of the time during a calendar year. The structure must not have a ditch or other structure delivering water to or from it.

Height of the dam cannot be greater than 15 feet from the bottom of the stream channel to the spillway crest. Impoundment volume of the reservoir cannot exceed 10 acre-feet. If the LSWT is five feet or less in height to the spillway, and two acre-feet capacity or less, no application is necessary, but an application may be filed to obtain a priority between LSWT's. It is important to note that this is not a water right, but only

provides a priority between LSWT's. The LSWT does not require a water right for its use but may be subject to curtailment from downstream senior users depending on the specific circumstances.

An outlet pipe with a regulation gate is required unless specifically waived by the Division Engineer during review of the application. Standard specifications and application forms are available from any Water Division office or the DWR website http://www.water.state.co.us/DWRDocs/Forms/Pages/DamForms.aspx. The application and fee should be submitted to the division office that the LSWT is to be located in. Construction of the LSWT may begin upon approval of the application by the Division Engineer. The State Engineer may then inspect the LSWT and within 10 days after receiving notice of completion or within 10 days after inspection he must then approve or disapprove of the structure. The U.S. Natural Resources Conservation Service may assist owners in preparing an application, or owners may wish to hire a licensed professional engineer experienced in dam design for assistance.

Erosion Control Dams

In Colorado, many farms and ranches need ways to control erosion. In recognition of this need, the Colorado legislature instituted statutes governing the development and use of these types of structures. Erosion control dams are governed under Section 37-87-122, C.R.S. (Also see Rule 17.5 of the Dam Safety Rules.)

An ECD requires a permit from the Office of the State Engineer. These dams may only be constructed on normally dry watercourses and are only for the purpose of controlling soil erosion caused by floods. The vertical height of the dam cannot exceed 15 feet from the bottom of the channel to the bottom of the spillway. The height is

measured at the toe of the upstream slope where the dam contacts the ground surface. The spillway must have a minimum freeboard of four feet to the dam crest. Impoundment volume of the reservoir cannot exceed 10 acre-feet at the emergency spillway level. An ECD with more than two acre-feet capacity must have an un-gated outlet conduit large enough to pass stored water in excess of two acre-feet within a 36-hour period, but no less than a 12-inch diameter. The vertical location of the outlet must be at or below the two acre-feet storage volume level. In certain circumstances, an outlet structure may be required for an ECD with less than two acre-feet capacity to address water administration issues.

A water right is not required for an ECD but a number is assigned, similar to a LSWT. An ECD is also subject to curtailment from downstream water rights depending upon the circumstances. Since an ECD is not intended to store water, a priority is not assigned. Standard specifications and application forms are available from any Water Division office or the DWR website http://www.water.state.co.us/DWRDocs/Forms/Pages/DamForms.aspx. The application, along with a fee, must be submitted to the Water Division office. Construction may begin upon approval of the application by the Division Engineer. The U.S. Natural Resources Conservation Service may assist owners in preparing an application, or owners may wish to hire a licensed professional engineer for assistance.

Other Regulatory Requirements

Other state and federal agencies regulate runoff from storm water in construction activities, industrial activities and concentrated animal feeding operations. These facilities may involve temporary or permanent detention, retention, or sediment ponds or

basins. These structures are designed to capture, settle, store and/or release water. These structures can be constructed by excavation and/or by placing an earthen embankment across a low area or drainage swale. They can be designed to maintain a permanent pool or to drain completely dry.

The two agencies that regulate these activities are the Colorado Department of Public Health and Environment, Water Quality Control Division http://www.cdphe.state.co.us/wq/PermitsUnit/ and the Environmental Protection Agency http://www.epa.gov/region8/water/stormwater/. Even though these structures are permitted and regulated by these other agencies they must still comply with all State water rights laws regarding diversion and depletion of surface water.

Compensatory Storage Doctrine (Transbasin Storage Agreements)

The cost of constructing and operating large projects precluded all but the largest municipalities. To provide a means to finance, acquire water rights and land surface rights, and for operations, the Colorado legislature created special statutory entities called water conservancy districts. The first of these districts was the Northern Colorado Water Conservancy District, created in 1937 to develop the Colorado-Big Thompson Project. Recognition of compensatory storage as an integral part of transmountain diversions by way of water conservancy districts came in 1943 when the Colorado legislature amended the original Water Conservancy Districts Act to require facilities to be constructed so as not to impair nor increase costs to existing or prospective water users within the natural basin of the Colorado River. Three reservoirs

have been built in the Colorado River drainage as a result of this act. The Colorado-Big Thompson Project built Green Mountain Reservoir with a capacity of 152,000 acre feet in return for the right to divert an expected 320,000 acre feet to the South Platte drainage. Of the 152,000 acre feet, 100,000 acre feet is in the compensatory pool for the benefit of in-basin users. These beneficiaries receive replacement releases either by the language of the authorizing legislation of the project or by contract. This authorizing legislation for the CBT, Senate Document 80, became the model for compensatory storage. The Fry-Ark Project built Ruedi Reservoir with a capacity of 102,000 acre feet in return for the right to divert an expected 69,200 acre feet to the Arkansas River drainage. An individual beneficiary of this compensatory pool obtains release of stored water by contract. The Windy Gap project provided $10M for the construction of compensatory storage, which ultimately helped build Wolford Mountain Reservoir, and the first 3,000 acre feet of Windy Gap water pumped to Granby Reservoir. Municipalities, irrigation companies, and other corporations that construct transmountain diversion projects are not required to provide compensatory storage because they are not incorporated or created under the statute requiring such storage.

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Colorado Division of Water Resources
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    - Additional direction to address activities allowed under SB13-41
    - Additional direction regarding paper fill
    - Miscellaneous, non-substantive, clarifying cleanup