Storage Examples and Definitions

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Overview

For any portfolio of water supply solutions implemented in the future, storage will be needed to address system flexibility and reliability. The purpose of a storage project can be multi-purpose or single purpose. A multi-purpose project meets a mix of needs (e.g., agriculture, environment, and municipal). Examples of single purpose projects could include storage to address drought supply, capture potentially higher amounts of run-off in the event of climate change, meet compact obligations, and share conserved or reused water. Storage projects capture water during high flow years and seasons to be used during low flow periods. Storage projects can include: construction of new reservoirs, enlargement of existing reservoirs, rehabilitation of existing reservoirs that have reduced storage volumes due to various structural problems, reservoir reoperation, and aquifer storage and recovery. Examples and definitions of these storage types are described below.

Storage Examples and Definitions

New Reservoirs

New storage projects include the construction of dam embankments to create on-channel or off-channel reservoirs. Off-channel reservoirs require the construction of diversion or pumping facilities from the river or stream to deliver the diverted water to storage. Another option for the development of new storage is the conversion of gravel pits to gravel lakes. These lakes are formed by reclaiming and lining pits created through gravel mining operations. Diversion or pumping facilities are also required to deliver water to gravel lakes.

Enlargement of Existing Reservoirs

Expansion of existing storage facilities can be utilized to develop additional storage. Options for increasing storage in existing facilities include raising dam embankments, dredging of sediments to deepen reservoirs and raising spillway levels.

Rehabilitation of Existing Reservoirs

Periodically, the State Engineer's Office compiles a list[1] of dams that are on restrictions throughout the state. This list describes the various reservoirs in the state that are in severe disrepair, have inadequate spillways, spillway erosion, or other structural defects. These facilities have restricted storage levels less than the normal operating capacity. If these reservoirs were to be rehabilitated and storage restrictions removed, additional water could be stored and available to meet increased demands. Table 1 below lists the number of facilities affected and storage volume lost by water division.

[1] State Engineer's 26th Annual Report on Dam Safety to the Colorado General Assembly Water Year 2009 - 2010 Published January 2010

Table 1 State of Colorado Restricted Storage Summary

Water Division	Number of Dams Affected	Volume of Storage Lost (acre-feet)
1 - South Platte River basin, Republican River basin, and Laramie River basin	72	26,491
2 – Arkansas River basin	21	70,378
3 – Rio Grande basin	9	12,397
4 – Gunnison River basin, San Miguel River basin, lower reaches of the Dolores River basin, and the Little Dolores River basin	28	1,754
5 – Colorado River basin	22	3,572
6 – Yampa River basin, White River basin, and North Platte River basin	14	1,014
7 –San Juan River basin and Dolores River basin	10	1,697
Total	**176**	**117,303**

Reservoir Reoperation

Reservoir reoperation means changing existing operation and management procedures for existing reservoirs to increase water related benefits from these facilities. Although reoperation is generally regarded as an alternative to construction of major new water facilities, physical modifications to existing facilities may be needed in some cases to expand the reoperation capability. Legal changes also may be needed. Changes in water demands, changing climate, or multi-purpose needs are the primary reasons to consider reoperation of existing facilities.

Aquifer Storage and Recovery/Conjunctive Use

Colorado's groundwater supplies are abundant but are limited in many areas by physical or legal availability or economic feasibility issues. Physical limitation affects the reliability and sustainability of groundwater as source of supply. Physical availability measures the amount of water an aquifer can produce, both in the short- and long-term, and primarily affects the sustainability of the resource. Legal availability relates to the amount of water that can be extracted from an aquifer under the water rights administration system that exists in a particular area, and can affect the reliability of the supply.

Conjunctive use of surface water and groundwater can maximize the benefits and reliability of both surface water and groundwater sources of supply. In its simplest form, conjunctive use involves using surface water when surface supplies are ample, such as during average to above average runoff conditions, and recharging aquifers with available surface water. When surface water supplies are in short supply, such as during below average runoff conditions, groundwater supplies would be used to a larger degree to meet demands. Both bedrock and alluvial aquifers can be used in a conjunctive use water supply operation by serving as a water storage bank. Deposits are made in times of surface water supply surplus and withdrawals occur when available surface water supply fails short of demand.