

# Water Quality Standards in Augmentation Plans and Exchanges: What are They and What Should They Be?

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## **Introduction**

Water has always been a scarce resource in Colorado. The South Platte, Arkansas and Rio Grande River basins are already over-appropriated, meaning that there is no reliable water available for development under a new appropriation. New water supply development on the west slope is also problematic as the amount of reliable water left to develop under the Colorado River Compact is the subject of speculation.

The Statewide Water Supply Initiative (SWSI) identified that municipal and industrial water demands will increase by approximately 630,000 acre-feet per year from 2000 to 2030. Under the most optimistic scenario, approximately 80% of this future demand may be met through "Identified Projects and Processes." These include the full use of existing absolute water rights, development of conditional water rights, acquisition of and transfer of agricultural water rights, acquisition of contracts in regional water supply projects and the full use of consumable return flows, through exchanges, augmentation, nonpotable or indirect potable reuse projects. (Colorado Water Conservation Board, 2004)

A water provider or other user seeking new supplies is left with limited options for acquiring additional supplies. In some areas of the state, water from existing regional water supply projects may be available. The Colorado Big-Thompson Project in the Northern Colorado Water Conservancy District and Wolford Mountain and Ruedi Reservoirs contract pools in the Colorado River Water Conservation District are examples of projects where additional water is currently available.

Agricultural water transfers are a key component of many water providers plans to meet future water demands. The transfer of agricultural water to M&I use results in a net amount of consumable return flow available to the M&I user, since M&I one time use is less consumptive than the typical agricultural use. Once historic return flows are accounted for, the M&I user has a volume of consumable return flows that can be reused. The use of other consumable water supplies, such as non-tributary groundwater and most trans-basin diversions also results in consumable return flows.

## **General Background on Exchanges and Augmentation Plans**

Water rights exchanges and augmentation plans are examples of maximizing both the utilization of the state's water resources and the use of consumable return flows. The

1969 Water Rights Determination Act expanded the concept of maximum beneficial use and allowed for adjudication of exchanges and augmentation plans. Exchanges are appropriative rights that deliver substitute supply to downstream senior water rights and in exchange take equivalent amount at upstream headgates. Augmentation plans operate outside of the priority system, by allowing the diversion of water out of priority as long as depletions are replaced to downstream senior water rights.

Colorado Revised Statutes section 37-92-305(5) governs the substitute supply of water that is exchanged or used to augment depletions to the downstream user:

**C.R.S. § 37-92-305(5)**

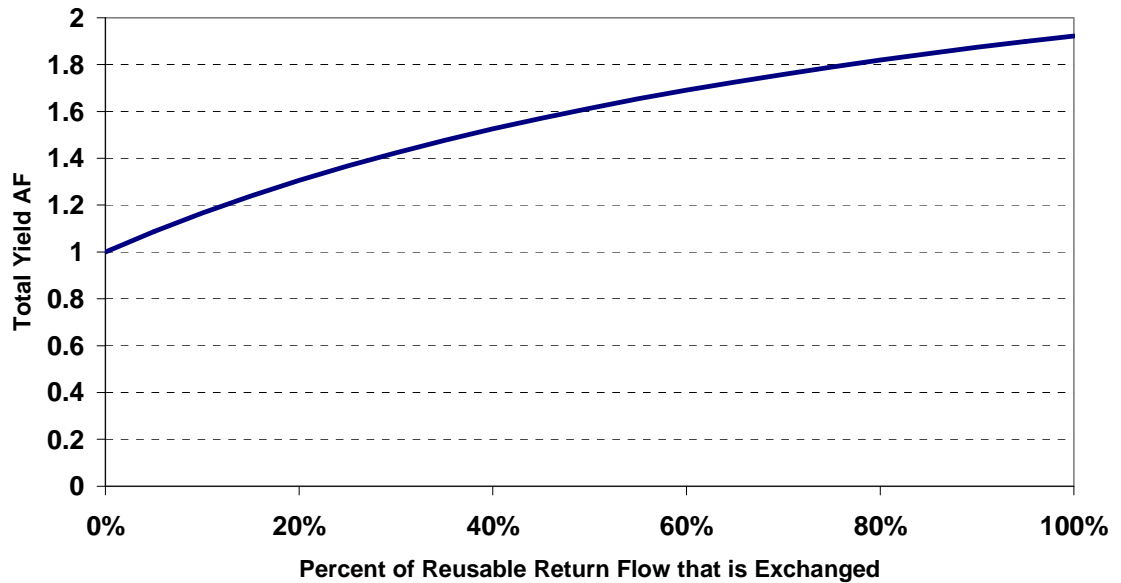
"In the case of plans for augmentation including exchange, the supplier may take an equivalent amount of water at its point of diversion or storage if such water is available without impairing the rights of others. Any substituted water shall be of a quality and quantity so as to meet the requirements for which the water of the senior appropriator has normally been used, and such substituted water shall be accepted by the senior appropriator in substitution for water derived by the exercise of his decreed rights."

The SWSI Report noted that exchanges and augmentation plans are an existing component of meeting existing and future water demands. Section 8.2.5.1 provides a summary of the benefits and issues with M&I exchanges (CWCB, 2004.) The same benefits and issues are also true for augmentation plans.

M&I reuse by water rights exchanges involves the exchange of legally reusable return flows for water diverted at a different location. Water is diverted at one source in exchange for water replaced to downstream users from a different source. In an M&I reuse exchange, the amount of non-CU water returned to the system, e.g., via effluent flows and/or return flows from landscape irrigation, depends on the CU associated with the demand (i.e., the higher the CU, the lower the percent of total diversions that can be reused).

The non-CU water can be reused multiple times, theoretically to extinction, with the total available water reduced with each application, since each time the water is diverted for reuse, a portion of it is consumed by the use. A schematic illustrating the exchange of consumable return flows is shown in Figure 8-4.

The increases in yield that can be achieved through the successive use and reuse of the return flows to extinction are shown in Figure 8-5. For example, if there are no return flows from the use of 1 AF of consumable water, then there is no additional yield and the total yield is one acre-foot. If 50 percent of the return flows from an M&I use of consumable water were exchanged and the return flows from each successive use used to extinction, the total yield realized from 1 AF of consumable water is 1.6 AF. This is based on an assumed M&I CU of 35 percent and return flows of 65 percent.



*Figure 8-5  
Total Yield from Exchange of 1 AF of Consumable Water Based on Reuse to Extinction*

Potential benefits of exchanging reusable flows include:

- Improves M&I reliability by providing for additional yields.
- Maximizes water use through successive uses.
- Maximizes beneficial use of water.
- May not require additional diversion structures or other facilities.
- Lesser environmental impacts than a new water supply project.

Potential issues and conflicts involving reuse by exchange include:

- There must be adequate exchange potential (physical supply) available at the upstream point of diversion.
- The substitute supply (the reusable water that is used to replace the water diverted by exchange) must be suitable for downstream water uses as required by statute.
- There may be water quality objections from downstream users. The substitute supply may be of a different water quality from what the downstream user would have received absent the exchange. A water court procedure allows these issues to be addressed.
- Storage may be needed to regulate year round effluent return flows. The timing of return flows may not match the times when there is exchange

potential. For example, winter effluent may need to be stored for exchange to agricultural users during the irrigation season.

- Previously unused reusable effluent historically resulted in reduced or more junior river calls controlling the river.
- As water availability decreases, M&I users are looking to develop or expand the reuse of existing reusable return flows via water rights exchanges. To the extent these reusable flows have been returning to the rivers, they have been used by downstream water users.
- As reusable supplies that have been historically used by downstream users are reused, river calls may become more senior, impacting all users. (CWCB, 2004)

Exchanges and augmentation plans are often the most cost-effective way for a water user to meet future water needs. In over-appropriated areas, there may be no available new supplies, and an exchange or augmentation plan may be the only means to provide for water supply for new users. Many uses have low consumptive use and the use of the state's water resources can be maximized by allowing an upstream water user to divert the water as long as the water is returned and depletions replaced to the downstream water rights holder. For example, domestic indoor water use is approximately 5% consumptive.

### **Substitute Water Supplies in Exchanges and Augmentation Plans**

Water rights exchanges and augmentation plans are used by all types of water users, though they have increasingly become popular with M&I users. Augmentation plans, however, are an important component of agricultural use for replacing alluvial well depletions. Water quality issues in augmentation plans are generally associated with M&I plans and this paper will focus on the water quality issues associated with M&I exchanges and augmentation plans using wastewater effluent as the substitute supply.

Septic system returns represent a simple type of augmentation plan where domestic well pumping can occur out of priority and only the depletions are replaced from another source. A depletion factor of 10% is common for septic returns to account for some minor additional consumptive use during the soil treatment process and groundwater returns. This type of augmentation plan is common in mountain areas and depletions are usually replaced via small local reservoirs storing surface water. The quality of the substitute supply has, to date, not been a source of significant conflict.

The primary source of substitute supply in an M&I exchange or augmentation plan is wastewater effluent. Effluent is a reliable supply, usually less expensive than purchasing or developing water rights and the existing NPDES permit regulates the wastewater treatment requirement. The discharge permit has been issued after review and determination by the Colorado Water Quality Control Division that the discharge meets the applicable downstream designated uses and stream standards.

It can be argued that the existence of a NPDES permit is prima facie evidence that a permitted discharge is acceptable water quality for downstream uses. Proponents of this argument cite Colorado Revised Statutes section 25-8-611(2):

**§ 25-8-611. Proceedings by other parties**

(2) A permit issued pursuant to this article may be introduced in any court of law as evidence that the permittee's activity is not a public or private nuisance. Introduction into evidence of such permit and evidence of compliance with the permit conditions shall constitute a prima facie case that the activity to which the permit pertains is not a public or private nuisance.

In certain instances, it may be that the downstream users have worked diligently to develop a reliable, high quality water supply. As a result, there is little additional water supply to develop and upstream users must implement an augmentation plan to fully meet their water needs. The downstream water users' position is that they invested resources in developing a very high quality supply, but it can now be degraded to a lower quality, while meeting stream standards. The upstream user is attempting to develop a new supply without incurring the true costs of water supply development and instead laying those costs on the downstream user. The upstream junior water right holder, on the other hand, might argue that the State has considered the downstream uses when issuing the discharge permit, the water court does not have jurisdiction in water quality matters, a portion of the effluent is going to be present regardless of the augmentation plan or exchange and denial of the plan does not promote maximum utilization.

**Two Water Court Cases Involving Wastewater Effluent as a Substitute Water Supply in Augmentation Plans**

Several water court cases have involved whether the quality of wastewater effluent discharged pursuant to and in compliance with an NPDES permit meets the acceptable water quality standard for a substitute water supply in C.R.S. § 37-92-305(5). Two cases are noted below. Both cases concluded that the water court could examine the acceptability of a substitute supply, even if the substitute supply was from a permitted discharge.

In 83CW361, the City of Golden sought to adjudicate an augmentation plan that would allow the discharge of treated effluent to Clear Creek, upstream of the Croke Canal headgate, which provides water for the Farmers Reservoir and Irrigation Company and the Cities of Northglenn, Thornton and Westminster. Golden and its experts argued that the existence of a valid NPDES permit was proof that its substitute supply was of acceptable quality. The then director of the Water Quality Control Division testified that the discharge permit was issued with knowledge of the downstream users and that the permit met stream standards and was protective of downstream uses, including drinking water. The objectors offered evidence of contaminants and potential health

risks from contaminants not regulated by the discharge permit. The Water Court Judge denied Golden's plan, stating that the burden of proof of non-injury was on the applicant and Golden did not prove that its substitute supply was acceptable. He offered Golden the opportunity to propose terms and conditions to prevent injury. The case was not appealed and a settlement among the parties eventually reached which permanently eliminated the wastewater discharge upstream of the Croke Canal headgate.

In 96CW194, the City of Thornton opposed a finding of diligence for Denver Water Board's exchanges of transmountain water. In the Court opinion, it was noted:

Denver argues that, if a decreed exchange is operated by substituting effluent subject to an NPDES permit, and the receiving water has been classified for the use of the downstream senior appropriator, the effluent is, as a matter of law, an appropriate substitute supply according to §305(5). Denver further observes that water quality standards and discharge permit limitations require a degree of uniformity and consistency that this Court cannot provide by applying §§ 120(3) and 305(5) in a piecemeal fashion to individual water right applications, arguing:

If the proposed plan would affect uses not protected by existing classification, or if the replacement water supply contains pollutants not regulated by the Commission, the water court should not consider the issue until it has been presented to the Commission. If the Commission acts the water court would then accord deference to the administrative decision. If the Commission declines to act, the court would consider the issue independently. *Water Quality v. Water Quantity: A Delicate Balance*, Hobbs & Raley, 34 Rocky Mtn. Min. L. Inst., §24, pp.54-56 (1988).

The Court also noted in the opinion:

Similarly, no provision of the WQCA "shall be interpreted so as to supersede, abrogate, or impair" water rights or "construed, enforced, or applied so as to result in material injury to water rights." C.R.S. § 25-8-104(1). A discharger who chooses consumptive types of treatment techniques, in order to meet water quality requirements, "must comply with the applicable provisions of articles 80 to 93 of title 37, and shall be obliged to remedy any material injury to water rights to the extent required under the provisions of articles 80 to 93 of title 37, C.R.S. The question of whether such material injury to water rights exists and the remedy therefor shall be determined by the water court". *Id.* Further, the express purpose of the WQA is to provide "additional and cumulative remedies to prevent, control, and abate water pollution and protect water quality." C.R.S. § 25-8-612(1). Hence, both federal and state legislation expressly disclaim preemption of the water court's authority to impose higher standards on substituted or exchanged water than is required under the WQCA.

The Commission and Division have exclusive jurisdiction over the quality of discharges to the stream; therefore, the water court cannot regulate the quality of a

given discharge. It may only determine whether the quality of such discharge meets the opposers' entitlement under §§ 120(3) and 305(5), or whether the applicant must use replacement water of higher quality than that which it proposes. This determination is not beyond the competence of the water court to understand and resolve and cannot result in inconsistent application of WQCA standards.

As noted above, the court *cannot* permit an applicant to introduce water into the stream system, in violation of his/her discharge permit. The limit of the court's authority is to require, in certain fact-specific cases, that replacement water be of higher quality than is required by WQCA standards.

In sum, then, the court must defer to the Commission standards and Division permits, insofar as they establish minimum water quality standards for discharges into the stream system. However, the court may not abdicate its authority to impose higher water quality standards in specific cases, where such stricter standards are necessary to the implementation of §§ 120(3) and 305(5). As a practical matter, if an opposer asserts that he/she normally required and used water of a quality that exceeds existing standards established under the CWQA, then the burden falls upon that opposer to prove that assertion. If the opposer does so, then the applicant must establish that the proposed replacement water meets the enhanced quality standard.

The public interest will not be served by this court's deferring to the judgment of the Commission and the Division, in applications for water rights that involve questions of enhanced water quality. The WCQA neither contemplates, nor is designed for, the resolution of disputes over water rights. Denver argues that WCQA standards preempt the court from establishing enhanced standards and supersede the quality requirements of all individual diverters irrespective of the level of quality that the diverters have historically needed and used. This principle would not serve the general public, because it would not foster the purpose of the Act to increase water quality. This principle would not serve the interests of senior water rights because, in certain fact situations, the quality of the water available to senior diverters would diminish. Finally, the impairment of water rights, which would result from diminished water quality, contravenes the express provisions of both federal and state water quality legislation, which provide that water quality legislation shall not interfere with vested water rights. *DISTRICT COURT, STATE OF COLORADO WATER DIVISION No. 1* Case No. 96CW145.

A settlement in 96CW145 was ultimately reached.

## Water Quality Issues with Wastewater Effluent as a Substitute Water Supply in Exchanges and Augmentation Plans

As noted, wastewater discharge permits are formulated to protect classified uses and stream standards. Many wastewater discharge permit include only the following parameters:

PARAMETER	PARAMETER LIMITATIONS		
	7-Day Average <u>1</u> /	30-Day Average <u>2</u> /	Instantaneous Maximum <u>3</u> /
(a) BOD <sub>5</sub>	45 mg/l	30 mg/l	N/A
(b) Total Suspended Solids (TSS)	45 mg/l	30 mg/l	N/A
(c) CBOD <sub>5</sub>	40 mg/l	25 mg/l	N/A
(d) Residual Chlorine			0.5 mg/l <u>3</u> /, <u>6</u> /
(e) pH			6.0 - 9.0 s.u. <u>3</u> /, <u>4</u> /
(f) Oil and Grease			10 mg/l <u>3</u> /, <u>5</u> /

Other constituents may be added, based on potential impacts to stream standards. While a discharge permit may typically have 10 or less regulated constituents, the Safe Drinking Water Act, which regulates the treated water quality of drinking water, includes over 80 regulated constituents. The presence of contaminants in the raw water supply for a water treatment plant can trigger additional and costly increased water quality monitoring

Concerns with the presence of wastewater effluent in drinking water supplies include:

- Disinfection By-Products
  - directly impacted by the organic carbon content of the supply and thus by wastewater discharges and their quality
- Microbials
  - WWTPs can contribute concentrations of cysts and microbes in the 100's/L to a stream that a downstream drinking water plant must remove (completely)

- Nutrients
  - Downstream reservoirs can be adversely affected by increases in nutrient loading from typical Wastewater Treatment Plant discharges
- Emerging Contaminants
  - Can now be detected at very low limits
  - Aquatic toxicity and human health concerns
  - Includes endocrine disrupting compounds (EDCs), pharmaceuticals and personal care products (PPCPs)

Though found in wastewater effluent and representing concerns to drinking water supplies, only disinfection by-products and microbials are currently regulated by the Safe Drinking Water Act. Nutrients may be regulated after a lengthy process of establishing nutrient standards for drinking water reservoirs. Emerging contaminants, which are receiving increasing public scrutiny, are not currently regulated, but have been detected in wastewater discharges. These emerging contaminants are generated by everyday household activities and have limited removal through conventional wastewater treatment processes.

Public water systems must annually provide customers with a Consumer Confidence Report. This report requires utilities to list levels of contaminants found in the drinking water supply and the potential health effects, even though all levels may be within Safe Drinking Water Act standards. The presence of effluent in the raw water supply may result in elevated levels of contaminants, increasing the level of concern of the public that is drinking the water.

Upgraded water treatment processes can be designed to deal with constituents of concern typically found in wastewater effluent. The following table compares relative costs of treatment, based on the source water quality. These costs are relative and for comparative purposes. These costs will be impacted by water treatment plant size and other local factors, such as opportunities for disposal of waste streams. The water treatment processes listed for poor quality source water are similar to processes proposed for several indirect potable water reuse plans, both locally and nationally.

**Relative Costs of Water Treatment based on Source Water Quality and Water Treatment Processes**

<b>Source Water Quality</b>	<b>Water Treatment Process</b>	<b>Range of Costs per gallon per day treatment capacity</b>	<b>Constituents addressed</b>	<b>Other Issues</b>
Good	Conventional	\$1.50 - \$2.00	Microbials	Not designed for significant taste and odors or supplies impacted by effluent
Poor, including brackish and effluent dominated	Alluvial withdrawal followed by reverse osmosis	\$2.00 - \$3.50 plus \$3.00 to \$7.00 for disposal of waste stream if cannot discharge to surface water	Hardness, Total Dissolved Solids, Taste and Odors, Total Organic Carbon, Emerging Contaminants	Disposal of waste concentrate can be problematic and increase cost by 2 to 3 times if zero liquid discharge is required
Poor, including brackish and effluent dominated	Conventional with ultrafiltration, softening, granular activated carbon and ozone or ultraviolet disinfection	\$3.50 to \$5.00	Hardness, Total Dissolved Solids, Taste and Odors, Total Organic Carbon, Emerging Contaminants	May still have taste and odor and some esthetic issues. Hardness reduced, but high TDS. Additional waste sludge that must be disposed

Given that exchanges and augmentation plans involving wastewater effluent discharged pursuant to a valid discharge permit will continue, the following issues should be examined on a case by case basis:

1. Is the existence of a discharge permit prima facia evidence the substitute supply is of an acceptable quality and meets the requirements of C.R.S. § 37-92-305(5)?
2. Does the existence of a discharge permit shift the burden of proof to the opposer(s)?
3. Are the discharge permit and stream standards adequate to protect vested property rights?
4. Since there are constituents of concern for which, as yet, there are no state or federal standards, should the water court be precluded from considering injury based on such constituents?

5. Should the applicant be required to prove that the substitute supply will not cause and violation of any Safe Drinking Water Act parameters?
6. Should there be an incremental analysis of impacts, if the wastewater discharge will be present regardless if the exchange or augmentation plan is approved?
7. Would the denial of the exchange or augmentation plan result in the discharger upgrading the overall wastewater treatment process or just for the volume of effluent used as a substitute supply?
8. Is additional water treatment cost to the downstream user based on potential health risks an injury to vested water rights?
9. Is the current quality of the existing supply of the downstream user relevant or just the incremental change from the proposed exchange or augmentation plan?