Modification of Permits Based on Consumptive Use

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Summary

The distinction between consumptive and non-consumptive use of water is a critical aspect of effective water management. Consumptive use of water means that no water is returned to the water source from which it was withdrawn; the water is consumed and is not available for use by other water users downstream. Non-consumptive water use means that, after use, the water is returned to the source for use by others downstream. The importance of the distinction between the two types of water use is their effect on downstream water users. Non-consumptive water use returns the water to the stream for renewed use by other water users downstream. Consumptive use means the water is not be returned to the stream, reducing the water available to downstream water users.

The distinction is especially important when a permit is modified by EPD, and some or all of the original permit is transferred to another location or use. The issue in modifying permits is the potential unintended effects that may occur on other, downstream water users. If a permit modification is approved by the Georgia Environmental Protection Division (EPD) without consideration of the consumptive vs. non-consumptive nature of the permitted withdrawal, it is possible that return flows could be reduced or eliminated, causing less water to be returned to the river or stream for use by other water users downstream. The conclusion is that EPD should authorize permit modification only when either (a) return flows are not reduced, or (b) only the consumptive part of the water used is to be transferred.

Thesis

One objective of water management is to make best use of the available water. To do so may require permits to be modified by EPD. If an existing permit allows a use of water that is inefficient and wasteful, EPD should be able to modify part or the entire permit to gain efficiency. If an existing permit is no longer useful to the permit holder, he should be able to return his/her existing permit to the state so that the water can be used more productively; however, the permit holder should receive some economic incentive from the state for retiring his permit. If an existing permit holder makes more efficient use of his existing supplies, he should be able to return his unused supply to the state and receive some sort of economic incentive for doing so.

However, the difficulty in modifying permits is the potential unintended effects that may occur on other, downstream water users. While the "reasonable use" underlying an existing permit may consume some of the water and make that portion unavailable to

downstream users, some percentage of the water withdrawn will probably be returned to the river or stream for use by downstream users.

The unintended effect of modifying the permit may be that the return flows are reduced or eliminated, causing less water to be returned to the river or stream for use by other water users downstream. This "third party effect" means there may be less water available to a municipality downstream resulting in higher costs or less ability to provide water to its citizens. There may be less water available for cooling purposes for an electric plant or less water for irrigation downstream. The modification could cause less water to be available for wetland renourishment or for recreational canoeing. The modification could reduce the waste assimilation of the downstream reaches and disrupt the local TMDL management plan. In every case, one potential unintended consequence of a permit modification is the loss of water to downstream users because the return flows, or the non-consumptive portion of the "reasonable use" is diminished.

Clearly, no unintended consequences occur if permit modification is done with the requirement that (a) water available to downstream users not be reduced, or (b) only the consumptive part of the water used may be reallocated by EPD. If these parameters are imposed, permit modification will have minimal effects on other water users.

Consumptive v. Non-Consumptive Use of Water

1. Definition of Consumptive Use

a. The USGS defines "consumptive use as:

> **Consumptive use**--that part of water withdrawn that is evaporated, transpired by plants, incorporated into products or crops, consumed by humans or livestock, or otherwise removed from the immediate water environment. Also referred to as water consumed.

b. The Minnesota DNR definition is:

> **Consumptive use** is defined as water withdrawn that is not directly returned to its original source. Under this definition, surface water withdrawals are considered consumptive if the water is not directly returned to the source so that it is available for immediate further use.

c. Definitions Applied to All Water Uses:

Arguably, it is erroneous to define certain water uses as "consumptive" and others as "non-consumptive." All uses are partially consumptive and partially non-consumptive. The following examples are illustrative.

	Water Consumption (%)	
	Western U.S.	Coastal GA
(1) Domestic/Commercial	23.2	18.3
(2) Irrigation/Livestock	53.6	95.8
(3) Industrial/Mining	31.2	11.9
(4) Out-of-Basin Transfers	0.0	100.0
(5) Thermoelectric/nuclear Power	5.8	3.2

2. Examples of Consumptive Use Patterns

a. Consider a small municipality under a municipal withdrawal permit that withdraws 500,000 gallons per day for water supply from the Chattahoochee River. It distributes those 500,000 gallons to businesses and industry, homes and apartments, etc. and the water is used in many different ways. Some of it is used for household use (bathing, cooking, toilets, etc.), some of it is used in manufacturing processed, and, after use some of it is discharged into the city sewers as waste. The city waste treatment facility collects this waste (from the businesses and industry, the homes and apartments, etc.), treats the waste and puts the treated wastewater back into the Chattahoochee. For this example, 400,000 gallons of wastewater is discharged. Thus, the municipality's use is 20% consumptive (100,000 gpd) and 80% non-consumptive.

b. Consider a farmer in the Lower Flint River who withdraws 200,000 gpd for irrigation from the Floridan Aquifer. He applies the water to his crop and 40,000 gpd is not used by the crop production (evaporation, transpiration and other biological functions of plant growth) but soaks into the ground. Over several days, maybe weeks, the water travels downward into the Floridan Aquifer that lies 1 meter below the surface. In this case, the farmer's use of the water is 80% consumptive (160,000 gpd) and 20% non-consumptive.

3. The Effect of Consumptive Use

Withdrawal and use of water can result in the water being consumed in the process (like being absorbed into the body by a human, animal or plant). When water use is consumptive, the water is not returned to the water source and is no longer available for use by anyone downstream.

On the other hand, when water use is non-consumptive, water is returned to the water source and is available for use by other water users downstream. The water user may be another person, an industry or business, a fish or another part of the natural environment. Consider the following simple scenarios. A Water User can be a municipality, an industry, a farmer or a part of the natural environment like wetland re-nourishment or providing fish habitat. Consider these admittedly simplistic examples.

a. If Water User #1 makes non-consumptive use of the water and returns all the water he has withdrawn, User #2 has use of all the water withdrawn by User #1. If User #2 again makes non-consumptive use, User 3 downstream can again make use of all the water. An infinite number of such non-consumptive users can make use of the water.

b. If User #1 consumes 20% of the water withdrawn (as happens for the average municipality), User #2 has use of 80% of the water withdrawn by User #. If User 2 consumes 20% of the water and returns the rest to the water source, User #3 has 64% of the water withdrawn by User #1. Continuing this logic, a User # 10 far downstream will still have use of about 16% of the water withdrawn by User #1.

c. Is User #1 consumes 50% of the water withdrawn and returns 50% to the water source, User #2 downstream will have use of 50% of the water withdrawn by User #1. After User #2 consumed 50%, User #3 downstream will have use of only 25% of what User #1 withdrew. User #10 far downstream will have use if less than 1.0% of what User #1 withdrew.

d. If User #1 consumes 100% of the water, everyone downstream is deprived of use of that water.

4. Conclusions about Consumptive v. Non-Consumptive use.

a. The non-consumptive use of water allows multiple uses of the water by others downstream. This water may be used by humans (like municipalities, or industry), by recreational enthusiasts (like fishing or boating) or by the environment. Non-consumptive use of water will not cause harm (neglecting changes in quality) to water users downstream.

b. The consumptive use of water means the water is lost to the system. Users downstream either have to rely on other sources of water (like tributaries downstream) to make up the shortage or use less water. It is the removal of water from the system that may cause harm to the downstream water users.

Modifications of Existing Permits

Existing permits consider withdrawal only, not the ultimate amount of consumptive water use versus non-consumptive water use. For the farmer described above, his permit results in 80% of the withdrawal water being lost to the system. However, 20% of the withdrawal is returned to the Floridan and is available to other users. The 20% is probably significant to the neighboring farmer who lays down gradient and reuses the groundwater for his irrigation. Likewise the municipality described above returns 80% of the water it has withdrawn and this is probably significant to the industrial user or municipality downstream that depends on the same surface source.

Generally then, if permit modification by EPD is made without consideration of the consumptive vs. non-consumptive nature of the permit, it is possible that all the water

will be consumed and nothing will be available to be returned to the water source for downstream users. Over time and many permit modifications, there could be serious disruptions to the water available downstream. Unless the permit modification system is managed to account for consumptive use of water withdrawals, these potential series effects will not become apparent until it is too late for change or it becomes extremely expensive for the state to remedy the effects.

Clearly, no unintended consequences occur if permit modification is done with the requirement that either (a) return flows not be reduced, or (b) only the consumptive part of the water used may be transferred. If these parameters are imposed, permit modification will have minimal effects on other water users.