

FINANCIAL RISKS OF DEVELOPING NEW WATER SUPPLY RESERVOIRS IN THE SOUTHEAST, AND ELEMENTS OF A PRUDENT PATH TO SECURING WATER SUPPLIES

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Abstract. This paper is based on our July 2012 report documenting the financial and water resource risks tied to developing new water supply reservoirs in the Southeast. Many local governments throughout Georgia are considering significant spending of taxpayer and ratepayer dollars to build new reservoirs. Georgia reservoir proposals as of 2012 could total \$10 billion in taxpayer and ratepayer dollars.

We outline five financial and water resource risks inherent in the pursuit of new water supply from reservoirs: (1) Reservoirs are highly expensive, usually bringing on debt for ratepayers and taxpayers; (2) a reservoir's cost is typically a "moving target;" (3) reservoir financing plans often rely on high population growth projections, ultimately leaving existing residents responsible for costs; (4) a reservoir depends on increasingly uncertain rainfall and loses water when high temperatures cause evaporation; and (5) reservoir water is a contested resource subject to competing demands in the river system. We also examine recent projects that provide cautionary tales of communities burdened by borrowing capital to develop new reservoirs.

We offer five key recommendations for local leaders who seek to reduce their communities' risks in planning for enough clean water for the future: (1) Optimize existing water infrastructure first; (2) plan for water use to decrease as a community grows; (3) pursue flexible water supply solutions; (4) demand accurate assessments of costs; and (5) examine water availability to minimize resource risks.

As communities endeavor to secure water supplies, it is critical that decision-making enhance the community's flexibility and resilience. Water supply strategies that can respond to unexpected economic and climatic changes place a community in a better financial position when facing an uncertain future. Low-impact supplies rooted in efficiency are best suited to this task.

Introduction

Many Georgia communities and water utilities continue to face challenging questions when it comes to securing cost-effective, reliable water supplies for the future.

When searching for solutions to these challenges, many local elected leaders reach reflexively for a new water supply reservoir as the logical solution. Many leaders perceive reservoirs as a historically proven way to secure new water, but looking in the rearview mirror is not the most prudent way to navigate the terrain ahead. The assumptions underlying new reservoir development—plentiful and predictable rainfall, uncontested access to the water flowing in the contributing rivers, continued demand growth and sufficient financial resources—are outdated. Georgia communities have many more expedient, lower cost, lower-impact solutions at hand. The intersection of today's financial strains with the challenges posed by stressed water resources calls for caution before investing heavily in traditional supply-side solutions.

Many local governments throughout Georgia are considering significant spending of taxpayer and ratepayer dollars to build new reservoirs. Georgia reservoir proposals as of 2012 could total \$10 billion in taxpayer and ratepayer dollars.

In July 2012, American Rivers' Southeast Region highlighted these issues in a report titled *Money Pit: The High Cost and High Risk of Water Supply Reservoirs in the Southeast*. (The full report is available at: www.AmericanRivers.org/MoneyPit.) The report also delves into the causes and effects of recent financially difficult water supply reservoir projects in North Georgia, such as the Hickory Log Creek Reservoir in Canton and the Hard Labor Creek proposal in Walton County. The financial difficulties faced in developing these projects and others provide important lessons for water utilities, local elected leaders and citizens statewide. Now is the time to acknowledge these difficulties and take a fresh look at securing future water supplies for North Georgia communities.

As communities endeavor to secure water supplies, it is critical that decision-making enhance the community's flexibility and resilience. Water supply strategies that can respond to unexpected economic and climatic changes place a community in a better financial position when facing an uncertain future. Low-impact supplies rooted in optimizing existing infrastructure are by far best suited to this task.

The report outlines five financial and water resource risks inherent in the pursuit of new water supply from reservoirs: (1) Reservoirs are highly expensive, usually bringing on debt for ratepayers and/or taxpayers; (2) a reservoir's cost is typically a "moving target," making prudent planning difficult for utility and community leaders; (3) reservoir financing plans often rely on high population growth projections, ultimately leaving existing residents responsible for costs; (4) a reservoir depends on increasingly unpredictable rainfall and loses water to evaporation; and (5) reservoir water is a contested resource subject to competing demands in the river system.

We also offer a framework for reducing communities' risks in planning for enough clean water for the future: (1) Optimize existing water infrastructure first; (2) plan for water use to decrease as a community grows; (3) pursue flexible water supply solutions; (4) accurately assess costs; and (5) examine water availability to minimize resource risks. Devoting attention to water availability in our river systems is increasingly important given the variability of hydrologic conditions, including repeated severe drought, presently stressing our water resources.

While reservoirs have been an important water supply strategy in decades past, the financial and resource risks no longer justify their being the first choice for securing reliable, cost-effective clean water supplies. And while there is no one-size-fits-all water supply solution—no panacea—what is clear is that new reservoirs should be the last, not the first, water supply option for communities.

There is a more prudent and proven path to providing water supply and ensuring flexibility for the future, one rooted in stewardship of public dollars and natural resources both. As Southeastern communities move forward to develop strategies to meet tomorrow's needs, the communities that choose a prudent path will be better positioned—from both a financial and water resource perspective—to address the needs of today and the future.

Water Utilities and Stewardship

Increasingly, water utilities in Georgia and across the country are wisely employing an integrated resource management approach which implies a role of stewardship

over natural resources on the part of utilities. This is a welcome development given the water resource challenges we currently face, be they in water supply, wastewater, stormwater or all of the above. In the realm of water supply, this stewardship implies a recognition of the fact that no single utility can operate in a vacuum. Other communities in the same river basin have an interest in sustainable water supplies and river flows throughout the basin. This has become apparent in the context of the Tri-State Water Wars, of course, but is equally important in river basins that don't cross state lines.

Stewardship also implies a recognition of the ecosystem impacts of various water supply strategies. The added stress that reservoir development places on our river systems is real and significant. Reservoirs dam healthy, free-flowing rivers and streams, disrupting the valuable natural functions of river systems. Few things have such a fundamental impact on a river system as a reservoir. Reservoirs block water flow and can harm clean water, fish and wildlife, and recreational opportunities.

Ecologically healthy rivers have flows that vary throughout seasons and years. This natural variation is critical to protecting and supporting the natural communities that live in and along the river. Reservoirs and the water withdrawals to fill reservoirs alter flows downstream, often decreasing the volume of water and changing the natural variability of flows. Evaporation from a reservoir's surface creates a permanent net loss of water to the river system, meaning there is less water for downstream needs.

On the other hand, ecologically healthy rivers provide many benefits to the environment, the economy and quality of life. Healthy rivers are essential to ensuring water availability for communities at present and in the future.

Risks in Reservoir Development

There are now clear pitfalls in pursuing the reservoir path to secure water supply. Given the growing financial risk related to water supply reservoirs and their inflexibility in the face of the climatic and water resource challenges ahead, building reservoirs should be the last option that communities reach for in order to address their water supply needs effectively. Detailed here are five key risks inherent in pursuing water supply from new dams and reservoirs:

#1: Reservoirs are highly expensive, racking up debt for ratepayers and taxpayers. The cost per yield of water supply from a reservoir is usually significantly higher than the cost of other water supply strategies. Part of the reason for the high price tag is that a supply-side solution such as

a reservoir requires additional infrastructure investments in treatment, transmission and so forth. The reservoir alone has significant costs as well, including land acquisition, planning, permitting, construction, and mitigation.

Perhaps more important, financing a reservoir typically requires a utility to borrow heavily, which can be difficult in today's economic and political environment. Meanwhile, course corrections in order to respond to lower-than-anticipated population growth or water demand are very difficult once a utility has committed financially to a reservoir project.

#2: A reservoir's price tag is typically a moving target. Steeply escalating costs are a hallmark of reservoir projects. Project costs are difficult to contain, are typically under-estimated at the outset, and often climb upward—sometimes dramatically—throughout the development of a reservoir project. The true cost of building a reservoir is almost always a moving target for decision-makers. This pattern of unpredictable cost escalation precludes real benefit-cost comparisons at the outset, stacking the deck against other water supply strategies that are in reality more cost-effective.

#3: Reservoir financing plans often rely on inflated population growth projections, ultimately leaving existing residents holding the bag. Utilities must be very careful about planning around revenue streams that depend on demand growth in order to pencil out. If future growth and associated revenue forecasts are over-estimated in a project's financial plan, then the project can easily become a major drain on the utility's bottom line. Existing ratepayers and/or taxpayers will be the ones left responsible for the cost of the project. Water utilities are forced to increase water rates to cover the cost of the water that ratepayers don't need and don't want to pay for.

#4: A reservoir is weather-dependent infrastructure and an evaporation pool. A reservoir's reliability as a water source ultimately depends on the weather—specifically, rain falling in the right place at the right time. Recent years' climatic and hydrologic conditions have shown that there is a limit to water supply strategies based on storage here in the Southeast. Pumped-storage systems are increasingly common but are no panacea: many still depend on rivers that are increasingly strained for water supply.

Meanwhile, impounding water causes the river system to suffer a net loss in water supply due to evaporation. Here in the Southeast we lose on average roughly 1 million gallons of water per acre of reservoir area to evaporation each year, with evaporation rates at their highest in the summer months when rivers run lower—and when

both river systems and communities can least afford to lose the water.

#5: Reservoir water is a contested resource subject to competing demands in the river system. Reservoirs are vulnerable to the often conflicting demands people place upon rivers. Downstream communities often raise concerns or object to water supply reservoirs that may impair flows to their community. With concern over water scarcity presently on the rise in the Southeast, many communities and stakeholders are increasingly wary of any actions upstream that may affect water supply. Downstream communities may raise concerns, initiate lawsuits or take other recourse to ensure healthy river flows in their own communities, delaying or derailing a new reservoir project. This type of upstream-downstream conflict has led the State of Alabama, for example, to oppose new reservoirs in the upper Coosa River basin in Georgia.

A Framework for Reducing Risk

Recent cases demonstrate the tremendous financial risks of building new reservoirs. It is critical that water utilities remain financially healthy while providing clean water for residents, businesses and economic development in the years ahead. The smart path forward is one rooted in flexibility and resilient water supply strategies. Specific solutions must fit the fiscal and natural resources of the community, but the key is to pursue strategies that avoid investing in high-risk, high-cost water supply ventures.

In fact, keeping water supply costs in check gains even more critical importance when looking ahead: Utilities across the country are looking ahead to the need for extensive repairs and upgrades to water, wastewater and stormwater infrastructure. Having the financial resources to maintain the quality of our water systems and their environmental sustainability into the future will be critical. Utilities that avoid over-spending now for water supply projects will be better prepared to meet this ubiquitous and mounting challenge. While we feel it is crucial that utilities are able to set rates that recover the full cost of their services, it is equally important that ratepayers and taxpayers are asked to fund only those projects that are needed, smart, cost-effective and improve resilience and flexibility for the future.

Critical to prudent planning for future water supply are a full understanding of the real scope of future water demand, an awareness of the strategies available that have secured water supplies for other communities while keeping them financially healthy, and the pursuit of options that are flexible and allow for course corrections to adapt to resource constraints. Following are five broad recommendations for local leaders who seek to reduce their

communities' risks—both financial risks and closely-linked water resource risks—in planning for enough clean water for the future. First, below we present four ways of optimizing existing infrastructure.

Recommendation #1: Optimize existing water infrastructure first. Existing water system infrastructure holds the greatest potential for lowest-cost new supplies in almost any community. Maximizing the value of existing investments before making a major new public investment in a reservoir is common sense. More important, it is a far less risky path: less likely to spark conflicts with other water users and easier to implement in an incremental fashion, rather than taking on significant debt all at once for a major capacity expansion.

Water Efficiency

Many Georgia utilities have successfully implemented water efficiency measures, but there remains more progress to be made in treating efficiency as a supply source in the state. Treating water efficiency as water supply requires 1) performing comprehensive strategic planning tailored to the specific water utility in order to identify the most cost-effective programs that will secure a specified amount of water; 2) setting water saving goals and investing funds in efficiency to get results—albeit significantly less funding than what is needed for a reservoir; and 3) aggressively implementing the programs to secure savings. With a financial and programmatic commitment, utilities find real savings that translate into water supply.

Water efficiency is reliable. A utility that chooses to create new water supply through efficiency will be able to count on that savings when drought arrives. The utility is not on the hook for that increment of water and does not need to create new capacity for it. In this way, water efficiency is a far more reliable supply source than stored water that is subject to drought or the needs of other communities.

Water efficiency is flexible. A utility can implement water efficiency programs aggressively to ratchet down demand quickly if needed. Or, it can implement them at a slow and steady pace, as in Seattle's 1-percent-per-year reduction program, which provided more than enough water for new residents. The pace at which a utility implements and invests in water efficiency programs can be adjusted to meet its changing needs over time as compared with the "all-or-nothing" approach of building a reservoir.

Also, as noted in an article published recently in *The Georgia Engineer* magazine and reprinted in *The Georgia Operator*, in 2010 EPA Region IV issued its Guidelines on Water Efficiency Measures for Water Supply Projects

in the Southeast (Baughman et al.). These guidelines indicate various measures that utilities can undertake to find new water supply via water efficiency—measures to take before pursuing a new reservoir.

Potable Water Reuse

Indirect potable water reuse is an under-utilized and readily available source of water supply. In contrast to non-potable water reuse, which is often used for irrigation and is highly consumptive, indirect potable reuse can come close to a closed-loop system with little loss and minimal need for augmentation. This way it can displace the need for "new" potable water to be secured. Clayton County Water Authority's reuse system has become well-known in Georgia not just as an innovative approach to wastewater treatment, but also a secure and reliable water supply for the community, even during severe drought conditions. There is certainly potential for similar systems to work effectively elsewhere in Georgia to reduce ecosystem impacts on stressed river systems and to benefit utilities.

Interconnections to Meet Peak Demand

Often reservoir proposals arise from an interest in addressing a water system's peak water use, or "drought-proofing" a community's water supply. A more cost-effective option for "bridging" across periods of drought can exist in the form of water system interconnections. System interconnections can be a way to secure water supply, especially for relatively brief periods of time, without additional reservoirs, and at significantly lower capital expense and with shorter timelines. Interconnections can provide flexibility in addressing peak usage and drought's challenges, since they can be tapped more readily than many other infrastructure sources. Structured correctly to avoid unintended impacts of transferring water, interconnections can provide a lower-impact, lower-cost solution to the problem of meeting peak demands.

Interconnections also provide for more flexibility financially: While there might be the need for an initial outlay of funds to connect delivery pipes, the purchase of the water can be structured in such a way to allow for fluctuations in use so that a community is only paying for the water it uses when it uses it, rather than paying for the high price of a reservoir regardless of whether its water is used.

Repurposing or Reallocation of Existing Reservoir Storage

Many existing reservoirs serve multiple purposes such as flood control, water supply, hydropower generation,

navigation, and water quality. Each purpose has a specified allocation of water, and these allocations can be adjusted. For instance, flooding often can be managed effectively by restoring and reconnecting a floodplain to the river upstream of the reservoir. With the floodplain upstream of the reservoir absorbing significant quantities of water (as floodplains are naturally designed to do) and taking the pressure off of reservoir downstream, the space that was once allocated for flood control in the reservoir can then be allocated for water supply. In many cases this approach is a feasible, more cost-effective option for reallocating existing reservoir storage for water supply purposes.

In Raleigh, North Carolina, utility leaders are actively considering the reallocation of impounded water in Falls Lake Reservoir as an alternative to building the proposed Little River Reservoir. Falls Lake has storage capacity allocated to sedimentation, flood control, water quality and water supply. If the purpose of water quality can be met without its current allocation, or with less of the stored water, then the remaining water could be reallocated for water supply. As of this writing, reallocation of water storage in Falls Lake is the most likely alternative to be pursued by the water system. Along with reduced demand in the Raleigh system due to investments in water efficiency, reallocation at Falls Lake can provide more than the 13.7 million gallons per day (mgd) yield that the proposed Little River Reservoir is projected to provide.

Recommendation #2: Plan for water use to decrease as a community grows. Growing population does not necessarily equate to growth in water demand, especially when so many ways to ratchet down demand remain untapped here in the Southeast. Typically, water demand forecasts project an increase in water needs as population grows. However, such projections are not always reliable. For example, officials in Seattle, Washington have conducted 11 water demand forecasts since 1967, and actual demand has never in the past reached the forecast amount.

Communities can plan for decreased water consumption even as population increases. Through water efficiency, communities across the country have demonstrated that it is possible to reduce overall water consumption while population grows. For example, in Seattle total water consumption has declined by 52 mgd, or 30 percent, since 1990—down to levels used in the late 1950s—while population has increased 15 percent during those same years. (See Figure 1.) Meanwhile, Raleigh’s service population grew by 30,000 customers between 2007 and 2011, at the same time that the city reduced demand by 2 percent. And the water systems that are part of the South Florida Water Management District used 83 mgd less wa-

ter in 2010 than in 2000, while population grew by 600,000 people over the same period.

The prudent path is to incorporate aggressive water efficiency plans into demand projections before determining future needs. Not only can this reduce capital costs for any capacity expansions, or push expansions further into the future, it also helps a water system avoid spending for capacity that it doesn’t need. In this way the utility avoids paying today for water it may not need for another 40 years, if at all.

Figure 1: Population versus Demand—Seattle Public Utilities, 1975-2010

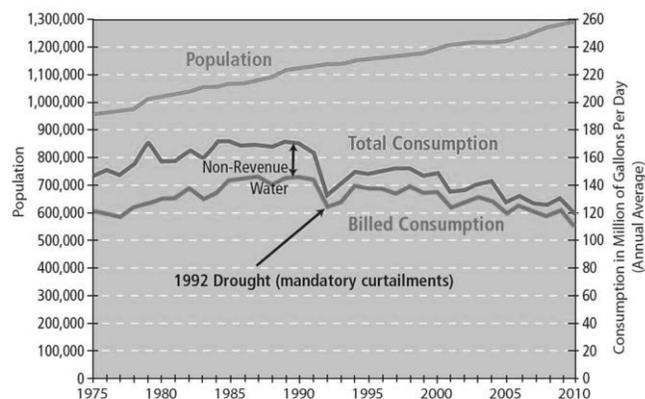


Image Credit: Seattle Public Utilities

Recommendation #3: Pursue flexible water supply solutions. Too often communities commit to major infrastructure investments which tie up critical capital resources and do not allow for course corrections when circumstances change. Changing economic and resource conditions require that utilities move away from water supply planning based around presumptions of “certainty” and embrace water supply options with inherent flexibility. Communities need water infrastructure that is responsive to variable weather, development patterns and economic circumstances.

Water supply alternatives such as water efficiency, storage reallocation, indirect potable water reuse and enhanced water system interconnections have the potential to better address the water infrastructure challenges ahead because they can be deployed incrementally, at lower cost, and at lower financial risk.

Recommendation #4: Accurately assess costs. It is imperative that local leaders examine accurate depictions of water supply projects’ costs in order to minimize risk and avoid over-extending the community’s fiscal resources. Worse than just making a reservoir appear more affordable than it is, a low preliminary cost estimate precludes

accurate benefit-cost comparisons, stacking the deck against other water supply strategies.

Similarly, in the planning stages a reservoir's projected yield often appears rosy, with assumptions that the lake level will always produce full yield. This makes the proposal's benefit-cost ratio appear rosy too. In reality, many reservoirs are producing less than full yield much of the time due to constraints on water resource availability (see Recommendation 5 below). Critically, this means their benefit-cost ratios come out lower than projected.

Local leaders can check proposed project costs against an accepted cost range from \$4 million to \$10 million per one million gallons per day yield, cited in a 2008 report for the Georgia Environmental Facilities Authority (GEFA Inventory and Survey). It is important to note that often, reservoir projects start out with a low-end cost estimate, and over the course of the project the price tag moves closer to the high-end estimate or even higher.

Recommendation #5: Examine water availability to minimize resource risks. Many rivers are running lower and drier. Stark images of reservoirs without water periodically captivate public attention. There are limits to how far our finite water supplies will stretch. The everyday water supply demands placed on our rivers by industry, agriculture, public water systems, and energy production, combined with extreme multi-year droughts, have pushed the supply-side solution of building new storage reservoirs to its limit in much of the Southeast.

When looking for reliable water supply solutions, local leaders should have a detailed understanding of current and projected water resource availability in the river basin, and associated resource risks, before pursuing a plan to impound stream water. Any water availability assessment should take into account the multiple water supply needs for communities along the river and the critical environmental functions upstream and downstream throughout the entire river basin.

Given the water quantity stresses affecting so many river systems throughout the Southeast, and because a reservoir's reliability depends on water inflows, building a new reservoir is a risky venture. Where our rivers are over-stressed for water supply, we run the risk of drying up and destroying the very natural resources on which we all depend.

Conclusion

It is critical that water utilities in Georgia and nationwide find ways to secure the revenues needed to maintain

water systems in the decades ahead. Just as critical, however, is controlling costs for any new infrastructure.

The more flexibility that can be built into the operations of a water system, the better it is able to respond to changes and serve its community cost-effectively. If population growth slows, industrial use decreases, or for any reason water demand doesn't match projections, water supply options that can respond to these changes place a community in a better economic position.

After all, change is a constant. To minimize risks related to the availability of water resources, utilities should pursue water supplies that are resilient in the face of extreme weather. Low-impact supplies rooted in optimizing existing infrastructure are by far best suited to this task. Maintaining financial flexibility by avoiding outsized, risky investments is a critical first step. As our communities move forward to develop strategies to meet tomorrow's needs, those communities that choose the prudent path will be better positioned—from both a financial and natural resource perspective—to address the needs of today and the future.

References

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