

Rivanna Water & Sewer Authority  
Revised Staff Recommendation  
A Multi-Step, Integrated Water Supply Strategy  
Urban Water Service Area

July 22, 2002  
Revised: October 28, 2002

## INTRODUCTION

At the direction of the Board of Directors, the Rivanna Water & Sewer Authority (RWSA) began a most important journey some six years ago. The journey was focused on determining the best possible strategy to supply the future drinking water needs of our community.

From the onset, the RWSA Board of Directors insisted that the public have extensive opportunity for input and that their views be carefully considered in forming the final recommendation. The RWSA took this charge very seriously and, over the course of the study, offered numerous opportunities for public input and the RWSA carefully considered many options suggested by the public. The public participation process is perhaps a model for others to follow when considering important subjects that will help shape our community in the future.

The objective of this report is to update the report provided to the RWSA Board of Directors on July 22, 2002 based on the recent findings from the emergency water supply study (September – October 2002).

## STAFF RECOMMENDATION - PLANNING HORIZON

The water supply study effort focused on a 50-year planning horizon for the future urban water supply. However, during the study it became apparent that there is uncertainty in making long-range water supply and demand projections. Members of the public articulated to the RWSA that many variables could affect 2050 water supply and demand projections including uncertainty about area population growth, uncertainty as to the level of community support for water conservation along with other factors including future governmental policies or decisions.

The RWSA staff is therefore recommending to the Board that our future water supply strategy be a **two-step strategy** with our initial efforts focused on meeting the projected water supply need through 2030. The second step in our recommended strategy will be to reassess the projected 2050 water supply needs and take timely action to obtain necessary permits and construct needed facilities to address any projected shortfall.

RWSA staff believes that more accurate and complete data will be available to predict the 2050 water demand in the future. For example, better data on area growth will be available, the results on water conservation will be clear and the Board will have the knowledge gained from implementing the 2030 water supply strategy.

In the 2020 timeframe, it is recommended that the Board of Directors direct RWSA staff to re-evaluate the then better defined gap between 2050 water needs and projected 2050 water availability. Again, this process should involve the public and it should be started in time to ensure adequate time for the possible lengthy permitting process depending on the 2050 water supply option.

The projected water supply demands, developed by the RWSA staff from the six-year study, for 2030, and for 2050, adjusted for three percent water demand reduction due to water conservation, are:

2030	16 MGD
2050	19.5 MGD

These figures assume that unaccounted for “water loss” is maintained at 13 percent or less by RWSA, the City and the ACSA. A 13 percent “water loss” is acceptable for a complex and older water supply system like ours. Some of this water is not truly a “loss” in that it is used for fire protection, in-plant uses and other legitimate purposes.

The public has commented that the three percent water conservation assumption made by RWSA staff is low particularly when the City and ACSA have established 10 percent water conservation goals. The RWSA staff believe our community can do better than three percent; however, for the purposes of this recommendation we have elected to remain conservative and use the three percent goal. If the community can sustain a greater than three percent reduction in water use, it will stretch the need for further investments and improvements in the water supply. We are hopeful that the community will prove our assumption to be wrong and both achieve and sustain the ten percent water conservation goal.

### **STAFF RECOMMENDATION – SAFE YIELD**

The urban water supply serving the City of Charlottesville and Albemarle County is currently served by four reservoirs. The future water supply study highlighted a serious sedimentation problem in the South Fork Rivanna Reservoir (SFRR). The study experts predicted that the SFRR will continue to lose capacity throughout the planning period due to sediment load from the watershed, and its safe yield will fall to zero sometime around 2050.

The March 2002 bathymetric study conducted by RWSA indicated there was a small gain in storage in SFRR in 2002 (questionable given the accuracy of the measurement method). This was certainly positive news but we believe the small “gain” was mainly attributable to the lack of major storms in the watershed last year, which will not be the case in future years. RWSA staff believes that the characteristics of the watershed and the historical trend data, illustrates that the sedimentation problem in the SFRR is **real** and must be addressed as part of the future water supply strategy.

## **STAFF RECOMMENDATION – MINIMUM INSTREAM FLOWS**

Members of the public have clearly articulated a desire for RWSA to provide releases from its reservoirs to the Rivanna River and the Moormans River to supplement instream flows. The RWSA staff believes that we have a **responsibility** to protect and enhance the environment as an integral part of our water supply mission. In the current severe drought, RWSA has changed its operating procedures to minimize drawdown from the Sugar Hollow Reservoir. We also continued our release to the Moormans River and continued our historical instream flow release to the Rivanna River for as long as practicable. We have artfully transferred production to the South Fork Rivanna water treatment plant to reduce water withdrawals from the Sugar Hollow system, and to help maintain water in the Sugar Hollow system for water supply and more naturalized instream flow. While our highest priority in a water supply crisis must be our **customers** and the community we serve, our recent actions demonstrate that the times when RWSA will not be capable of making instream releases should be a very small percentage of the time.

## **STAFF RECOMMENDATION – BASIC COMPONENTS OF STRATEGY**

On February 25, 2002, the RWSA staff made a draft recommendation to the Board concerning our future water supply strategy. The staff recommendation was a **synthesis** of the findings by the technical experts, comments from the public, along with RWSA staff judgment. The February 25, 2002 staff recommendation was built upon the following strategic building blocks:

WATER CONSERVATION  
WATERSHED APPROACH  
MAINTENANCE DREDGING  
SELECTED INFRASTRUCTURE ADDITION  
ENVIRONMENT TOO

This **harmonized strategy** is a modern strategy and not one dominated by “building new stuff”. It is perhaps a more challenging strategy since some of its elements, like watershed protection and maintenance dredging, are new ideas not completely locked down with engineering precision. We believe the **innovative strategy** we are recommending to the Board is a model for others to follow and we are excited to have the opportunity to work through the challenges and paradigm shifts, which we will face in bringing the approved strategy to fruition.

This strategy is a **multi-step, integrated solution** which RWSA staff believes is the optimal route to meet our area’s future needs and which is clearly responsive to the views of our community.

## **CURRENT DROUGHT CONDITIONS**

Our area is in the midst of a major drought that has its genesis as far back as four years ago. Annual precipitation over this time period has consistently been below historical levels. Area streams are at all time daily low flows and groundwater levels are severely depressed. The low groundwater levels adversely affect the baseflow in area streams that, in turn, reduces recharge into our reservoirs. Our community clearly needs a long, extended time period of above normal precipitation to replenish our groundwater, provide baseflow to streams and replenish our

reservoirs. The current conditions will not be corrected by a week, a month or a season of higher rainfall. It is essential that our water supply strategy recognize that droughts are a reality which must be addressed.

In October 2001, our total reservoir capacity reached approximately 68 percent and RWSA, the City and the ACSA called for voluntary water conservation (i.e., drought management). The City and ACSA have provided water conservation leadership in our community for years. Most recently, they have launched a major water conservation campaign, fully funded by the City of Charlottesville and the Albemarle County Service Authority, which is striving to convince area residents that water conservation is both easy and important. This is a long-term journey and we must stay the course to change individual water use patterns.

The current drought has brought urgency to the timetable to move forward on our future water supply. The message appears clear ...it is time to move forward to implement a Board approved water supply strategy for our urban service area.

## **PRINCIPLES UNDERPINNING THE WATER SUPPLY STRATEGY**

The principles underlying the strategy being recommended by RWSA staff were generally outlined in the February 25, 2002 report to the Board. Nearly all of these principles were strongly supported in the public comments at the May 1, 2002 public hearing.

The key strategic principles underpinning the RWSA staff recommendation are as follows:

The community wants the SFRR preserved which requires that we address the sediment problem. RWSA needs to be more active in watershed protection and both water supply and environmental benefits will occur.

Controlling sediment loads, at the source, in the watershed is desirable.

Water conservation must continue to be a key strategic element for the long-term.

The Buck Mountain Creek Reservoir must be retained as a future water supply option.

Environmental protection is an integral part of RWSA's basic mission

## **PUBLIC HEARING AND MEETINGS WITH ELECTED/APPOINTED OFFICIALS**

On May 1, 2002, the RWSA held a public hearing on the proposed water supply strategy. A copy of the hearing summary is attached.

The February 25, 2002 future water supply recommendation was also presented to the Albemarle County Board of Supervisors, the City of Charlottesville City Council and the Board of Directors of the Albemarle County Service Authority.

## **IMMEDIATE WATER SUPPLY STRATEGY (ADDRESS NEEDS TO 2030)**

The RWSA staff recommends the following water supply strategy be implemented to meet our area's projected water supply needs through 2030 and possibly beyond.

## **1. TAKE A WATERSHED APPROACH**

### **Become More Active Watershed Stewards**

RWSA will increase its role in the active stewardship of the watersheds serving our water supply system. We will work as partners with responsible individuals and organizations to protect and preserve the watersheds feeding our water supply. We will talk and act in a manner that illustrates that we have no higher priority than the protection of our watersheds.

### **Address Sediment Load from the SFRR Watershed**

RWSA, working with others, will identify the significant sources of sediment currently entering the SFRR. It is thought to be mainly a result of streambank erosion during high flows, but we need to understand our watershed better and identify the actual sources of sediment entering the SFRR.

RWSA then needs to develop partnerships with landowners and proactively seek creative ways to secure watershed improvements. We need to help organize a more active watershed community to bring greater focus and resources to bear on known and future challenges. We need to offer funding support where we identify severe watershed problems that are adversely affecting our future water supply. We will seek other partners and possible grant funds and become more visible watershed leaders.

We believe that source control of sediments will be a wise investment in that it will maintain or extend reservoir life and minimize the amount of sediment that must be removed through more expensive dredging.

## **GENERATE BETTER DATA FOR DECISIONS**

Good decisions require good data. Good data on streamflows and water quality is currently lacking and we must address this fault.

RWSA will continue to assist, as needed, in the financial support of the Mechums River gauging station. This station was recently restored to operation through the joint efforts of the Virginia Department of Environmental Quality (DEQ) and the RWSA.

RWSA will partner with the DEQ and the US Geological Survey (USGS) in establishing a flow gauging station downstream of the SFRR. RWSA will also investigate the development of a water supply model to enhance our ability to achieve the optimal balance in the operation of our facilities.

Water quality sampling of the SFRR and its major tributaries was unfortunately discontinued several years ago. RWSA has already re-initiated this sampling program and the first set of water quality samples have been collected. RWSA is also investigating a data management system to better organize all of our monitoring data, which is now only available in hard copy. We believe such a system will enhance our ability to track trends and make databased decisions.

## **WATER CONSERVATION BY ACSA AND THE CITY**

RWSA will continue to support the City of Charlottesville and the ACSA in their efforts to institutionalize water conservation. We offer hearty congratulations to both our customers for developing and funding the current 10 percent water conservation campaign. We believe in our local citizens and believe that they will embrace water conservation with the same enthusiasm they have recycling.

## **ADD FOUR FOOT CREST CONTROLS ON THE SFRR**

RWSA will immediately proceed with the surveying, engineering, and construction of four-foot crest controls on the SFRR. Our first steps will be to commission a survey in the fall to define the new reservoir pool level and communicate with the watershed community. This action will increase useable system storage by 600 million gallons and provide an increase in safe yield of approximately 7 MGD in 2050. Our technical experts estimate the cost of this improvement to be \$7.5 million (includes \$2 million for potential bridge replacement). RWSA staff believes this is an essential part of our immediate water supply strategy.

## **MAINTAIN DOWNSTREAM STREAMFLOW RELEASES AND MATCH DURING CRITICAL DROUGHTS**

RWSA understands its responsibility for both water supply and sound environmental management. We do not see a conflict between these two important responsibilities.

It is RWSA intent to honor the historical commitment to make an 8 MGD instream flow release from the SFRR except during severe drought conditions during which such action would threaten our ability to provide drinking water to the community. We believe these occasions will be rare, but we recognize that they may occur. Our technical experts have estimated that RWSA will be able to make the 8 MGD release approximately 99 percent of the time. Our environmental stewardship during the current drought illustrates our commitment to making the environment part of our daily operating philosophy.

During critical drought events, RWSA will match the SFRR release to the estimated flow into the SFRR.

The RWSA also intends to honor our commitment to release 400,000 gallons per day to the Moormans River at all times unless the total available reservoir water storage falls below 80 percent. Again, we have continued to make this release during the current drought. In time, we understand the need to look closer at the adequacy of this release to determine if it is protective of the Moormans River and its biota.

## **IMPROVED WATER SYSTEM MANAGEMENT AND DROUGHT PREDICTION**

RWSA has already taken action during the current drought to improve the environmental management of our water supply system. We have demonstrated the ability to make “systems decisions” in which we maximize water storage in one or more reservoirs and vary production at our treatment facilities to maximize operating flexibility while still meeting customer demands and environmental goals. We believe the water supply model we are investigating will help us further optimize our daily operation to meet overall objectives.

We will, of course, continue to work constructively with the City, the ACSA and other organizations, along with citizens, to research ways to improve drought prediction and better ways to communicate drought warnings to the public.

### **PERFORM MAINTENANCE DREDGING ON THE SFRR**

A great deal of the public comment and debate has occurred concerning dredging the SFRR. In the recent public hearing, there was strong community support for preserving the SFRR as a community asset and determining ways to perform dredging. One public commenter has stated that other communities have found ways to economically dredge their reservoirs.

RWSA has recently investigated the feasibility and costs of maintenance dredging on a portion of the SFRR. We recognize that some of the costs previously advanced by RWSA contractors were extremely large and RWSA experts also identified a myriad of potential logistical challenges. Any significant dredging project will generate a large volume of material, requiring significant transportation costs and a need to locate a large land area for the dredged solids. RWSA staff believes that periodic maintenance dredging of the SFRR should be part of our future water supply strategy. We believe that periodic maintenance dredging will preserve water supply capacity along with the beauty and environmental benefits of the reservoir. Having said that, we also recognize that questions about dredging and its costs must be further researched. However, RWSA staff are planning to undertake a dredging project to restore approximately 31 MG of storage by moving this material to a site adjacent to the reservoir, at a cost of approximately one-half of the unit cost of the previous estimate.

As part of its watershed approach, the RWSA also believes that source control in the watershed is clearly linked to the protection of the SFRR from future sedimentation.

RWSA staff recommends that the Board continue to provide support to study the methods, costs and logistics of periodic maintenance dredging with the understanding that RWSA staff will provide the Board with the study results and recommendations prior to proceeding with actual dredging projects.

RWSA staff also recognizes that the approximate 5 MGD historical loss of SFRR safe yield could be recovered through restorative dredging if proven economical.

### **EXPAND WATER SOURCES TO INCLUDE THE MECHUMS RIVER**

A pump station formerly existed on the Mechums River (1965), which was part of the urban water supply system. The pump station formerly captured Mechums River flow and pumped it to the Ragged Mountain (RM) Reservoirs or the Observatory water treatment plant.

Since February 25, 2002, RWSA staff, county staff and a local citizen have been working to determine the potential costs and benefits of rehabilitating this pump station. Meetings have been held with regulators as a part of this analysis.

The normalization of flow in the Moormans River was a major component of public comments made throughout the water supply study process. Many citizens expressed the view that a Moormans River solution should be included as a part of the future water supply strategy and

they pointed to the environmental value and beauty of the Moormans River as an asset to our community.

Previous technical investigations indicated that reactivation of the Mechums River pump station drawing solely from the flows in the Mechums River provided essentially no increase in the overall system yield. However, based on our recent investigations conducted as part of the emergency water supply study, RWSA experts identified the desirability of reactivation of the Mechums River pump station in combination with use of storage in Lake Albemarle and a portion of the available water supply storage in Beaver Creek Reservoir as a supplemental water source. Lake Albemarle is a State-owned recreational facility. A portion of the water supply storage in Beaver Creek Reservoir is currently used to meet the needs of Crozet and a portion could be used for the Urban Service Area. This pump station and storage would add to our available water supply serving the Observatory water treatment plant.

Also, as part of the Ragged Mountain dam rehabilitation study, we will be looking at the costs and benefits of increasing water supply storage in RM. As such, a Mechums River pump station may provide a water supply source that will allow us to take advantage of a storage and safe yield increase at RM. An additional benefit of a Mechums River pump station is that during above normal flow conditions it would provide a “non-reservoir” source of water to our system, although it could not meet 100 percent of our demand.

RWSA staff recommends that the Board approve this option as a part of our water supply strategy while RWSA staff continues to work towards a complete technical evaluation of the water supply and environmental benefits (including potential RM and Beaver Creek Reservoir storage benefits), the costs and environmental impact of this proposal. RWSA staff will keep the Board updated on this activity.

## **LONGER TERM WATER SUPPLY ALTERNATIVES TO MEET PROJECTED WATER DEMANDS BEYOND 2050**

The urban water supply needs through 2050 might not be met simply by implementing the 2030 water supply strategy. We fully expect that RWSA will eventually need to add additional sources of water to either meet the 2050 water demands or to go beyond 2050. The two-step strategy we are recommending to the Board will, however, allow us to make immediate needed progress and earn the time to better define our future water needs and the available water supply options.

As part of its two-step strategy, the RWSA believes that the following strategies constitute viable future water supply options that the Board should consider more fully after we have gained additional experience. RWSA is not recommending that immediate action be undertaken to implement the following water supply alternatives but RWSA staff currently regards them as part of the potential strategy to meet the water needs either prior to or beyond 2050.

### **1. CONSTRUCT DAM AND RESERVOIR ON BUCK MOUNTAIN CREEK**

The RWSA staff believes that the Buck Mountain Creek Reservoir property must be retained by the Board as a potential future water supply alternative for our community.

## **2. OBTAIN RAW WATER FROM THE JAMES RIVER**

The RWSA staff recommends that the Board retain the option to take water from the James River to supply our future area needs.

## **3. OBTAIN RAW WATER FROM CHRIS GREENE LAKE**

Based on work performed under the emergency water supply study, the RWSA staff recommends that we supplement low flows in the North Fork Rivanna River which serves the North Fork water treatment plant with raw water from Chris Greene Lake. If implemented in a timely manner during a critical drought, the water stored in Chris Greene Lake can be utilized to boost safe yield and preserve capacity in the reservoirs serving the Urban Service Area.

## **4. ADD EIGHT-FOOT CREST CONTROLS ON SFRR**

The RWSA staff recommends that the Board retain the option of adding four additional feet of crest controls on the SFRR to supply our future area needs.

## **5. UPSTREAM BASE FLOW AUGMENTATION WITH HIGHLY TREATED WASTEWATER**

The RWSA staff believes that a potential future water supply option is using highly treated wastewater from the Moores Creek Treatment Plant to supplement flow upstream of our reservoirs. We believe that public acceptance will need to evolve, however, before this could be considered to be a viable alternative.

## **6. RAISE RAGGED MOUNTAIN DAM**

Our technical experts advised that a 50 foot higher dam at RM would provide a viable long-term supply.

## **7. RELEASE WATER FROM BEAVER CREEK RESERVOIR**

The recent emergency water supply study indicated that at least on a short-term basis, and possibly on a long-term basis, some water could be released from Beaver Creek Reservoir, and then pumped at a renovated Mechums River pump station. Further study is required to assess Crozet's water supply requirements, and thereby confirm how much water is available for release. If Beaver Creek Reservoir's current water supply pool storage is not adequate to meet RWSA's needs, RWSA intends to explore use of the 600 million gallon flood pool storage for future water supply.

## **OTHER RELATED (NON-SUPPLY) WATER SYSTEM NEEDS**

In the course of the emergency water supply study, several priority needs in our existing water system were identified, and must be addressed to properly utilize our current facilities. Several of these improvements are presented below and in the cost summary, and are recommended for inclusion in the Water Supply Strategy since they add flexibility and reduce risk.

### **1. NORTH FORK INTAKE AND PUMP STATION**

Further study is required, but clearly we need to improve these facilities to routinely deliver up to 2 mgd to the North Fork water treatment plant. Use of the full plant capacity is critical in preserving storage in the reservoirs serving the Urban Service Area. Additionally, the current design of the raw water pump station is causing excessive pump replacement costs.

### **2. OBSERVATORY WATER PLANT AND PUMP STATION**

The Observatory water treatment plant capacity is currently limited by aging equipment and apparent hydraulic deficiencies. In order to better utilize the Ragged Mountain/Sugar Hollow Reservoirs, and the proposed Mechums River pump station, RWSA needs to assess and improve the capacity of the raw water supply and water treatment plant capacity up to its original reported capacity of about 7.7 mgd.

It also appears prudent to add a finished water pump station to the Observatory water treatment plant system, so that it can deliver desired pressures.

These investments to the Observatory system should substantially defer the need for expansion at the South Fork Rivanna water treatment plant (possibly until about 2030).

### **3. RESERVOIR AERATION**

Currently, only the SFRR has in-situ aeration capabilities. During the current drought, RWSA staff experienced considerable difficulty in treating “bottom waters” from Sugar Hollow Reservoir. In-situ aeration systems are recommended for Sugar Hollow and Ragged Mountain Reservoirs to enhance water quality. These systems can be used both during a drought to enhance water quality in the lower pool, and routinely to minimize the impact of seasonal changes.

## WATER SUPPLY STRATEGY – SAFE YIELD AND COST PROJECTION

The following summarizes the available safe yield and estimated costs for implementing the immediate water supply strategy to satisfy water needs through 2030 or so.

ELEMENT	INCREASE IN 2050 SAFE YIELD	CAPITAL COST	ANNUAL COST
<b>IMMEDIATE WATER SUPPLY STRATEGY (ADDRESS NEEDS TO 2030)</b>			
WATERSHED APPROACH Study sediment Buffers/stabilization Seed money for watershed group		\$100,000	\$250,000 \$10,000
BETTER DATA/DECISIONS MODEL AND NEW GAUGE		\$75,000	\$25,000
WATER CONSERVATION	Addressed by City and ACSA		
4 FOOT SFRR CREST CONTROLS AT SFRR	7 MGD	\$7.5 million (includes \$2 million for bridge replacement)	
INSTREAM FLOW RELEASES	up to 1.6 MGD	\$400,000	
IMPROVED DROUGHT MGT.	2.4 MGD	\$250,000	
SFRR MAINTENANCE DREDGING RESTORATIVE DREDGING	0.15 MGD	\$100,000 for study \$1 million for current project	
MECHUMS RIVER WATER SOURCE/BEAVER CREEK RESERVOIR RELEASE	UP TO 2 MGD	\$10,000 for additional studies \$500,000 for pump station rehabilitation	
<b>OTHER RELATED (NON-SUPPLY) WATER SYSTEM NEEDS</b>			
NORTH FORK INTAKE AND PUMP STATION		\$100,000	
OBSERVATORY WATER PLANT AND FINISHED WATER PUMP STATION		\$3,000,000	
RESERVOIR AERATION FOR SUGAR HOLLOW AND RAGGED MOUNTAIN RESERVOIRS		\$200,000	
<b>Total</b>		<b>\$13.2 million</b>	

The total projected cost is approximately \$13,200,000. The Board will have to consider a major bond issue to address these needs.

## **SCHEDULE FOR ACTION**

With Board approval, the RWSA staff intends to move forward within the approved budget. However, significant progress is tied to obtaining funding from a new bond issue and FY 2004 operating funds. As previously described, we are already actively implementing several elements of the strategy. With the concurrence of the Board, we would suggest that we focus upon the initial tasks for the addition of the four-foot crest controls, which is the long-lead item in our strategy. Our present estimate is that if we start now, the crest control improvements would be operational in early 2007.

## **RECOMMENDATION TO THE RWSA BOARD OF DIRECTORS**

The RWSA staff recommends that the Board approve the revised future water supply strategy as outlined in this presentation. A specific financial plan will be presented at a future Board meeting. The financial plan must also include the results of the CIP, the RM dam rehabilitation project, and the infrastructure and deferred maintenance study to provide a complete picture of the future costs.

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