Ragged Mountain Expansion

Major Components:

The major components associated with this alternative include:

1. replacing the dam at Ragged Mountain Reservoir with a new dam at higher elevation;
2. a pipeline connecting the RMR and the South Fork Rivanna Reservoir (SFRR) and SFRR Water Treatment Plant (WTP);
3. pumping stations at the RMR and SFRR;
4. a new pipeline connecting RMR and Observatory WTP;
5. a new raw water intake and low lift pump station at SFRR;
6. a pre-treatment facility located at the SFRR; and
7. an expansion of the water treatment facilities at SFRR WTP.
8. A release structure to meter flows and release water to the streams.

These facilities can be seen in Figure 14.

Following substantial public outreach comments related to the stream flow needs of the Moormans River and a Pre-Application Meeting with the regulatory agencies on June 22, 2005, the Ragged Mountain Reservoir Expansion Alternative was modified with respect to the refilling of the reservoir. Instead of replacing the SHR to RMR pipeline and refurbishing the Mechums River Pump Station as described in Section V of this report, the revised alternative reflect refilling the reservoir through a new pipeline from SFRR.

Raising the normal pool elevation of the RMR by 45 feet to an elevation of 686 feet would provide the necessary increase in the Urban System safe yield to provide an adequate drinking water supply over the 50-year planning horizon. This would be accomplished by constructing a new dam immediately downstream from the existing Lower RM Dam and the subsequent breaching of both the Upper and Lower RM Dams once the new dam is completed. Clearing of approximately 180 acres would be required for the expanded RM Reservoir based on the area required for access roads, staging areas, and clearing one vertical foot above the proposed normal pool elevation. Approximately 29,000 feet of either temporary or permanent access roads would need to be constructed and maintained over the course of the dam construction.

Raising the normal pool elevation of the reservoir would cause it to expand to the south side of Interstate 64 (I-64) via an existing 8-foot square culvert under the highway. It is anticipated that embankment may need to be stabilized to accommodate these changed conditions. The embankment stabilization would include stripping, filling, and seeding/mulching as well as constructing extensions of the box culvert with new head walls. In order to gain access to this portion of the expanded RMR, approximately 2,650 feet of permanent access road would be constructed. This road can be unpaved in order to appropriately maintain the wooded, high quality environment of this area.

A pipeline connecting the RMR to Observatory WTP and the SFRR would be constructed. The pipeline would provide water supply from the SFRR to the Observatory WTP under normal operating conditions and would be used to refill RMR from the SFRR when RMR is drawn down. This pipeline would also be used during severe drought conditions to provide water from RMR to both SFRR WTP and Observatory WTP in any proportions as system conditions dictate. Preliminary pipeline corridors have been selected, reviewed in the field, and presented to the public for comment. Much of the RMR-to-SFRR pipeline crosses large parcels and has been discussed with property owners. The RMR-to-Observatory route is assumed to parallel an existing pipeline. Acquisitions of 20' easements over approximately 25,200 and 11,000 linear feet would be required along the RMR-to-SFRR and RMR-to-Observatory WTP pipelines, respectively.

New pump stations would be constructed at both of the reservoirs to allow the transfer of water through the pipeline in either direction. The pump station at RMR would be located at or below the dam and would serve as a dual-purpose pump station with the ability to send water to either the SFRR or the Observatory WTP. The SFRR pump station would be a high lift pump station that would be used to transfer water to the RMR and the Observatory WTP. A new raw water intake and low lift pump station would be constructed at the SFRR that would deliver the raw water to the existing SFRR WTP and the proposed pre-treatment facility located on the SFRR WTP site. The pretreatment facility is designed to provide primarily sediment removal, turbidity reduction, and nutrient reduction. This will reduce wear on the high lift pumps delivering water to RMR or Observatory WTP, decrease operation and maintenance expense for the pipeline, and improve raw water quality transferred to RMR.

Facility sizes were selected based on the following criteria and assumptions:

1. The average daily demand (ADD) of the entire Urban system is 18.7 MGD.
2. Peak day demand (PDD) is 1.5 times the ADD and equals 28.0 MGD.
3. The North Fork source is limited to 2 MGD and the North Fork WTP would be expanded to 2 MGD.
4. Observatory WTP would be expanded to about 10 MGD.
5. SFRR WTP would be expanded to about 16 MGD so that the total Urban system WTP capacity meets the projected PDD.
6. The SFRR to RMR pipeline would be able to transfer a maximum of 20 MGD peak flow for refilling RMR. It must, in addition, have capacity to provide flows to Observatory WTP for continuous operation. When RMR is initially being refilled after a drought, it is likely that water conservation measures will still be in place and that the calculated PDD will not occur. Therefore, an additional allowance of one-half of the Observatory capacity of 10 MGD (which is 5 MGD) is projected to be adequate. This results in a maximum design flow of 25 MGD for the RMR to SFRR pipeline. The pipeline must also be able to convey up to 16 MGD in the opposite direction (from RMR to the SFRR WTP) when storage in SFRR and SHR is depleted at the end of a drought.
7. The pretreatment facility is also sized for 25 MGD so that all of the raw water pumped from SFRR to RMR can be pretreated for turbidity reduction and nutrient reduction.
8. The total capacity of the SFRR intake and low lift pump station for delivering water either to the SFRR WTP, or to the pretreatment facility for pumping to RMR or the Observatory WTP, is 41 MGD. This is the total of the peak day pumping rate to RMR and Observatory WTP (25 MGD) and the anticipated capacity of the SFRR WTP of 16

MGD.

Operating Guidelines

Operating guidelines were established to simulate future operating conditions for the RWSA Urban system including the proposed RMR Expansion and related features to:

1. Confirm that reasonable operating guidelines could be established;
2. Determine the size and configuration of the expanded RMR that will provide the projected water supply demand;
3. Understand potential changes in stream flow patterns, reservoirs operating statistics; and
4. Establish pumping guidelines for refilling RMR from SFRR.
   The guidelines discussed below were applied to the computerized raw water model originally developed to analyze the existing system and referenced in Section II of this report. These guidelines are established for the 2055 conditions and generally apply to times of drought, since these are critical for determining RMR reservoir size and other key operating parameters. During other times when water is plentiful, RWSA will use raw water to meet its demand conditions in any proportion with respect to its individual reservoirs and treat water in any proportion at its water treatment plants, subject to facility limitations. The release conditions discussed in operating guideline number 6 (below) and RMR refill conditions discussed in note 1 (below) will be followed at all times.

Operating Guidelines

1. *RWSA will be able to treat water in any proportion at its treatment plants, subject to facility capacity limitations, once the SFRR to RMR pipeline is constructed.*
2. *When necessary to maximize safe yield, use the maximum available from North Fork up to the established 2 MGD water treatment plant permit and withdraw remainder of demand at SFRR.*
3. *When flow past the SFRR stops, use the water from SFRR and SHR first, reserving RMR for last.*
4. *As the SFRR is drawn down, transfer water from SHR to SFRR as appropriate. SFRR should be sufficiently drawn down to avoid "losing" any runoff that may occur.*
5. *Assume 25% of water released from SHR is lost to stream baseflow during transfer. Note, actual performance should be monitored over time and appropriate adjustments made.*
6. *In addition to water demands, withdraw water from SFRR and pump to refill RMR when necessary according to the following schedule:*

SFRR Flow Past the Dam (MGD)	Maximum Allowable RMR Refill Pumping Rate (MGD)
0 to 18	0
18 to 40	10
> 40	Unregulated

Notes:

1. Assume that a minimum release at SFRR is the lesser of 8 MGD or the natural inflow to the reservoir. Until the SFRR to RMR pipeline is completed, minimum releases at Sugar Hollow are 0.4 MGD when storage exceeds 80 percent of SHR total storage. After the SFRR to RMR pipeline is completed, SHR will remain full and flow past the dam will mimic natural conditions except during drought periods when releases are authorized as expressed in these Operating Guidelines, or for conditions stated in Note 7. There are no minimum releases from RM; however RM is assumed to have constant seepage loss.
2. Dead storage in RMR is assumed to be 15 percent of total storage.
3. 2055 Average Day Demand is 18.7 MGD. Peak Daily Demand is 28.0 MGD.
4. Reservoirs are full at the beginning of the drought.
5. When SFRR flow past the dam exceeds 40 MGD, the maximum allowable RMR refill rate is not regulated and is limited only by the capacity of the pumping system as indicated in Operating Guideline 6. Hydraulic modeling concludes that following asevere drought, the actual refill rate under these SFRR flow conditions may need to be at least 20 MGD to refill RMR before the next dry season.
6. All water demands will be withdrawn from the SFRR during RMR refill. Peak daily demands will be satisfied as necessary.
7. None of the guidelines for any dam or reservoir are intended to prohibit short-term deviations in dam operation or downstream releases that may result from maintenance requirements, or in the interest of public safety under forecasts of severe weather events, such as a flash flood watch or warning or other similar circumstances.