MEMORANDUM

TO: **RWSA BOARD OF DIRECTORS**

FROM: **TOM FREDERICK, EXECUTIVE DIRECTOR**
JENNIFER WHITAKER, CHIEF ENGINEER

DATE: **APRIL 6, 2005**

SUBJECT: **RAGGED MOUNTAIN DAM UPGRADE COST COMPARISON**

At the March 3, 2005 joint boards meeting, there was considerable discussion about the options for implementing required dam safety improvements and their relationship to the water supply planning process. Cost estimates for some of the options discussed by the joint boards were not available at that time, and RWSA staff agreed to have Gannett Fleming provide these estimates. This memorandum summarizes this additional work.

Currently, RWSA holds conditional operating permits for the Upper and Lower Ragged Mountain Dam structures and must work to rectify the dam safety concerns at these facilities. Specifically, Virginia Dam Safety is requiring that RWSA make progress in the design of dam safety improvements by July 2005. The first step toward design progress, not yet accomplished, is to decide if dam safety concerns will be addressed by: (1) reinforcing the existing dam and building a new spillway; or by (2) constructing a new dam. This decision is best made with consideration of the likely ultimate height of the dam. Since the ultimate height of the dam is determined by the water supply planning process, and that process is subject to regulatory approval, the most conclusive way to address the ultimate height is to complete the water supply plan and submit it for approval. If the dam safety design decisions are made first, assumptions about the future height have to be made and some financial risk is accepted.

In 2004, Gannett Fleming conducted a structural assessment of the existing Ragged Mountain dams based on physical surface evidence, corings in the earthen dam, and available records of the dam design. They identified risks of catastrophic dam failure (with major property damage and potential loss of life) in the event of a major flood event or earthquake. As part of the further evaluation of the Ragged Mountain water supply alternative made public in January 2005, Gannett Fleming also offered that a decision to reinforce the existing lower dam will likely not support a future raising of the dam by more than 13 feet. Gannett Fleming then recommended that a new dam be constructed in lieu of reinforcing the existing lower dam if RWSA anticipates raising the reservoir in the future by more than 13 feet.

For purposes of spreading out capital costs over time, a new dam can be designed and built so that it is constructed in phases. However, Gannett Fleming has recommended that the foundation (built in the first phase of construction) be sized to accommodate the desired ultimate height. A dam built to accommodate future expansion requires a larger foundation and therefore a higher cost than a dam built to the same height with no future expansion.

The table below summarizes the initial phase costs of various alternatives regarding the Ragged Mountain Dam in two columns. All of the costs in the first column provide a dam that meets dam safety requirements but provides NO increase in safe yield over that which was available from the existing upper and lower dams. All costs in the second column include a raise of the reservoir by 13 feet. The differences in costs within a column represent the cost of different size foundations to support different ultimate heights. By example, $5,250,000 reinforces the existing dam for the same size reservoir, but does not build "opportunity" for future expansion. $14,148,000 provides a new dam to support the same size reservoir, but with the opportunity in a future phase to raise the reservoir as much as 45 feet (note that only initial phase costs are shown in this table, the future costs to raise the dam is not included).

	Cost Estimate to Build Dam at Current Size ($2005)	Cost Estimate to Build Dam with a 13' Height Increase ($2005)
Rehabilitation of Existing Dam	$ 5,250,000	$ 11,055,000
New Dam with Ultimate 33' Height Increase	$ 13,464,000	$ 17,971,000
New Dam with Ultimate 38' Height Increase	$ 13,749,000	$ 18,273,000
New Dam with Ultimate 45' Height Increase	$ 14,148,000	$ 18,691,000

To illustrate the meaning of financial risk expressed above, a couple of more examples are chosen. First, assume RWSA moves forward to implement the least cost option to correct dam safety concerns, without a decision on the community water supply. The $5,250,000 project is selected and the existing dam is reinforced. Later, when the water supply plan is completed, if the option approved by the regulatory agencies includes no Ragged Mountain component, the risk pays off and no further action at Ragged Mountain is required. On the other hand, if a significant raise in the Ragged Mountain reservoir becomes an essential part of future regulatory approval of the water supply plan, RWSA still has to build a new dam raised to a new height, which includes breaching the old dam. In this case, the "breach" includes the destruction of the same improvements that were completed with $5,250,000 of funds provided by the water rate payer.

Second, assume RWSA moves forward to design and build a new dam with a foundation to support an ultimate 45-foot increase, at a budget of $14,148,000. Later, if the Ragged Mountain alternative is permitted, the risk pays off. On the other hand, if the permitted option included no Ragged Mountain component, one could argue that $8,898,000 more (the difference between $14,148,000 and $5,250,000) was spent on dam safety repair than would have been necessary had the dam safety and water supply plan decisions been coordinated.

Based on the financial risk expressed above, RWSA staff continues to recommend that the community water supply plan decisions be coordinated with the dam safety design decisions. Further, continued progress toward completing the Community Water Supply Plan is recommended as the best way to keep these decisions coordinated and show "good faith efforts" to Virginia Dam Safety toward the completion of dam safety needs. It remains the staff recommendation to maintain this course, and toward that purpose staff is available to the Board of Directors, as directed, to achieve what is necessary to reach for that goal.

Attachment

cc: Ms. Andrea Terry
Dr. Robert Wichser

File: Community Water Supply – Phase III – Ragged Mountain Reservoir
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