

1.0 EXECUTIVE SUMMARY

The Rivanna Water & Sewer Authority (RWSA) has retained Schnabel Engineering, LLC (Schnabel) to perform a preliminary design study for the proposed earthen embankment dam. The purpose of this new structure will be to increase the impoundment capacity of raw water for the Ragged Mountain Reservoir (Charlottesville Reservoir) in Albemarle County, Virginia. Schnabel has concluded the preliminary design phase of the project which included the following:

- Hydrological Analysis
- Hydraulic Analysis
- Borrow Source Assessment
- Embankment Seepage Analysis
- Embankment Stability Analysis
- Foundation Excavation and Seepage Control
- Summary of Technical Specifications
- Preliminary Opinion of Costs

The following reports, under separate cover and prepared by Schnabel, were utilized in the preparation of this preliminary design report:

- *Alternatives Assessment Report-New Ragged Mountain Dam*, Prepared by Schnabel, May 2010.
- *Geologic and Geotechnical Report-New Ragged Mountain Dam*, Prepared by Schnabel May, 2010.

The proposed dam will be a 135-foot-high zoned earthen embankment with 2.75H:1V upstream and downstream slopes. The crest of the dam will be 25 feet wide at an elevation of 695.5 feet. The dam will consist of a two-stage, low-permeability core surrounded by higher permeability shell material. Sources of proposed earthfill to construct the earthen embankment dam have been identified on the existing western and eastern reservoir rims. The proposed borrow areas are in close proximity to the new dam, with the majority of the area below the water surface of the raised reservoir.

Embankment seepage and stability analyses were performed to develop the proposed embankment zoning and geometry. The results of the seepage analysis were used in the preliminary stability analyses performed and in the preliminary design of seepage control and collection systems. Stability analyses were performed to evaluate the stability of the dam under normal operating conditions, during a rapid drawdown of the reservoir, and during seismic loading. The calculated factors of safety were in general accordance with accepted dam safety criteria for the load conditions analyzed. The preliminary design of the seepage control and collection system includes a low permeability core in the earthen embankment, a grout curtain in the rock foundation, a chimney drain in the earth embankment, a blanket drain below the downstream shell of the dam and on the downstream dam abutments, and a toe drain around the perimeter of the downstream slope. Additional seepage and stability conditions will be evaluated in the final design of the dam.

The principal spillway will consist of a 90-foot-high concrete riser structure. An eight-foot wide weir in the proposed riser structure will control the normal pool of the reservoir at an elevation of 686 feet. Flows produced in excess of the 500-year storm will be conveyed through a 125-foot-wide rock-cut auxiliary spillway with an inlet control set at an elevation of 689 feet. A series of gates located at various

elevations along the riser structure all discharge from the reservoir to service the Observatory Plant or receive flows into the reservoir from the South Fork Rivanna River. A separate gate located near the bottom of the riser structure will serve as a means to drain the reservoir.

Based upon the preliminary design evaluation as described herein, Schnabel has estimated that the cost to construct an earthen embankment dam at the proposed site would range from approximately \$20,300,000 to \$27,100,000. This range includes a cost factor ranging from -10% to +20%. The cost for engineering design and construction observation and testing services, including a 10% cost factor, was estimated to be \$4,100,000.