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Review of the components in *C-Ville Water's Worst Case Scenario* alternative proposal as addressed in Black & Veatch 1994 study, VHB 2001study, Gannett Fleming studies/memos, and etc.

- Camp Dresser & McKee (CDM), July 1977 *Report on Alternative Water Supply Sources*
- B&V Study, *Urban Raw Water Management Plan Summary Report*, dated November 1994
- VHB 1997 study is the *Water Demand Analysis*, dated October 1997
- VHB 2001 study is the *Rivanna Water and Sewer Authority Water Supply project, Summary of Recommended Alternatives*, noted as Revised Draft May 16, 2001.
- Gannett Fleming *Demand Analysis for the Urban Service Area*, dated May 2004.
- Gannett Fleming *Water Supply Alternatives Supplemental Evaluation*, dated July 2004
- RWSA Response to Water Supply Inquiries, 3/2/2005
- Where cited, current dollars derived using an inflation calculator: http://data.bls.gov/cgi-bin/cpicalc.pl
- Note: [emphasis added]
- Note: C-Ville Water costs do not have separate line items matching the 20% for Engineering, Permitting and Construction Management or the 25% for Contingences. It must be assumed that these values are included in each line item. Where necessary, costs from other sources are modified to allow comparison per line item. CW makes no citation of cost estimate sources. Assumption is they are in current (2008) dollars.

Introduction: On their web page, http://cvillewater.info/, the local group opposing the adopted Community Water Supply plan offers three scenarios (including cost estimates) as viable alternatives to the adopted Plan. These are titled *Best Case*, *Moderate Case*, and *Worst Case*.

- The Best Case scenario is claimed to yield 17.3 mgd Safe Yield and to "restore and/or maintain capacity at SFRR, RMR, and the SHR. Use existing lakes as emergency backup."
- The Moderate Case scenario is claimed to yield 17.3 mgd and to "restore and/or maintain capacity at SFRR, RMR, and the SHR. Use existing lakes as emergency backup. Assumes higher costs for dredging and sediment traps."
- The Worst Case scenario is claimed to yield 19.1 mgd and to "restore and maintain capacity at SFRR and SHR. Increase capacity at RMR. Upgrade treatment and pipeline sizes to accommodate increased capacity. Use existing lakes as emergency backup."

The following information relates to the components proposed in the *Worst Case* scenario, as this is the only alternative identified as meeting the projected 2055 water demand for the Urban Service Area. However, several components appear in all three alternative scenarios.

C-Ville Water Alternative Component	Best Case	Moderate Case	Worst Case
Access currently-unused deep water storage at SFRR	X	X	X
Build SFRR sediment traps, periodically dredge them for 50 yrs	X	X	X
Install Flow valves on Beaver Creek	X	X	X
Install Flow valves on Chris Greene	X	X	X
Install Flow valves on Lake Albemarle	X	X	X
Restoration Dredging of SFRR	X	X	X
Renovate OH WTP at 4 mgd	X	X	
Repair RM Dam Spillway at existing height	X	X	
Replace RMR to OH WTP pipeline, with 18"	X	X	
Replace Sugar Hollow to RMR pipeline with 18"	X	X	
Upgrade SFRR WTP to 16 mgd	X	X	
Increase existing RM Dam by 13 feet			X
Increase RMR to OH WTP pipeline to 24"			X
Replace Sugar Hollow to RMR pipeline with 24"			X
Upgrade OH WTP at 6 mgd			X
Upgrade SFRR WTP to 18 mgd			X

C-Ville Water's *Worst Case Scenario* alternative. Cited as meeting projected demand. From webpage.

- Restore and maintain capacity at SFRR and SHR. Increase capacity at RMR. Upgrade treatment and pipeline sizes to accommodate increased capacity. Use existing lakes as emergency backup.
  - Increase existing Ragged Mountain Dam by 13 feet
  - Restoration Dredging of SFRR
  - Build SFRR sediment traps and periodically dredge them for 50 years
  - Install Flow Valves on Beaver Creek, Lake Albemarle, & Chris Greene
  - Access currently-unused deep water storage at SFRR
  - Increase RMR to Observatory Water Treatment Plant pipeline to 24"
  - upgrade Observatory Water Treatment Plant at 6mgd
  - Upgrade SFRR Water Treatment Plant to 18 mgd
  - Replace Sugar Hollow to RMR pipeline with 24"

CW Proposal: Install Flow Valves on Beaver Creek

VHB 2001 Study

- Page 21: "This alternative involves conveying water from Beaver Creek Reservoir to the Mechums River to supplement flows to the SFRR during severe drought conditions."
- Page 22: "This alternative is not effective, because water demand in the Crozet area is expected to utilize the entire safe yield of Beaver Creek by 2050. Furthermore, the ability to capture a significant portion of any in-stream release is uncertain, and would depend on stream characteristics. Specifically, during drought conditions, when this alternative would be needed, the receiving streams could be sufficiently dry that a significant portion of the release would be lost to infiltration. The only method of documenting this possibility is field-testing during such drought conditions."
- Page 22: "A cost of $500,000 is included for necessary flow measuring equipment downstream of the reservoir."
- Page 22: "Because it would provide no safe yield, we recommend that this alternative is not part of a practicable long-term solution. However, in the short-term, before demand in Crozet reaches the 2 mgd level, Beaver Creek could offer some additional yield. We therefore recommend that necessary evaluations take place during the next severe drought."

- Page 39: Regarding suggestions that some alternatives have not been evaluated. "Although the SFRR currently provides the bulk of the raw water for the region, other existing impoundments at Chris Greene Lake and Beaver Creek were analyzed for their water supply potential."

RWSA Response to Water Supply Inquiries, 3/2/2005

- Page 1: "Unlike the urban water system with multiple reservoirs, the Crozet system is completely reliant in the Beaver Creek Reservoir for future demands. With only 0.8 mgd of unused projected safe yield at 2025 and the uncertainty of future Crozet water needs beyond the twenty years projected by Albemarle County, the use of Beaver Creek Reservoir as a permanent water supply for the urban system was not recommended."

CW Cost: Assume $500,000 (Web page shows $1.5-million for Beaver Creek, Chris Greene Lake and Lake Albemarle Flow Valves.)
Note: GF 2005 cost estimate sheets, Alternative 5: Beaver Creek Flow Controls estimated at $500,000. Accounting for 20% E/P/CM and 25% Contingency, $750,000. In 2008 $s, $831,693.

CW Proposal: Install Flow Valves on Chris Greene

VHB 2001 Study, page 17, 18:

- "This alternative involves use of water in Chris Greene Lake to supplement the water supply system during periods of drought."
- "For all these versions, water would be piped directly from the lake to the North Fork water treatment plant in order to prevent pump damage and maintenance problems that presently result from the intake of suspended sediments in the North Fork Rivanna River at higher pumping rates. In addition, in order to describe an alternative that would take advantage of the existing 2 mgd treatment capacity of the North Fork Treatment Plant, to the extent that it is practicable to do so, while avoiding major infrastructure costs associated with other variations of this alternative, a drawdown of 0.5' utilizing a direct stream release was analyzed. This represents the maximum use of the existing North Fork facilities that is feasible given existing constraints on pump usage and maintenance. However, there is insufficient water demand presently for use of this water in the northern segment of the Urban Service Area, and infrastructure does not currently exist for distributing this water to the main portion of the service area to the south."
- Page 18: "However, there is no need for this water at present in the northern portion of the Urban Service Area and it would have to be transmitted south, involving additional infrastructure expense, to be beneficial to the system."
- Page 18: "As stated above, the 0.5' option would utilize existing treatment capacity, and would require limited infrastructure improvements to serve the North Fork service area. The $500,000 estimate covers the cost for control and gauging improvements at the dam, as well as valving improvements in the North Fork distribution system."
- Page 19: "The total cost of this alternative could increase further if Albemarle County were required to replace any impacted recreational facilities, which were constructed at Chris Greene Lake using Land and Water Conservation Funds. If recreation of any kind were eliminated or suspended, Albemarle County would have to develop a replacement facility of equal recreational usefulness as determined by the State Comprehensive Outdoor Recreation Plan. Although the value of the recreational facilities at the lake is uncertain, recent recreational improvements made by the County at Walnut Creek and Darden Towe Memorial Park suggest that replacement could cost approximately $4 million."
- Page 20: "The Virginia Department of Health has raised concerns about allowing of primary contact recreation (swimming) should the lake be utilized for water supply purposes via the direct pipeline method described in the Alternatives Evaluation. Given the practical difficulty in capturing the water in the stream release option and existing pump damage and maintenance

issues at higher pumping rates, the direct pipeline represents the only way to assure access to the safe yield provided by the drawdown. In a written response, the VDH has raised the possibility that use of the lake for water supply could result in prohibition of all primary contact recreation. This would represent the loss of a significant community amenity, and could also have cost implications, as discussed above. Finally, lowered pool levels would temporarily impact wetlands and submerged vegetation, but are not anticipated to have long-term impacts. Pipeline construction could result in impacts to less than 1 acre of wetlands."

- Page 20: "Utilization of the 0.5' drawdown should be seen as a potential emergency measure during severe drought periods. The difficulties associated with withdrawal using the direct stream release and the lack of demand for the resulting yield in the northern portion of the service area make full time use of this option impracticable at present."
- Page 39: Regarding suggestions that some alternatives have not been evaluated. "Although the SFRR currently provides the bulk of the raw water for the region, other existing impoundments at Chris Greene Lake and Beaver Creek were analyzed for their water supply potential."

On Chris Greene Lake being evaluated as a Pumped Storage Reservoir
VHB 2001 Study

- Page 21: "This alternative would provide no increase in safe yields due to lack of storage capacity in the lake during non-drought conditions and lack of sufficient flow in the North Fork Rivanna River during those times when storage is available."
- "Because it would provide no safe yield, we recommend that this alternative not be included as part of a practicable solution."

RWSA Response to Water Supply Inquiries, 3/2/2005

- Page 1: [The 2004 Water Supply Alternatives Supplemental Evaluation] concluded that the concept of using Chris Greene Lake and Lake Albemarle were not further developed due primarily to their minimal safe yield contributions, existing condition, ownership issues, and logistics of use."

CW Cost: Assume $500,000 (Web page shows $1.5-million for Beaver Creek, Chris Greene Lake and Lake Albemarle Flow Valves.)
Note: GF 2005 cost estimate sheets, Alternative 5: Beaver Creek Flow Controls estimated at $500,000. Accounting for 20% E/P/CM and 25% Contingency, $750,000. In 2008 $s, $831,693.

CW Proposal: Install Flow valves on Lake Albemarle
RWSA Response to Water Supply Inquiries, 3/2/2005

- Page 1: [The 2004 Water Supply Alternatives Supplemental Evaluation] concluded that the concept of using Chris Greene Lake and Lake Albemarle were not further developed due primarily to their minimal safe yield contributions, existing condition, ownership issues, and logistics of use."

CW Cost: Assume $500,000 (Web page shows $1.5-million for Beaver Creek, Chris Greene Lake and Lake Albemarle Flow Valves.)
Note: GF 2005 cost estimate sheets, Alternative 5: Beaver Creek Flow Controls estimated at $500,000. Accounting for 20% E/P/CM and 25% Contingency, $750,000. In 2008 $s, $831,693.

CW Proposal: Restoration Dredging of SFRR
VHB 2001 Study

- Page 13: "The dredging alternative consists of removing and disposing of some or all of the accumulated sediment in the upper and middle reaches of the SFRR. The reservoir is currently losing storage capacity due to siltation at a rate of approximately 13 million gallons per year."
- Page 13: "The first option involves a one-time dredge event sometime prior to 2050. This action would return the reservoir to roughly its original storage capacity; thereafter sedimentation would continue and yield would diminish. The second option involves annual maintenance dredging to maintain the current yield of the SFRR. Both options would result in similar safe yield increases in 2050."
- Page 13: "Additional research performed concerning this alternative subsequent to our prior evaluation has included contacting several additional dredging contractors to solicit cost estimates. This investigation uncovered a wide range of possible costs; the original estimate in the Alternatives Evaluation is within that range."
- Page 14: "The first scenario assumes a one time dredging event, around year 2020, with permanent disposal at an upland site that requires a degree of construction to contain and dewater the sediment. In order to achieve 7.2 mgd in safe yield, 3.07 million cubic yards of sediment would need to be dredged (assuming siltation rates remain constant). The total cost for such an event is approximately $40-miilion….[as detailed below].

    - Land Purchase — $2 million [2008 $s = $2.45 million]
    - Earthen dams — $2 million [2008 $s = $2.45 million]
    - Dredging at $7/CY — $21.5 million [2008 $s = $26.3 million]
    - Wetland Mitigation — $800,000 [2008 $s = $978,310]
    - Improvements to WTP — $3 million [2008 $s = $3.67 million]
    - Subtotal — $29.3 million [2008 $s = $35.8 million]
    - Eng., legal, admin. Fees 15% — $4.4 million [2008 $s = $5.4 million]
    - Contingencies — $5.9 million [2008 $s = $7.2 million]
    - Total — $39.6 million [2008 $s = $48.4 million]

Note: In 2008 $s, 3.07 mcy dredged at $48.4 million equates to $15.77 per cy. Dredging 5 mcy could be estimated to cost approx. $78.8 million. VHB assumed the acquisition of 180-acres at roughly $10,000 per acre. GF 2007 estimate ranged between $199 million and 223 million and assumed land costs of $40,200 per acre. Adjustments for inflation increase the 2001 VHB assumption to only $13,000 per acre.

- Page 14: "A second scenario assumes that disposal options prove more restricted, and that spoil material has to be dewatered at a temporary site and then hauled to a permanent location. The following figures assume a 25-acre drying site, on which 8' high earthen dikes are constructed to contain sediment at a depth of 6'. Such a site would be capable of containing approximately 240,000 cubic yards of sediment. Assuming 13 dredge events over 8 years (allowing roughly six months dewatering time for each event), the full 3 million cubic yards could be handled. The total cost under these conditions is approximately $75 million, as detailed below…

    - Land Purchase — $275,000 [2008 $s = $336,290]
    - Dredge/dry/haul @ $17 per cubic yard — $52.2 million [2008 $s = $63.8 million]
    - Improvements to WTP — $3 million [2008 $s = $3.67 million]
    - Subtotal — $55.5 million [2008 $s = $67.9 million]
    - Eng., legal, admin. Fees 15% — $8.3 million [2008 $s = $10.2 million]
    - Contingencies — $11.1 million [2008 $s = $13.6 million]
    - Total — $74.9 million [2008 $s = $91.6 million]

Note: In 2008 $s, 3 mcy dredged at $91.6 million equates to $30.53 per cy. Dredging 5 mcy could be estimated to cost approx. $153 million. VHB assumed the acquisition of 25-acres at $10,000 per acre. GF 2007 estimate ranged between $199 million and 223 million and assumed land costs of $40,200 per acre. Adjustments for inflation increase the 2001 VHB assumption to only $13,000 per acre.

- Page 15: "Each of these scenarios assumes that the spoil material must be disposed of. If a beneficial use could be found for some or all of the material, costs could be reduced accordingly. In fact, depending on the use, grant funding may be available to assist with the total cost. The amount of grant funding available could be very limited, however, and account for only a small portion of the total project cost, Furthermore given the large amount of material in question, finding beneficial uses for a substantial portion could prove difficult."
- Page 15: "Dredging would also temporarily resuspend bottom sediments and organic detritus. Costs are included for temporary increases in water treatment resulting from this disturbance."
- Page 15: "This alternative offers the potential to increase safe yield over the loner-term, but has a higher unit cost and greater environmental impacts than the alternatives recommended herein for immediate implementation."

CW Proposal: Build SFRR sediment traps [forebays] and periodically dredge them for 50 years

VHB 2001 study

- Page 8: "Construction of forebays has the potential to reduce, but not eliminate, sedimentation into the SFRR. [F]orebays are estimated to have a 40% sediment removal efficiency."
- Page 9: "The above efficiency therefore does not imply that forebays could reduce the total sediment load into the reservoir by 40%. Furthermore, the large size of the watershed is a contributing factor, and could diminish the overall effectiveness of forebays."
- Page 9: "This discussion assumes construction of 2 forebays—one at the head of the reservoir below the confluence of the Meechums, Moormans, and Buck Mountain Creek, and one where Ivy Creek enters the reservoir. The total estimated cost to design and construct the forebays is $232,000 [and] clean out maintenance equates to an annual cost of roughly $46,000.

Note: In 2008 $s, estimate for forebays and 50 years of annual maintenance costs would be $3.13-million. Excludes wetland mitigation, see below.

- Page 9: "The impact of constructing sediment forebays would depend on the exact location, size and design of the facilities. Possible effects include the loss of wetlands, but the extent of that impact would depend on the variable factors described above. No cost for wetland mitigation was included; however, depending on specific location, mitigation may be required."

CW Proposal: Access currently-unused deep water storage at SFRR

RWSA Response to Water Supply Inquiries, 3/2/2005

- Page 2: [In response to question about Dead Storage being used as "viable future water supply."] "In reservoir design and in regulatory review, it is considered standard practice to reserve Dead Storage area for sediment and not include this volume in the calculation of the reservoir's safe yield."
- Page 2: "Although dead storage cannot be counted as part of the usable water supply storage under normal circumstances, as a practical matter, if the community ever faced a more severe drought than the current drought of record, and water levels were approaching the defined interface between the Water Supply Pool and the Dead Storage, RWSA would be actively obtaining data on the quality of any water in the Dead Storage to determine if that water could be removed by a sump pump and treated to drinking water standards. Since such practice would be exercised only under extenuating circumstances, and there is no guarantee the water in this zone would be suitable for treatment, it is not considered safe yield."

CW Proposal: Ragged Mountain Reservoir to O-Hill WTP Pipeline

- *Worst Case*. Increase RMR to Observatory Water Treatment Plant pipeline to 24"
    - CW cost: $6,000,000

Note: Permit Support Doc, June 2006, Page 56, Table 13: RMR to Observatory Pipeline noted at $7,700,000 (RM option). Accounting for 20% E/P/CM and 25% Contingency, estimate for this pipeline could between approximately $11,500,000.

CW Proposal: O-Hill WTP

- *Worst Case*. Upgrade Observatory Water Treatment Plant at 6 mgd
    - CW cost: $10,000,000

Note: Permit Support Doc, June 2006, Page 56, Table 13: "Observatory WTP Upgrades $14,200,000." Unclear how Permit Docs and CW proposal compares relative to capacity, necessary improvements, etc.

CW Proposal: Ragged Mountain Dam

- *Worst Case*. Increase existing Ragged Mountain Dam by 13 feet
    - CW cost: $11,000,000

Note: GF memo April 6, 2005 re: RM Dam: Rehabilitation of existing Dam Plus 13 feet, $11,050,000 (2005 $s). In 2008 $s, $12,253,620.

CW Proposal: South Fork Rivanna Reservoir Water Treatment Plant

- *Worst Case*. Upgrade SFRR Water Treatment Plant to 18 mgd
    - CW cost: $12,000,000 [6 add'l mgd equates to $2.0-million / mgd]

Note: GF 2005 cost estimate sheets, WTP Upgrades at $1,500,000 / mgd. In 2008 $s, $1.66-million. Plus Engineering, Permitting and CM (20%), and Contingency (25%), Total = $2.49- million / mgd. Therefore, an add'l 6 mgd could be estimated at $14.9-million

CW Proposal: Sugar Hollow to Ragged Mountain Pipeline

- *Worst Case*. Replace Sugar Hollow to RMR pipeline with 24"
    - CW cost: $20,000,000 [66,000 LF equates to $303 / LF]

Note: GF Feb 16, 2005 memo, RE: RMR: 18" pipeline estimated at $195/lf (2004 $s). Equals $224 in 2008 $s. Plus Engineering, Permitting and CM (20%), and Contingency (25%), Total = $336 / LF. Therefore, a 24" pipeline could be estimated at, *at least*, $22.2-million.

Component	C-Ville Water Cost	GF Estimate (plus E/P/CM and Cont.
RM to OH pipeline	$6,000,000	$11,500,000
Upgrade OH WTP	$10,000,000	$14,200,000
RM Dam Repair + 13ft	$11,000,000	$12,253,620
Expand SFRR WTP	$12,000,000	$14,900,000
SH to RM pipeline	$20,000,000	$22,000,000
Total (Above components only)	**$59,000,000**	**$74,853,620**

Additional Issues

Buck Mountain Reservoir

CW does not address this on their web page except by reference to letters by William Cructhfield. In recent public statements they have raised it as an option that should be reevaluated. Members of CW have recently challenged local officials to *prove* that the James Spinymussel has been identified in the area along Buck Mountain Creek.

In the Daily Progress, 12/3/08, pg A9, Kevin Lynch is cited for stating that "the Buck Mountain Creek was dismissed as a source of water partly because of infrastructure problems."

Note: According to the 1977 CDM study, the Buck Mountain reservoir option (noted as Site B) would require inundation of 306 acres and would require a 34,600 ft transmission line between the dam site and the [SFRR] treatment plant.

Note: According to the 2001 VHB study, sheet 3 of the Alternative Matrix, constructing a reservoir at Buck Mountain would cost an estimated $57-million [$69.7-million in 2008 $s], would impact 59-acres of wetlands, and noted the existence of the James Spinymussel in the area.

Note: Reference the GF 2004 *Supplemental Evaluation*, page 47, *Alternative 2 – Construct a New Dam at Buck Mountain Creek.*

- "Based on preliminary analysis done to-date, the projected cost of this alternative is $109.7 million." [Roughly $125-million in 2008 $s.]
- "The [James Spinymussel] is federally listed as an endangered species and it has been confirmed as a resident in the project area."
- "An estimated 25 acres [of wetlands] would be impacted, requiring avoidance if possible, and in any event appropriate compensatory mitigation."
- "Approximately 40,000 linear feet of stream and associated habitat would be impacted, mitigation may be required."
- "Based on the impacts to the James spinymussel and the high level of anticipated impacts to wetlands and linear feet of stream habitat it is recommended that this option NOT be considered for more detailed analysis."

Note: According to information provided by the Nature Conservancy, on August 19, 2004 biologists from the Virginia Cooperative Fish and Wildlife Research Unit identified "one live Pleurobema collina" [James Spinymusssel] at the "confluence of Buck Mountain Creek and Rivanna River."

Population/Demand Projections

CW Claim: (from the web page)

- "RWSA projects daily usage of 18.7 mgd in 2055. This is artificially high because of 3 faulty premises."
  - #2 "This inflated baseline is further compounded by 50 years of population growth estimates that are 7% higher than the accepted state (VEC) accepted numbers."

B&V 1994 Study:

- Page 4: "Water demands were computed by the Authority using population estimates projected to the year 2040 and an average daily per capita consumption of 121 gallons."
- The Authority's projected average daily demand in the year 2040 is 18.7 mgd.

Note: This projection correlates to a projected year 2040 Urban Service Area population of 154,545.

VHB 1997 Study

- Page 10: For the City of Charlottesville. "Based on the three analyses it appears reasonable to estimate the City population to be approximately 45,000 people in the year 2050."
- Page 12: For the City of Charlottesville. "Based on the population projection of 45,000 people for the City, and the estimated per capita daily consumption of 111 gallons per person per day, this method results in an estimated water demand, in the year 2050, of approximately 5.0 MGD."…."
- Page 22: For the Albemarle County Urban Service Area. "[The] estimated population to be served is made up of three components: 1) current population within the [Albemarle] Urban Service Area boundaries (34,613); 2) future population within the [Albemarle] Urban Service Area boundaries (70,158); and 3) the population currently served that is outside the[Albemarle] Urban Service Area boundaries (5,208). This results in a total estimated population served of approximately 111,000 [sic] people."
- Page 22: For the Albemarle County Urban Service Area. "Based on these projections and assumptions, it is estimated that the population served in 2050 will be approximately 110,000 people."
- Page 23: For the Albemarle County Urban Service Area. "Based on the projection of population served of 110,000 people in the year 2050, and the estimated per capita daily consumption of 99 gallons per person per day, this method results in an estimated water demand, in the year 2050, of approximately 10.89 MGD."

Note: Excluding UVA, in the Urban Service Area the total [VHB] projected 2050 population is 155,000 with a daily demand from the projected at 15.89 MGD.

VHB 2001 Study

- Page 38: "This study concludes, using all four approaches and the best available data, that demand can be expected to continue to rise from its current level to the design year 2050. In addition, it was found that each of the approaches results in total demand estimates that correlate well with the other approaches used. Total demand estimates fall within a range of approximately 20 percent. While thee demand estimates result in a range of values, the study does not conclude that any one approach results in a better projection than any other approach. As a result, the study comes to the overall conclusion that total water demand in the year 2050 will range between 18 MGD and 21 MGD."

GF 2004 Demand Analysis, Table 1: City and County Service only, Excludes UVA.

- City of Charlottesville
  - Projected 2055 Population: 39,861
  - Per Capita (daily) Demand: 108.5 gallons
- Albemarle County Urban Service Area
  - Projected 2055 Population: 101,941
  - Per Capita (daily) Demand: 93 gallons
- Metered use Outside Albemarle County Urban Service Area
  - Projected 2055 Population: 1,431
  - Per Capita (daily) Demand: 93 gallons

From the above:

- Projected 2055 Population: 143,233
- Total Projected Daily Demand: 13.8 MGD

GF 2004 Demand Analysis

- Page 6: "[The trend line] provided a 2055 population projection of 39,861 people for the City of Charlottesville. This projection compares favorably with the information indicated by the Virginia Economic Commission population projections through 2030."
- Page 8: "[The trend line for Albemarle County] provides a population projection of 167,116 for the year 2055. Utilizing the 61% connectivity to the urban system, the population served by RWSA is projected at 101,941."

Note:

- On 11/21/08, from the VEC web page, the projected 2030 population for Charlottesville was 42,278. (2010 projection, 40,639; 2020 projection, 41,423.) This trend line suggests a 2055 population of approximately 45,000 people vs. GF's 39,861. With the latest VEC projection, the projected demand is increased by approximately 0.48 mgd.
- On 11/21/08, from the VEC web page, the projected 2030 population for Albemarle was 120,456. (2010 projection, 96,247; 2020 projection, 107,760.) This trend line suggests a 2055 population of approximately 155,000 people vs. GF's 167,116. With the latest VEC projection—and using the same methodology as GF--the projected County Urban Service Area demand is reduced by approximately 0.69 mgd.
- The above suggests a net reduction of 0.21 mgd to the projected demand based on population. (+0.48 mgd and -0.69 mgd = -0.21mgd)
- (See Table 1 in GF Demand Analysis) Projected 2055 demand (18.7 mgd) is based on the average of four methods: Historic Production (20.44 mgd), Population (18.3 mgd), Comprehensive Plan (20.51 mgd), and Historic Demand (19.11 mgd). The projection based on Population was 18.3 mgd. Reducing this value by 0.21 mgd equals 18.09 mgd. Recalculating the average for the four methods, the result is a projected demand of 18.56; a net reduction of 0.14 mgd from the GF 2004 estimate.

Water Conservation Plan

VHB 2001 Study

- Page 4: "The [study] concludes that voluntary conservation measures can reduce demand in 2050 by approximately 1.7 mgd (8% of 2050 total demand). Because a variety of factors will affect the program's success, an exact figure cannot be calculated."
- Page 5: "The cost for this alternative is estimated to be $2.5-million, excluding any potential reduction in revenues due to lower sales." [Note: In 2008 $s, estimate would be $3.06-million.]

Site Work for Repair Existing Ragged Mountain Dam vs. New

CW Claim: (from web page) **"**Build five miles of roads at the Ragged Mountain Natural Area. Roads will be required for clear cutting of timber, dam construction, and reinforcement of the I-64 embankment. In addition, two miles of the now rural Reservoir Road will need to be widened and improved for the heavy equipment needed to build the dam."

Note: Will the repair of the Ragged Mountain Dam—versus replacement—NOT require access by heavy equipment? Similarly, most of the 14 mile R.O.W. for the Sugar Hollow to Ragged Mountain pipeline is forested. What issues will be raised regarding the loss of trees and habitat for the replacement-in-place or substantial repair of the existing pipeline?

Quality of SH Water v SFRR Water

CW Claim: "By eliminating the pipeline that links the Sugar Hollow Reservoir directly to the water system, the cleanest water in the area will no longer be available to the citizens of the city and county. Instead, the Rivanna River, an impaired waterway, will be used to supply all the water to the community."

Note: This seems to contradict the argument that Ragged Mountain not be expanded, and instead the SFRR is dredged to become the primary impoundment.

Loss of 50,000 trees at Ragged Mountain

CW Claim: "This plan clear cuts 50,000 trees." [At times also cited as 52,000 trees.]

Note: The plan requires the clearing of 133.5-acres at Ragged Mountain. If there are 50,000 trees on 133.5-acres, that works out to ONE tree for every 116 square foot—suggesting an average spacing between trees of roughly 10-feet. With the understanding that the RM area logged in the 1960s, we can assume that the trees are around 40 years old, suggesting a range of tree diameters between 15 and 25 inches. In very general terms, a healthy forest with an average 20-inch tree diameter should have a spacing of roughly 531 SF per tree. Thus, we could assume that a healthy 40-year old forest on 133.5-acres *should* have roughly 10,952 *mature* trees.

Downstream Flows from the SFRR

CW Claim: "Decreased flow in the Rivanna River along city and county parks. The current plan will double (or more) daily water intake from the South Fork Rivanna Reservoir (SFRR) -- even as the reservoir is allowed to silt in. In addition, the water needed to fill and refill the expanded Ragged Mountain Reservoir (RMR) - two billion gallons - will be drawn from the same intake source. The DEQ permit to build the dam lowers the minimum release from the SFRR from the current level of 8 mgd to 1.3 mgd. Furthermore, while today, more than 8 mgd goes over the dam 97% of the year, that will be allowed to fall to 50% (pg 65 permit support doc)."

Note: From the June 30, 2006 Permit Support Documents, page 65:

- "Although there are no regulatory release requirements, current RWSA voluntary release policy indicates a minimum of the lesser of 8.0 MGD or natural inflow would be released. From the historical record, SFRR is spilling and providing a downstream flow in excess of 8 MGD over 97% of the time."

There is **NO reference to a 50% reduction** in the "more than 8 mgd [flow that] goes over the dam 97% of the year." In fact, on page 12 of the Draft [DEQ] VWP Individual Permit No. 06-174 is the following under "Total downstream flow provisions After Both the Expanded Ragged Mountain Reservoir and the Pipeline from the South Fork Rivanna Reservoir to Ragged Mountain are Operational."

"a.i. [From the SFRR] If total storage available to the urban Water System is equal to or greater than 2.36 billion gallons. Total downstream flow past [SFRR] must be at least 70% of the natural inflow or 1.3 mgd, whichever is greater [subject to exceptions]…."

Changing Proposals

Kevin Lynch e-mail, November 20, 2008

- "Another way is to dredge beyond the original contours of the reservoir. This is one reason to do side scan surveys of the reservoir – so that the feasibility of this option can be evaluated."

Note: *Dredging beyond the original contours* is not dredging, it's excavation.

- "The cheapest way would be to use a four bladder on the SFRR, which was in the original plan (remember – the one that we used to justify raising the water rates). The bladder was never presented as an option to the regulators, but was internally ruled out because the stream and wetland impact would be slightly more than the impacts of the 45 foot RMR expansion."

Note: GF memo, January 20, 2005, Re: SFRR Expansion.

- Page 9: "Based on this analysis, replacement or modification of the bridge on route 676 would be required for a 4-foot increase in normal pool at the SFRR."
- Page 10: "The total area to be submerged is approximately 115.65 acres."
- Page 11: "[The] 4 foot crest increase will result in a total wetland impact of 30.6 acres."
- Page 11: "An estimated total of 18,000 linear feet of streams will be impacted by the 4 foot raise in water level."
- Page 14: "Provides 3.3 MGD"

Note: GF memo, February 16, 2005, RE: RMR (45-ft) Expansion

- Page 11: Affected wetlands, "4.0 acres."
- Page 13: Affected streams, "approximately 11,382 linear feet of streams."
- Page 21: "133.5 acres to be inundated."
- Page 22: "Provides 9.9 MGD"

	4 Foot Bladder	RM Expansion
Wetlands	30.6 acres	4.0 acres
Streams	18,000 LF	11,382 LF
Acres inundated	115.65	133.5
Increase in Safe Yield	3.3 MGD	9.9 MGD