



# Community Water Supply Capital Program

## Presentation to the Board of Directors Water Supply Status Update May 24, 2004



**Gannett Fleming**



*Vanasse Hangen Brustlin, Inc.*



# Agenda

- 💧 Background
- 💧 Phase I Overview
- 💧 Updated Safe Yield
- 💧 Updated Demands
- 💧 Review Alternatives Analysis to date
- 💧 Action plan and schedule to move forward





# Background

Early project concepts and preliminary permitting coordination included:

- 💧 Demand Analysis Report - October '97
- 💧 Supply Analysis Report - October '97
- 💧 Analysis of Alternatives - Feb 2000
- 💧 Recommended Alternatives - March 2001
- 💧 Summary of Recommended Alternatives - May 2001



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# Background

Community Water Supply Capital Program  
was developed:

- 💧 Request for Proposals - July 2003
- 💧 Interview – August 2003
- 💧 Award to Gannett Fleming - Sept 2003
- 💧 Contract Kickoff - October 2003
- 💧 Safe Yield Study – January 2004
- 💧 Phase I work approved – February 2004



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# Phase I Reformulate Alternatives

- 💧 2002 Drought
- 💧 Ragged Mtn. Dam Spillway Upgrade
- 💧 Crozet Master Plan
- 💧 Operational/Release Practices
- 💧 Updated Demands
- 💧 Regional Cooperation





# Key Safe Yield Findings

- 💧 Total reservoir storage changes with time.
- 💧 Worst droughts of record: 2002 & 1930
- 💧 System safe yield depends on:
  1. Storage in system
  2. Minimum release
  3. Operating procedures
- 💧 2002 Safe Yield ~ 12.8 MGD
- 💧 2055 Safe Yield ~ 8.8 MGD





# Sedimentation Curve

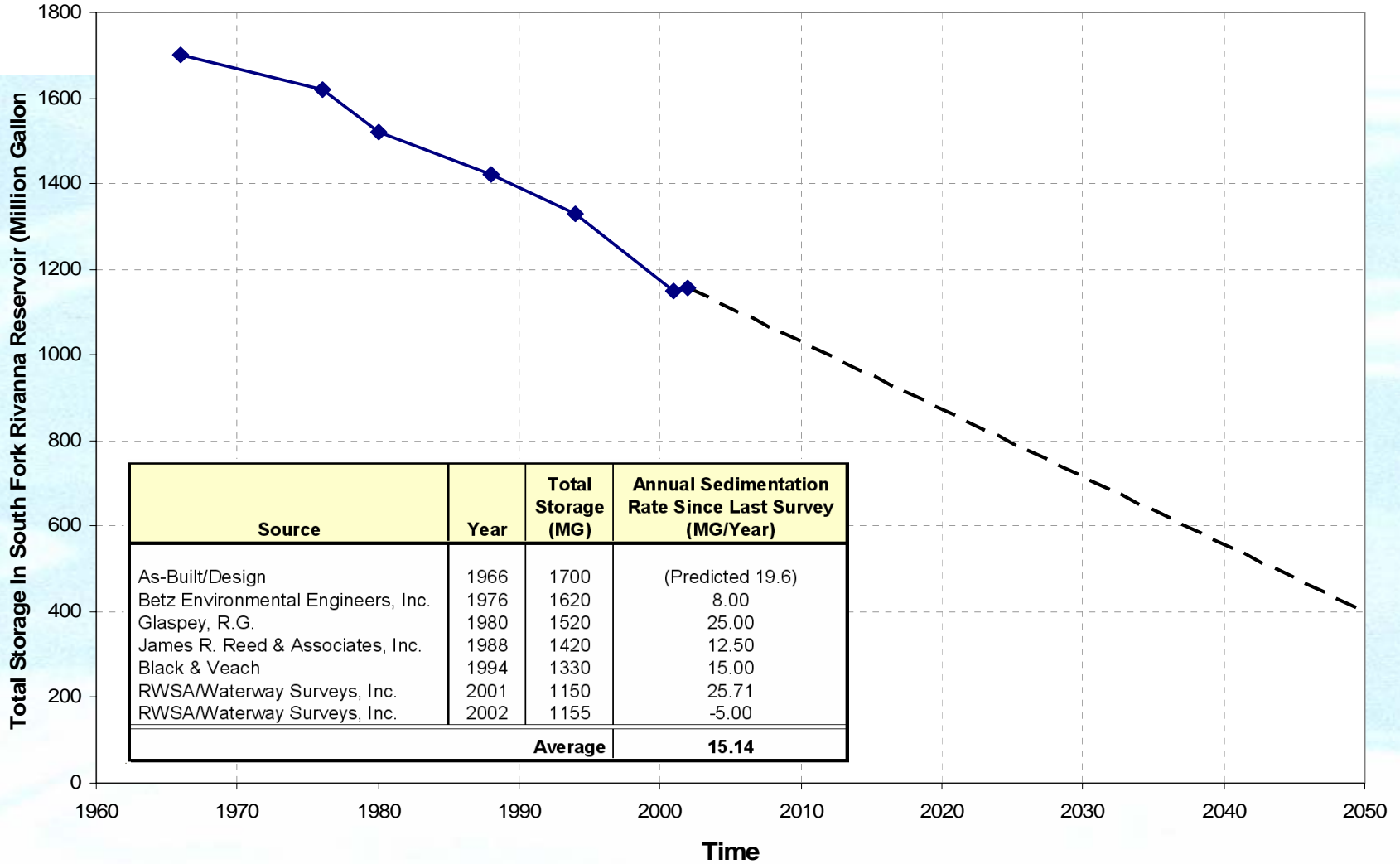


Figure 1. Plot Showing Change In Total Storage Over Time Due to Sedimentation at South Fork Rivanna Reservoir





# Demand Forecast

## 💧 Methodology

- Projected water demand through 2055 (previously through 2050)
- Utilized 1996 demand analysis methodology with updated data through 2003
- Four demand analysis methods averaged for demand projection – Production, Population, Comprehensive Plan, and Historic

## 💧 Results

- Average Daily Demand projected at 18.7 MGD in 2055 (urban system). Previous study estimated 19.5 MGD in 2050
- Difference is based on additional demand data, different planning horizon, and water conservation







# Crozet Demands

- 🔹 Crozet Master Plan Estimates Build-Out Population of 12,000
- 🔹 Average Usage In ACSA is 93.0 GPCD
- 🔹 Ultimate Average Day Demand in Crozet is 1.1 MGD





# Supply Deficit

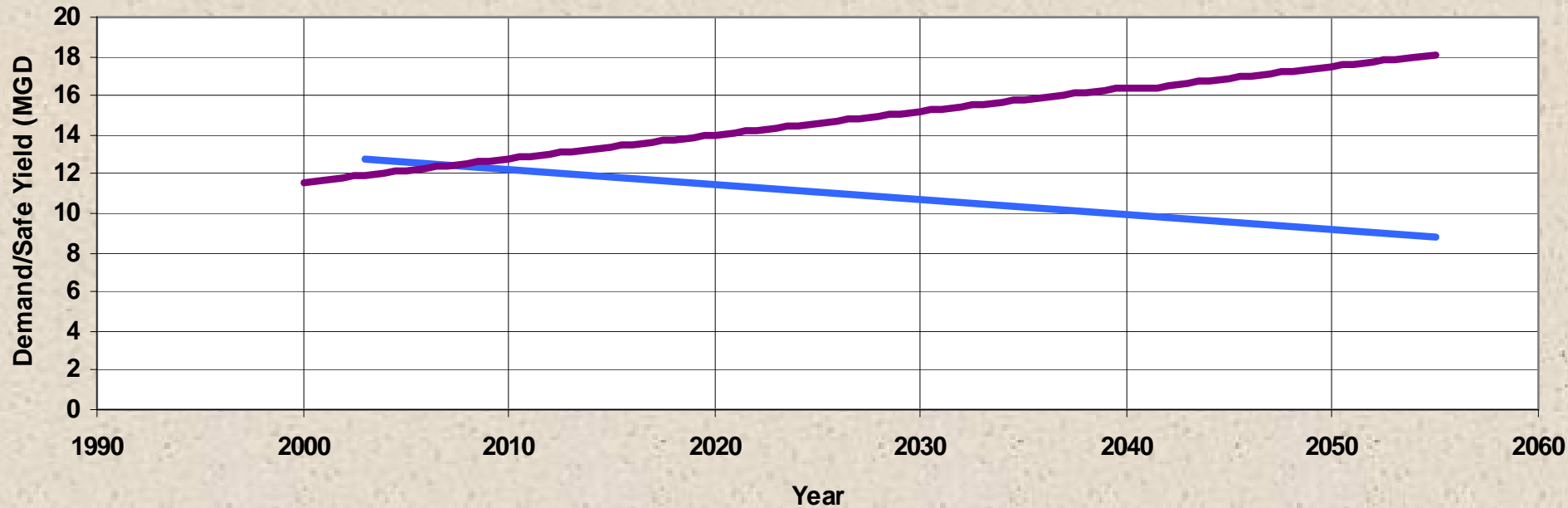
- 💧 Deficit is defined as Safe Yield - Average Daily Demand
- 💧 Urban System 2055 Deficit is **9.9 MGD**
- 💧 Average Daily Demand exceeds water supply available during the drought of record (safe yield) in approximately 2007/2008





# Demand vs. Safe Yield

Projected Annual Demand vs. Safe Yield Scenarios



— Safe Yield - Current Configuration

— Average Annual Demand (Approx.)



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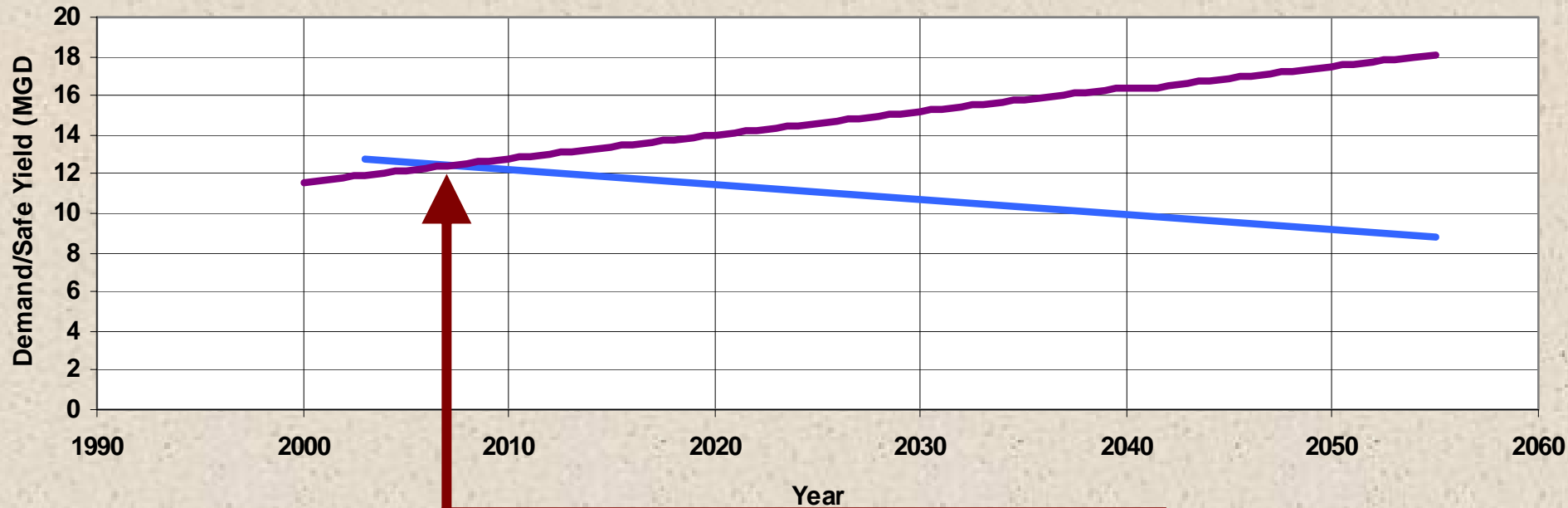


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# Demand vs. Safe Yield

Projected Annual Demand vs. Safe Yield Scenarios



Lines cross between 2007 and 2008

— Safe Yield - Current Configuration

— Average Annual Demand (Approx.)



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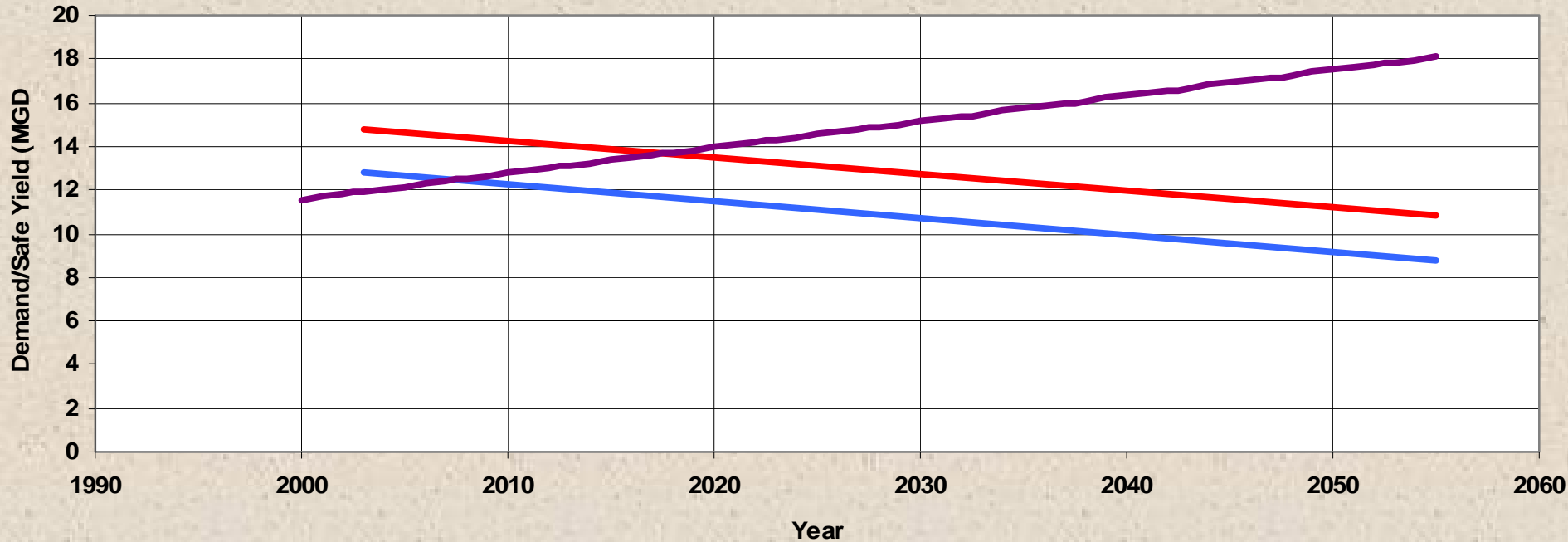


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# Use of Beaver Creek

Projected Annual Demand vs. Safe Yield Scenarios



— Safe Yield - Current Configuration

— Safe Yield - Including Beaver Creek Res.

— Average Annual Demand (Approx.)



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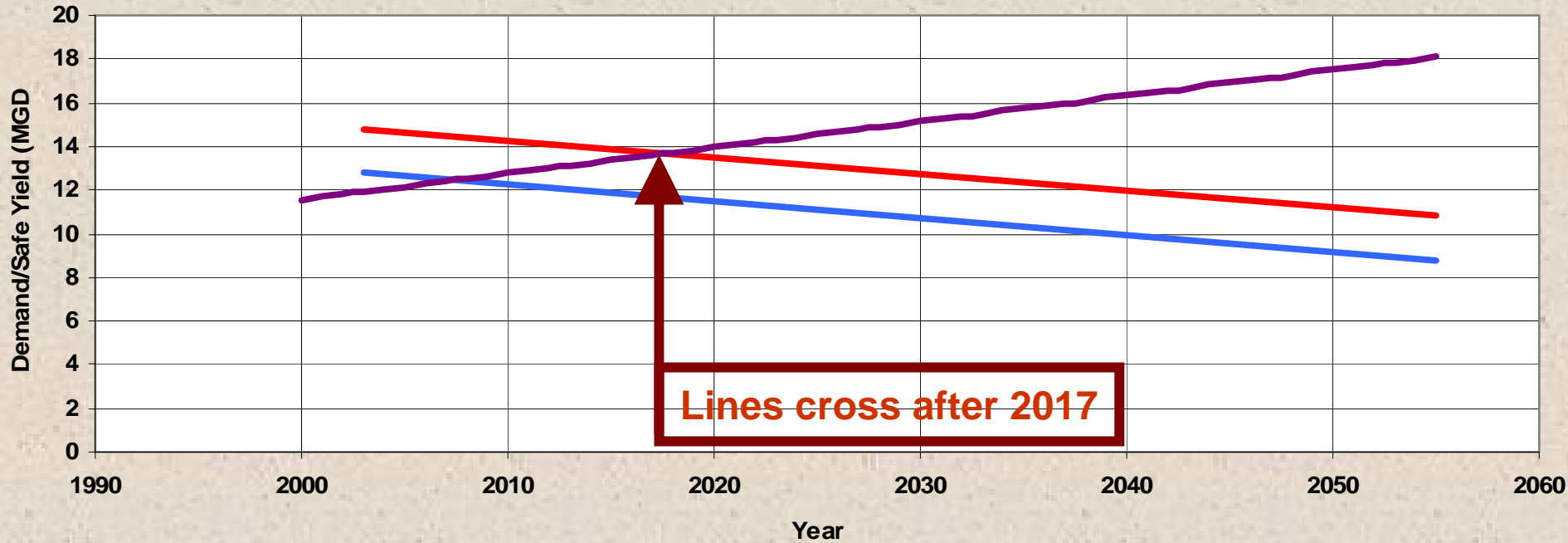


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# Use of Beaver Creek

Projected Annual Demand vs. Safe Yield Scenarios



— Safe Yield - Current Configuration

— Safe Yield - Including Beaver Creek Res.

— Average Annual Demand (Approx.)

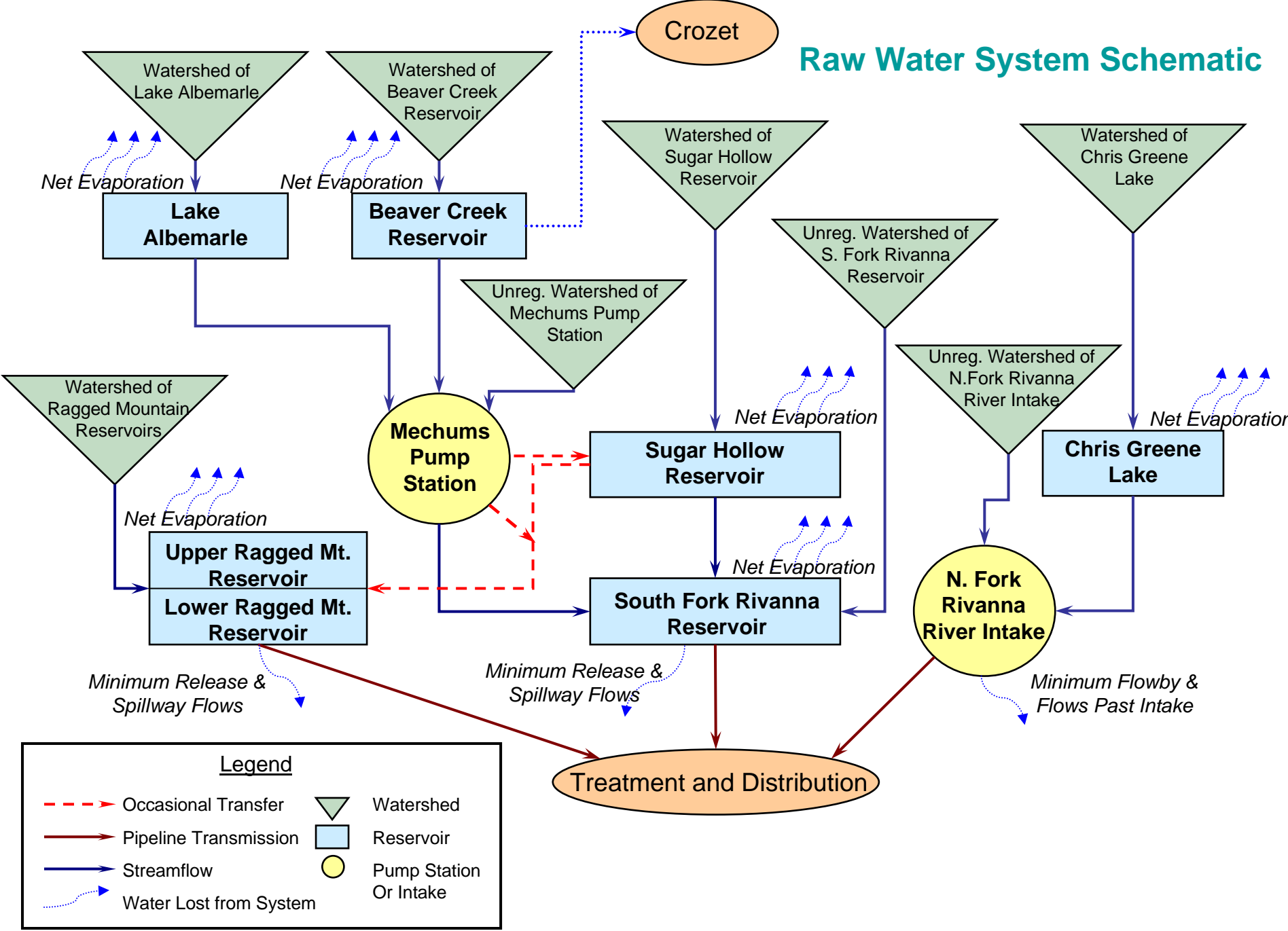


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# Raw Water System Schematic



**Legend**

- - - Occasional Transfer
- Pipeline Transmission
- Streamflow
- · · Water Lost from System
- ▾ Watershed
- ▭ Reservoir
- Pump Station Or Intake



# Source Water Alternatives

## 💧 Methodology

- Identified raw water supply alternatives based on past studies
- Identified additional alternatives based on discussions with RWSA Staff
- Determined approximate safe yield for each alternative individually

💧 **Very few components meet deficit of 9.9 MGD individually**





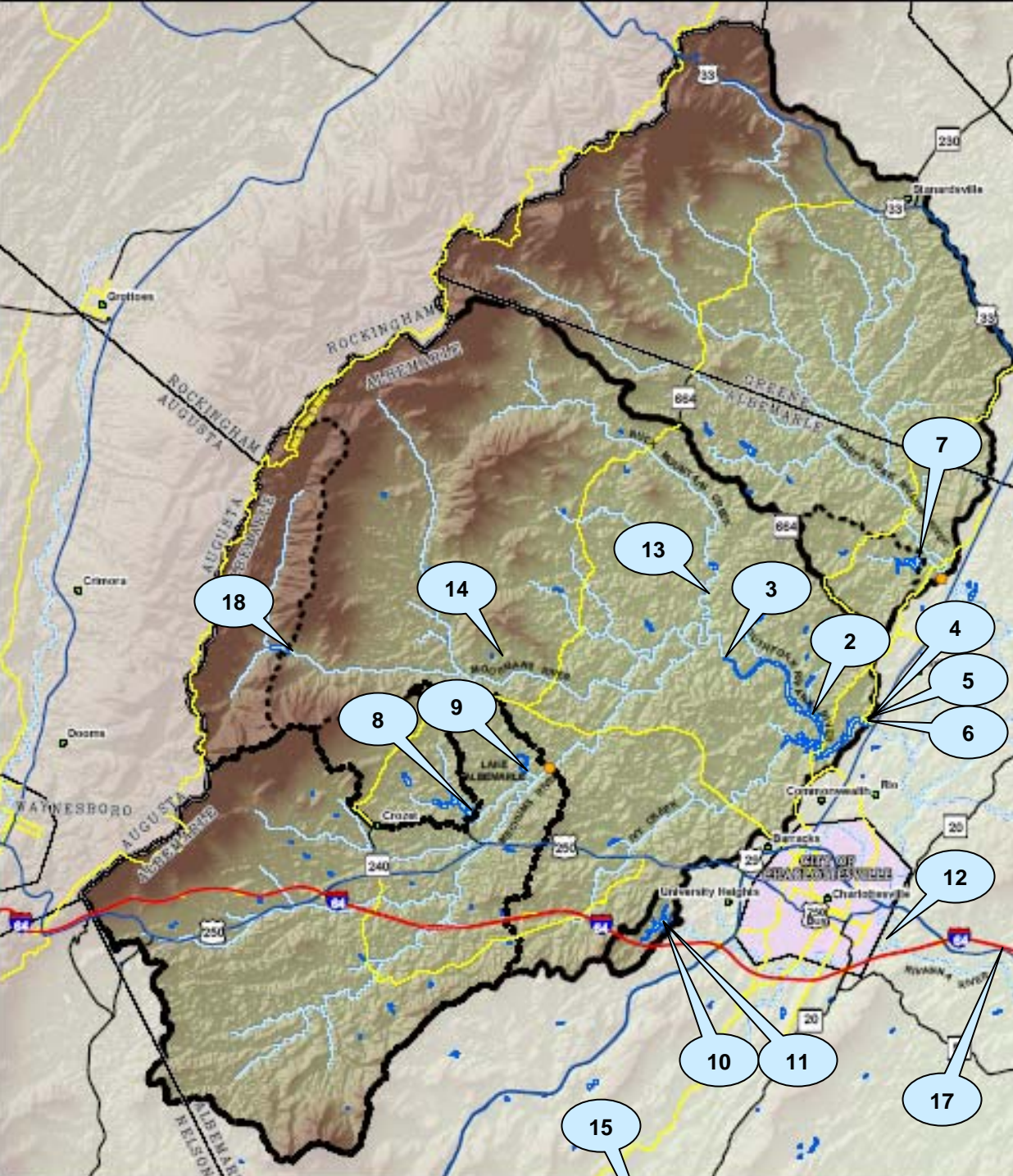


# Source Water Components

Components	Brief Description	Increase 2055 SY
1. No Action		0
2. Dredge South Fork Rivanna Reservoir (Maintain 2002 Vol.)		4
3. Reduce Sediment Load into South Fork Rivanna Reservoir	Assumes a 75% reduction in sediment loading.	3
4. Add 4 ft. Crest Controls on South Fork Rivanna Dam		3.3
5. Add 8 ft. Crest Controls on South Fork Rivanna Dam		7.2
6. Crest Controls on South Fork Rivanna Dam to Meet Full Deficit		9.9
7. Drawdown of Chris Greene Lake (5 ft. Drawdown)	Recreational lake – Public acceptance issues	0.5
8. Use Beaver Creek Reservoir as Raw Water Source	Requires new outlet controls	2.6
9. Use Available Storage at Lake Albemarle	Lake Albemarle not owned by RWSA	0.7
10. Raise Ragged Mountain (RM) Reservoir Dam		9.1
11. Raise RM Dam & Convert to Pumped Storage Reservoir		9.9
12. Pumpback From Moores Creek WWTP to SFRR Tributary	Reuse issue – VDH concerns.	9.9
13. Construct New Dam at Buck Mountain		9.9
14. Construct New Pumped Storage Facility at Wards Creek		9.9
15. James River Withdrawal		9.9
16. Rivanna River Withdrawal		0
17. Regional Cooperation – Fluvanna/Louisa Counties	Withdrawal in Fluvanna Co.	9.9
18. Expand Sugar Hollow Reservoir		7.3



# Water Supply Components



## 1. No Action:

- Current Safe Yield = 12.8 MGD (2002)
- 2055 Safe Yield = 8.8 MGD

## 2. Dredge South Fork Rivanna Reservoir to Maintain 2002 Usable Storage Volume

## 3. Reduce Sediment Load into South Fork Rivanna Reservoir

## 4. Add 4 ft. Crest Controls on South Fork Rivanna Dam

## 5. Add 8 ft. Crest Controls on South Fork Rivanna Dam

## 6. Add Crest Controls on South Fork Rivanna Dam to Meet Full Deficit

## 7. Drawdown of Chris Greene Lake (5 ft. Drawdown)

## 8. Use Beaver Creek Reservoir as Raw Water Source

## 9. Use Available Storage at Lake Albemarle

## 10. Raise Ragged Mountain Reservoir Dam

## 11. Raise Ragged Mountain Reservoir & Convert to Pumped Storage Reservoir

## 12. Pumpback From Moores Creek WWTP to SFRR Tributary

## 13. Construct New Dam at Buck Mountain

## 14. Construct New Pumped Storage Facility

## 15. James River Withdrawal

## 16. Rivanna River Withdrawal

## 17. Regional Cooperation – Fluvanna/Louisa Counties – James River Withdrawal

## 18. Expand Sugar Hollow



# Treatment Alternatives

- 💧 Treatment Plant Capacity Determined through 2055
- 💧 Plant Capacity requirements will vary depending on raw water alternative





# Treatment Plant Alternatives

Proposed Action	Description
No Action	No action taken – Observatory WTP must be rehabbed
Expand Observatory WTP with No Added Basins	Expand Observatory WTP
Expand Observatory WTP	Expansion of WTP by addition of new basins to increase capacity
Expand South Fork Rivanna WTP	Expand South Fork Rivanna WTP to increase capacity
Close Observatory WTP and Construct New WTP	New WTP to satisfy projected water demands
Expand North Fork Rivanna WTP	Expand North Fork Rivanna WTP to increase capacity





# Alternative Formulation Methodology

- 💧 All options meet the goal of providing 2055 safe yield of 18.7 MGD (except no action)
- 💧 Determined water supply options that could meet safe yield with a single modification
- 💧 Determined reasonable combinations of water supply options that could meet safe yield
- 💧 Identify related WTP improvements





# Water Supply Alternatives

Water Supply/Treatment Alternatives	South Fork	North Fork	Observatory	New WTP
1. No Action	12	2	7.7	0
2. New Dam at Buck Mountain	24	2	7.7	0
3. New Pumped Storage Facility at Wards Creek	24	2	7.7	0
4. James River Intake	12	2	0	20
5. Ragged Mountain(RM) w/Pumped Storage	12	2	20	0
6. Pumpback from Moores Creek WWTP	24	2	7.7	0
7. Raise SFRR	24	2	7.7	0
8. Regional Cooperation with Fluvanna/Louisa	12	2	7.7	15
9. Dam at Buck Mountain + Beaver Creek (BC)	24	2	7.7	0
10. Pumped Storage at Wards Creek + BC	24	2	7.7	0
11. James River Intake + BC	15	2	0	18
12. Raise RM with Pumped Storage + BC	15	2	20	0
13. Pumpback from Moores Creek WWTP + BC	24	2	7.7	0
14. Raise SFRR + BC	24	2	7.7	0
15. Cooperation w/Fluvanna/Louisa + BC	15	2	7.7	12
16. Expand Sugar Hollow Reservoir + BC	24	2	7.7	0
17. Raise Ragged Mountain Dam + BC	15	2	20	0
18. RM Pumped Storage + BC + 4 ft on SFRR	16	2	16	0
19. RM + BC + 4 ft. on SFRR	16	2	16	0
20. Pumpback from WWTP to SFRR + BC + 4 ft. on SFRR	24	2	7.7	0
21. Expand Sugar Hollow Reservoir + BC + 4 ft. on SFRR	24	2	7.7	0





# Analysis of Alternatives

Potential Alternative	Cost	Property	Cultural Resources		Endangered Species	Wetland Impacts
			Structures	Arch.		
1. No Action	\$17.4 M	0	0	0	0	0
2. New Dam at Buck Mountain	\$75.4M				James spiny mussel	
3. New Pumped Storage Facility at Wards Creek	\$76.9M					
4. James River Intake	\$66.7 M	0	unknown	1	unknown	5
5. Ragged Mountain(RM) w/Pumped Storage	\$73.9 M	1	0	0	0	5
6. Pumpback from Moores Creek WWTP	\$53.4 M	0	unknown	unknown	James spiny mussel	3.5
7. Raise SFRR	\$60.4 M	2	1	1	James spiny mussel	39
8. Regional Cooperation with Fluvanna/Louisa		0	0	0		
9. Dam at Buck Mountain + Beaver Creek (BC)	\$73.4 M				James spiny mussel	
10. Pumped Storage at Wards Creek + BC	\$74.9 M					
11. James River Intake + BC	\$65.5 M	0	unknown	1	unknown	5
12. Raise RM with Pumped Storage + BC	\$77.4 M	1	0	0	0	5
13. Pumpback from Moores Creek WWTP + BC	\$53.9 M	0	unknown	unknown	James spiny mussel	3.5
14. Raise SFRR + BC	\$58.4 M	2	1	1	James spiny mussel	39
15. Cooperation w/Fluvanna/Louisa + BC	\$65.9 M					
16. Expand Sugar Hollow Reservoir + BC		0	0	0		
17. Raise Ragged Mountain Dam + BC	\$82.4 M		0	0	0	
18. RM Pumped Storage + BC + 4 ft on SFRR	\$66.9 M	3	1	1	James spiny mussel	23
19. RM + BC + 4 ft. on SFRR	\$65.4 M		1	1	James spiny mussel	
20. Pumpback from WWTP to SFRR + BC + 4 ft. on SFRR	\$56.4 M	2	unknown	unknown	James spiny mussel	21.5
21. Expand Sugar Hollow Reservoir + BC + 4 ft. on SFRR	\$65.9 M				James spiny mussel	





# New Water Supply Alternatives

- 💧 Ragged Mtn. Dam re-evaluated
- 💧 Beaver Creek Dam release
- 💧 Additional storage at Sugar Hollow Dam
- 💧 New pumped storage dam locations
- 💧 Regional Cooperation (Fluvanna/Louisa)







# Action Plan

- 💧 Receive feedback from RWSA Board
- 💧 Review reformulated alternatives methodology with Regulators (early July)
- 💧 Complete ranking of alternatives
- 💧 Present ranked alternatives to RWSA Board. Get RWSA Board approval to present highly ranked alternatives to regulators (7-26-04 meeting)
- 💧 Present findings to regulators
- 💧 Continue with rigorous analysis of highly ranked alternatives and initiate permit support documentation





# Schedule

## RWSA Water Supply Study & Permitting



Oct. 19, 2003

2004

2005

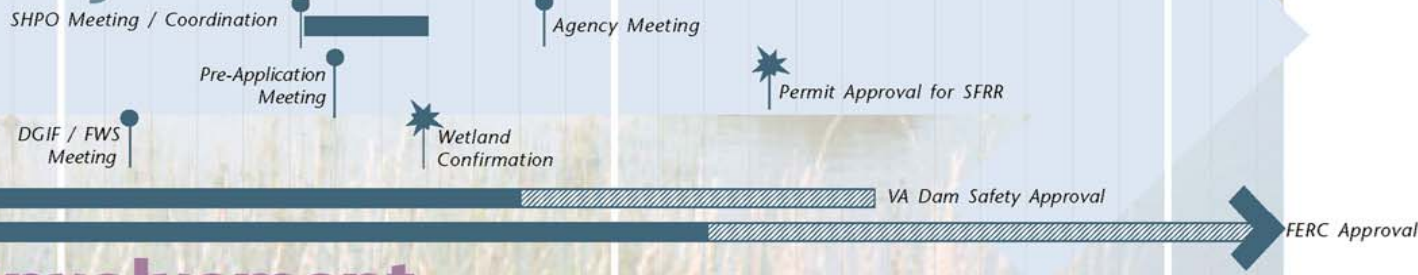
2006

Jan Feb Mar Apr May June July Aug Sept Oct Nov Dec Jan Feb Mar Apr May June July Aug Sept Oct Nov Dec Jan Feb Mar

### Technical Tasks



### Regulatory



### Public Involvement



Legend: Project Milestone

Note: \* Confirmation of supplemental activities will be determined after the additional Hydrologic Model & Review of Favorable Water Supply Alternatives is complete.



# Gannett Fleming



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# Schedule

## RWSA Water Supply Study & Permitting



Oct. 19, 2003

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### Technical Tasks



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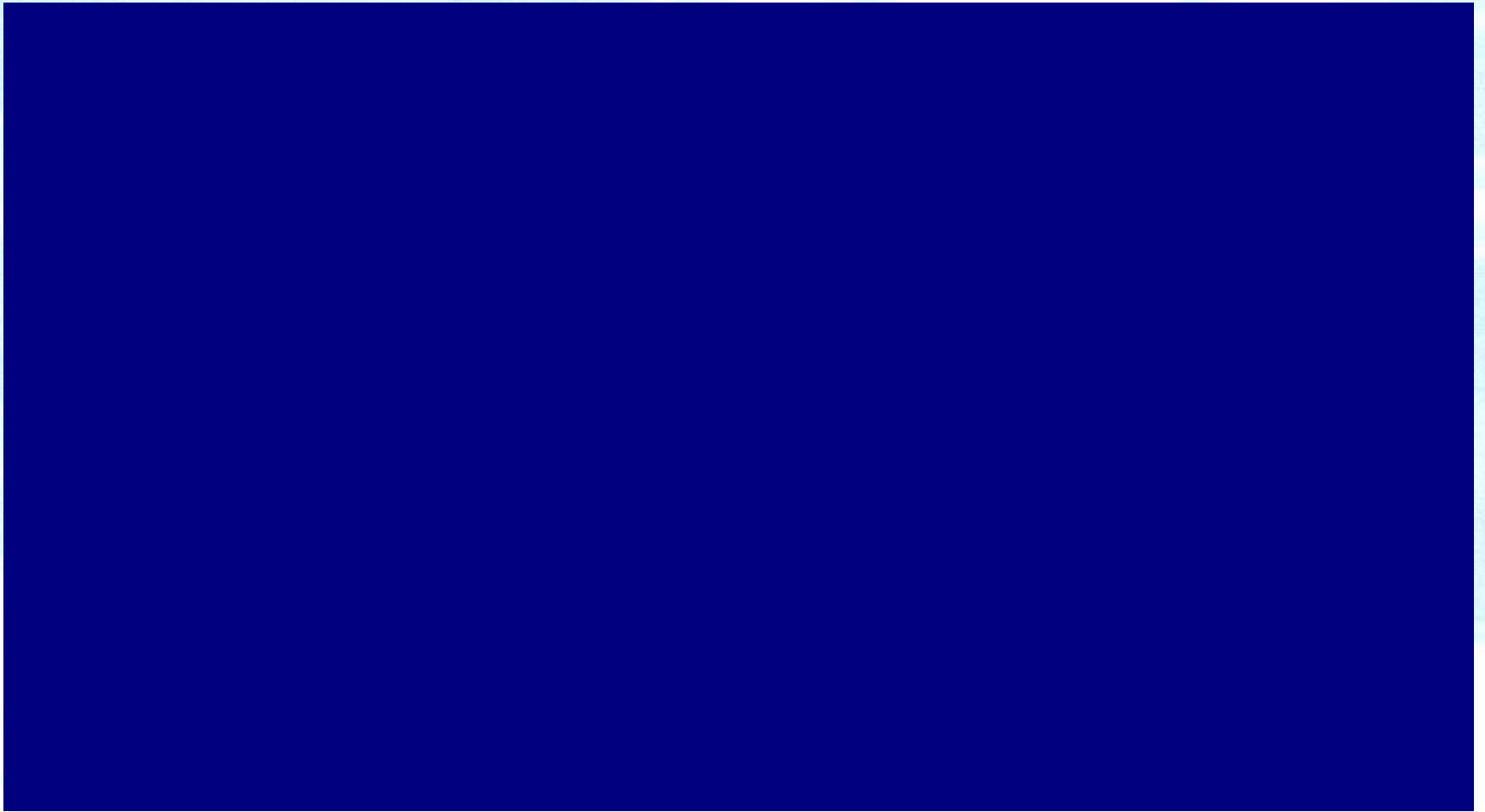
Legend: Project Milestone

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# Questions



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