DRAFT of Chapter 6
ADDRESSING WATER RESOURCE NEEDS AND REGIONAL GOALS

[Pertaining to Middle Chattahoochee, Upper Flint & Lower Flint Water Planning Regions]

6. ADDRESSING WATER NEEDS AND REGIONAL GOALS

6.1 Identifying Water Management Practices
6.1.1 Existing Plans and Practices
6.1.2 Selection of Management Practices and Evaluation Criteria

Management Practices Categories

- Water Demand Management Practices
- Water Return Management Practices
- Water Supply Management Practices
- Enhanced Water Quality Standards and Monitoring Practices
- Enhanced Pollution Management Practices

Evaluation Criteria

- Economic/Financial (Capital Cost, Operation and Maintenance Cost, Life Cycle Costs)
- Social (Public Perception, Impact on Public)
- Environmental (Water Quality, Restoration of Impaired Waters)
- Governance and Regulatory (Policy, Regulatory Compliance)
- Technical (Efficiency, Reliability)

6.1.3 Water Demand Management Practices

[Outline for this section (partial writeups follow)]

- Measurement and Water Use Assessment Practices
- Practices to Reduce Water Loss (i.e. 2010 GA Water Stewardship Act)
- Practices to Increase Water Use Efficiency
- Conservation Oriented Rate Structures and Other Incentives
- Education and Outreach Programs
- Water Reuse (non-potable, indirect potable, direct potable)
- Energy Water Efficiency and System Management
- Agricultural Water Efficiency and System Management
    - Increased efficiency of irrigation systems
    - Irrigation suspension
    - Irrigation retirement
    - Irrigation Districts
- Voluntary Certification Program for Landscape Professionals

- Golf Course Water Conservation Management Practices and Strategies
- More Specific Drought Planning and Response (i.e Ag, Urban)

6.1.3.x Agricultural Water Efficiency and System Management

Increased efficiency of agricultural irrigation systems.

The benefit from comprehensive implementation of conservation equipment on irrigation systems to streamflow at Bainbridge is estimated to be between 32.9 and 81.4 cfs. This benefit estimate assumes a baseline level of implementation of 50% for both surface water and groundwater supplied systems.

Quantification of agricultural withdrawal permits would allow for more precise and fair demand management.

6.1.3.x.x Irrigation Suspension

Irrigation suspension during dry years.

Flint River Drought Protection Act[1] is presently the only means of reducing irrigation demand.

Develop a agriculture specific Drought Plan for irrigated land.

The benefit to streamflow that could be attained with irrigation suspension is 658.2 cfs. This benefit estimate assumes 100% suspension of irrigation, which would be a severe policy measure, especially if implemented post-planting.

The tables below use these estimates to project potential benefits to streamflow at Bainbridge given various levels of irrigation suspension. Given that the impact estimates are based on assumption of dry-year, August (high agricultural demand) conditions, the projections in the tables are high end estimates of the potential benefit of irrigation suspension.

Table 1: Surface Water Irrigation Suspension Impacts on Bainbridge Flows, Dry-Year August Estimates

% of Acreage Suspended	Acres Affecting Bainbridge Flows (in LFO & UF regions)	Estimated Impact per Acre Suspended (cfs/acre)	Flow Improvement Estimate (cfs)
10%	141,791	0.0027	38.3
20%	141,791	0.0027	76.6
25%	141,791	0.0027	95.7
50%	141,791	0.0027	191.4

[1] O.C.G.A. 12-5-540

75%	141,791	0.0027	287.1
100%	141,791	0.0027	382.8

Table 2: Groundwater Irrigation Suspension Impacts on Bainbridge Flows, Dry-Year August Estimates

% of Acreage Suspended	Acres Affecting Bainbridge Flows (in LFO & UF regions)	Estimated Impact per Acre Suspended (cfs/acre)	Flow Improvement Estimate (cfs)
10%	211,880	0.0013	27.5
20%	211,880	0.0013	55.1
25%	211,880	0.0013	68.9
50%	211,880	0.0013	137.7
75%	211,880	0.0013	206.6
100%	211,880	0.0013	275.4

6.1.3.x.x Irrigation Retirement

Permanent suspension of irrigation.

6.1.3.x.x Irrigation Districts

Another tool that would facilitate agricultural demand management is the establishment of agricultural irrigation institutions, such as irrigation districts. These structures could be used by farmers to share resources and develop common supply infrastructure. They might also be used to manage water demand among multiple operations and provide for some flexibility in management.

6.1.3.x.x Summary for Demand Management Practices for Agriculture

6.1.4 Water Return Management Practices

[Outline for this section]

- Increase water returns by decreasing use of septic systems
- Increase water returns by decreasing use of land application systems
- Nonpotable Reuse
- Indirect Potable Reuse
- Direct Potable Reuse

6.1.5 Water Supply Management Practices

Shortfalls in attaining flow targets can be addressed through supply and flow augmentation practices. The use of augmentation practices would offset the need for demand management.

[Outline for this section. Partial writeups follow.]

- New surface water storage reservoirs
- Farm ponds
- Increase existing surface water storage reservoirs
- Alternative management of existing reservoirs
  - *Effects of acf modeling done by Middle Chattahoochee Water Coalition (Dr. Georgakakos)*
  - *The USACOE only uses 3 of the 12 reservoirs to meet the flow requirements at Woodruff Dam*
- Changes to RIOPs
- New groundwater sources
  - *What is the best use of the surplus water in aquifers below the Fall Line (1.1 BGD v 667 MGD usage)?*
- Interbasin transfers (IBTs)
- Streamflow augmentation via direct pumping from aquifers
- Aquifer storage and recovery (ASR)
- Desalination
- Interconnection of supply systems
- Additional hydrologic and environmental study of the ACF river basin system
  - *Scientific justification for >5000 cfs at Woodruff Dam?*
  - *Use of 2009 data (extreme flood) and 1920s data (extreme drought)*
  - *Reassessment of the Critical [Low] Flow levels that have historically been used for water quality modeling (lower flow levels would increase the water supply?)*
- Comprehensive update to the USACOE Water Control Manual that reconsiders the uses and stated purposed for the all the Federal reservoirs
  - *Improves the balance and priorities for uses and stated purposes (i.e. hydropower, flood control, water supply, recreation, fish & wildlife habitat)*
  - *Optimizes the uses within the context of the Federal Operating Permit*

6.2.2.1.1 New Surface Water Reservoirs

6.2.3.2.1 Farm Ponds

On-farm storage is an option for replacing direct pumping from surface streams or wells during the growing season. To minimize impact on flow conditions during drought, ponds would be constructed in non-drainage areas.

Supplying the needs of an average 100 acre field would require 337 acre feet of storage.

6.2.3.2.2 Increase Existing Surface Water Storage Reservoirs
6.2.3.2.3 Alternative Management of Existing Reservoirs
6.2.3.2.4 Changes to RIOPs
6.2.3.2.5 New Groundwater Sources
6.2.3.2.6 Interbasin Transfers

Inter-basin transfer is often a controversial option, and it raises many concerns that greatly limit its feasibility or desirability. However, for illustrative purposes, an example is provided as to how this practice could be used to address flow shortfalls in the Flint. The closest river system from which to consider a transfer to the Flint is the Ocmulgee, which is approximately 27 miles east of the Flint at its closest point (near Fort Valley, GA). Review of flow data from the Ocmulgee at Hawkinsville, which is downstream of the potential withdrawal point, indicates that during drought conditions in August 2007, (when a transfer would be most likely to be needed to augment flow in the Flint), total Ocmulgee flow at that point in the river is roughly half of the maximum shortfall at Bainbridge. Transfers from the Ocmulgee during low-flow would necessarily be limited to levels that would protect that river's flows. While an inter-basin transfer option might remain viable for smaller-scale augmentation purposes, it does not appear that such a solution can significantly impact estimated gaps on the Flint. Moreover, political opposition to inter-basin transfers could great limit the viability of considering this option.

In effect, in the Flint, interbasin transfer from the Ocmulgee basin might be viewed as a reversal of upstream interbasin transfers from the ACF to the Ocmulgee. An alternative approach with a similar outcome could be to consider reversal of existing transfers out of the ACF system.

6.2.3.2.7 Streamflow augmentation via direct pumping from aquifers

In dry periods, it is believed that streamflow might be augmented through direct pumping of groundwater into surface water streams.

A *well yielding 1,000 gallons per minute would provide 2.23 cfs flow to the receiving stream.* A 1,000 gallon per minute well is a respectable yield for a Coastal Plain well.

In the Lower Flint-Ochlockonee region, where Upper Floridan Aquifer withdrawals have been estimated above sustainable yield levels in several HUC-12s, pumping from the Upper Floridan for augmentation would not be desirable. It would only exacerbate groundwater availability concerns. Furthermore, it would adversely affect surface water flows through the interaction effect of the Floridan on surface water. Therefore, only other, deeper aquifers would need to be considered. It appears that the Claiborne might have adequate sustainable yields to support additional withdrawals, but yields from the Claiborne have not been assessed in the southern part of the Lower Flint-Ochlockonee region.

6.2.3.2.8 Aquifer Storage and Recovery(ASR)

Aquifer storage and recovery could be used in the region to withdraw and store surface water during periods of high flow and provide augmentation for flows or supply in dry periods. The yield potential of ASR projects can vary greatly depending on location, condition of the receiving aquifer and water quality considerations both for injected water and that returned to the stream. For a report on an ASR application specific to the Lower Flint River Basin, see:
http://www.h2opolicycenter.org/pdf_documents/water_workingpapers/WP2006-005.pdf

As this report indicates, ASR is probably best suited to provide water supply storage. Augmentation of flows with water of drinking water quality would likely not make economic sense.

Treated water ASR using treated surface water, treated wastewater, treated stormwater or treated industrial flow should be considered in addition to traditional groundwater ASR.

6.2.3.3 Desalination
6.2.3.4 Interconnection of Supply Systems
6.2.3.5 Additional Study of the ACF River Basin

6.1.6 Enhanced Water Quality Standards and Monitoring Practices

[Outline for this section]

- Constructed treated wetlands
- Action to protect/manage source water quality and quantity
- New development Stormwater Management Standards
- Watershed improvement projects
- Stormwater public education and outreach
- Source water supply protection
- Groundwater recharge protection
- Regional/local monitoring programs
- Water supply security
- Enhanced Water Quality Standards and Monitoring Practices
- New designations of Significant Natural Resource Waters (increases level of protection)
- Impacts of USFWS critical habitat designations on water resource management
- Impacts of the proposed Florida nutrient standards

6.1.7 Enhanced Pollution Management Practices

[Outline for this section]

- Reduce impervious surfaces
- Establish a stormwater utility
- Protect sensitive land
- Pollution prevention programs
- Coordinated environmental planning
- Maintenance for septic systems
- Water quality trading
- Post development stormwater management

6.2 Selected Water Management Practices for the XYZ Region <PC>

6.2.6 Near-term Water Management Practices
6.2.7 Long-term Water Management Practices
6.2.8 Interregional Implications of Selected Management Practices

6.3 Fiscal Implications <PC>

Planning level costs of the selected water management practices as well as funding sources and options (14.7.c.xiv).