SECTION 5. MEETING FUTURE WATER SUPPLY NEEDS

Part of the strategy for meeting future water supply needs will obviously include the planning and development of additional water supplies. Some additional reservoirs will likely be built in North Carolina, although the era of major dam construction is passed. In some cases, reallocating storage in existing reservoirs to water supply purposes may achieve additional water supply. Pilot studies are underway in eastern North Carolina to determine if potable water can be stored underground for later use when needed. In coastal areas of the state, reverse osmosis is a proven method for desalinating brackish ground water to produce potable water. In many cases, regionalization of water supply systems could provide a solution by linking systems with inadequate supplies to regional sources that can meet regional needs.

In addition to increasing the supply of water, an equally important part of the strategy for meeting future water supply needs will be more efficient use of water supplies. Water conservation needs to evolve from being thought of as a response to occasional emergencies to being a tool for practical, everyday water management. Both residential and industrial users of water have many opportunities for water conservation. It is increasingly important to take advantage of these efficiencies. North Carolina also has great opportunities to reuse highly treated wastewater, particularly for irrigation and industrial purposes, thereby reducing demand for new water supplies.

5.1 Developing Additional Water Supplies

Developing a new water supply source can be a costly and lengthy process. Alternatives to a new source should first be considered. Enhancing an existing supply delays the need to develop a new water source, and may even make a new source unnecessary.

5.1.1 Enhancing Existing Supplies

Enhancement of existing sources begins with an evaluation of a system's facilities. A water system should examine existing water supply sources and operations to decide if they can produce additional drinking water before adding a new source. Three areas in particular may be examined:

(1) The available water supply from existing sources should be reevaluated. The source may be able to safely supply more water than is currently assumed.
(2) For run-of-river systems (those withdrawing directly from a river or stream), increasing water withdrawals may be possible if instream flow needs and water quality downstream will not be significantly affected. Repositioning the intake may also make more streamflow accessible during low flows. For systems with insufficient streamflows during dry periods, adding an off-stream storage reservoir should be considered. Off-stream reservoirs, generally much smaller than on-stream reservoirs, store water during wetter periods to augment water supply

in drier periods when withdrawals may be limited.

(3) For systems with water supply reservoirs, raising the dam spillway or adding flashboards can increase useable storage for water supply. It may also be possible to relocate or configure the reservoir intake to make more water available without adversely affecting water quality.

Another important way to enhance an existing water supply is to protect the quality of the source. Since treating water of poorer quality is more costly and less efficient, maintaining a high level of raw water quality is vital.

5.1.2 Developing New Sources

If enhancement or expansion of existing supplies does not provide sufficient opportunities for increasing water supply, developing a new water source may be necessary. Any proposed surface water supply source must be sufficient to meet projected water supply needs and instream flow requirements, even during periods of drought. Also, raw water quality must be acceptable for producing drinking water. Most high quality, readily available water sources are already being used, so new sources may be more expensive to get and treat and may involve lengthy approvals.

Options for new sources include purchasing water from a nearby system, developing a new surface or ground water supply, or an appropriate combination of these water supply options.

Purchasing Water: A purchase arrangement often requires the least time to develop, and is often an attractive option for smaller systems, especially those near systems with surplus capacity. A purchase arrangement can sometimes provide an interim solution while another source is being pursued. Even after the other source is complete, the interconnection can increase the reliability of both systems. It is extremely important for both systems involved in a water purchase to have a contract that specifies the maximum purchase amount, how long the agreement will remain in place, the price structure, and any other details of concern.

On-Stream Reservoir: Developing an on-stream reservoir is typically the most lengthy water supply option. It may also be the most reliable and is often the only feasible long-term option for large systems. The safe yield available from a reservoir should be based on a specific risk of water shortage. For smaller water systems serving less than 50,000 people, a 20-year safe yield is recommended, meaning that the supply is expected to be inadequate in one year out of 20 on the average. For larger systems serving 50,000 or more people, a 50-year safe yield is recommended, meaning that the supply is expected to be inadequate in only one year out of 50 on the average. Most reservoirs will also require a minimum release from the dam that will affect the reservoir's safe yield.

Run-of-river intakes: Run-of-river systems simply withdraw water from a stream or river as it

flows past an intake point. Run-of-river withdrawals may be limited during low flow periods to ensure that instream flow needs are met downstream of the intake. An off-stream storage reservoir may be needed to supplement run-of-river withdrawals during low-flow periods.

Ground water supplies: The quantity and quality of ground water varies across the state. However, for areas with adequate ground water supplies, installing water supply wells can be an economical water supply option. The 12-hour supply available from a well, as determined from a 24-hour pump test, should be used for determining if a ground water supply is adequate. In areas with water quality problems, treatment may be necessary. Desalination of brackish ground water by reverse osmosis is becoming a primary method of producing potable water in Dare, Currituck, and Hyde Counties–systems in these counties have the capacity to desalt nearly 11 million gallons of ground water daily.

Aquifer storage and recovery (ASR) is the injection and storage of potable water in the ground for later retrieval. ASR may have potential for application in some areas of the coastal plain. In fact, the City of Greenville is proceeding with pilot testing of an ASR project. The city would treat surface water from the Tar River to drinking water standards and then inject it into the ground, and later during periods of high demand, would pump this water back out of the ground and distribute it with minimal treatment.

5.2 Water Conservation

Water conservation is increasingly becoming a necessary part of overall water management for water systems across the state. Water conservation can help a water system extend the use of its available water supplies, reduce the impacts caused by drought, delay expansion of treatment facilities, and reduce operating costs.

Some advances in water conservation have resulted from federal water use standards for plumbing fixtures, such as toilets, faucets, and showerheads manufactured in the United States after January 1, 1994. As communities grow, new housing will require less water to meet indoor demand, compared with what would have been necessary with the continued use of less efficient fixtures. Retrofitting older housing with newer, more efficient fixtures will further reduce overall per capita water demand.

However, most other advances in water conservation will depend on local efforts. An effective, comprehensive water conservation plan should include the following programs: (1) water shortage response, (2) water loss reduction, (3) water use efficiency, and (4) public education and outreach.

5.2.1 Water Shortage Response

A water shortage response program prepares a system to respond to drought or other water shortages, and should ideally be put into place well before a shortage develops. Because water systems in North Carolina are so numerous and diverse, the best place to address water shortages is at the local level. A water shortage response program can enable a community to respond to water shortages early and avoid the need for more extreme measures later.

The most important element of a water shortage response plan is enactment of an ordinance that provides for the declaration of a water shortage and specifies the voluntary and mandatory measures to reduce water demand. Classifying different water uses as essential or non-essential is important when deciding which water uses should be restricted or banned first. A successful water conservation ordinance should also have specific triggers (such as lake level, streamflow, etc.) to gage the severity of the shortage and determine when each level of response should begin.

5.2.2 Water Loss Reduction and Leak Detection

Water loss reduction and leak detection is a process that identifies and decreases the amount of water losses and reduces wasteful potable water use. A water loss reduction program of water audits and leak detection are essential to effective water conservation efforts. Water loss reduction programs help systems use water more efficiently, make more water available for customers, recover more of their operational costs through more accurate billing, and reduce operational costs.

A water audit provides an accounting of all types of water use–both metered and un-metered. Unaccounted-for water can include water leaks from pipes, fire hydrant use, faulty meters, un-metered connections, water main breaks, and street cleaning, and can result in serious financial problems for water supply systems. Water systems measure unaccounted-for water as a percentage of all the finished water produced and purchased. According to the American Water Works Association, unaccounted-for water between 10-15 percent or less of the average daily use is generally acceptable. If the water audit suggests unaccounted-for water is more than 15 percent of the average daily water use, they should inspect the system for leaks.

Most people do not regard a small leak, such as one gallon per minute, as a significant water loss, but a one gallon per minute leak amounts to a loss of over a half million gallons per year. Considerable amounts of water (and revenue) can be lost in a year from one small leak.

The Division of Water Resources provides leak detection assistance and loans of equipment. On-site training and videos on how to find underground leaks are also available upon request.

5.2.3 Water Use Efficiency

Water conservation includes not only those measures needed to respond to a water shortage emergency–it also includes the day-to-day measures that have a positive effect on the normal daily demands placed on water systems. This includes developing demand management strategies that help systems meet normal daily water demands more efficiently and make the best use of available potable water supplies. Specific measures include:

Rate Structures: Water systems should establish water rate structures that encourage water conservation and discourage wasteful water use. One-charge (blanket) rates and declining rates do nothing to encourage water conservation and should not be used. On the other hand, flat rates and, especially, increasing rate structures discourage unnecessary water use. Increasing rate structures typically allow for average water usage at a reasonable rate, however, above a certain amount of normal household water usage, rates are substantially higher per unit of water used. Therefore, customers that use large amounts of potable water for lawn irrigation would pay considerably more each month than someone who does not. Historically, just the opposite has been the case, water rates per unit of water decreased as more was used.

Low-flow Fixtures: Water systems should promote and/or provide low-flow plumbing devices and fixtures. Retrofitting existing plumbing fixtures can significantly reduce per capita indoor household water use. Replacing older shower heads with low-flow models, installing faucet aerators in older kitchens and baths, and installing early-close flappers in older toilet tanks can reduce household water use by an estimated 10-15 percent. These retrofit kits are quite inexpensive and can pay for themselves with water savings in a matter of months.

Outdoor Water Use: Water systems serving areas where residential irrigation is common should target excessive outdoor water use for reduction. Promoting proper lawn watering practices and encouraging drought tolerant landscaping can significantly reduce outdoor water usage. Most people overwater their lawns. Less frequent watering can help establish better root systems, making lawns and shrubs more drought tolerant.

Non-Residential Water Use: For many public water supply systems, industrial and other non-residential water uses represent a major component of water demand. Improving the water use efficiency of these non-residential customers can have a significant impact on overall demand. The North Carolina Division of Pollution Prevention and Environmental Assistance offers assistance to businesses, industries, and municipalities in North Carolina. Their program emphasizes source reduction, reuse, and recycling as ways to reduce both water use and wastewater generation. Assistance is available by contacting the Division of Pollution Prevention and Environmental Assistance at 1-800-763-0136 or (919) 715-6500.

5.2.4 Public Education and Outreach

A comprehensive program informing all water users of the many opportunities and benefits of conserving water will increase the effectiveness of a system's other water conservation efforts. In-school programs, water treatment plant tours, and water bill inserts are all part of this effort.

The Division of Water Resources offers water conservation information and technical assistance to public water systems. For further information on water conservation, contact the Division of Water

Resources at (919) 733-4064. Water conservation information is also available on the Division of Water Resources' web page at *www.ncwater.org*.

5.3 Water Reuse

Water reuse, or water reclamation, is the use of highly treated wastewater to satisfy non-potable demands for water. All water systems have a certain percentage of uses that do not require water treated to drinking water standards. Substitution of reclaimed, non-potable water for uses that do not require potable water (e.g., some industrial uses and irrigation) could reduce demand on current potable water supplies and postpone the need for additional water supplies and treatment capacity.

Current regulations allow many uses of reclaimed water, such as irrigation, cooling water, process water, fire fighting, street and vehicle washing, and dust control (North Carolina Administrative Code 15A 2H .0219). However, reclaimed water cannot be used for potable water supply, irrigation of direct food chain crops, or filling pools or tubs.

For some systems, installing a reclaimed water distribution system may be more cost-effective than increasing raw water supplies and expanding treatment facilities. Installing dual (potable and non-potable) water distribution systems for new development is more economical than retrofitting existing development, and should be considered in areas where reclaimed water access is feasible. However, retrofitting of existing development can still be a viable option. For example, the Town of Cary is currently retrofitting a reclaimed water distribution system to make reclaimed water available to both residential and nonresidential customers.

In addition to Cary's reuse project, numerous other major water reuse projects are underway or planned by water systems across the state, including Raleigh, Charlotte-Mecklenburg, Wilson, and Johnston County.

Systems interested in obtaining additional information about water reuse requirements should contact the North Carolina Division of Water Quality at (919) 733-5083.

5.4 Regional Water Supply Systems

Cooperation and coordination between water systems is becoming an increasingly important water supply planning strategy. Water systems can be linked by interconnections to take advantage of regional water supply opportunities. Regional water supplies, many of which already exist, are those supplies that serve a significant portion of a county or counties or a number of municipalities on a regular basis. More than 60 water supplies across the state can be considered regional water supplies.

In some cases, water systems with inadequate water supplies may link with systems that have surplus water supply. In other cases, water systems needing future water supplies may team together to develop a long-term regional water supply that would otherwise be too expensive or perhaps have political or institutional difficulties.