

Chapter 8

Water and Sewer

WATER AND SEWER SYSTEM: INTRODUCTION

Greensboro's primary water supply comes from the three City-owned lakes, Brandt, Higgins, and Townsend, all located to the north. Water is pumped from those three lakes to water plants, where it is treated and then pumped to the Greater Greensboro area.

Greensboro is a city that grew up around railroad lines, rather than a natural water source, such as a river. As such, the water supply is limited, although the City continues to grow. Greensboro's supplemental water supply comes from Reidsville, Winston-Salem, and High Point. These municipalities sell Greensboro some of their water. As of 2000, the agreements with other cities are for emergencies only and are not necessarily long-term options. Reidsville is the exception, as that city may provide Greensboro with five to six million gallons of water per day on an ongoing basis.

Sewer capacity is another critical issue for Greensboro, as this also has an impact on growth and development. This lack of access to a major river can cause difficulties on wastewater. This has an effect on the City's ability to discharge treated wastewater into streams because they limit the City's legal outflow.

Primary information in this chapter serves to describe the various aspects of the City's water and sewer system.

WATER AND SEWER: SUMMARY HIGHLIGHTS

Water Supply

Greensboro's primary water supply comes from the three City-owned lakes, Brandt, Higgins, and Townsend. These lakes cover 2,507 acres and contain 9.5 billion gallons of water. Working volume for the three lakes totals 7,930 million gallons of raw water.

The Randleman Dam project was permitted in April 2001 and construction is scheduled to begin during the summer of 2001. The project is scheduled to be complete by 2005-2006.

The addition of the Randleman Reservoir will increase Greensboro's water capacity by 28 mgd or approximately 75%. This capacity should meet Greensboro's water needs for the next 25 to 35 years.

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Water Capacity & Demand

Greensboro's water capacity is limited by its geography. As stated in the Natural Environment chapter (7), Greensboro is located at the headwaters (or "top of the hill") of the Cape Fear River Basin. In addition, permitting requirements and other federal regulations make it difficult to increase capacity.

Average daily demand between 1990 and 1999 has been 32.55 mgd. The 30-year safe yield is 36 mgd. Peak daily demand for the period ranged from a high in 1998 of 50.65 to a low of 39.50 in 1991.

Sewer Capacity & Demand

For the same geographical reason that the water capacity is limited, the wastewater discharge capacity is limited. In fact, the City's long-term wastewater capacity is more problematic than its water capacity, since the approval of the Randleman Dam.

Capacity for sewer service has increased 2 mg since 1998 to 38 mg. Sewer allocation increased to 40 mgd capacity in 2000, will increase to 46 mgd capacity in 2001, and 56 mgd for 2003.

Water and Sewer Service Areas

Historically, until 1998, Greensboro followed a policy of extending water and sewer service essentially wherever it was requested and feasible. Since 1998, however, the City has adopted a policy of extending water and sewer service only to areas outside the City within a limited boundary. This change is in keeping with the clear need to more effectively manage Greensboro's limited water and sewer treatment resources. [See Water and Sewer Services Area map for boundary line.]

Long term (15 years for sewer, 25-35 years for water), Greensboro will likely have reached its limit of conventional water and wastewater treatment resources. If the City is to continue to grow, alternative methods of increasing these resources will be necessary to service demand. Likely alternatives would involve such measures as interbasin transfers, indirect potable reuse of treated effluent (recycling), and additional (and more stringent) conservation measures.

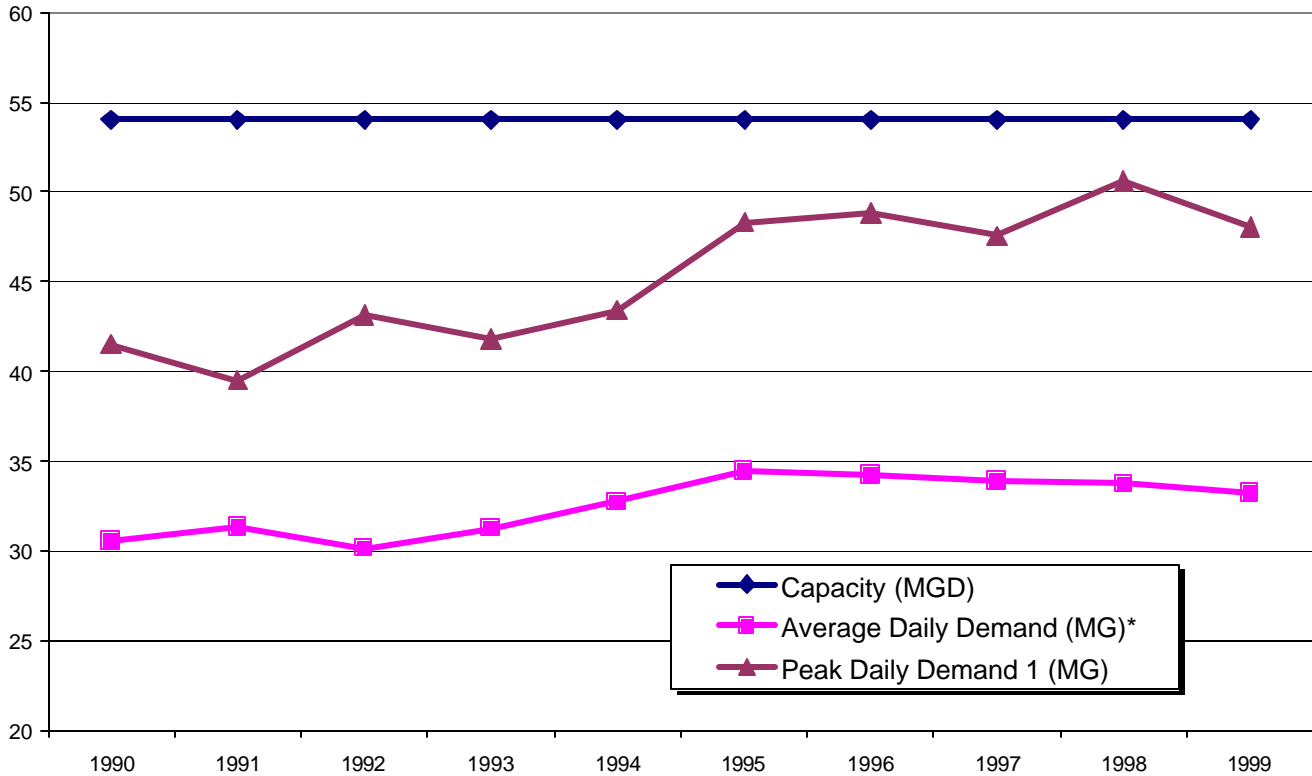
WATER AND SEWER SYSTEM

Greensboro's water is supplied to its citizens by pumping raw water from the three City-owned lakes into the water plants, where it is treated and then pumped to homes and businesses throughout the Greater Greensboro area. Greensboro's peak daily capacity for water is 54 million gallons per day (mgd). This is the capacity used to satisfy demand on hot dry days when citizens are using higher than normal amounts of water to irrigate lawns, in addition to the usual residential, commercial, and industrial demands. Capacity is limited by what the City lakes are capable of supplying day after day, over a long period of time. If 54 million gallons per day were supplied continuously over several months, it is likely that the lakes would be drawn down to dangerously low levels unless an unusually high amount of rain fell, in which case the demand on water for irrigation purposes would be very low.

Year	Capacity (MGD)	Average Daily Demand (MG)*	Peak Daily Demand 1 (MG)
1990	54	30.55	41.51
1991	54	31.34	39.50
1992	54	30.14	43.11
1993	54	31.27	41.80
1994	54	32.74	43.42
1995	54	34.46	48.31
1996	54	34.21	48.80
1997	54	33.88	47.58
1998	54	33.72	50.65
1999	54	33.19	48.02
Average	N/A	32.55	45.27

Source: Greensboro Water Resources Dept., 2000. *Based on Calendar Year Pumpage Report for treated water.

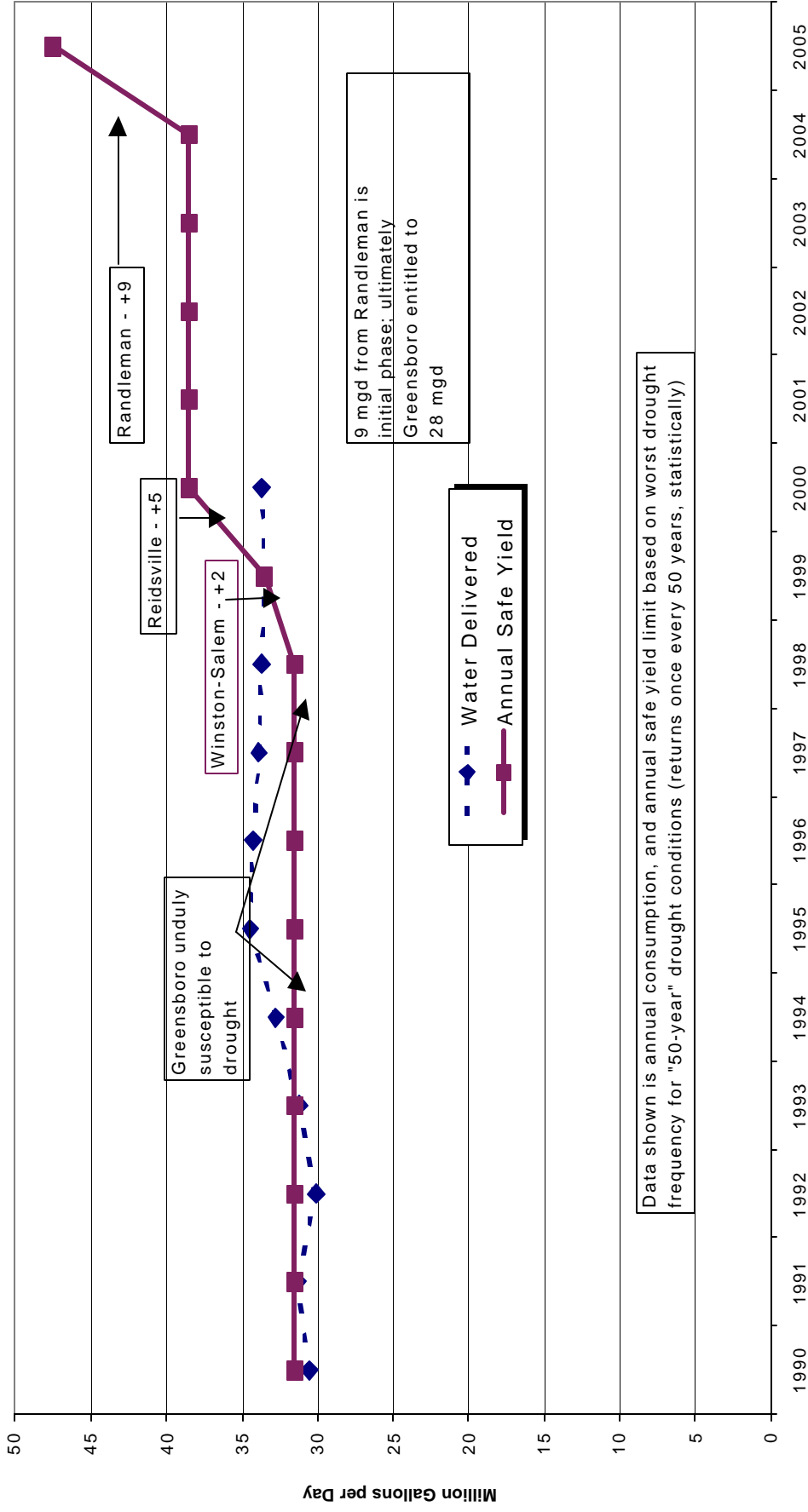
Figure 8-1: Peak Water Capacity and Demand for Greensboro Service Area, 1990-1999



Source: Greensboro Water Resources Dept., 2000. *Based on Calendar Year Pumpage Report for treated water.

Determining the lakes' capacity to supply water over a long period of time is complicated. Some of the factors considered in determining capacity are historic rainfall and streamflow records, and the volume of the lakes. The analysis shows that the lakes and water plants should not be relied upon to supply more than about 31.5 million gallons per day (mgd) on an annual average basis. Otherwise, the City will run the risk of dangerously low lake levels. For this reason, the City's lake water supply is supplemented by purchasing up to three mgd of water from Winston-Salem and six mgd from Reidsville, so that 38.5 mgd can be safely supplied on an average annual basis.

Figure 8-2: Greensboro Water Usage, 1990-2005



Source: Greensboro Water Resources Dept., 2000. Due to delay in permitting the Randleman Dam, it is not expected to come online until 2005-2006, rather than 2004-2005 as indicated on this figure.

City	Amount of Water	Status
High Point	1 mgd*	Complete
Winston-Salem	1-3 mgd*	Complete
Reidsville	2.5 - 6 mgd*	Complete

Source: Greensboro Water Resources Dept., 2000. The current (as of the year 2000) agreements with other cities are emergency agreements & not necessarily long-term options, with the exception of Reidsville which may provide us with 5-6 million gallons of water per day on an ongoing basis. *Million gallons per day.

Greensboro's consolidated water and sewer utility presently serves approximately 85,200 customers within the city limits and in various unincorporated areas of Guilford County. Major users include Oak Ridge Textiles, Lorillard Tobacco Company, Elastic Fabrics of America, Procter & Gamble, Konica Manufacturing USA, Precision Fabrics, Sheraton Greensboro Hotel at Four Seasons, University of North Carolina at Greensboro, Moses H. Cone Hospital, and Cone Mills Corporation.

Historically, until 1998, Greensboro followed a policy of extending water and sewer service essentially wherever it was requested and feasible. Since 1998, the City has adopted a policy of extending water and sewer service only to areas outside the City within a limited boundary. This change is in keeping with the clear need to more effectively manage Greensboro's limited water and sewer treatment resources. [See Water and Sewer Service Area map for boundary line.]

Two water filtration plants, two pumping stations, and a distribution system furnish water to the City and a portion of the unincorporated areas of the County. A \$4.5 million renovation of the Mitchell Water Plant was completed in 1990. A \$9.4 million renovation of the Townsend Water Plant was completed in 1995. Three City-owned lakes, fed by Brushy Creek, Horsepen Creek and Reedy Fork Creek, supply raw water. The water filtration plants have a combined capacity of 54 million gallons per day. Average consumption during calendar year 2000 was 33.7 mgd. The City has a 23 million gallon (mg) finished water storage capacity. There are 7.5 mg of clearwell storage and 15.5 mg of elevated storage capacity.

Facility	Working Volume (MGD)*
Lake Higgins	792
Lake Brandt	1752
Lake Townsend	5386
Total	7930

Source: Greensboro Water Resources Dept., 2000.
*30 year safe yield (MGD)=36.

Lake	Acres Covered	Gallons of Water* Contained	Gallons of Water* in Usable Storage
Brandt	787	2.2	1.75
Higgins	280	0.8	0.8
Townsend	1,440	6.5	5.4

Source: Greensboro Water Resources Dept., 2000. *In Billions.

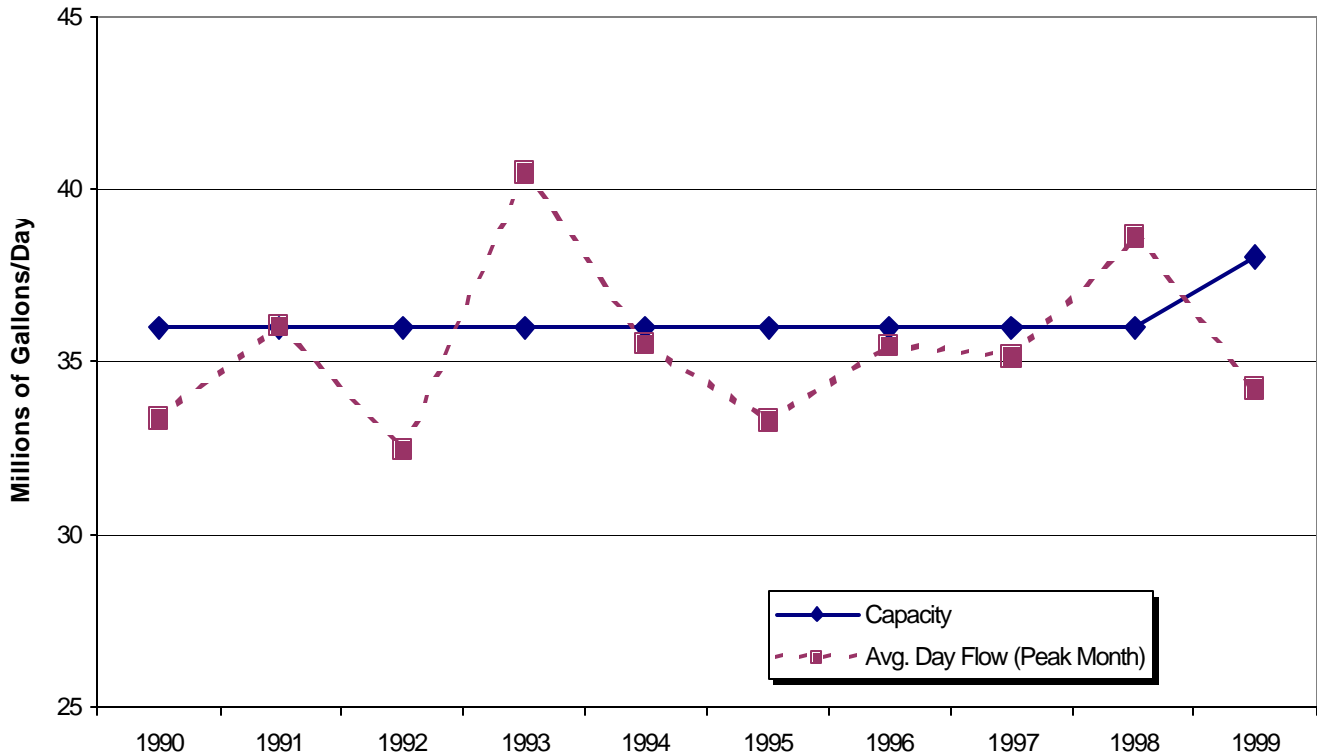
Greensboro's water capacity is limited because it is supplied by small streams in and around the City at the headwaters of the Cape Fear Basin. This is the same geographical reason that the wastewater discharge capacity is limited. In fact, the City's long-term wastewater capacity is more problematic than its water capacity, since the approval of the Randleman Dam.

The City operates two wastewater treatment plants using the activated sludge process. Both of these plants are tertiary plants employing nitrification. The total capacity of 38 mgd is divided between the North Buffalo Wastewater Treatment Plant (16 mgd) and the T.Z. Osborne Wastewater Treatment Plant (22 mgd). The average sewage treatment during calendar year 2000 was 31.5 mgd. Both plants meet final National Pollutant Discharge Elimination System (NPDES) permit limits.

Year	Capacity (MG)	High Flow Month	Avg. Day Flow for Peak Month (MGD)
1990	36	May	33.35
1991	36	Apr	36.03
1992	36	Apr	32.43
1993	36	Apr	40.44
1994	36	Mar	35.54
1995	36	Mar	33.32
1996	36	Jan	35.44
1997	36	Mar	35.10
1998	36	Jan	38.65
1999	38	Sep	34.18

Source: Greensboro Water Resources Dept., 2000.
Note: Sewer allocation increased to 40 MG Capacity for 2000. It will increase to 46 MG Capacity for 2001 & 56 MG for 2003.

Figure 8-3: Sewer Capacity and Demand for Greensboro Service Area, 1990-1999



Source: Greensboro Water Resources Dept., 2000. Note: Sewer allocation increased to 40 MG Capacity for 2000. It will increase to 46 MG Capacity for 2001 & 56 MG for 2003.

The City issued \$50 million Combined Enterprise System Revenue Bonds in 1995 to finance various improvements to the water and sanitary sewer system. Approximately \$40 million is being used to expand the capacity of the T. Z. Osborne Wastewater Treatment Plant (WWTP) from 20 mgd to 30 mgd, to construct centrifuges and a sludge incinerator, and to construct transfer lines between the Osborne and North Buffalo plants. The centrifuges and the sludge incinerator are in operation. The expansion of the Osborne Plant began in April 1996 and was expanded to 22 mgd in January 1999. The expansion from 22 mgd to 30 mgd was completed in June 2001. This expansion is designed to meet projected demand through the year 2010.

In addition, by 2003, based on recent decisions to invest in the expansion of the Osborne Plant, Greensboro will have 56 mgd of sewage treatment capacity. Under current growth rates, this capacity will likely last approximately 12-15 years.

In 1998, the City issued \$40 million in Combined Enterprise System Revenue Bonds. These funds will allow Greensboro to rehabilitate a City reservoir for increased water storage capacity, upgrade systems to comply with the State clean water guidelines, replace sanitary sewer system lift stations, and construct new water feeder mains, lines, and tanks, among

other projects.

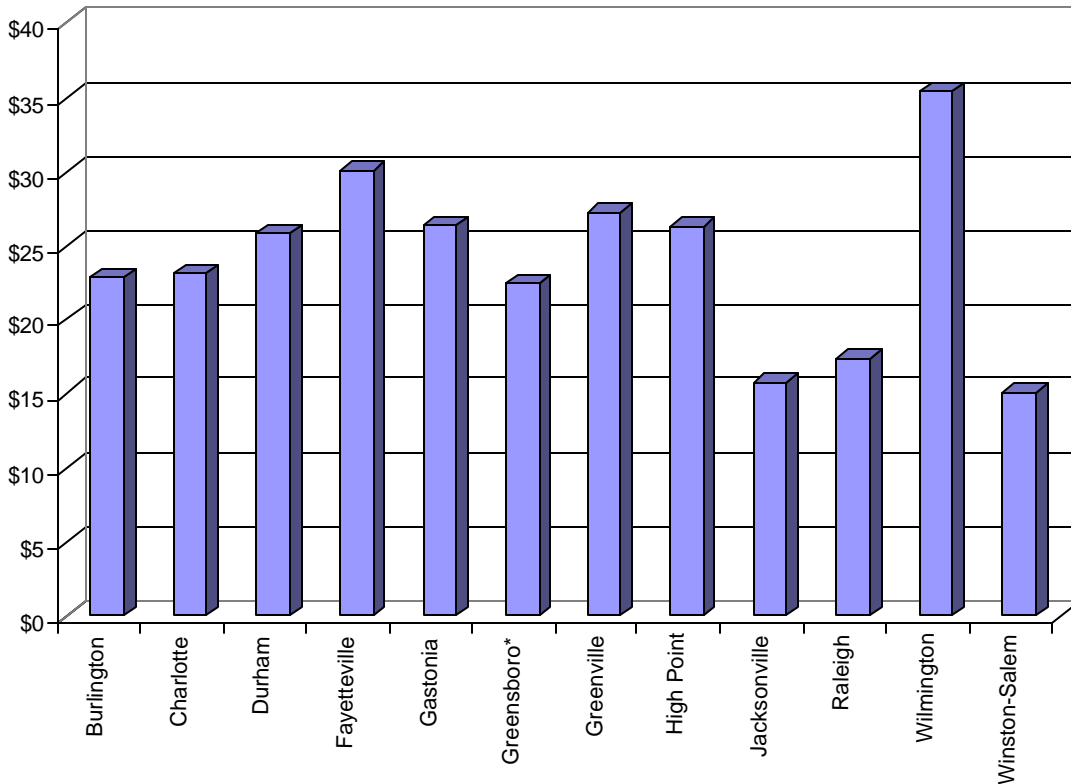
Greensboro has entered into a service agreement with Guilford County that provides for the construction of water and sewer facilities outside the City's corporate limits. The Installment Financing Agreement requires the County to pay the City for the contracted amount of work to be performed. Greensboro lets all contracts and manages the construction program. The revenues derived from water and sewer service to these areas are divided between the City and County on a 75%-25% basis, respectively. Over \$30 million has been expended in the development of water and sewer facilities to provide service in the County. During 1998-1999, approximately \$6.5 million in construction was accomplished through this agreement.

Since 1995, Greensboro has spent or budgeted for expenditures of \$127 million in badly needed capital improvements for water and sewer. These investments have necessitated large increases in water and sewer rates during that same period, ranging from 47% for low volume users to 278% for high volume users. Despite these increases, Greensboro's water and sewer rates remain below the average for the 13 largest cities in North Carolina.

Table 8-6: Comparative Average Water and Sewer Charges for Selected NC Cities, July 2001	
Municipality	Bill Charge
Asheville	\$47.97
Burlington	\$22.90
Charlotte	\$23.12
Durham	\$25.84
Fayetteville	\$30.11
Gastonia	\$26.40
Greensboro*	\$22.48
Greenville	\$27.27
High Point	\$26.32
Jacksonville	\$15.70
Raleigh	\$17.36
Wilmington	\$35.52
Winston-Salem	\$15.11

Source: Greensboro Water Resources Dept., 2001.
 *This rate is effective until January 1, 2002, at which time the rate will be \$24.47. Note: Rate represents the average residential use, which for Greensboro is 6,000 gallons per month inside the City limits. Also, cities above were chosen to match the study conducted by the Water Resources Dept.

Figure 8-4: Comparative Average Water and Sewer Charges for Selected NC Cities, July 2001



Source: Greensboro Water Resources Dept., 2001. *This rate is effective until January 1, 2002, at which time the rate will be \$24.47. Note: Cities above were chosen to match the study conducted by the Water Resources Dept.

The Piedmont Triad Regional Water Authority, jointly organized by six local governments, including the City of Greensboro, has agreed to build and operate the estimated \$117 million Randleman Dam, Water Plant, and Lake project to meet the area’s water needs. The project will serve Randolph County and five municipalities located in Guilford and Randolph Counties: Greensboro, High Point, Jamestown, Archdale, and Randleman. The project was originally scheduled to begin in 1998 and to be completed by the year 2000. However, due to delays in obtaining the required regulatory approvals and permits, the project did not begin as scheduled. The project was permitted in April 2001, construction is scheduled to begin during the summer of 2001, and is anticipated to be completed by 2005-2006. The addition of the Randleman Reservoir will increase Greensboro’s water capacity by 28 mgd or approximately 75%. This capacity should meet Greensboro’s water needs for the next 25 to 35 years.

Long term (15 years for sewer, 25-35 years for water), Greensboro will likely have reached its limit of conventional water and wastewater treatment resources. If the City is to continue to grow, alternative methods of increasing these resources will be necessary in order to service demand. Likely alternatives would involve such measures as interbasin transfers, indirect potable reuse of treated effluent (recycling), and additional (and more stringent) conservation measures.