Jordan Lake Water Supply Storage Allocation Application

Town of Cary

and

Town of Apex

MAY 2001

Prepared By

CH2MHILL

3125 Poplarwood Court, Suite 304
Raleigh, North Carolina 27604

TOWN MANAGER'S OFFICE

May 31, 2001

Mr. John Morris, Director
Division of Water Resources
North Carolina Department of Environment and Natural Resources
P.O. Box 27687
Raleigh, NC 27611-7687

Subject: Jordan Lake Water Supply Allocation Application – Round 3

Dear Mr. Morris:

The Towns of Cary and Apex, in preparing to meet future potable water demands, are submitting this application for an increased allocation from Jordan Lake. Cary and Apex are prepared to expand their existing financial agreement with the State of North Carolina for reimbursement to the U.S. Army Corps of Engineers for the construction and operation and maintenance costs associated with the water supply pool of Jordan Lake.

With this application, the Towns of Cary and Apex request approval of the following allocations:

Level I: 34 mgd (includes 21-mgd allocation recommended in Round 2)
Level II: 10 mgd

These allocations will allow the Towns to meet average day demands through 2050, as shown below, while maintaining demand at 80 percent of available supply.

Year	Cary and Apex Total ADD (mgd), Incorporating Conservation	Jordan Lake Water Supply Required to Maintain Demand at 80% of Available Supply
2000	12.8	16.5
2010	18.7	24.0
2020	25.9	33.3
2030	31.3	39.9
2040	34.0	43.4
2050	34.0	43.4

Since Cary and Apex are planning to construct, and expand as needed, regional wastewater treatment facilities that discharge to the Cape Fear River, this allocation request will not involve any increase in interbasin transfer above the currently recommended 24 mgd. Cary and Apex are committed to keeping the interbasin transfer below 24 mgd through the 2050 planning period.

TOWN *of* CARY
316 North Academy Street • Cary, NC 27513 • PO Box 8005 • Cary, NC 27512-8005
tel 919-469-4007 • fax 919-460-4929 • www.townofcary.org

Please note that Cary and Apex have cooperated with Wake County/Research Triangle Park and the Town of Morrisville in preparing allocation applications. While the Cary/Apex water treatment plant will continue to provide water treatment for all these communities, we are requesting individual allocations for water supply. Because the towns of Cary and Apex also provide wastewater treatment for most of the communities, we urge you to consider this regional cooperation when reviewing the allocation and wastewater discharge issues.

Further, please note that Cary and Apex have aggressively pursued regional solutions for our water supply challenges, including completion of a Long-Range Water Supply Plan document and joint sponsorships of ongoing water supply feasibility studies of Kerr Lake and Middle Creek as potential Cary/Apex water supplies. Because the Kerr Lake and Middle Creek studies are ongoing, the information in this application is preliminary.

We appreciate the assistance provided by your staff in preparing this application, and the consideration of this application at your earliest convenience.

Respectfully,

William B Coleman Jr

William B. Coleman, Jr.
Town Manager

cc: William B. Sutton, Town Manager, Town of Apex
Kim Fisher, Town of Cary
Leila Goodwin, Town of Cary
Tim Donnelly, Town of Apex

BC/01-31

Apex
THE PEAK OF GOOD LIVING

Town of Apex
P. O. BOX 250
APEX, NORTH CAROLINA 27502

May 29, 2001

Mr. John Morris, Director
Division of Water Resources
North Carolina Department of Environment and Natural Resources
PO Box 27687
Raleigh, NC 27611-7687

Dear Mr. Morris:

SUBJECT: Jordan Lake Water Supply Allocation Application – Round 3

The Towns of Cary and Apex, in preparing to meet future potable water demands, are submitting this application for an increased allocation from Jordan Lake. Cary and Apex are prepared to expand their existing financial agreement with the State of North Carolina for reimbursement to the U.S. Army Corps of Engineers for the construction and operation and maintenance costs associated with the water supply pool of Jordan Lake.

With this application, the Towns of Cary and Apex request approval of the following allocations:

Level I: 34.0 mgd (includes current 21.5 mgd recommended allocation)
Level II: 10 mgd

These allocations will allow the Towns to meet average day demands through 2050, as shown below, while maintaining demand at 80 percent of available supply.

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2020	25.9	33.3
2030	31.3	39.0
2040	34.0	43.4
2050	34.0	43.4

With construction and expansion of regional wastewater treatment facilities with a Cape Fear River discharge, as demands require, our allocation request will not involve an interbasin transfer of water. Cary and Apex are committed to abiding by our requested interbasin transfer through the 2050 planning period.

APEX NORTH CAROLINA

Please note that Cary and Apex have cooperated with Wake County/Research Triangle Park and the town of Morrisville in preparing allocation applications. While the Cary/Apex water treatment plant will continue to provide water treatment for all these communities, we are requesting individual allocations for water supply. Because the Towns of Cary and Apex also provide wastewater treatment for most of the communities, we urge you to consider this regional cooperation when reviewing the allocation and wastewater discharge issues.

Further, please note that Cary and Apex have aggressively pursued regional solutions for our water supply challenges, including completion of a Long-Range Water Supply Plan document and joint sponsorships of ongoing water supply feasibility studies of Kerr Lake and Middle Creek as potential Cary/Apex water supplies.

We appreciate the assistance provided by your staff in preparing this application, and the consideration of this application at your earliest convenience.

Respectfully,

William M. Sutton
Town Manager

Cc: William B. Coleman, Jr., Town Manager, Town of Cary

Introduction

The towns of Cary and Apex have been experiencing tremendous growth over the last decade, which has highlighted the need for long-range water supply planning. This rapid population increase is straining the existing infrastructure, requiring long-term planning and capital improvements on a continuous basis.

Key elements of water resource planning for both towns are forecasting growth rates and water consumption levels; identifying a dedicated source of drinking water to meet these forecasted demands; and providing adequate utility infrastructure in a timely manner. To plan for a dedicated source of water, the Town of Cary and the Town of Apex are applying jointly for an allocation from Jordan Lake. The additional allocation will supplement the 21-million-gallon-per-day (mgd) allocation recommended by the Division of Water Resources following the second round of Jordan Lake Water Supply Storage Allocation applications. The Towns' allocation is treated at the Cary/Apex Water Treatment Plant (WTP).

This application provides information substantiating the need for this allocation in the following sections:

Section 1 - Water Demand Forecast
Section 2 - Conservation and Demand Management
Section 3 - Current Water Supply
Section 4 - Future Water Supply Needs
Section 5 - Alternative Water Supplies
Section 6 - Plans to Use Jordan Lake
Attachment A - Cary Local Water Supply Plan
Attachment B - Apex Local Water Supply Plan
Attachment C – Alternative Cost Estimates
Attachment DMaps of the Cary and Apex service areas
Attachment E - Cary Conservation Ordinance
Attachment F - Apex Conservation Ordinance
Attachment G - Draft Water Quality Monitoring Plan

Section 1 - Water Demand Forecast

1.1 Methodology

The forecasted water demand for the Cary/Apex water service area is based on historic and anticipated population growth trends and historic per-capita water use patterns. This method utilizes buildout population forecasts developed for the *Town of Cary Land Use Plan* (1996), subsequent *Growth Management Plan* (Clarion, draft October 1999) and projections by the Towns of Cary and Apex staff. Growth and development projections were based on socioeconomic data provided by the Capital Area Metropolitan Planning Organization (CAMPO) to develop the 2025 Transportation Plan. The CAMPO growth and development projections assume the Urban Services Area (USA) as the basis of the ultimate municipal water and sewer services area, though some areas outside the USAs have been specifically identified by Cary and Apex for future service area growth.

Water demand forecasts in each town were developed for the following water use sectors:

- Residential, including:
    - single-family
    - multi-family
- Non-Residential, including:
    - Commercial
    - Industrial
    - Institutional
- Bulk Water Sales
- Process Water
- Unaccounted-for Water

1.2 Water Use Sectors

1.2.1 Residential Use Sector

Residential water demand forecasts were developed based on projections of housing accounts and the usage per account. The total water usage for the sector is in million gallons per day (mgd) and the usage per account is expressed in gallons per day (gpd). The Town of Cary itemizes single-family and multi-family residential accounts, while the Town of Apex maintains a single residential account classification. For Cary, the single-family residential designation applies to all individually-metered accounts, whether they are detached dwellings or apartment/condominium units. The multi-family residential designation applies, for example, to master metered apartment complexes, and the number of individual

dwelling units in each account is not readily available to permit calculation of water use per dwelling unit. However, to simplify matters and make Cary's estimates consistent with Apex's, historical residential use for Cary is shown here as a single residential sector.

Table 1-1 summarizes water use by the residential sector in the Town of Cary from 1997 through 1999. The 1997-1999 average unit water usage for the residential sector was approximately 240 gpd per account or 78 gpd per capita, well within the regional benchmarks for residential water use. Because the year 1997 was much higher than the other two years mentioned, a usage factor of 75 gpcd will be used.

TABLE 1.1
Historical Residential Water Usage for the Town of Cary
Jordan Lake Water Supply Storage Allocation Application

Year	Residential Population	Residential Accounts	Residential Water Use (mgd)	Average Usage per Account (gpd)	Average Usage per Capita (gpcd)
1997	82,700	26,359	6.850	260	83
1998	85,232	27,756	6.425	231	75
1999	88,249	29,076	6.725	231	76

The Town of Apex maintains a single residential account classification. Due to a change in record-keeping practices in August 1998, data prior to that month is not readily available for analysis. Water use data for Apex residential accounts from 1997 through 2000 is summarized in Table 1-2. The 1997-2000 unit water usage for the residential sector was between 171 and 194 gpd per account, or 57 to 75 gpd per capita, well within the regional benchmarks for residential water use. While the year 2000 shows a great reduction in the average use per capita, this reduction is consistent with the stringent water restrictions applied during that year. For this reason, a usage factor of 70 gpcd will be used for Apex.

TABLE 1-2
Historical Residential Water Usage for the Town of Apex
Jordan Lake Water Supply Storage Allocation Application

Year	Residential Population	Residential Accounts	Residential Water Use (mgd)	Average Usage per Account (gpd)	Average Usage per Capita (gpcd)
1997	12,000	4,310	0.83	193	69
1998 (August to December)	13,420	5,201	1.007	194	75
1999	17,673	6,433	1.125	175	64
2000	22,453	7,507	1.28	171	57

1.2.2 Non-Residental Use Sector

The Non-residential water demand forecasts were based on employment and account information for both Cary and Apex, and each community's historic demands are discussed below. Non-residential accounts by Apex are not disaggregated, while Cary disaggregates non-residential accounts into Commercial, Industrial and Institutional subsectors.

Town of Cary

Commercial Use Subsector

The commercial use sector includes water use by businesses, including retail, service, offices, churches, golf courses, health care facilities, hotels, restaurants, commercial irrigation and car washes. Growth in the commercial sector is closely linked with growth in the housing sector due to the fact that population growth is the driver for additional commercial goods and services. As indicated in Table 1-3, commercial usage in Cary remained consistent in unit terms, averaging about 1,200 gpd per account and 77 gpd per employee in 1998 and 1999.

TABLE 1-3
Historical Commercial Water Usage - Town of Cary
Jordan Lake Water Supply Storage Allocation Application

Year	Commercial Accounts	Commercial Water Use (MG)	Usage per Account (gpd)	Commercial Employment (TAZ Estimate)	Commercial Usage per Employee (gpd)
1998	1,679	743	1,212	26,400	77
1999	1,761	784	1,219	27,700	77

Source: Town of Cary, Employment estimates from CAMPO

Industrial Sector Use

The industrial sector includes two types of uses: processing and warehousing. Projections and a usage factor are developed using employment projections provided for Traffic Analysis Zones (TAZ's) by CAMPO in a manner similar to the commercial demand. As indicated in Table 1-4, industrial usage in Cary remained consistent at 19 gpd per employee in 1998 and 1999, though the average consumption per account appears to have been affected by the severe water use restrictions in 1999, which were imposed during the summer drought conditions.

TABLE 1-4
Historical Industrial Water Usage -Town of Cary
Jordan Lake Water Supply Storage Allocation Application

Year	Industrial Accounts	Industrial Water Use (MG)	Usage per Account (gpd)	Industrial Employment (TAZ Estimate)	Industrial Usage per Employee (gpd)
1998	21	41	5,288	5,800	19
1999	29	45	4,215	6,440	19

Source: Town of Cary

Institutional Sector Use

The institutional sector category consists of educational and municipal uses, including schools, medical facilities, water main flushing, cooling tower makeup water, and other internal uses by the Town of Cary. A relationship is observed between historical institutional demand and residential demand. An evaluation of 1995 through 1999 data (ref. *Town of Cary Water System Master Plan, 2000*) indicate that institutional demand is consistently approximately 2 percent of residential demand. Historical use for the institutional sector of the Town of Cary can be seen in Table 1-5. Both as a percentage of residential use and on a per-account basis, institutional water use remained fairly consistent for 1998 and 1999.

TABLE 1-5
Historical Institutional Water Usage - Town of Cary
Jordan Lake Water Supply Storage Allocation Application

Year	Institutional Accounts	Institutional Water Use (MG)	Institutional Usage per Account (gpd)	Institutional Use as Percent of Residential Use (%)
1998	93	44	1,295	1.9
1999	102	50	1,351	2.0

Source: Town of Cary

Town of Apex

Non-residential water use in Apex includes commercial, industrial and institutional use. Growth in the non-residential sector is closely linked with growth in population since population growth is the driver for additional commercial goods and services. In addition, Apex has an historic industrial base that is expected to grow through the planning horizon as well. While TAZ employment projections for the planning period were used to develop projections and usage factors, these projections decreased in percentage of population fairly drastically near the end of the planning period. Recent planning by Apex is intended to keep the employment to population ratio at 20%. This is the ratio projected for 2000 by TAZ, and it is comparable or low compared with other triangle communities. As indicated in

Table 1-6, non-residential usage in Apex has increased in per-employee units and remained somewhat consistent in per account units. The historical data provides average water usage of about 1011 gpd per account and 84 gpd per employee in 1999.

TABLE 1-6
Historical Non-Residential Water Usage – Town of Apex
Jordan Lake Water Supply Storage Allocation Application

Year	Non-Residential Accounts	Non-Residential Water Use (MG)	Usage per Account (gpd)	Apex Employment (TAZ Estimate)	Non-Residential Usage per Employee (gpd)
1998 (August – December)	296	46	1,010	4,281	70
1999	381	137	987	4,415	85
2000	420	159	1,036	4,549	96

Source: Town of Apex

1.2.3 Bulk Water Sales

The Town of Cary is currently committed to providing water to the RDU International Airport, and has done so since 1984. The current water service agreement allows a maximum of 0.4 mgd to be purchased by the airport. This number was based on a monthly average and a maximum rate of 2,400 gpm (3.6 mgd). This agreement expires in 2003, but can be renewed by mutual consent until 2033 Projections for future water demand for the year 2000 through buildout (year 2030) for RDU were based on projected population growth for this period and projected changes in water use unit factors through reuse and water conservation. It is assumed that the agreement between Cary and RDU will be renewed at least though the planning horizon used in this application, and the projected demands will be purchased.

Cary also supplies water and sewer services to the Town of Morrisville under a September 1995 agreement. Morrisville's maximum average day water demand in 2000 is approximately half of the 1.0 mgd contract limit. In addition, the Town of Cary supplies water to the Wake County portion of Research Triangle Park, or RTP South. The average water provided to RTP South customers in year 2000 to date is approximately 0.27 mgd. Both of these entities applied for a Jordan Lake Water Supply Storage Allocation separately under Round 2 and under Round 3, and the requested Cary/Apex allocation does not address their water demands. The demands of Morrisville and RTP South will not be discussed further within this Application.

1.2.4 Process Water

A portion of the raw water withdrawn by the Towns of Cary and Apex is used during the water treatment process for filter backwashing or is lost in treatment residuals. Table 1-7 summarizes the amount of process water used at the Cary/Apex facilities from 1996 through 2000. Year 2000 process water losses may not be representative due to construction

activities relating to the treatment capacity upgrade, so only 1996 through 1999 data were used in estimating average process water use. The average amount of process water used during this time period was roughly 8 percent of the raw water treated, or 9 percent of the finished water produced.

TABLE 1-7
Historical Process Water Use, 1996-2000
Jordan Lake Water Supply Storage Allocation Application

Month	Raw Water Treated (MG)	Total Finished Water Pumped (MG)	Process Water (MG)	Process Water (% of Raw Water)
Jan-96	292	272	20	7%
Feb-96	235	217	18	8%
Mar-96	292	269	23	8%
Apr-96	303	276	27	9%
May-96	347	312	36	10%
Jun-96	356	316	40	11%
Jul-96	278	246	31	11%
Aug-96	225	206	19	8%
Sep-96	292	271	20	7%
Oct-96	342	316	26	8%
Nov-96	289	269	21	7%
Dec-96	290	268	22	8%
Jan-97	295	275	20	7%
Feb-97	262	247	15	6%
Mar-97	248	231	17	7%
Apr-97	259	247	12	5%
May-97	293	285	8	3%
Jun-97	303	294	9	3%
Jul-97	362	358	3	1%
Aug-97	385	386	0	0%
Sep-97	357	340	17	5%
Oct-97	395	363	32	8%
Nov-97	322	296	27	8%
Dec-97	313	286	28	9%
Jan-98	315	286	28	9%
Feb-98	286	253	32	11%
Mar-98	335	304	31	9%
Apr-98	325	287	38	12%
May-98	325	293	32	10%
Jun-98	365	333	31	9%
Jul-98	370	338	33	9%
Aug-98	359	337	22	6%
Sep-98	350	332	18	5%
Oct-98	363	349	14	4%

TABLE 1-7
Historical Process Water Use, 1996-2000
Jordan Lake Water Supply Storage Allocation Application

Month	Raw Water Treated (MG)	Total Finished Water Pumped (MG)	Process Water (MG)	Process Water (% of Raw Water)
Nov-98	248	217	31	13%
Dec-98	284	253	32	11%
Jan-99	334	298	36	11%
Feb-99	251	220	31	12%
Mar-99	367	328	39	11%
Apr-99	390	341	49	13%
May-99	409	362	47	11%
Jun-99	311	272	39	13%
Jul-99	302	265	37	12%
Aug-99	253	214	39	16%
Sep-99	295	170	25	13%
Oct-99	2006	180	26	13%
Nov-99	188	167	21	11%
Dec-99	146	129	17	12%
Jan-00	174	150	23	13%
Feb-00	215	192	24	11%
Mar-00	169	152	17	10%
Apr-00	169	149	30	18%
May-00	301	267	33	11%
Jun-00	243	205	38	15%
Jul-00	185	153	32	17%
Aug-00	224	197	26	12%
Sep-00	230	202	27	11%
Oct-00	291	264	28	10%
Nov-00	245	319	26	11%
Dec-00	225	199	26	11%
		AVERAGE	26 MG	9%

Source: Town of Cary

1.2.5 Unaccounted-For Water

Based on an analysis of 1993 through 2000 data, unaccounted-for water ranged from approximately 4 to 13 percent of the Cary/Apex water system demand. In this period, 1995 unaccounted-for water was uncharacteristically high (13 percent) compared with a range of 4 to 7 percent in the other years of that period. The Cary average unaccounted-for water is about 5 percent of its finished water demand, and the Apex average unaccounted-for water is about 7 percent of its finished water demand. Cary and Apex have extensive leak

detection programs to identify and repair leaks in the distribution system in order to reduce unaccounted-for water.

1.2.6 Summary of Historic Water Use

Table 1-8 summarizes historic water use factors for Cary, Apex and the combined system. Due to the differences in historic data available for Cary and Apex, water use factors for the combined system will be provided for residential, non-residential, process water and unaccounted for water use categories, and the projections will not be further disaggregated. Because 1999 and 2000 saw imposition of significant water use restrictions in Cary and Apex due to the summer drought conditions, the water use factors developed from the available data between 1996 and 1998 will be used to determine future water demand.

TABLE 1-8
Population and Account Growth Forecasts

	Cary Use Factor	Apex Use Factor
Residential	**75 gpcd**	**70 gpcd**
Non-Residential	**-**	**70 gpd/employee**
Commercial	**77 gpd/commercial employee**	NA
Industrial	**19 gpd/industrial employee**	NA
Institutional	**2% of residential total**	NA
Bulk Water Sales	**Up to 0.7 mgd**	
Process Water	**9% of Subtotal Demand**	
Unaccounted-For Water	**5% of Subtotal Demand**	**7% of Subtotal Demand**

1.3 Population Projections

Historic population data shows that Cary has increased in population from a rural community of 3,356 in 1960 to a 2000 population of 96,000. Cary is now the seventh-largest municipality in North Carolina. Apex has also experienced rapid growth, increasing in population from 1,368 in 1960 to 22,453 in 2000. A primary driver for the growth of western Wake County has been development linked to the Research Triangle Park, which is expected to continue bringing technical and business professionals to the area.

The *Town of Cary Land Use Plan* evaluated three scenarios for future development of the Town, its extra-territorial jurisdiction (ETJ) and environs. The Modified Compact Development scenario predicted that an ultimate population of about 236,000 could be accommodated within a Planning Area defined by the Town Limits, ETJ and other areas inside its municipal service boundaries. It is likely that redevelopment of the Town will continue after buildout, increasing population density in existing developed areas. This is the Cary ultimate population used in population forecasts. Likewise, Apex's service area

buildout population is based upon projection of present population densities for the town on its USA and environs.

Growth in the number of residential accounts is projected based on the Towns of Cary's and Apex's estimates of population growth during the 2000-2050 planning horizon. Both Towns anticipate their populations will grow to buildout capacity during the planning horizon.

Based on data provided by the Town of Cary and Town of Apex Planning Departments, Table 1-9 shows anticipated populations and corresponding residential account "meter equivalents" through 2050. The combined service area population is expected to increase from 118,670 in 2000 to 338,172 in 2035, then stabilize at this population for the period 2035 through 2050. This represents an increase of approximately 185% in combined service area population, and an average annual rate of increase of 2.1%. For Cary, the 1998 average of about 0.36 residential meter equivalent per capita is used, composed of 0.358 single family meter equivalents per capita and 0.00138 multi-family meter equivalents per capita, respectively.

TABLE 1-9
Population and Account Growth Forecasts - Cary/Apex

Year	Cary Population Forecast	Apex Population Forecast	Total Population Forecast	Total Residential Account "Meter Equivalents"
2000	96,217	22,453	118,670	42,648
2005	115,781	35,627	151,407	54,413
2010	134,222	48,800	183,022	65,774
2015	152,601	61,700	214,301	77,015
2020	172,653	74,600	247,253	88,858
2025	192,971	87,500	280,471	100,796
2030	215,679	100,400	316,079	113,592
2035	236,000	102,172	338,172	121,532
2040	236,000	102,172	338,172	121,532
2045	236,000	102,172	338,172	121,532
2050	236,000	102,172	338,172	121,532

The 1990's have seen significant population growth in both Cary and Apex, exceeding projections made even a few years earlier. As a result, in an effort to present the most accurate picture available with regard to the Towns' future growth expectations, population forecasts contained in this application have been adjusted based on the observations and projections of Towns' planning staff through year 2000.

The Town of Cary water/sewer utility service area is currently located within Wake County, but Cary anticipates extension of water and sewer utility service into a small, contiguous portion of Chatham County by about 2008. Table 1-10 disaggregates the projected Cary service area into Wake County and future Chatham County components.

TABLE 1-10
Cary Service Area Population Projections, Disaggregated by County
Jordan Lake Water Supply Storage Allocation Application

Year	Cary Service Area Population in Wake County	Cary Service Area Population in Chatham County	Total Projected Cary Service Area Population
2000	96,217	0	96,217
2005	115,781	0	115,781
2010	133,130	1,092	134,222
2015	151,389	1,212	152,601
2020	170,144	2,509	172,653
2025	189,165	3,806	192,971
2030	211,873	3,806	215,679
2035	232,194	3,806	236,000
2040	232,194	3,806	236,000
2045	232,194	3,806	236,000
2050	232,194	3,806	236,000

1.4 Water Demand Forecasts

Average day water demand forecasts are based upon the methods presented in Section 1.1. To determine water demand projections for the Commercial and Industrial Sector for Cary, TAZ estimates of the total number of employees in these sectors through 2025 were used. Growth in employment beyond 2025, the latest year for which TAZ projections were available, was based upon employment growing proportionate to population growth for that period. The Town's anticipate continued growth in the commercial and industrial sectors to balance growth in the residential sector.

The Town of Cary is currently located within Wake County, but Cary does anticipate extending water and sewer service into a small, contiguous portion of Chatham County in the future, to commence about year 2008. Table 1-11 summarizes total Cary and Apex employment projections used in water demand forecasts, and categorizes the projected number of commercial and industrial employees in the Wake County and Chatham County segments of the eventual Cary utility service area.

Water Demand Forecasts for all sectors discussed are summarized in Table 1-12. Average day water demands for the Cary/Apex service area are expected to increase from about 13 mgd in 2000 to about 35 mgd in 2050.

TABLE 1-11
Employment Projections for Cary and Apex, Disaggregated by County
Jordan Lake Water Supply Storage Allocation Application

	CARY						APEX
Year	**Cary / Wake Co Commercial Employment**	**Cary / Chatham Co Commercial Employment**	**Total Commercial Employment**	**Cary / Wake Co Industrial Employment**	**Cary / Chatham Co Industrial Employment**	**Total Industrial Employ - ment**	**Total Employ - ment**
2000	29,040	0	29,040	7,080	0	7,080	4,549
2005	37,400	0	37,400	10,200	0	10,200	7,125
2010	49,474	121	49,600	13,576	18	13,600	9,760
2015	64,661	126	64,800	17,161	24	17,200	12,340
2020	81,138	139	81,286	20,378	39	20,429	14,920
2025	96,843	148	97,000	23,937	51	24,000	17,500
2030	107,683	157	107,840	25,819	63	25,881	20,080
2035	117,843	157	118,000	28,257	63	28,320	20,434
2040	117,843	157	118,000	28,257	63	28,320	20,434
2045	117,843	157	118,000	28,257	63	28,320	20,434
2050	117,843	157	118,000	28,257	63	28,320	20,434

Source: CAMPO, Town of Cary

TABLE 1-12
Projected Average Daily Water Demand - Cary/Apex Service Area[1]

	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Cary	**10.3**	**12.6**	**15.0**	**17.6**	**20.6**	**23.4**	**26.1**	**28.5**	**28.6**	**28.6**	**28.6**
Wake Co Residential	7.2	8.7	10.0	11.4	12.8	14.2	15.9	17.4	17.4	17.4	17.4
Chatham Co Residential	0.0	0.0	0.1	0.1	0.2	0.3	0.3	0.3	0.3	0.3	0.3
Total Residential	7.2	8.7	10.0	11.4	12.9	14.5	16.2	17.7	17.7	17.7	17.7
Wake Co Commercial	1.9	2.5	3.3	4.3	5.4	6.5	7.2	7.9	7.9	7.9	7.9
Chatham Co Commercial	0.0	0.0	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
Total Commercial	1.9	2.5	3.3	4.3	5.4	6.5	7.2	7.9	7.9	7.9	7.9
Wake Co Industrial	0.1	0.2	0.3	0.3	0.4	0.5	0.5	0.5	0.5	0.5	0.5
Chatham Co Industrial	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Total Industrial	0.1	0.2	0.3	0.3	0.4	0.5	0.5	0.5	0.5	0.5	0.5
Institutional	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.4	0.4
Bulk Water Sales[2]	0.4	0.4	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7
Unaccounted-For Water	0.5	0.6	0.7	0.8	1.0	1.1	1.3	1.4	1.4	1.4	1.4
Apex	**2.1**	**3.3**	**4.5**	**5.7**	**7.0**	**8.1**	**9.3**	**9.5**	**9.5**	**9.5**	**9.5**
Residential	1.6	2.5	3.4	4.3	5.2	6.1	7.0	7.2	7.2	7.2	7.2
Non-Residential	0.4	0.6	0.8	1.0	1.3	1.5	1.7	1.7	1.7	1.7	1.7
Unaccounted-For Water	0.1	0.2	0.3	0.4	0.5	0.5	0.6	0.6	0.6	0.6	0.6
Bulk Water Sales[2]	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02	0.02
Process Water (9%)	**1.1**	**1.4**	**1.6**	**1.9**	**2.2**	**2.4**	**2.6**	**2.8**	**2.8**	**2.8**	**2.8**
Water Conservation Savings	**(0.3)**	**(1.3)**	**(1.9)**	**(2.6)**	**(3.3)**	**(4.1)**	**(6.1)**	**(6.2)**	**(6.2)**	**(6.2)**	**(6.2)**
Total Service Area Demand	**13.2**	**16.0**	**19.2**	**22.6**	**26.5**	**29.8**	**31.9**	**34.6**	**34.7**	**34.7**	**34.7**

1. All data in million gallons per day (mgd).
2. Includes sales by Cary to RTP South, and by Apex to Seltonsville Community. Does not include bulk sales to Morrisville or RTP South.

2. Conservation and Demand Management

The Towns of Cary and Apex have demonstrated their commitment to water conservation to reduce water demands and increase the efficient utilization and protection of existing natural resources. Projected water demands exceed the existing capacity of the Cary/Apex WTP, and will require substantial capital expenditures to provide adequate water supply for the growing population. To help in maintaining an adequate supply, a reduction in demand is being pursued.

2.1 Town of Cary

The Town's water conservation ordinance is included in Attachment E. The Town of Cary developed a Conservation Plan in 2000 following an extensive study of conservation options, and the Town is implementing this program. One focus of the Conservation Plan is to address peak summer usage levels. Goals for this program are aggressive to reduce demand in the short-term, since the Cary/Apex Water Treatment Plant expansion is not yet on-line and the Plant approaches capacity production during summer months. This peak seasonal demand is driven by a large proportion of residential customers, an affluent customer base, and high community standards for the appearance of commercial properties. The primary objective of the short-term demand management measures is to address these summer peaks. In addition to the short-term focus on peak demand management, the Conservation Plan addresses long-term conservation measures designed to achieve a substantive reduction in total water demand over a ten-year planning horizon. Benefits from water savings during this longer-term planning horizon include conservation of the Jordan Lake resources as well as savings associated from the deferral of capital projects that would otherwise have been necessary in the absence of conservation.

2.1.1 Current Water Conservation Programs

The Town of Cary includes both supply-side conservation and demand-side conservation elements in its current water conservation programs.

Reuse: A Supply-Side Conservation Measure

To address the peak seasonal demand from a supply side perspective, Cary is committed to the construction of a Reclaimed Water System to provide non-potable reclaimed water for irrigation systems within its local water service area. The reclaimed water distribution system will initially be limited to selected areas close to the Town's North Cary Wastewater Treatment Plant (WWTP) and South Cary WWTP, to be completed in 2001. The use of reclaimed water is expected to reduce potable water demand by up to 0.5 MGD during in the summer of 2001 (June-October). When fully implemented, the reuse system may supply up to 2 mgd of irrigation demands during the growing season.

Demand-Side Conservation Measures

Demand side conservation activities currently conducted by the Town to address long-term conservation of water by its customers include:

- A *Public Education Program* that incorporates a "Block Leader Program" and a summer "Beat the Peak Program" to convey to the public an understanding of why water conservation is important;
- A *Toilet Flapper Rebate Program* to provide customers with the incentive to replace existing flappers with early closure models;
- A *Water Waste Ordinance* that prohibits wasteful outdoor watering that falls directly onto impervious surfaces;
- A *Rain Sensor Ordinance* that requires all existing and new customers with irrigation systems to install a rain sensor that measures rainfall and overrides the irrigation cycle of the system; and
- A *Conservation Rate Structure* designed to encourage more efficient use of water resources by charging higher unit rates to customers as their level of consumption increases. The highest rate tier is designed to charge customers about 4 times the lowest rate for excessive irrigation use.

The Town has also been proactive in addressing its peak demand management issues by implementing year-round odd-even day outdoor watering. Other water use restrictions such as a total ban on turf watering may be imposed during those periods that constitute a water emergency.

2.1.2 Assessment of Water Conservation Potential

The vast majority of water sales in Cary are attributable to four of the six customer groups: single-family and multi-family residential (63% and 12% respectively), commercial (20%), and irrigation (2.1%). Therefore, these four customer groups provide the greatest potential to achieve long-term average day water savings through conservation measures and efforts. However, newer communities such as Cary may have more difficulty achieving long-term average water savings than older communities, since a larger proportion of homes and businesses were built after the adoption of revised plumbing codes in 1992 which mandated water conserving features. As discussed in Section 1 of this Application, the residential water usage patterns measured on a per household basis already demonstrate acceptable water use efficiency.

From the perspective of deferring proposed water capital improvement projects (additional expansions to the Cary/Apex WTP), the objective is to reduce summer peak day water use because water treatment plants are sized, and expansions are timed, based upon peak day demand. Outdoor water use by the four groups identified above represents over 95% of the total retail outdoor water use. As a result, there appears to be potential for significant conservation in each of these customer groups related to outdoor or landscape water use.

2.1.3 Conservation Plan and Implementation Recommendations

The Town's Water Conservation Plan project considered over 130 potential conservation measures. After a screening process, water savings were estimated and costs were developed for 15 conservation measures or programs. Benefits and costs were compared in a formal present worth analysis and conclusions were drawn about which programs produce cost-effective water savings for the Town. Based on the results of the benefit-cost analysis, a recommended plan was developed using the following criteria:

- Benefit-cost ratio greater than 1.0 (i.e., the program must save more than it costs);
- Reasonable cost (i.e., affordable);
- Significant water savings; and
- Acceptable non-quantifiable impacts.

The recommended plan includes seven programs targeted mainly at residential (RSF and RMF), commercial, and irrigation accounts. A list of the programs, water savings, and total costs (over the first five years) of each program included in the recommended plan are shown in Table ES-2.

- Residential Water Audits
- Public Education
- Flapper Rebate
- New Home Points Program
- Landscape Water Budgets
- Landscape/Irrigation Codes
- Increasing Block Rate Structure
- Water Reclamation Facility (Water Reuse)

The plan was accepted by the Town Council, and implementation of these programs has begun. Water savings in retail water production expected from the Conservation Plan by the end of the Plan's forecast period in 2028 total 4.6 MGD. This represents a reduction in water production of approximately 16.3%.

Benefits of the plan include the deferral of considerable capital expenditures associated with expanding the Cary/Apex WTP, and reducing the annual system operating costs. By extending the timing of the capital cost associated with these expansions, the present worth of these expansions is reduced.

Town of Apex

The Town of Apex water conservation ordinance was amended in March 2000, and is included in Attachment F. The Town's conservation program includes the following elements for demand management:

- A *Water Waste provision* in the water conservation ordinance that prohibits wasteful outdoor watering that falls directly onto impervious surfaces;

- A *Rain Sensor provision* in the water conservation ordinance that requires all existing and new customers with automatic irrigation systems to install a rain sensor that measures rainfall and overrides the irrigation cycle of the system; and
- A *Conservation Rate Structure* designed to encourage more efficient use of water resources by charging higher unit rates to irrigation customers as their level of consumption increases.
- Public education
- Water loss improvements

In addition, the Town participates with Cary to increase the water plant efficiency, to reduce plant process water, and has been awarded a grant to implement a water reuse system in Apex. The water reuse system, funded by a Clean Water Management Trust Fund grant and Town funds, would be focused in Phase 1 on the Lufkin Road area industries near the Town's wastewater treatment plant. Targeted uses include concrete manufacturing, Potters Industries, school irrigation, and a truck watering station. Phase 1 is expected to complete design and permitting activities in 2001, and be constructed beginning in 2002, and is targeted for up to 200,000 gpd supply in the growing season.

Supply-side water conservation efforts wisely conserve the Jordan Lake water supply. Apex estimates its water conservation and water use efforts can reduce per-capita water use by up to 15 percent, to be phased in over 15 years.

Summary

The combined projected impact of proposed water conservation programs through the 2000-2050 planning horizon is summarized in Table 2-1.

TABLE 2-1
Projected Reduction in Average Day Water Demand as a Result of Conservation Programs, in mgd

	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Cary	**0.2**	**0.8**	**1.3**	**1.7**	**2.1**	**2.7**	**4.6**	**4.6**	**4.6**	**4.6**	**4.6**
Reuse		0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Residential	0.1	0.5	0.9	1.2	1.6	2.1	4.0	4.0	4.0	4.0	4.0
Commercial/ Industrial	0.1	0.1	0.1	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3
Apex	**0.04**	**0.5**	**0.6**	**0.9**	**1.2**	**1.4**	**1.5**	**1.6**	**1.6**	**1.6**	**1.6**
Reuse		0.2	0.3	0.3	0.4	0.4	0.4	0.4	0.4	0.4	0.4
Residential	0.03	0.2	0.2	0.5	0.6	0.8	0.9	1.0	1.0	1.0	1.0
Non-Residential	0.01	0.1	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2
TOTAL	**0.26**	**1.3**	**1.9**	**2.6**	**3.3**	**4.1**	**6.1**	**6.2**	**6.2**	**6.2**	**6.2**

3. Current Water Supply

The Towns of Cary and Apex obtain their primary water supply from Jordan Lake through a single water treatment plant, the Cary/Apex WTP on Wimberly Road (SR 1063). This WTP serves the municipalities of Cary, Apex and Morrisville, the Raleigh/Durham International Airport (RDU Airport), and the Wake County portion of Research Triangle Park (RTP South). The plant capacity is presently 16 mgd, and is being upgraded to 40 mgd capacity under an ongoing project to be completed in 2001. The plant capacity is divided between Cary (77 percent) and Apex (23 percent).

The water supply for the Cary/Apex WTP comes solely from Jordan Lake, which is approximately 4 miles from the Town of Cary limits. Cary and Apex share an allocation from Jordan Lake's surface water yield of 100 mgd. Upon completion of Round 2 of the Jordan Lake Water Supply Storage Allocation process, the joint Cary/Apex allocation for Jordan Lake storage is expected to be 21.0 mgd.

The water for the Cary/Apex WTP is withdrawn from the eastern water intake structure (dam structure 35°39'15" north latitude and 79°04'05" west longitude), which has a maximum design flow of about 50 mgd in its present configuration. The Town of Cary adheres to a watershed protection plan for Jordan Lake to help protect the quality of the water supply.

Cary and Apex have also entered into a temporary agreement with the City of Raleigh to purchase finished water on a regular basis. Cary is connected to Raleigh's water system near the intersection of N.C. 54 and I-40. The Towns purchase up to 4.73 mgd from Raleigh. The Apex agreement will expire in November 2001 and the Cary agreement will expire in 2003, and Raleigh has stated they are not willing to extend the agreements. A similar agreement has been developed between Cary and the City of Durham for up to 3.5 mgd. The connection to Durham is on Davis Drive and a second interconnect is possible for the northern border of the Town of Cary. The Town of Apex also has agreements with Raleigh and Cary to obtain water on an emergency basis.

Table 3-1 summarizes the current water supply sources for Cary and Apex.

TABLE 3-1
Current Water Supply Sources – Cary and Apex

Source Name	Source Location		Source Type (surface, ground, purchase)	Estimated Yield	Water Quality (excellent, good, poor)
	County	River Basin			
Jordan Lake	Chatham	Cape Fear	surface	16 mgd[a]	good
Raleigh	Wake	Neuse	purchase	4.73 mgd[b]	good
Durham	Durham	Neuse	purchase	3.5 mgd[b]	good
Reuse	Wake	Neuse	reclaimed water	0.7 mgd	non-potable

[a] Current allocation amount; Allocation increase to 21 mgd anticipated in 2001.

[b] Contracted 4.50 mgd with Cary, and 0.23 mgd with Apex, maximum day amount, for regular use.

4. Future Water Supply Needs

Based on the water demand forecasts presented in Section 1 and the current water supply capacity of 21 mgd (expected upon completion of the pending Round 2 Jordan Lake Allocation process and the Interbasin Transfer certificate process), the future water supply needs for the Towns of Cary and Apex service areas are summarized in Table 4-1. Until November 2001, the Towns' water supply will be 29.23 mgd, due to Cary and Apex agreements with Raleigh and Durham for a total 8.23 mgd of maximum water purchases on a regular basis. After Apex's agreement with Raleigh expires, and until April 2002, the Towns' water supply will be 29.0 mgd, with 8.0 mgd of maximum water purchase on a regular basis from Cary's agreements with Raleigh and Durham. The Durham agreement for 3.5 mgd water purchase is in effect until 2008, though after April 2002 will be for emergency use only. Between April 2002 and September 2003 (when the Raleigh agreement for water supply expires), the Towns' available wate supply for normal use will be 25.5 mgd. After September 2003, the Towns' only water supply source will be their Jordan Lake water supply allocation. The Towns project a water supply deficit beginning about 2012.

Due to continued growth within the service areas of both Cary and Apex, average-day water demands are projected to increase to approximately 32 mgd by 2030 and to approximately 35 mgd by 2050. The water supply deficit based on the projected 21 mgd Round 2 water supply allocation, and on average day demand constituting no more than 80 percent of available supply, is estimated to be 12 mgd by 2020 and 23 mgd by 2035. The Towns of Cary and Apex are pursuing several alternatives for expanding its water supply capacity and reducing its demand, including intensive water conservation efforts described in Section 2.

TABLE 4-1
Future Water Supply Needs
Cary/Apex Jordan Lake Water Supply Storage Allocation Application - Round 3

	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Available Supply											
(1) Existing Surface Water Supply	16.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
(2) Existing Ground Water Supply	0	0	0	0	0	0	0	0	0	0	0
(3) Existing Purchase Contracts	8.23	3.5	0	0	0	0	0	0	0	0	0
(4) Future Supplies	0	0	0	0	0	0	0	0	0	0	0
(5) Total Available Supply	24.23	24.5	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
Average Daily Demand											
(6) Service Area Demand [2]	12.8	15.6	18.7	22.1	25.9	29.2	31.3	34.0	34.0	34.0	34.0
(7) Existing Sales Contracts[3]	0.4[1,3]	0.4[1,3]	0.5[1,3]	0.5[1,3]	0.6[1,3]	0.6[1,3]	0.6[1,3]	0.6[1,3]	0.7[1,3]	0.7[1,3]	0.7[1,3]
(8) Future Sales Contracts	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(9) Total Average Daily Demand	13.2	16.0	19.2	22.6	26.6	29.8	31.9	34.6	34.7	34.7	34.7
(10) Demand as Percent of Supply	54%	65%	91%	108%	127%	142%	152%	165%	165%	165%	165%
(11) Supply Needed to Maintain 80%	16.5	20.0	24.0	28.3	33.3	37.3	39.9	43.5	43.4	43.4	43.4
Additional Information for Jordan Lake Allocation											
(12) Sales Under Existing Contracts	0.4[1,3]	0.4[1,3]	0.5[1,3]	0.5[1,3]	0.6[1,3]	0.6[1,3]	0.6[1,3]	0.6[1,3]	0.7[1,3]	0.7[1,3]	0.7[1,3]
(13) Sales Under Future Contracts	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(14) Demand in Each Planning Period	13.2	16.0	19.2	22.6	26.6	29.8	31.9	34.6	34.7	34.7	34.7
(15) Supply Minus Demand	11.0	8.5	1.8	-1.6	-5.6	-8.8	-10.9	-13.6	-13.7	-13.7	-13.7

[1] Cary has water sales contracts with RDU International Airport, the Town of Morrisville, and the Wake County portion of Research Triangle Park (RTP South), as described in Section 1 of this application. However, Morrisville and RTP South have separate applications for Jordan Lake Water Supply Storage Allocations and their demands are not reflected in this application. This category includes Cary's commitment to RDU International Airport and Apex's commitment to Feltonsville Community for regular water supply.

5. Alternative Water Supplies

The Towns of Cary and Apex have considered a number of alternatives to meet short-term and long-term water supply needs to the 2050 planning horizon. These water supply alternatives were evaluated in the *Town of Cary Long-Range Water Supply Plan* (CH2M HILL, 2000). A summary of alternatives considered in this application is provided in Table 5-1. As noted in Section 4, successful completion of the ongoing interbasin transfer certification process, yielding a Cary/Apex allocation of 21 percent of the Jordan Lake water supply storage pool, is a basis of all Cary/Apex water supply alternatives.

TABLE 5-1
Summary of Water Supply Alternatives
Cary/Apex Jordan Lake Water Supply Storage Allocation Application, Round 3

Water Supply Alternative	Description
1	Increase Jordan Lake Water Supply Allocation by 23 mgd
2	a) Obtain Water Supply from Cape Fear River b) Increase Jordan Lake Water Supply Allocation by 13 mgd
3	Obtain additional Jordan Lake Water Supply Allocation of 23 mgd by Raising Lake Permanent Pool Elevation
4	a) Obtain additional Jordan Lake Water Supply Allocation by Converting a Portion of Lake Sediment Storage Pool to Water Supply Pool b) Increase Jordan Lake Water Supply Allocation so that total yield for this alternative is 23 mgd
5	a) Utilize Kerr Lake as a Water Supply b) Increase Jordan Lake Water Supply Allocation by 13 mgd
6	a) Utilize Harris Lake as a Water Supply b) Increase Jordan Lake Water Supply Allocation by 12 mgd
7	a) New Reservoir on Middle Creek b) Increase Jordan Lake Water Supply Allocation by 13 mgd
8	a) Raise Lake Michie Water Surface Elevation b) Interim Water Purchase from Durham c) Increase Jordan Lake Water Supply Allocation by 12 mgd

Each water supply alternative was evaluated using the criteria contained in the *Jordan Lake Water Supply Storage Allocation Application Guidelines:*

- Environmental Impacts (compared to the Jordan Lake Alternative)
- Water quality classification
- Timeliness of implementation
- Interbasin transfers
- Potential for regional partnerships

- Technical complexity
- Institutional complexity
- Political complexity
- Public benefits
- Consistency with local plans
- Capital costs and operations/maintenance cost

A summary of the results of the evaluation of each water supply alternative is shown in Tables 5-2A and 5-2B. These costs also include the contractor's mobilization/demobilization, overhead and profit, a contingency, engineering design and administration, legal and administrative costs, and the cost of permitting and other regulatory issues. Note also that many of these alternatives are regional solutions, and that the costs may include Cary and Apex's pro rata share of the costs of a larger, and more costly, project. Attachment C provides a more detailed estimate of costs for each of the alternatives.

TABLE 5-2A
Summary of Water Supply Alternative Evaluations (part 1 of 2)
Cary/Apex Jordan Lake Water Supply Storage Allocation Application, Round 3

	Alternatives			
Alternative Description	**Jordan Lake**	**Cape Fear River/Harnett**	**Change Jordan Lake Operating Rules**	**Convert Jordan Lake Sediment Storage**
	1	**2**	**3**	**4**
Total Supply (MGD)	23	23	23	23
Environmental Impacts	Same	Same	Worse	Same
Water Quality Classification	WS IV B NSW CA	WS IV CA	WS IV B NSW CA	WS IV B NSW CA
Interbasin Transfer (MGD)	24 mgd[1]	24 mgd[1]	24 mgd[1]	24 mgd[1]
Regional Partnerships	Yes	Yes	Yes	Yes
Technical Complexity	Not Complex	Complex	Complex	Complex
Institutional Complexity	Not Complex	Complex	Complex	Complex
Political Complexity	Not Complex	Complex	Complex	Complex
Public Benefits	No	No	Few	No
Consistency with Local Plans	Yes	Yes	Yes	Yes
Total Cost ($ Millions)	$43.3	$178.8	$49.6	$49.6
Unit Cost ($/gpd)	$1.88	$7.77	$2.16	$2.16

1. Based on no increase above recommended interbasin transfer; EMC action is anticipated in July 2001

TABLE 5-2B
Summary of Water Supply Alternative Evaluations (part 2 of 2)
Cary/Apex Jordan Lake Water Supply Storage Allocation Application, Round 3

	Alternatives			
Alternative Description	**Kerr Lake**	**Harris Lake**	**Middle Creek**	**Expand Lake Michie**
	5	**6**	**7**	**8**
Total Supply (MGD)	23	23	23	23
Environmental Impacts	Worse	Worse	Worse	Worse
Water Quality Classification	WS III B	WS V	C NSW	WS III NSW
Interbasin Transfer (MGD)	(a) 37 mgd (b) 24 mgd[1]	24 mgd[1]	24 mgd[1]	24 mgd[1]
Regional Partnerships	Yes	No	Yes	Yes
Technical Complexity	Very Complex	Complex	Very Complex	Very Complex
Institutional Complexity	Very Complex	Very Complex	Very Complex	Very Complex
Political Complexity	Very Complex	Very Complex	Very Complex	Very Complex
Public Benefits	No	No	Many	Few
Consistency with Local Plans	n/a	n/a	n/a	n/a
Total Cost ($ Millions)	(a) $90.6 (b) 134.3	$62.1	$136.1	$88.0
Unit Cost ($/ gpd)	(a) $3.94 (b) $5.84	$2.70	$5.92	$3.83

1. Based on no increase above recommended interbasin transfer; EMC action is anticipated in July 2001

Impact of Water Conservation

Section 2 of this application describes a number of water conservation measures which Cary and Apex intend to implement to reduce forecast water demand. These measures include a conservation rate structure, reuse of treated wastewater effluent for irrigation, public education, indoor plumbing fixture replacement incentives, restrictions against wasteful water use practices, and cooperative programs with water users to identify and implement water-wise practices.

Full implementation of the programs may take more than 25 years, but are expected to reduce Cary's and Apex's long range water demand deficit by 29 percent, from approximately 20 mgd to 14 mgd. The impact of water conservation on the future demands is summarized in Table 5-3.

TABLE 5-3
Projected Impact of Cary/Apex Water Conservation Programs on Projected Average Day Water Demand, in mgd
Cary/Apex Jordan Lake Water Supply Storage Allocation Application, Round 3

	2000	**2005**	**2010**	**2015**	**2020**	**2025**	**2030**	**2035**	**2040**	**2045**	**2050**
Forecasted Water Demand (Before Conservation)	13.5	17.3	21.1	25.2	29.9	33.9	38.0	40.8	40.9	40.9	40.9
Minus: Water Conservation Savings	*0.3*	*1.3*	*1.9*	*2.6*	*3.3*	*4.1*	*6.1*	*6.2*	*6.2*	*6.2*	*6.2*
Net Forecasted Water Demand	***13.2***	***16.0***	***19.2***	***22.6***	***26.6***	***29.8***	***31.9***	***34.6***	***34.7***	***34.7***	***34.7***
Available Water Supply Yield	24.2	24.5	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
Net Supply minus Demand	***11.0***	***8.5***	***1.8***	***-1.6***	***-5.6***	***-8.8***	***-10.9***	***-13.6***	***-13.7***	***-13.7***	***-13.7***

1. Increase Jordan Lake Water Supply Allocation

This option increases the allocation for withdrawals through the Town's existing raw water intake on the east bank of Jordan Lake. To satisfy water demand for the Cary/Apex service area and applying an 80 percent of available capacity threshold, the required average water allocation would be at least 44 mgd in 2035 and beyond.

In the short term, all wastewater from Cary and Apex will be discharged to the Neuse River Basin, resulting in an interbasin transfer. The EMC will act in July 2001 on a request to increase the transfer amount from 16 mgd to 27 mgd; the hearing officers have recommended 24 mgd. Construction of a new WWTP in the Cape Fear River basin, with an initial capacity of 9 mgd, is planned to limit interbasin transfer. Future water demands will be offset by increased discharges to the Cape Fear River Basin in order to keep the interbasin transfer from exceeding the recommended 24-mgd maximum day amount.

The water intake screens and intake piping can handle a maximum flow of 50 mgd. Since the projected combined peak demands of Cary, Apex, Morrisville and RTP South (with reserve capacity) will exceed 50 mgd, this alternative requires replacement of the existing intake screens with larger screens and modification of the backwash air system. Also, the existing Cary/Apex WTP would be expanded incrementally to meet increased demands in the study period, and the distribution system would be upgraded to accommodate future demands.

Total Net Present Value of this alternative for Cary/Apex is $43.3 million. The unit cost is $1.88 per gallon of additional water supply. Costs include capital and O&M costs for the construction of facilities.

	Comments
Available Supply	23 mgd
Environmental Impacts	No adverse impact on environment anticipated. New screens must adhere to 0.5 ft/sec velocity criteria.
Water Quality Classification	WS IV B NSW CA
Timeliness	WTP upgrade to 40 mgd by 2001, to 57 mgd by 2016. Cape Fear WWTP by 2010.
Interbasin Transfer	No increase in the currently recommended maximum day IBT of 24 mgd
Regional Partnerships	Coordination with other utilities may be necessary to develop a regional water supply approach for Jordan Lake.
Technical Complexity	Screen modifications will require underwater installation. Removal of existing air lines from inside 54-inch intake pipelines presents greater challenge, and may require short pump station shutdown.
Institutional Complexity	Requires completion of DWR Jordan Lake Round 3 allocation process
Political Complexity	Complex
Public Benefit	None
Consistency w/ Local Plans	Yes
Cost	Capital expenditures for expansion of Cary/Apex WTP intake and treatment capacity, distribution system, construction of Cape Fear regional WWTP.

2. Cape Fear River Supply and Increase in Jordan Lake Water Supply Allocation

Harnett County operates a water treatment plant in Lillington, with an intake on the Cape Fear River. The plant has a capacity of 12 mgd, and Harnett County has initiated a pilot-testing program to re-rate the plant's capacity to 18 mgd. This option expands the Harnett County water plant to 48 mgd at its present site. A maximum yield of 10 mgd is available under this option. This option would be implemented as a form of indirect reuse, increasing the water available for withdrawal at the Harnett County WTP through discharges to the Cape Fear River basin from a Cape Fear River regional WWTP. There is no net interbasin transfer for this arrangement. This option relies on a Cape Fear River regional WWTP.

This option utilizes the proposed finished water pipeline from the Harnett County WTP to Holly Springs as well as an existing interconnection with the Cary water distribution system, which could then provide the water to Morrisville. To supplement this water supply so that the Cary/Apex demand is met throughout the planning period, an additional Jordan Lake allocation of 13 mgd would be needed. The details and impacts of this additional project can be seen in the explanation of Alternative 1.

Total Net Present Value of this alternative for Cary/Apex is $178.8 million. The unit cost is $7.77 per gallon of additional water supply. Costs include capital and O&M costs for the construction of facilities. The costs include capacity use payments to Harnett County of $1.10 per 1,000 gallons for water estimated to be used under this alternative.

	Comments
Available Supply	23 mgd; 10 mgd from Harnett Co/Cape Fear River, 13 from Jordan Lake
Environmental Impacts	No adverse impact on environment anticipated.
Water Quality Classification	WS IV CA
Timeliness	Harnett County WTP expansion online about 2005. West Cary WWTP completed in 2010.
Interbasin Transfer	No increase in the currently recommended maximum day IBT of 24 mgd
Regional Partnerships	Requires establishment of a contractual relationship with Harnett County for Cary's participation in the Harnett County WTP. Also requires coordination with Holly Springs regarding the flow of Harnett County finished water through its system to Cary.
Technical Complexity	Option requires expansion of raw water intake facilities on Cape Fear River and expansion of Harnett County WTP treatment facilities. Potential for disinfection system incompatibility.
Institutional Complexity	Cape Fear WWTP subject to SEPA process. The EA may include evaluation of impacts on river quality and downstream assimilation of wastewater discharges as raw water withdrawals from Cape Fear River are increased.
Political Complexity	Complex
Public Benefit	None
Consistency with Local Plans	Yes
Cost	Share in capital expenditures for expansion of Harnett County WTP and intake, expansion of finished water pipelines to Holly Springs and Cary system, and internal distribution system expansions.

3. Increase Jordan Lake Reservoir Full Pool Elevation

This option increases the available water supply pool for Jordan Lake Reservoir by modifying the Army Corps of Engineers operating rules to raise the top of the conservation pool elevation from its present 216 ft. By preliminary evaluation of stage-storage relations for Jordan Lake, an additional 4.5 billion gallons of water supply pool could be created by raising the pool elevation by 1 ft. This additional water supply pool could increase the safe yield from the lake by as much as approximately 30 mgd. In addition to potential environmental impacts that would be addressed by an EA/EIS, recreational facilities at the lake would be impacted by the change in top of pool elevation.

Scenarios to modify the lake's operating rules would require a USACE Section 216 Study process before the Corps would assent to the proposed change. Raising the permanent pool would also decrease available flood storage in the reservoir. According to discussions with USACE staff, USACE approval to raise the permanent pool of Jordan Lake is not assured, and such an application could take ten years.

Total Net Present Value of this alternative for Cary/Apex is $49.6 million. The unit cost is $2.16 per gallon of additional water supply. Costs include capital and O&M costs for the construction of facilities.

	Comments
Available Supply	23 mgd
Environmental Impacts	Potential impacts to existing wetlands and uplands from submergence.
Water Quality Classification	WS IV B NSW CA
Timeliness	Determination on agreement with DWR and USACE could be reached by 2002, though 216 study may take 5 years to complete and legal challenges may substantially delay implementation. WTP capacity upgrades by 2016.
Interbasin Transfer	No increase in the currently requested maximum day IBT of 24 mgd.
Regional Partnerships	A larger water supply pool is created, so other regional utilities may desire allocation increases. Coordination with other utilities is necessary to develop a regional water supply approach for Jordan Lake that results in sufficient increase for Cary.
Technical Complexity	This option would not alter the dam facilities but would require revision of dam safety documentation. Option may require relocation of some existing recreation facilities. This option incorporates improvements to the existing Cary/Apex raw water supply intake.
Institutional Complexity	Option is feasible for relatively minor adjustment of permanent pool. DWR allocation required to increase withdrawals. EIS/EA and USACE study required to address impacts from raising reservoir pool. Dam safety certification must also be revised, and concurrence from Corps for new operating rules.
Political Complexity	Very complex
Public Benefit	Few
Consistency with Local Plans	Yes
Cost	Capital expenditures for expansion of Cary/Apex WTP intake and treatment capacity, distribution system, construction of West Cary WWTP, as well as permitting costs.

4. Convert a Portion of Jordan Lake Sediment Storage to Water Supply Storage

This option increases the Jordan Lake water supply pool by reclassifying a portion of the 24.3 bg of existing lake volume allocated to sediments. If 10 percent of present sediment storage were converted to water supply pool, the estimated additional water supply storage volume which could be obtained in this manner is 2.43 bg, which may increase the safe yield of the reservoir by as much as 16 mgd.

This option will require USACE involvement and concurrence to change the reservoir's operating rules. This option may be linked to Section 216 Studies and to implementation of additional best management practices to reduce rate of sedimentation. The USACE might require these practices to be adopted by all local governments which discharge stormwater to Jordan Lake to justify reclassification of sediment storage pool to water supply pool.

Regulatory approval to convert a portion of the sediment storage of Jordan Lake to water supply pool is not assured, and such an application could take several years. To supplement this water supply so that the Cary/Apex demand is met throughout the planning period, an additional Jordan Lake allocation of 13 mgd would be needed. The details and prospective impacts of this additional project can be seen in the explanation of Alternative 1.

Total Net Present Value of this alternative for Cary/Apex is $49.6 million. The unit cost is $2.16 per gallon of additional water supply. Costs include capital and O&M costs for the construction of facilities.

	Comments
Available Supply	23 mgd
Environmental Impacts	No adverse impact on environment anticipated.
Water Quality Classification	WS IV B NSW CA
Timeliness	Determination on agreement with USACE could be reached by 2002, though 216 study may take 5 years to complete and legal challenges may substantially delay implementation. WTP capacity upgrades by 2016.
Interbasin Transfer	No increase in the currently requested maximum day IBT of 24 mgd.
Regional Partnerships	Cooperation with other regional utilities may increase the likelihood of USACE approval for the change in operating rules and DWR increased allocation. Coordination with other utilities may be necessary to develop a regional water supply approach for Jordan Lake that results in sufficient increase for Cary.
Technical Complexity	Option may require implementation of local ordinances requiring additional best management practices to reduce sediment loading rates to Jordan Lake. Improvements to existing Cary/Apex raw water supply intake required.
Institutional Complexity	No significant DWR regulatory process anticipated for reclassification. USACE approval required, probably following a lengthy 216 Study. IBT and DWR allocation anticipated prior to increasing withdrawals.
Political Complexity	Very complex
Public Benefit	None
Consistency with Local Plans	Yes
Cost	Capital expenditures for expansion of Cary/Apex WTP intake and treatment capacity and distribution system.

5. Utililize Kerr Lake as Water Supply Reservoir, Increase Jordan Lake Allocation

This option draws water supply from the Kerr Lake reservoir. This option would construct a new WTP from a new intake structure. After treatment, the finished water would be provided to Cary, and then on to RTP South. Unless a corresponding quantity of treated effluent is returned to the Roanoke basin, this option includes an interbasin transfer. Obtaining a municipal water supply allocation from Kerr Lake would require a USACE study process. USACE approval to obtain the Kerr Lake allocation is not assured due to competing users and interbasin/interstate transfer issues, and such an application could take several years.

To supplement this water supply so that the Cary/Apex demand is met throughout the planning period, particularly since a Kerr Lake supply would not be in place until 2022, an additional Jordan Lake allocation would be needed.

Total Net Present Value of the baseline alternative for Cary/Apex is $90.6 million, with a unit cost of $3.94 per gallon of additional water supply. The version of this alternative that returns the interbasin transfer to the Roanoke Basin has a Net Present Value of $134.3 million and a unit cost of $5.84 per gallon of additional water supply. Costs include capital and O&M costs for the construction of facilities.

	Comments
Available Supply	23 mgd;10 mgd to Cary/Apex from Kerr Lake, 13 from Jordan Lake
Environmental Impacts	This option has impacts on environment anticipated as a result of new intake and pipeline. Island Creek, a potential intake site, is reported to have heavy metals contamination.
Water Quality Classification	WS III B
Timeliness	Determination with DWR on IBT and interstate issues could be reached by 2007, and WTP and pipeline improvements completed by 2022, though legal challenges may prevent implementation indefinitely.
Interbasin Transfer	Option requires IBT process for flows from Roanoke basin to Neuse basin, potential inter-state transfer issues.
Regional Partnerships	This option requires close coordination with Durham, Raleigh and Granville County as part of regional water supply approach. In addition, use of Kerr Lake will involve interstate coordination.
Technical Complexity	Option requires construction of raw water intake at Kerr Lake, new WTP, and finished water transmission pipeline, as well as upgrade of finished water pipelines within Cary/Apex system.
Institutional Complexity	USACE controls water supply allocations from Kerr Lake. Subject to SEPA process in NC, and depending on intake location, in VA. EIS would be required for the withdrawal facilities and new transmission line.
Political Complexity	Very complex – option has active opposition from citizens group.
Public Benefit	None
Consistency with Local Plans	N/A
Cost	Capital expenditures for construction of new Kerr Lake raw water intake, possible WTP and 45-50 mile water transmission pipeline with booster pumping from Kerr Lake, as well as permitting and IBT certification costs.

6. Utilize Harris Lake as Water Supply Reservoir, Increase Jordan Lake Allocation

Harris Lake was developed by Carolina Power and Light (CP&L) as a reservoir for the storage of cooling water for its Shearon Harris nuclear power plant. At present, it is used for this, as well as some recreational uses. Harris Lake is not presently classified as a water supply reservoir. According to permitting documents for the Shearon Harris plant, the storage volume between normal and minimum lake levels contains approximately 15.4 bg and the safe yield of Harris Lake exceeds 11 mgd.

This option would classify Harris Lake as a water supply reservoir and utilize the lake as a Cary/Apex water source. Tritium is apparently present in Harris Lake, in quantities less than state water quality limits, so an evaluation of the lake prior to reclassification as a water supply will have to consider whether the quality of the Harris Lake water is safe.

This option includes construction of raw water intake facilities at Harris Lake and a new 10 to 15 mile raw water transmission main to the Cary/Apex WTP, depending on the intake location. To supplement this water supply so that the Cary/Apex demand is met throughout the planning period, particularly since this option could not be in effect until 2015, an additional Jordan Lake allocation of 12 mgd would be needed. Details and prospective impacts of this additional project are discussed in Alternative 1.

Total Net Present Value of this alternative for Cary/Apex is $62.1 million. The unit cost is $2.70 per gallon of additional water supply. Costs include capital and O&M costs for the construction of facilities.

	Comments
Available Supply	23 mgd; 11 mgd from Harris Lake, 12 from Jordan Lake
Environmental Impacts	No adverse impact on environment anticipated.
Water Quality Classification	WS V
Timeliness	Unknown since CP&L does not at present appear willing to negotiate for availability of the lake for water supply. Capital facilities could be completed by 2015, pending regulatory approvals. It is likely the lake will not be available for water supply withdrawals until the power plant is off-line.
Interbasin Transfer	No increase in the currently requested maximum day IBT of 24 mgd
Regional Partnerships	CP&L as well as other regional utilities may desire an allocation from this new water supply pool.
Technical Complexity	This option would construct new raw water intake facilities for Cary/Apex and a raw water pipeline to the Cary/Apex WTP.
Institutional Complexity	Subject to SEPA process. EA required to address establishment of intake.
Political Complexity	Very Complex
Public Benefit	None
Consistency with Local Plans	N/A
Cost	Capital expenditures for construction of a new Harris Lake intake and raw water pipeline to the existing Cary/Apex WTP, expansion of Cary/Apex WTP treatment capacity, distribution system, as well as permitting costs.

7. Construct New Middle Creek Reservoir, Increase Jordan Lake Allocation

This option would develop a new Middle Creek reservoir as a joint venture with local governments in Wake County and Johnston County. Cary/Apex would have a 28 percent share in the safe yield from the new reservoir. This option would include construction of a new dam, spillway and intake facilities; relocation of existing roads and bridges, including SR 1330 and possibly Interstate 40; construction of an approximately 30 mile raw water transmission pipeline from the intake to the Cary/Apex WTP and other regional partners; and expansion of the existing Cary/Apex WTP. To supplement this water supply so that the Cary/Apex demand is met throughout the planning period, particularly since this option could not be in effect until 2022, an additional Jordan Lake allocation of 13 mgd would be needed. The details and prospective impacts of this additional project can be seen in the explanation of Alternative 1.

New or increased point source wastewater discharges by Cary and Fuquay-Varina to Middle Creek may affect the use of the creek for water supply as the creek has been given a biologic rating of "fair" to "poor" by DENR due to past nonpoint and point source wastewater discharges.

Total Net Present Value of this alternative for Cary/Apex is $136.1 million. The unit cost is $5.92 per gallon of additional water supply. Costs include capital and O&M costs for the construction of facilities.

	Comments
Available Supply	23 mgd; 10 mgd to Cary/Apex from Middle Creek Reservoir, 13 mgd to Cary/Apex from increased Jordan Lake allocation.
Environmental Impacts	Potential impacts to existing wetlands and uplands from submergence. Water withdrawal from Neuse River may have impact on downstream water quality, especially with regard to nitrogen loading allocations.
Water Quality Classification	C NSW
Timeliness	Uncertain; 20 years or more for new reservoir permitting and construction.
Interbasin Transfer	No increase in currently requested maximum day IBT of 24 mgd
Regional Partnerships	Increasing Cary's water supply from Neuse River basin may reduce the yield available to downstream regional utilities. Coordination with affected regional entities may be necessary to develop a regional water supply approach.
Technical Complexity	Construction of dam, reservoir, intake and transmission pipeline present significant engineering challenges; existing roads and bridges will have to be modified or relocated.
Institutional Complexity	Subject to SEPA process; EIS for new reservoir and intake facilities. The EIS would include an evaluation on river water quality.
Political Complexity	Very complex
Public Benefit	Many – Recreational use of new reservoir and surrounding park land
Consistency with Local Plans	N/A
Cost	Capital expenditures for land acquisition, construction of facilities listed above, as well as permitting and IBT costs.

8. Expansion of Durham's Lake Michie Reservoir, Purchase from the City of Durham, and Increase Jordan Lake Allocation

Durham is considering raising the Lake Michie Dam to increase its water supplies. The study *Evaluation of Alternative Reservoirs on the Flat River and Little River* (Hazen and Sawyer, 1988), estimated that the 20-year safe yield of Lake Michie could be increased by 33 mgd if the dam is raised to elevation 380 ft. Durham has acquired approximately one-half of the 2,160 acres that would be submerged if Lake Michie were expanded to the 380 ft elevation. Since this option is located within the Neuse River basin, it has the potential to substantially reduce the quantity of interbasin transfer for Cary's water supply.

This option would partner Cary/Apex with Durham to raise the Lake Michie Dam to 380 ft, with the additional safe yield translating to an average treated water supply of about 11 mgd. Cary/Apex would pay 33 percent of project costs. Cary/Apex would contract with Durham to treat the water, and would obtain the water through upgraded interconnections. To supplement this water supply so that the Cary/Apex demand is met throughout the planning period, 4.3 mgd of finished water will be purchased from the City of Durham in years 2010-2014, and an additional Jordan Lake allocation of 12 mgd would be needed.

Total Net Present Value of this alternative for Cary/Apex is $88.0 million. The unit cost is $3.83 per gallon of additional water supply. Costs include capital and O&M costs for the construction of facilities.

	Comments
Available Supply	23 mgd; 11mgd to Cary/Apex from Lake Michie, up to 13 mgd to Cary/Apex from Jordan Lake allocation, and 4.3 interim water purchase from Durham
Environmental Impacts	Potential impacts to existing wetlands and uplands from submergence. Water withdrawal may have impact upon downstream water quality and yield of Falls Lake reservoir, the primary Raleigh water source.
Water Quality Classification	WS III NSW
Timeliness	Uncertain; ~ 15 years for reservoir permitting and construction.
Interbasin Transfer	No increase in the currently requested maximum day IBT of 24 mgd
Regional Partnerships	Increasing Cary's water supply from Neuse River basin may reduce the yield available to downstream regional utilities, such as Raleigh's Falls Lake. Coordination with affected regional entities may be necessary to develop regional water supply approach for Neuse River.
Technical Complexity	Construction of dam, expansion of reservoir, raw water intake and transmission facilities, and relocation of existing roads and bridges present challenges.
Institutional Complexity	Subject to SEPA process; EIS for new reservoir and intake facilities.
Political Complexity	Very complex
Public Benefit	Few
Consistency with Local Plans	N/A
Cost	Capital expenditures for land acquisition, land preparation and construction of a new dam, intake facilities, and raw water transmission main from intake to Durham's Brown WTP, as well as permitting costs. Treatment costs to be paid through contract with City of Durham.

6. Plans to Use Jordan Lake

The Towns of Cary and Apex are applying for a 34 mgd Level I and an additional 10 mgd Level II allocation from the Jordan Lake water supply pool to meet their long-term water demands. If a water supply allocation is granted, Cary and Apex plan to expand existing facilities. The expanded facilities will also serve Morrisville and RTP South, although each community is pursuing its own allocation. Construction of capacity upgrades to the Cary/Apex WTP and its Jordan Lake intake structure and raw water transmission line is currently under way and will be completed in 2001. In addition, a storage tank for raw water is being added at the plant site. In addition to the raw water storage, Apex has a 1.5 million gallon elevated storage tank for treated water. Both Cary and Apex plan to implement Phase 1 of their reuse programs in the next two years.

The anticipated schedule for these and other relevant activities is shown below:

TABLE 6-1
Implementation Schedule - Water Supply Actions Relating to Jordan Lake Allocation

Activity	Expected Date
Construct Phase 1 of Cary Reuse System	2001
Complete Expansion of Cary/Apex WTP to 40 mgd	2001
Construct Phase 1 of Apex Reuse System	2003
Complete new Discharge of Reclaimed Water to Cape Fear Basin	2009
Complete Expansion of Cary/Apex WTP to 60 mgd	2015

Attachment A

Local Water Supply Plan - Cary

North Carolina Department of Environment and Natural Resources

Division of Water Resources

LOCAL WATER SUPPLY PLAN for JORDAN LAKE ALLOCATION APPLICATION 2000-2001
Part 1: Water Supply System Report for Calendar Year 2000

Completed By: Leila Goodwin Date: 5/29/01

SECTION 1: GENERAL INFORMATION

1-A. Water System: Cary 1-B. PWS Identification #: NC03-92-020

1-C. River Sub-Basin(s): Neuse and Cape Fear

1-D. County(s): Wake

1-E. Contact Person: Robert K. Fisher Title: Director of Public Works & Utilities

1-F. Mailing Address: PO Box 8005 CITY Cary ZIP 27512

1-G. Phone: 919.469.4090 1-H. Fax: 919.469.4304 1-I. E-mail:

1-J. Type of Ownership (Check One): ☒ Municipality F County F Authority F District F Non-Profit Association F For-Profit Business
F State F Federal F Other

SECTION 2: WATER USE INFORMATION

2-A. Population Served in 2000 Year-Round 96,217

Seasonal (if applicable) N/A For Months of

2-B. Total Water Use for 2000 including all purchased water: 4,048 Million Gallons (MG)

2-C. Average Annual Daily Water Use in 2000: 10.907 Million Gallons per Day (MGD)

2-D. List 2000 Average Annual Daily Water Use by Type in Million Gallons per Day (MGD): *

	Metered Connections		Non-Metered Connections		Total
Type of Use	Number	Average Use (MGD)	Number	Estimated Average Use (MGD)	Average Use (MGD)
(1) Residential	29,076	6.694	N/A	N/A	6.694
(2) Commercial	1,761	2.026	N/A	N/A	2.026
(3) Industrial	29	0.127	N/A	N/A	0.127
(4) Institutional	102	0.139	N/A	N/A	0.139
(5) Sales to other Systems					1.422
(6) System Processes					0.426
(7) Subtotal [sum (1) thru (6)]					10.834
(8) Average Annual Daily Water Use [Item 2-C]					10.907
(9) Unaccounted-for water [(8) - (7)]					0.074

2-E. List the Average Daily and Maximum Day Water Use by Month for 2000 in Million Gallons per Day (MGD):

	Average Daily Use	Maximum Day Use	Max/Ave Ratio		Average Daily Use	Maximum Day Use	Max/Ave Ratio		Average Daily Use	Maximum Day Use	Max/Ave Ratio
Jan	8.79	9.629	1.10	May	14.30	18.14	1.27	Sep	10.97	12.70	1.16
Feb	9.17	9.72	1.06	Jun	13.31	17.45	1.31	Oct	13.23	15.85	1.20
Mar	9.53	11.18	1.17	Jul	11.39	13.49	1.18	Nov	11.28	15.67	1.39
Apr	9.81	11.76	1.20	Aug	11.55	13.49	1.17	Dec	9.31	11.55	1.24

2-F. List the system's 10 Largest Water Users and their Average Annual Daily Use in Million Gallons per Day (MGD) for 2000: (include sales to other systems)

Water User	Average Daily Use	Water User	Average Daily Use
RDU International Airport	0.269	SAS Institute, Incorporated	0.030
John Q Hammons Hotels	0.055	Presspart Incorporated	0.028
Austin Quality Food Company	0.049	Equity Residential Properties	0.026
Mobile Estate Company	0.042	Chatham Forest Apartment Homes	0.025
Wake Medical Center	0.035	MCI Telecommunications	0.025

2-G. WATER SALES TO OTHER WATER SYSTEMS IN 2000 List all systems that can be supplied water through existing interconnections (regular and emergency). Mark the locations of connections on the System Map.

1 Water supplied to:		2 Average Daily Amount		3 Contract Amount		4 Pipe Size(s)	5* R or E
Water System	PWSID	MGD	# of Days	MGD	Expiration Date	Inches	
Town of Morrisville	03-92-075	0.95	366	1.0	9/2015	16,16,16	R
RDU Airport Authority		0.27	366	0.40	6/2003	16	R
City of Durham	3-32-010	0	0	3.5	10/2008	16	E
RTP South		0.21	366				

***NOTE** Column 5 **R=**Regular Use, **E=**Emergency Use

2-H. What is the Total Amount of Sales Contracts for Regular Use? __1.4__MGD

SECTION 3: WATER SUPPLY SOURCES

3-A. SURFACE WATER List surface water source information. Mark and label locations of intakes on the System Map.

1 Name of Stream and/or Reservoir	2 Drainage Area Square Miles	3 Is Withdrawal Metered? Y / N	4 Sub-Basin	5 Average Daily Withdrawal For days used		6 Maximum Day Withdrawal	7* Available Supply		8* System Component Limiting Daily Output		9 Useable On-Stream Raw Water Supply Storage Million Gallons	10* R or E
				MGD	# of Days	MGD	MGD	Qualifier	Capacity MGD	System Component		
B. Everett Jordan	17,000	Y	Haw	7.21	305	18.14	16	0	16	T	1120 MG	R
							16	Totals	16			

***NOTES** Column 7 Supply Qualifiers: **C=**Contract amount, **SY20=2**0-year Safe Yield, **SY50=**50-year Safe Yield, **F=**20% of 7Q10 or other instream flow requirement, **T=**Treatment plant capacity, O=Other (specify) Existing Round 1 Jordan Lake Water Supply Storage Allocation (pending Round 2 increase to 21.5 mgd) showed with Apex

Column 8 Component: **R=**Raw water pumps, **T=**Treatment facilities, **M=**Transmission main, **D=**Distribution system, **O=**Other (specify)_____

Column 10 **R=**Regular Use, **E=**Emergency Use

3-B. What is the Total Surface Water Supply available for Regular Use? __16__ MGD

3-C. Does this system have off-stream raw water supply storage? ☒ No F Yes Useable Capacity _____N/A_____ Million Gallons

3-D. WATER PURCHASES FROM OTHER WATER SYSTEMS IN 2000

List all systems that can supply water to this system through existing interconnections (regular and emergency). Mark the locations of the connections on the System Map.

1 Water supplied by:		2 Average Daily Amount		3 Contract Amount		4 Pipe Size(s)	5* R or E
Water System	PWSID	MGD	# of Days	MGD	Expiration Date	Inches	
City of Raleigh		3.198	366	3.50	9/2003	24	R
City of Durham		3.599	366	3.50	9/2008	16,16	R
Harnett County (via S.Wake Water Line)		0	0	N/A	N/A	16	E

***NOTE** Column 5 **R=**Regular Use, **E=**Emergency Use

3-E. What is the Total Amount of Purchase Contracts available for Regular Use? ___7.0___MGD (Do not include emergency use connections in total)

3-F. GROUND WATER List well information. ***Mark and label the location of all wells on the System Map.***

1 Name or Number of Well	2 Well Depth Feet	3 Casing Depth Feet	4 Screen Depth Top Feet	4 Screen Depth Bottom Feet	5 Well Diameter Inches	6 Pump Intake Depth Feet	7 Is Well Metered? Y / N	8 Average Daily Withdrawal for Days Used MGD	8 Average Daily Withdrawal for Days Used # of Days	9 Maximum Day Withdrawal MGD	10 12-Hour Supply Million Gallons	11* System Component Limiting Daily Output Capacity MGD	11* System Component Limiting Daily Output System Component	12* R or E
N/A														

***NOTES** Column 11 Component: **R=**Raw water pumps, **T=**Treatment facilities, **M=**Transmission main, **D=**Distribution system, **O=**Other (specify)_____
Column 12 **R=**Regular Use, **E=**Emergency Use

3-G. What is the Total 12-Hour Supply of all wells available for Regular Use? N/A million gallons

3-H. Are ground water levels monitored? ☒ No F Yes How often? _____

3-I. Does this system have a wellhead protection program ☒ No F Yes F Under development

3-J. WATER TREATMENT PLANTS List all WTPs, including any under construction, as of 12/31/2000. ***Mark and label locations on the System Map***.

Water Treatment Plant Name	Permitted Capacity MGD	Source(s)
Cary/Apex Water Treatment Plant	16.0	Jordan Lake
Upgrade Cary/Apex WTP	add 24.0 by 2001	Jordan Lake

3-K. What is the system's finished water storage capacity? 13.8 Million Gallons (existing and under construction)

SECTION 4: WASTEWATER INFORMATION

4-A. List Average Daily Wastewater Discharges by Month for 2000 in Million Gallons per Day (MGD)

	Average Daily Discharge		Average Daily Discharge		Average Daily Discharge		Average Daily Discharge
Jan	12.27	Apr	11.57	Jul	10.51	Oct	10.62
Feb	13.08	May	10.70	Aug	10.58	Nov	10.83
Mar	11.52	Jun	10.69	Sep	11.69	Dec	10.77

4-B. List all Wastewater Discharge and/or Land Application Permits held by the system***. Mark and label points of discharge and land application sites on the System Map***.

1 NPDES or Land Application Permit Number	2 Permitted Capacity Dec. 31,2000 MGD	3 Design Capacity MGD	4 Average Annual Daily Discharge MGD	5 Name of Receiving Stream	6 Sub-Basin	7 Maximum Daily Discharge MGD
NC0048879	12	10	5.96	Crabtree Creek	Neuse	16.88
NC0065102	16	12.8	4.44	Middle Creek	Neuse	14.99

4-C. List all Wastewater Discharge Connections with other systems. Mark and label the locations of connections on the System Map.

1 Wastewater Discharger		2 Wastewater Receiver		3 Average Daily Amount Discharged or Received		4 Contract Maximum
Name	PWSID	Name	PWSID	MGD	# of Days	MGD
Town of Morrisville	03-92-075	Town of Cary	03-92-020	0.67	366	2.0
RTP South				0.09	366	
RDU International				0.16	366	
Apex (restroom in a park)				0.0005	366	
Air National Guard Helicopter Facility				0.0067	366	

4-D. Number of sewer service connections: 32,844

4-E. Number of water service connections with septic systems: 220 (Number in Sub-basin 1 ____ Number in Sub-basin 2 ____ Number in Sub-basin 3 ____)

4-F. Are there plans to build or expand wastewater treatment facilities in the next 10 years? F No ☒ Yes Please explain. Regional WW discharge to Cape Fear River by 2010.

SECTION 5: WATER CONSERVATION and DEMAND MANAGEMENT ACTIVITIES

5-A. What is the estimated total miles of distribution system lines? 611 miles

5-B. List the primary types and sizes of distribution lines:

	Asbestos Cement (AC)	Cast Iron (CI)	Ductile Iron (DI)	Galvanized Iron (GI)	Polyvinyl Chloride(PVC)	Other
Size Range	1”-8”		2”-48”		2”-30”	
Estimated % of lines	35%		42%		23%	

5-C. Were any lines replaced in 2000? F No ☒ Yes 1,686 linear feet

5-D. Were any new water mains added in 2000? F No ☒ Yes 80,776 linear feet

5-E. Does this system have a program to work or flush hydrants? F No ☒ Yes How often? ____Every 6 months___X___

5-F. Does this system have a valve exercise program? ☐ No ☒ Yes How often? Once every five to six years. The program began in 1999. Approximately 7-8% of the system valves are cleared, tested and exercised.

5-G. Does this system have a cross-connection control program? ☒ No F Yes Currently working on an ordinance.

5-H. Has water pressure been inadequate in any part of the system? F No ☒ Yes Please explain. This is typically where old 2" galvanized mains are present. There is a program to replace all galvanized within four years. This started in 2000; lines were charged in 2001. Also, lines are charged by exception as needed.

5-I. Does this system have a leak detection program? ☐ No ☒ Yes As a part of the maintenance program.

5-J. Has water use ever been restricted since 1992? F No ☒ Yes Please explain. 1999 and 2000 Water Use Restrictions during summer drought period.

5-K. Does this system have a water conservation plan? F No ☒ Yes Please attach a copy. (attached)

5-L. Did this system distribute water conservation information in 2000? F No ☒ Yes Beat the peak, block leader, and school education programs.

5-M. Are there any local requirements on plumbing fixture water use which are stricter than the NC State Building Code? ☒ No F Yes Please explain._____

_____

5-N. Does this system have a program to encourage replacement or retrofit of older, higher water-use plumbing fixtures? F No X Yes

5-O. Does this system have a water shortage or drought response plan? F No ☒ Yes Please attach a copy.

5-P. Is raw water metered? F No ☒ Yes

5-Q. Is finished water output metered? F No ☒ Yes

5-R. Do you have a meter replacement program? F No ☒ Yes

5-S. How many meters were replaced in 2000? 1488 meters

5-T. How old are the oldest meters in the system? 10 years

5-U. What type of rate structure is used? F Decreasing Block F Flat Rate ☒ Increasing Block F Seasonally Adjusted F Other_____

5-V. Are there meters for outdoor water use, such as irrigation, which are not billed for sewer services? F No ☒ Yes # of meters 2,120

5-W. Does this system use reclaimed water or plan to use it within the next five years? F No ☒ Yes # of connections 403 ; 1.6 MGD

SECTION 6: SYSTEM MAP

Review, correct, and return the enclosed system map Check Plot to show the present boundaries of the water distribution system service area, points of intake and discharge, wells, water and wastewater treatment facilities, and water and wastewater interconnections with other systems. Also, show any proposed points of intake or discharge, wells, water and wastewater facilities, water and wastewater interconnections, and future service area extensions. Use symbols shown on the attached map.

LOCAL WATER SUPPLY PLAN for JORDAN LAKE ALLOCATION APPLICATION 2000-2001
Part 2: Water Supply Planning Report

Completed By: Leila Goodwin Date: 5/29/01

WATER SYSTEM: Town of Cary PWSID: NC03-92-020

SECTION 7: WATER DEMAND PROJECTIONS

7-A. Population to be Served	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Year-Round	96,217	115,781	134,222	152,601	172,653	192,971	215,679	236,000	236,000	236,000	236,000
Seasonal (if applicable)*											

*Please list the months of seasonal demand: N/A Attach a detailed explanation of how projections were calculated.

Table 7-B. Projected Average Daily Service Area Demand in Million Gallons per Day (MGD). (Does not include sales to other systems)
Sub-divide each water use type as needed for projecting future water demands.

	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
(1) Residential	7.1	8.2	9.1	10.2	11.3	12.4	12.2	13.7	13.7	13.7	13.7
(2) Commercial	1.8	2.3	3.0	3.9	5.0	6.0	6.9	7.4	7.4	7.4	7.4
(3) Industrial	0.1	0.2	0.2	0.2	0.3	0.4	0.4	0.4	0.4	0.4	0.4
(4) Institutional	0.1	0.2	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.4	0.4
(5) System Processes	0.9	1.1	1.3	1.5	1.7	1.8	1.9	2.1	2.1	2.1	2.1
(6) Unaccounted-for water	0.5	0.6	0.7	0.8	1.0	1.1	1.3	1.4	1.4	1.4	1.4
(7) Total Service Area Demand [sum (1) thru (6)]*	10.5	12.6	14.5	16.8	19.6	22.0	23.0	25.4	25.4	25.4	25.4

*Also includes a reduction in demand due to reuse in Cary. This could not be assigned to one particular use.

7-C. Is non-residential water use expected to change significantly through 2050 from current levels of use? F No ☒ Yes
If yes, please explain; changes due to growth of population

Table 7-D. FUTURE SUPPLIES List all new sources or facilities which were under development as of December 31, 2000 and mark locations on the System Map.

Source or Facility Name	PWSID (if purchase)	Surface water or Ground water	Sub-Basin of Source	Water Quality Classification	Additional Supply MGD	Development Time years	Year Online
N/A							

***NOTE** **R=**Regular Use, **E=**Emergency Use

7-E. What is the Total Amount of Future Supplies available for Regular Use? ____0____ MGD

Table 7-F. FUTURE SALES CONTRACTS that have been already agreed to. List new sales to be made to other systems.

1 Water supplied to:		2 Contract Amount and Duration			3 Pipe Size(s) Inches	4* R Or E
System Name	PWSID	MGD	Year Begin	Year End		
N/A						

***NOTE** **R=**Regular Use, **E=**Emergency Use

7-G. What is the total amount of existing Future Sales Contracts for Regular Use? _____0_____ MGD

SECTION 8: FUTURE WATER SUPPLY NEEDS
***Completed jointly by Cary & Apex**

Local governments should maintain adequate water supplies to ensure that average daily water demands do not exceed 80% of the available supply. Completion of the following table will demonstrate whether existing supplies are adequate to satisfy this requirement and when additional water supply will be needed.

Table 8-A. AVERAGE DAILY DEMAND AS PERCENT OF SUPPLY Show all quantities in MGD.

Available Supply, MGD	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
(1) Existing Surface Water Supply (Item 3-B)	16.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
(2) Existing Ground Water Supply (Item 3-G)	0	0	0	0	0	0	0	0	0	0	0
(3) Existing Purchase Contracts (Item 3-E)	8.23	3.5	0	0	0	0	0	0	0	0	0
(4) Future Supplies (Item 7-E)	0	0	0	0	0	0	0	0	0	0	0
(5) **Total Available Supply** [sum (1) thru (4)]	24.23	24.5	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
Average Daily Demand, MGD											
(6) Service Area Demand (Item 7-B, Line 7)	12.8	15.6	18.7	22.1	25.9	29.2	31.3	34.0	34.0	34.0	34.0
(7) Existing Sales Contracts (Item 2-H)	0.4	0.4	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7
(8) Future Sales Contracts (Item 7-G)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(9) **Total Average Daily Demand** [sum (6) thru (8)]	13.2	16.0	19.2	22.6	26.5	29.8	31.8	34.6	34.7	34.7	34.7
(10) Demand as Percent of Supply [(9) / (5)] x 100	54%	65%	91%	108%	127%	142%	152%	165%	165%	165%	165%
(11) **Supply Needed to maintain 80% [(9) / 0.8] - (5)**	16.5	20.0	24.0	28.3	33.3	37.3	39.9	43.4	43.4	43.4	43.4
Additional Information for Jordan Lake Allocation											
(12) Sales Under Existing Contracts	0.4	0.4	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7
(13) Expected Sales Under Future Contracts	0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
(14) Demand in each planning period [(6)+(12)+(13)]	13.2	16.0	19.2	22.6	26.5	29.8	31.8	34.6	34.7	34.7	34.7
(15) Supply minus Demand [(5) - (14)]	11.0	8.5	1.8	-1.6	-5.6	-8.8	-10.9	-13.6	-13.7	-13.7	-13.7

8-B. Does Line 10 above indicate that demand will exceed 80% of available supply before the year 2030? F No ☒ Yes

If yes, your Jordan Lake Water Supply Storage Allocation Application should include the following items:

(1) Alternatives for obtaining additional water supply to meet future demands. Use the following tables to summarize the various future water supply alternatives available to your system. Attach a detailed description of each water supply project shown in each alternative. The sooner the additional supply will be needed, the more specific your plans need to be.

(2) A demand management program to ensure efficient use of your available water supply. A program should include: conducting water audits at least annually to closely monitor water use; targeting large water customers for increased efficiency; modifying water rate structures; identifying and reducing the amount of leaks and unaccounted-for water; and reusing reclaimed water for non-potable uses.

(3) Restrictive measures to control demand if the additional supply is not available when demand exceeds 80% of available supply, such as placing a moratorium on additional water connections until the additional supply is available or amending or developing your water shortage response ordinance to trigger mandatory water conservation as water demand approaches the available supply.

Future Supply Alternative List the components of each alternative scenario including the planning period when each component will come online.

(#1)	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
(1) Line (15) from Table 8-A "Existing Supply – Demand"	11.0	8.5	1.8	-1.6	-5.6	-8.8	-10.9	-13.6	-13.7	-13.7	-13.7
(2) Available supply from Project 1 (Jordan Lake Allocation)		13.0	13.0	13.0	13.0	23.0	23.0	23.0	23.0	23.0	23.0
Available supply from Project 2 (describe)											
Available supply from Project 3 (describe)											
(3) Supply available for future needs [(1) + (2)]	11.0	21.5	14.8	11.4	7.4	14.2	12.1	9.4	9.3	9.3	9.3
(4) Total discharge to Source Basin	0.0	0.0	1.9	4.8	7.1	10.6	13.9	17.1	17.1	17.1	17.1
(5) Consumptive Use in Source Basin	1.8	2.4	3.1	3.8	4.6	5.6	6.3	6.8	6.8	6.8	6.8
(6) Total discharge to Receiving Basin	9.0	10.9	11.1	10.5	11.0	9.4	7.5	6.0	6.1	6.1	6.1
(7) Consumptive Use in Receiving Basin	2.4	2.7	3.1	3.5	3.9	4.2	4.2	4.7	4.7	4.7	4.7
(8) Amount not returned to Source Basin [(6) + (7)]	11.4	13.6	14.2	14.0	14.9	13.6	11.7	10.7	10.8	10.8	10.8

List details of the future supply options include in this alternative in the table below.

Future Source or Facility Name	PWSID (if purchase)	Surface water or Ground water	Sub-Basin of Source	Water Quality Classification	Additional Supply (MGD)	Development Time years	Year Online
Jordan Lake Allocation		Surface		WS IV B NSW	23	5	2005

Future Supply Alternative List the components of each alternative scenario including the planning period when each component will come online.

(#2)	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
(1) Line (15) from Table 8-A "Existing Supply - Demand"	11.0	8.5	1.8	-1.6	-5.6	-8.8	-10.9	-13.6	-13.7	-13.7	-13.7
(2) Available supply from Project 1 (Cape Fear River)		13.0	13.0	13.0	13.0	23.0	23.0	23.0	23.0	23.0	23.0
Available supply from Project 2 (Jordan Lake Allocation)											
Available supply from Project 3 (describe)											
(3) Supply available for future needs [(1) + (2)]	11.0	21.5	14.8	11.4	7.4	14.2	12.1	9.4	9.3	9.3	9.3
(4) Total discharge to Source Basin	0.0	0.0	1.9	4.8	7.1	10.6	13.9	17.1	17.1	17.1	17.1
(5) Consumptive Use in Source Basin	1.8	2.4	3.1	3.8	4.6	5.6	6.3	6.8	6.8	6.8	6.8
(6) Total discharge to Receiving Basin	9.0	10.9	11.1	10.5	11.0	9.4	7.5	6.0	6.1	6.1	6.1
(7) Consumptive Use in Receiving Basin	2.4	2.7	3.1	3.5	3.9	4.2	4.2	4.7	4.7	4.7	4.7
(8) Amount not returned to Source Basin [(6) + (7)]	11.4	13.6	14.2	14.0	14.9	13.6	11.7	10.7	10.8	10.8	10.8

List details of the future supply options include in this alternative in the table below.

Future Supply Sources

Future Source or Facility Name	PWSID (if purchase)	Surface water or Ground water	Sub-Basin of Source	Water Quality Classification	Additional Supply (MGD)	Development Time years	Year Online
Cape Fear River		Surface		WS IV	10	6	2006
Jordan Lake Allocation		Surface		WS IV B NSW	13	5	2005

Attach additional pages as needed to summarize all alternatives.

Future Supply Alternative List the components of each alternative scenario including the planning period when each component will come online.

(#3)	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
(1) Line (15) from Table 8-A "Existing Supply – Demand"	11.0	8.5	1.8	-1.6	-5.6	-8.8	-10.9	-13.6	-13.7	-13.7	-13.7
(2) Available supply from Project 1 (Jordan Lake Allocation)		13.0	13.0	13.0	13.0	23.0	23.0	23.0	23.0	23.0	23.0
Available supply from Project 2 describe)											
Available supply from Project 3 (describe)											
(3) Supply available for future needs [(1) + (2)]	11.0	21.5	14.8	11.4	7.4	14.2	12.1	9.4	9.3	9.3	9.3
(4) Total discharge to Source Basin	0.0	0.0	1.9	4.8	7.1	10.6	13.9	17.1	17.1	17.1	17.1
(5) Consumptive Use in Source Basin	1.8	2.4	3.1	3.8	4.6	5.6	6.3	6.8	6.8	6.8	6.8
(6) Total discharge to Receiving Basin	9.0	10.9	11.1	10.5	11.0	9.4	7.5	6.0	6.1	6.1	6.1
(7) Consumptive Use in Receiving Basin	2.4	2.7	3.1	3.5	3.9	4.2	4.2	4.7	4.7	4.7	4.7
(8) Amount not returned to Source Basin [(6) + (7)]	11.4	13.6	14.2	14.0	14.9	13.6	11.7	10.7	10.8	10.8	10.8

List details of the future supply options include in this alternative in the table below.

Future Source or Facility Name	PWSID (if purchase)	Surface water or Ground water	Sub-Basin of Source	Water Quality Classification	Additional Supply (MGD)	Development Time years	Year Online
Jordan Lake Allocation		Surface	Haw	WS IV B NSW	23.0	5	2005

Future Supply Alternative List the components of each alternative scenario including the planning period when each component will come online.

(#4)	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
(1) Line (15) from Table 8-A "Existing Supply - Demand"	11.0	8.5	1.8	-1.6	-5.6	-8.8	-10.9	-13.6	-13.7	-13.7	-13.7
(2) Available supply from Project 1 (Jordan Lake Allocation)		13.0	13.0	13.0	13.0	23.0	23.0	23.0	23.0	23.0	23.0
Available supply from Project 2 (describe)											
Available supply from Project 3 (describe)											
(3) Supply available for future needs [(1) + (2)]	11.0	21.5	14.8	11.4	7.4	14.2	12.1	9.4	9.3	9.3	9.3
(4) Total discharge to Source Basin	0.0	0.0	1.9	4.8	7.1	10.6	13.9	17.1	17.1	17.1	17.1
(5) Consumptive Use in Source Basin	1.8	2.4	3.1	3.8	4.6	5.6	6.3	6.8	6.8	6.8	6.8
(6) Total discharge to Receiving Basin	9.0	10.9	11.1	10.5	11.0	9.4	7.5	6.0	6.1	6.1	6.1
(7) Consumptive Use in Receiving Basin	2.4	2.7	3.1	3.5	3.9	4.2	4.2	4.7	4.7	4.7	4.7
(8) Amount not returned to Source Basin [(6) + (7)]	11.4	13.6	14.2	14.0	14.9	13.6	11.7	10.7	10.8	10.8	10.8

Future Supply Sources

Future Source or Facility Name	PWSID (if purchase)	Surface water or Ground water	Sub-Basin of Source	Water Quality Classification	Additional Supply (MGD)	Development Time years	Year Online
Jordan Lake Allocation		Surface	Haw	WS IV B NSW	23.0	5	2005

Future Supply Alternative List the components of each alternative scenario including the planning period when each component will come online.

(#5a)	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
(1) Line (15) from Table 8-A "Existing Supply – Demand"	11.0	8.5	1.8	-1.6	-5.6	-8.8	-10.9	-13.6	-13.7	-13.7	-13.7
(2) Available supply from Project 1 (Kerr Lake)						10.0	10.0	10.0	10.0	10.0	10.0
Available supply from Project 2 (Jordan Lake Allocation)		13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0
Available supply from Project 3 (describe)											
(3) Supply available for future needs [(1) + (2)]	11.0	21.5	14.8	11.4	7.4	14.2	12.1	9.4	9.3	9.3	9.3
Total discharge to Roanoke Basin						0.0	0.0	0.0	0.0	0.0	0.0
Consumptive Use in Roanoke Basin (WTP Process)						0.8	0.8	0.8	0.8	0.8	0.8
(4) Total discharge to Haw Basin	0.0	0.0	1.9	4.8	7.1	10.6	13.9	17.1	17.1	17.1	17.1
(5) Consumptive Use in Haw Basin	1.8	2.4	3.1	3.8	4.6	5.6	6.3	6.8	6.8	6.8	6.8
(6) Total discharge to Neuse Basin	9.0	10.9	11.1	10.5	11.0	8.6	6.7	5.2	5.3	5.3	5.3
(7) Consumptive Use in Neuse Basin	2.4	2.7	3.1	3.5	3.9	4.2	4.2	4.7	4.7	4.7	4.7
(8) Amount not returned to Roanoke Basin						9.2	9.2	9.2	9.2	9.2	9.2
(8) Amount not returned to Haw Basin [(6) + (7)]	11.4	13.6	14.2	14.0	14.9	3.6	1.7	0.7	10.1	10.1	10.1

List details of the future supply options include in this alternative in the table below.

Future Source or Facility Name	PWSID (if purchase)	Surface water or Ground water	Sub-Basin of Source	Water Quality Classification	Additional Supply (MGD)	Development Time years	Year Online
Jordan Lake Allocation		Surface		WS IV B NSW	13.0	5	2005
Kerr Lake		Surface		WS III B	10	22	2022

Future Supply Alternative List the components of each alternative scenario including the planning period when each component will come online.

(#5b)	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
(1) Line (15) from Table 8-A "Existing Supply – Demand"	11.0	8.5	1.8	-1.6	-5.6	-8.8	-10.9	-13.6	-13.7	-13.7	-13.7
(2) Available supply from Project 1 (Kerr Lake)						10.0	10.0	10.0	10.0	10.0	10.0
Available supply from Project 2 (Jordan Lake Allocation)		11.0	11.0	11.0	11.0	14.0	14.0	14.0	14.0	14.0	14.0
Available supply from Project 3 (describe)											
(3) Supply available for future needs [(1) + (2)]	9.8	18.2	11.6	8.2	4.3	13.9	12.0	9.3	9.2	9.2	9.2
Total discharge to Roanoke Basin						9.2	9.2	9.2	9.2	9.2	9.2
Consumptive Use in Roanoke Basin (WTP Processes)						0.8	0.8	0.8	0.8	0.8	0.8
(4) Total discharge to Haw Basin	0.0	0.0	1.9	4.8	7.1	10.0	11.4	13.1	13.2	13.2	13.2
(5) Consumptive Use in Haw Basin	1.8	2.4	3.1	3.8	4.6	5.6	6.3	6.8	6.8	6.8	6.8
(6) Total discharge to Neuse Basin	9.0	10.9	11.1	10.5	11.0	0	0	0	0	0	0
(7) Consumptive Use in Neuse Basin	2.4	2.7	3.1	3.5	3.9	4.2	4.2	4.7	4.7	4.7	4.7
(8) Amount not returned to Roanoke Basin						0.0	0.0	0.0	0.0	0.0	0.0
(8) Amount not returned to Haw Basin [(6) + (7)]	11.4	13.6	14.2	14.0	14.9	4.2	4.2	4.7	4.7	4.7	4.7

List details of the future supply options include in this alternative in the table below.

Future Source or Facility Name	PWSID (if purchase)	Surface water or Ground water	Sub-Basin of Source	Water Quality Classification	Additional Supply (MGD)	Development Time years	Year Online
Jordan Lake Allocation		Surface		WS IV B NSW	13.0	5	2005
Kerr Lake		Surface	Roanoke	WS III B	10	22	2022

Future Supply Alternative List the components of each alternative scenario including the planning period when each component will come online.

(#6)	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
(1) Line (15) from Table 8-A "Existing Supply – Demand"	11.0	8.5	1.8	-1.6	-5.6	-8.8	-10.9	-13.6	-13.7	-13.7	-13.7
(2) Available supply from Project 1 (Harris Lake)				11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Available supply from Project 2 (Jordan Lake Allocation)		4.0	4.0	4.0	4.0	13.0	13.0	13.0	13.0	13.0	13.0
Available supply from Project 3 (describe)											
(3) Supply available for future needs [(1) + (2)]	9.8	11.2	4.6	12.2	8.3	13.9	12.0	9.3	9.2	9.2	9.2
(4) Total discharge to Source Basin	0.0	0.0	1.9	4.8	7.1	10.6	13.9	17.1	17.1	17.1	17.1
(5) Consumptive Use in Source Basin	1.8	2.4	3.1	3.8	4.6	5.6	6.3	6.8	6.8	6.8	6.8
(6) Total discharge to Receiving Basin	9.0	10.9	11.1	10.5	11.0	9.4	7.5	6.0	6.1	6.1	6.1
(7) Consumptive Use in Receiving Basin	2.4	2.7	3.1	3.5	3.9	4.2	4.2	4.7	4.7	4.7	4.7
(8) Amount not returned to Source Basin [(6) + (7)]	11.4	13.6	14.2	14.0	14.9	13.6	11.7	10.7	10.8	10.8	10.8

List details of the future supply options include in this alternative in the table below.

Future Source or Facility Name	PWSID (if purchase)	Surface water or Ground water	Sub-Basin of Source	Water Quality Classification	Additional Supply (MGD)	Development Time years	Year Online
Harris Lake		Surface		WS IV B NSW	11	6	2015
Jordan Lake Allocation		Surface	Haw	WS IV B NSW CA	13	5	2005

Future Supply Alternative List the components of each alternative scenario including the planning period when each component will come online.

(#7)	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
(1) Line (15) from Table 8-A "Existing Supply - Demand"	11.0	8.5	1.8	-1.6	-5.6	-8.8	-10.9	-13.6	-13.7	-13.7	-13.7
(2) Available supply from Project 1 (Middle Creek Reservoir)						10	10	10	10	10	10
Available supply from Project 2 (Jordan Lake Allocation)		13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0
Available supply from Project 3 (describe)											
(3) Supply available for future needs [(1) + (2)]	9.8	21.2	14.6	11.2	7.3	13.9	12.0	9.3	9.2	9.2	9.2
(4) Total discharge to Haw Basin	0.0	0.0	1.9	4.8	7.1	10.6	13.9	17.1	17.1	17.1	17.1
(5) Consumptive Use in Haw Basin	1.8	2.4	3.1	3.8	4.6	5.6	6.3	6.8	6.8	6.8	6.8
(6) Total discharge to Neuse Basin	9.0	10.9	11.1	10.5	11.0	9.4	7.5	6.0	6.1	6.1	6.1
(7) Consumptive Use in Neuse Basin	2.4	2.7	3.1	3.5	3.9	4.2	4.2	4.7	4.7	4.7	4.7
(8) Amount not returned to Haw Basin [(6) + (7)]	11.4	13.6	14.2	14.0	14.9	0.4	1.7	0.7	0.8	0.8	0.8

List details of the future supply options include in this alternative in the table below.

Future Supply Sources

Future Source or Facility Name	PWSID (if purchase)	Surface water or Ground water	Sub-Basin of Source	Water Quality Classification	Additional Supply (MGD)	Development Time years	Year Online
Middle Creek Reservoir		Surface	Neuse	WS IV CA	10	22	2022
Jordan Lake Allocation		Surface	Haw	WS IV B NSW	13	5	2005

Future Supply Alternative List the components of each alternative scenario including the planning period when each component will come online.

(#8)	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
(1) Line (15) from Table 8-A "Existing Supply – Demand"	11.0	8.5	1.8	-1.6	-5.6	-8.8	-10.9	-13.6	-13.7	-13.7	-13.7
(2) Available supply from Project 1 (Lake Michie Expansion)				11	11	11	11	11	11	11	11
Available supply from Project 2 (Interim Purchase from City of Durham)		0	4.3	0	0	0	0	0	0	0	0
Available supply from Project 3 (Jordan Lake Allocation)		2.0	2.0	2.0	2.0	12	12	12	12	12	12
(3) Supply available for future needs [(1) + (2)]	9.8	9.2	6.9	10.2	6.3	13.9	12.0	9.3	9.2	9.2	9.2
(4) Total discharge to Source Basin	0.0	0.0	1.9	4.8	7.1	10.6	13.9	17.1	17.1	17.1	17.1
(5) Consumptive Use in Source Basin	1.8	2.4	3.1	3.8	4.6	5.6	6.3	6.8	6.8	6.8	6.8
(6) Total discharge to Receiving Basin	9.0	10.9	11.1	10.5	11.0	9.4	7.5	6.0	6.1	6.1	6.1
(7) Consumptive Use in Receiving Basin	2.4	2.7	3.1	3.5	3.9	4.2	4.2	4.7	4.7	4.7	4.7
(8) Amount not returned to Source Basin [(6) + (7)]	11.4	13.6	14.2	14.0	14.9	0.4	1.7	0.7	0.8	0.8	0.8

List details of the future supply options include in this alternative in the table below.

Future Source or Facility Name	PWSID (if purchase)	Surface water or Ground water	Sub-Basin of Source	Water Quality Classification	Additional Supply (MGD)	Development Time years	Year Online
Jordan Lake Allocation		Surface	Haw	WS IV B NSW	12	5	2005
Lake Michie		Surface	Neuse	WS III NSW	11	22	2022
Purchase from City of Durham	3-32-010	Surface	Neuse		4.3	0	2001

8-C. Are peak day demands expected to exceed the water treatment plant capacity by 2010? ☒ No F Yes
If yes, what are your plans for increasing water treatment capacity?

Ongoing construction of upgrades at Cary/Apex WTP, when complete, should provide adequate peak day water supply thru about 2015.

8-D. Does this system have an interconnection with another system capable of providing water in an emergency? F No ☒ Yes If not, what are your plans for interconnecting (or please explain why an interconnection is not feasible or not necessary).

_____

_____

_____

8-E. Has this system participated in regional water supply or water use planning? F No ☒ Yes Please describe.

Cary has participated in numerous regional water supply initiatives for both water supply, efficient use and wastewater treatment and disposal, including feasibility studies for water supply alternatives to Jordan Lake Allocations and regional WRF discharging to Cape Fear River

8-F. List the major water supply reports or studies used for planning.

Town of Long-Range Water Supply Plan (2000); Water conservation Plan (2000); Reclaimed Water and Wastewater Reuse Program (1999); Interbasin Transfer Environmental Impact Statement (2000); Water System Master Plan (2000)

SECTION 9: TECHNICAL ASSISTANCE NEEDS

Is technical assistance needed:

9-A. to develop a local water supply plan? ☒ No F Yes

9-B. with a leak detection program? ☒ No F Yes

9-C. with a demand management or water conservation program? ☒ No F Yes

9-D. with a water shortage response plan? ☒ No F Yes

9-E. to identify alternative or future water supply sources? ☒ No F Yes

9-F. with a capacity development plan? ☒ No F Yes

9-G. with a wellhead or source water protection plan? ☒ No F Yes

9-H. with water system compliance or operational problems? ☒ No F Yes

9-I. with Consumer Confidence Reports? ☒ No F Yes

9-J. Please describe any other needs or issues regarding your water supply sources, any water system deficiencies or needed improvements (storage, treatment, etc.), or your ability to meet present and future water needs. Include both quantity and quality considerations, as well as financial, technical, managerial, permitting, and compliance issues.

1. Increase Jordan Lake Water Supply Allocation

This option increases the allocation for withdrawals through the Towns' existing raw water intake on the east bank of Jordan Lake. To satisfy water demand for the Cary/Apex service area and applying a 80 percent of available capacity threshold, the required Cary/Apex average water allocation would be at least 45 mgd in 2030.

In the short term, all wastewater from Cary and Apex will be discharged to the Neuse River Basin, resulting in an interbasin transfer. The Towns have requested an increase in the transfer amount from 16 mgd to 27 mgd. Construction of a new WWTP in the Cape Fear River basin, with an initial capacity of 9 mgd, is planned to limit IBT. Future water demands will be offset by increased discharges to the Cape Fear River Basin in order to keep interbasin transfer from exceeding the requested 27-mgd maximum day amount.

The water intake screens and intake piping can handle a maximum flow of 50 mgd. Since the projected combined peak demands of Cary and Apex (with reserve capacity) will exceed 50 mgd by about 2021, this alternative requires replacement of the existing intake screens with larger screens and modification of the backwash air system. Also, the existing Cary/Apex WTP would be expanded incrementally to meet increased demands in the study period, and the distribution system would be upgraded to accommodate future demands.

2. Cape Fear River Supply and Increase in Jordan Lake Water Supply Allocation

Harnett County operates a water treatment plant in Lillington, with an intake on the Cape Fear River. The plant has a capacity of 12 mgd, and Harnett County has initiated a pilot-testing program to re-rate the plant's capacity to 18 mgd. This option expands the Harnett County water plant to 48 mgd, ultimately, at its present site. A maximum yield of 10 mgd is available under this option. This option would be implemented as a form of indirect reuse, increasing the water available for withdrawal at the Harnett County WTP through discharges to the Cape Fear River basin from a Cape Fear River regional WWTP. There is no net interbasin transfer for this arrangement. This option relies on a Cape Fear River regional WWTP.

This option utilizes the proposed finished water pipeline from the Harnett County WTP to Holly Springs as well as an existing interconnection with the Cary water distribution system, which could then provide the water to Morrisville. To supplement this water supply so that the Cary/Apex demand is met throughout the planning period, an additional Jordan Lake allocation would be needed. The details of this additional project can be seen in the explanation of Alternative 1.

3. Increase Jordan Lake Reservoir Full Pool Elevation

This option increases the available water supply pool for Jordan Lake Reservoir by modifying the Army Corps of Engineers (USACE) operating rules to raise the top of the conservation pool elevation from its present 216 ft. By preliminary evaluation of stage-storage relations for Jordan Lake, an additional 4.50 billion gallons (bg) of water supply pool could be created by raising the permanent pool elevation by 1 ft. This quantity of additional water supply pool could increase the safe yield from the lake by as much as 30 mgd. In addition to potential environmental impacts that would be addressed by an

EIS or EA, recreational facilities at the lake would be impacted by the change in top of pool elevation.

Scenarios to modify the lake's operating rules would require a USACE Section 216 Study process before the Corps would assent to the proposed change. Raising the permanent pool would also decrease available flood storage in the reservoir. According to DWR staff, USACE approval to raise the permanent pool of Jordan Lake is not assured, and such an application could take several years.

4. Convert a Portion of Jordan Lake Sediment Storage to Water Supply Storage and Increase in Jordan Lake Water Supply Allocation

This option increases the Jordan Lake water supply pool by reclassifying a portion of the 24.3 bg of existing lake volume allocated to sediments. If 10 percent of present sediment storage were converted to water supply pool, the estimated additional water supply storage volume which could be obtained in this manner is 2.43 bg, which may increase the safe yield of the reservoir by as much as 16 mgd.

This option will require USACE involvement and concurrence to change the reservoir's operating rules. This option may be linked to Section 216 Studies and to implementation of additional best management practices to reduce rate of sedimentation. The USACE might require these practices to be adopted by all local governments which discharge stormwater to Jordan Lake to justify reclassification of sediment storage pool to water supply pool.

Regulatory approval to convert a portion of the sediment storage of Jordan Lake to water supply pool is not assured, and such an application could take several years. To supplement this water supply so that the Cary/Apex demand is met throughout the planning period, an additional Jordan Lake allocation would be needed. The details of this additional project can be seen in the explanation of Alternative 1.

5. Utilize Kerr Lake as Water Supply Resource and Increase in Jordan Lake Water Supply Allocation

This option draws water supply from the Kerr Lake reservoir. This option would construct a new WTP from a new intake structure. After treatment, the finished water would be provided to Cary, and then on to RTP South. Unless a corresponding quantity of treated effluent is returned to the Roanoke basin, this option includes an interbasin transfer.

Obtaining a municipal water supply allocation from Kerr Lake would require a USACE study process. USACE approval to obtain the Kerr Lake allocation is not assured due to competing users, and such an application could take several years.

To supplement this water supply so that the Cary/Apex demand is met throughout the planning period, particularly since a Kerr Lake supply would not be in place until 2022, an additional Jordan Lake allocation would be needed. The details of this additional project can be seen in the explanation of Alternative 1.

6. Utilize Harris Lake as Water Supply Source and Increase in Jordan Lake Water Supply Allocation

Harris Lake was developed by Carolina Power and Light (CP&L) as a reservoir for the storage of cooling water for its Shearon Harris nuclear power plant. At present, it is used for this, as well as some recreational uses.

Harris Lake is not presently classified as a water supply reservoir. According to permitting documents for the Shearon Harris plant, the storage volume between the normal and minimum lake levels contains approximately 15.4 bg and the safe yield of Harris Lake exceeds 11 mgd.

This option would classify Harris Lake as a water supply reservoir and utilize the lake as a Cary/Apex water source. Tritium is apparently present in Harris Lake, in quantities less than state water quality limits, so an evaluation of the lake prior to reclassification as a water supply will have to consider whether the quality of the Harris Lake water is safe.

This option includes construction of raw water intake facilities at Harris Lake and a new 10 to 15 mile raw water transmission main to the Cary/Apex WTP, depending on the intake location. To supplement this water supply so that the Cary/Apex demand is met throughout the planning period, particularly since this option could not be in effect until 2015, an additional Jordan Lake allocation would be needed. The details of this additional project can be seen in the explanation of Alternative 1.

7. Construct New Middle Creek Reservoir and Increase in Jordan Lake Water Supply Allocation

This option would develop a new Middle Creek reservoir as a joint venture with local governments in Wake County and Johnston County. Cary/Apex would have a 28 percent share in the safe yield from the new reservoir.

This option would include construction of a new dam, spillway and intake facilities; relocation of existing roads and bridges, including SR 1330 and possibly Interstate 40; construction of an approximately 30 mile raw water transmission pipeline from the intake to the Cary/Apex WTP and other regional partners; and expansion of the existing Cary/Apex WTP. To supplement this water supply so that the Cary/Apex demand is met throughout the planning period, particularly since this option could not be in effect until about 2022, an additional Jordan Lake allocation would be needed. The details of this additional project can be seen in the explanation of Alternative 1.

New or increased point source wastewater discharges by Cary and Fuquay-Varina to Middle Creek may affect the use of the creek for water supply. The creek has been given a biologic rating of "fair" to "poor" by DENR due to past nonpoint and point source wastewater discharges.

8. Participate in Expansion of Durhan's Lake Michie Reservoir and Interim Purchase from the City of Durham

Durham is considering raising the Lake Michie Dam to increase its water supplies. The study *Evaluation of Alternative Reservoirs on the Flat River and Little River* (Hazen and

Sawyer, 1988), estimated that the 20-year safe yield of Lake Michie could be increased by 33 mgd if the dam is raised to elevation 380 ft. Durham has acquired approximately one-half of the 2,160 acres that would be submerged if Lake Michie were expanded to the 380 ft elevation.

This option would partner Cary/Apex with Durham to raise the Lake Michie Dam to 380 ft, with the additional safe yield translating to an average treated water supply of about 11 mgd from Durham. Cary/Apex would pay 33 percent of the project costs for a 33 percent share in the increased safe yield. Cary/Apex would contract with Durham to treat the water, would obtain the water through upgraded interconnections with Durham.

Since this option is located within the Neuse River basin, it has the potential to substantially reduce the quantity of interbasin transfer for Cary's water supply. To supplement this water supply so that the Cary/Apex demand is met throughout the planning period, water will be purchased from the City of Durham in the interim.

Attachment B

Local Water Supply Plan - Apex

North Carolina Department of Environment and Natural Resources

Division of Water Resources

LOCAL WATER SUPPLY PLAN for JORDAN LAKE ALLOCATION APPLICATION 2000-2001
Part 1: Water Supply System Report for Calendar Year 2000

Completed By: CH2M HILL, Consultant to Town of Apex Date: May 31, 2001

SECTION 1: GENERAL INFORMATION

1-A. Water System: Apex 1-B. PWS Identification #: 03-92-045

1-C. River Sub-Basin(s): Neuse and Cape Fear

1-D. County(s): Wake

1-E. Contact Person: Tim Donnelly Title: Public Works & Utilities Director

1-F. Mailing Address: PO Box 250 CITY Apex ZIP 27502

1-G. Phone: 919.362.8166 1-H. Fax: 919.249.3358 1-I. E-mail: Tdonnelly@ci.apex.nc.us

1-J. Type of Ownership (Check One): ☒ Municipality F County F Authority F District F Non-Profit Association F For-Profit Business
F State F Federal F Other_____

SECTION 2: WATER USE INFORMATION

2-A. Population Served in 2000 Year-Round 22,453

Seasonal (if applicable) N/A For Months of _____

2-B. Total Water Use for 2000 including all purchased water: 722 Million Gallons (MG)

2-C. Average Annual Daily Water Use in 2000: 2.22 Million Gallons per Day (MGD)

2-D. List 2000 Average Annual Daily Water Use by Type in Million Gallons per Day (MGD):

	Metered Connections		Non-Metered Connections		Total
Type of Use	Number	Average Use (MGD)	Number	Estimated Average Use (MGD)	Average Use (MGD)
(1) Residential	7,507	1.28	0	---	1.28
(2) Non-Residential **	420	0.44	0	---	0.44

(5) Sales to other Systems	0.02
(6) System Processes	0.28
(7) Subtotal [sum (1) thru (6)]	2.02
(8) Average Annual Daily Water Use [Item 2-C]	2.22
(9) Unaccounted-for water [(8) - (7)]	0.20

** All non-residential combined

2-E. List the Average Daily and Maximum Day Water Use by Month for 2000 in Million Gallons per Day (MGD):

	Average Daily Use	Maximum Day Use	Max/Ave Ratio		Average Daily Use	Maximum Day Use	Max/Ave Ratio		Average Daily Use	Maximum Day Use	Max/Ave Ratio
Jan	1.50	1.72	1.15	May	2.62	3.46	1.32	Sep	1.94	2.29	1.18
Feb	1.55	1.82	1.17	Jun	2.45	3.63	1.48	Oct	2.65	3.49	1.32
Mar	1.67	2.27	1.36	Jul	1.95	2.50	1.28	Nov	2.12	3.35	1.58
Apr	1.64	2.25	1.37	Aug	1.93	2.48	1.28	Dec	1.65	2.14	1.29

2-F. List the system's 10 Largest Water Users and their Average Annual Daily Use in Million Gallons per Day (MGD) for 2000: (include sales to other systems)

Water User	Average Daily Use	Water User	Average Daily Use
Lufkin	0.051	Data General Corp	0.0059
Henry Wurst Inc	0.013	Ramada Inn	0.0059
Potters Industries	0.012	Lee Moore Oil Co.	0.0055
Ready Mix Concrete	0.011	Regency Realty Group	0.0054
Wake County Schools - Laura Duncan Rd	0.006	Tipper Tie	0.0051

2-G. WATER SALES TO OTHER WATER SYSTEMS IN 2000 List all systems that can be supplied water through existing interconnections (regular and emergency). Mark the locations of connections on the System Map.

1 Water supplied to:		2 Average Daily Amount		3 Contract Amount		4 Pipe Size(s)	5* R or E
Water System	PWSID	MGD	# of Days	MGD	Expiration Date	Inches	
Feltonsville Community	03-92-060	0.019	365	N/A	N/A	6	R
Town of Cary	03-92-024	0	0	N/A	N/A	16	E
Town of Holly Springs	03-92-050	0	0	1.0**	N/A	16	E
Harnett County	03-43-045	0	0	1.0**	N/A	16	E

***NOTE** Column 5 **R=**Regular Use, **E=**Emergency Use

** Apex can provide total of 1.0 mgd to either Harnett County or Holly Springs, but cannot supply both.

2-H. What is the Total Amount of Sales Contracts for Regular Use? ___0.019___MGD

SYSTEM NAME ___Apex_____ PWSID ____03-92-045_____

SECTION 3: WATER SUPPLY SOURCES

3-A. SURFACE WATER List surface water source information. Mark and label locations of intakes on the System Map.

1 Name of Stream and/or Reservoir	2 Drainage Area Square Miles	3 Is Withdrawal Metered? Y / N	4 Sub-Basin	5 Average Daily Withdrawal for days used		6 Maximum Day Withdrawal	7* Available Supply		8* System Component Limiting Daily Output		9 Useable On-Stream Raw Water Supply Storage Million Gallons	10* R or E
				MGD	# of Days	MGD	MGD	Qualifier	Capacity MGD	System Component		
Everett Jordan – See Town of Cary WSSR				1.81	365		4.94	0				R
								Totals				

***NOTES** Column 7 Supply Qualifiers: **C=**Contract amount, **SY20=2**0-year Safe Yield, **SY50=**50-year Safe Yield, **F=**20% of 7Q10 or other instream flow requirement, **T=**Treatment plant capacity, O=Other (specify) 23% Share in Cary/Apex WTP allocation of 21.5 mgd ADD from Jordan Lake

Column 8 Component: **R=**Raw water pumps, **T=**Treatment facilities, **M=**Transmission main, **D=**Distribution system, **O=**Other (specify)_____

Column 10 **R=**Regular Use, **E=**Emergency Use

3-B. What is the Total Surface Water Supply available for Regular Use? 4.94 MGD (ADD)

3-C. Does this system have off-stream raw water supply storage? ☒ No F Yes Useable Capacity _____ Million Gallons

3-D. WATER PURCHASES FROM OTHER WATER SYSTEMS IN 2000

List all systems that can supply water to this system through existing interconnections (regular and emergency). Mark the locations of the connections on the System Map.

1 Water supplied by:		2 Average Daily Amount		3 Contract Amount		4 Pipe Size(s)	5* R or E
Water System	PWSID	MGD	# of Days	MGD	Expiration Date	Inches	
City of Raleigh	03-92-010	0.23	365	0.23	Nov. 1, 2001	16	E

***NOTE** Column 5 **R=**Regular Use, **E=**Emergency Use

3-E. What is the Total Amount of Purchase Contracts available for Regular Use? 0.23 MGD (Do not include emergency use connections in total)

SYSTEM NAME Apex PWSID 03-92-045

3-F. GROUND WATER List well information. ***Mark and label the location of all wells on the System Map.***

1 Name or Number of Well	2 Well Depth Feet	3 Casing Depth Feet	4 Screen Depth Top Feet	4 Screen Depth Bottom Feet	5 Well Diameter Inches	6 Pump Intake Depth Feet	7 Is Well Metered? Y / N	8 Average Daily Withdrawal for Days Used MGD	8 Average Daily Withdrawal for Days Used # of Days	9 Maximum Day Withdrawal MGD	10 12-Hour Supply Million Gallons	11* System Component Limiting Daily Output Capacity MGD	11* System Component Limiting Daily Output System Component	12* R or E
N/A														

***NOTES** Column 11 Component: **R=**Raw water pumps, **T=**Treatment facilities, **M=**Transmission main, **D=**Distribution system, **O=**Other (specify)_____
Column 12 **R=**Regular Use, **E=**Emergency Use

3-G. What is the Total 12-Hour Supply of all wells available for Regular Use? ____N/A_____ million gallons

3-H. Are ground water levels monitored? F No F Yes How often? _____

3-I. Does this system have a wellhead protection program F No F Yes F Under development

SYSTEM NAME ___Apex_____ PWSID ____03-92-045_____

3-J. WATER TREATMENT PLANTS List all WTPs, including any under construction, as of 12/31/2000. ***Mark and label locations on the System Map***.

Water Treatment Plant Name	Permitted Capacity MGD	Source(s)
Cary /Apex Water Treatment Plant	16 total (Apex share 3.7 mgd)	Jordan Lake (operated jointly with the Town of Cary)
Expansion of Cary/Apex WTP Facilities	40 total (Apex share 9.2 mgd)	Jordan Lake (operated jointly with the Town of Cary)

3-K. What is the system's finished water storage capacity? 1.5 Million Gallons (existing; Apex also has 23% share in new 2.0 mg clearwell - 0.46 mg, and is designing another 1.5 mg elevated storage tank)

SECTION 4: WASTEWATER INFORMATION

4-A. List Average Daily Wastewater Discharges by Month for 2000 in Million Gallons per Day (MGD)

	Average Daily Discharge		Average Daily Discharge		Average Daily Discharge		Average Daily Discharge
Jan	1.85	Apr	1.65	Jul	1.64	Oct	1.54
Feb	2.24	May	1.51	Aug	1.82	Nov	1.47
Mar	1.68	Jun	1.51	Sep	1.86	Dec	1.45

4-B. List all Wastewater Discharge and/or Land Application Permits held by the system***. Mark and label points of discharge and land application sites on the System Map***.

1 NPDES or Land Application Permit Number	2 Permitted Capacity Dec. 31,2000 MGD	3 Design Capacity MGD	4 Average Annual Daily Discharge MGD	5 Name of Receiving Stream	6 Sub-Basin	7 Maximum Daily Discharge MGD
NC0064050	3.6	3.6	1.69	Unnamed Tributary of Middle Creek		

SYSTEM NAME Apex PWSID 03-92-045

4-C. List all Wastewater Discharge Connections with other systems. Mark and label the locations of connections on the System Map.

1 Wastewater Discharger		2 Wastewater Receiver		3 Average Daily Amount Discharged or Received		4 Contract Maximum
Name	PWSID	Name	PWSID	MGD	# of Days	MGD
Apex	03-92-045	Raleigh	03-92-010	0	0	0.75

4-D. Number of sewer service connections: 6,498

4-E. Number of water service connections with septic systems: 100 (Number in Sub-basin 1 ____ Number in Sub-basin 2 ____ Number in Sub-basin 3 ____)

4-F. Are there plans to build or expand wastewater treatment facilities in the next 10 years? F No ☒ Yes Please explain. Cape Fear/Apex plans to expand it WW Treatment capacity by 2010 with discharge to Cape Fear River Basin

SECTION 5: WATER CONSERVATION and DEMAND MANAGEMENT ACTIVITIES

5-A. What is the estimated total miles of distribution system lines? 128 miles

5-B. List the primary types and sizes of distribution lines:

	Asbestos Cement (AC)	Cast Iron (CI)	Ductile Iron (DI)	Galvanized Iron (GI)	Polyvinyl Chloride(PVC)	Other
Size Range	6" - 12"	6" - 8"	4" - 16" *	2"	4" - 8"	
Estimated % of lines	7%	7%	65%	3%	10%	

* Only Ductile Iron Pipe allowed for new installations

5-C. Were any lines replaced in 2000? No X Yes 800 linear feet

5-D. Were any new water mains added in 2000? F No ☒ Yes 40,000 linear feet

5-E. Does this system have a program to work or flush hydrants? F No ☒ Yes How often? twice per year

5-F. Does this system have a valve exercise program? F No ☒ Yes How often? once per year

SYSTEM NAME Apex PWSID 03-92-045

5-G. Does this system have a cross-connection control program? F No ☒ Yes

5-H. Has water pressure been inadequate in any part of the system? ☒ No F Yes Please explain. _____

_____

5-I. Does this system have a leak detection program? ☒ No F Yes What type of equipment or methods are used? _____

_____

5-J. Has water use ever been restricted since 1992? F No ☒ Yes Please explain. Water use restrictions during drought conditions of Summer 1999

5-K. Does this system have a water conservation plan? F No ☒ Yes Please attach a copy. Ordinance

5-L. Did this system distribute water conservation information in 2000? F No ☒ Yes

5-M. Are there any local requirements on plumbing fixture water use which are stricter than the NC State Building Code? F No ☒ Yes Please explain. Irrigation sensors required

5-N. Does this system have a program to encourage replacement or retrofit of older, higher water-use plumbing fixtures? ☒ No F Yes

5-O. Does this system have a water shortage or drought response plan? F No ☒ Yes Please attach a copy.

5-P. Is raw water metered? F No ☒ Yes

5-Q. Is finished water output metered? F No ☒ Yes

5-R. Do you have a meter replacement program? F No ☒ Yes Test larger meters (2+ inches) every 3 years, smaller meters upon request, replace if needed

5-S. How many meters were replaced in 2000? 30 meters

5-T. How old are the oldest meters in the system? 50 years

5-U. What type of rate structure is used? F Decreasing Block ☒ Flat Rate F Increasing Block F Seasonally Adjusted F Other_____

Attach a detailed description of the rate structure to this document.

5-V. Are there meters for outdoor water use, such as irrigation, which are not billed for sewer services? F No ☒ Yes # of meters 216

5-W. Does this system use reclaimed water or plan to use it within the next five years? F No ☒Yes # of connections 10 ; 0.2 MGD by 2005

SECTION 6: SYSTEM MAP

Review, correct, and return the enclosed system map Check Plot to show the present boundaries of the water distribution system service area, points of intake and discharge, wells, water and wastewater treatment facilities, and water and wastewater interconnections with other systems. Also, show any proposed points of intake or discharge, wells, water and wastewater facilities, water and wastewater interconnections, and future service area extensions. Use symbols shown on the attached map.

SYSTEM NAME Apex PWSID 03-92-045

LOCAL WATER SUPPLY PLAN for JORDAN LAKE ALLOCATION APPLICATION 2000-2001
Part 2: Water Supply Planning Report

Completed By: CH2M HILL, Consultant to Town of Apex Date: 5/31/01

WATER SYSTEM: Town of Apex PWSID: 03-92-045

SECTION 7: WATER DEMAND PROJECTIONS

7-A. Population to be Served	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Year-Round	22,453	35,627	48,800	61,700	74,600	87,500	100,400	102,172	102,172	102,172	102,172
Seasonal (if applicable)*											

*Please list the months of seasonal demand: _____ Attach a detailed explanation of how projections were calculated.

Table 7-B.* Projected Average Daily Service Area Demand in Million Gallons per Day (MGD). (Does not include sales to other systems)
Sub-divide each water use type as needed for projecting future water demands.

	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
(1) Residential	1.6	2.3	3.2	3.8	4.6	5.3	6.1	6.2	6.2	6.2	6.2
(2) Non-Residential	0.3	0.3	0.4	0.6	0.7	0.9	1.1	1.1	1.1	1.1	1.1
(5) System Processes	0.2	0.3	0.3	0.4	0.5	0.6	0.7	0.7	0.7	0.7	0.7
(6) Unaccounted-for water	0.1	0.2	0.3	0.4	0.5	0.5	0.6	0.6	0.6	0.6	0.6
(7) Total Service Area Demand [sum (1) thru (6)]	2.2	3.1	4.2	5.2	6.3	7.3	8.5	8.6	8.6	8.6	8.6

*These estimates include a reduction in demand due to conservation programs.

7-C. Is non-residential water use expected to change significantly through 2050 from current levels of use? ☐ No ☒ Yes
If yes, please explain; Further commercial and industrial development is expected to accompany residential development toward buildout.

Table 7-D. FUTURE SUPPLIES List all new sources or facilities which were under development as of December 31, 2000 and mark locations on the System Map.

Source or Facility Name	PWSID (if purchase)	Surface water or Ground water	Sub-Basin of Source	Water Quality Classification	Additional Supply MGD	Development Time years	Year Online
N/A							

***NOTE** **R=**Regular Use, **E=**Emergency Use

7-E. What is the Total Amount of Future Supplies available for Regular Use? _____ MGD

Table 7-F. FUTURE SALES CONTRACTS that have been already agreed to. List new sales to be made to other systems.

1 Water supplied to:		2 Contract Amount and Duration			3 Pipe Size(s) Inches	4* R Or E
System Name	PWSID	MGD	Year Begin	Year End		
			-	-		
			-	-		

***NOTE** **R=**Regular Use, **E=**Emergency Use

7-G. What is the total amount of existing Future Sales Contracts for Regular Use? _____ MGD

SECTION 8: FUTURE WATER SUPPLY NEEDS

***Completed jointly by Cary & Apex**

Local governments should maintain adequate water supplies to ensure that average daily water demands do not exceed 80% of the available supply. Completion of the following table will demonstrate whether existing supplies are adequate to satisfy this requirement and when additional water supply will be needed.

Table 8-A. AVERAGE DAILY DEMAND AS PERCENT OF SUPPLY Show all quantities in MGD.

Available Supply, MGD	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
(1) Existing Surface Water Supply (Item 3-B)	16	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
(2) Existing Ground Water Supply (Item 3-G)	0	0	0	0	0	0	0	0	0	0	0
(3) Existing Purchase Contracts (Item 3-E)	7.0	3.5	0	0	0	0	0	0	0	0	0
(4) Future Supplies (Item 7-E)	0	0	0	0	0	0	0	0	0	0	0
(5) **Total Available Supply** [sum (1) thru (4)]	23.0	24.5	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0	21.0
Average Daily Demand, MGD											
(6) Service Area Demand (Item 7-B, Line 7)	12.8	15.6	18.7	22.1	25.9	29.2	31.3	34.0	34.0	34.0	34.0
(7) Existing Sales Contracts (Item 2-H)	0.4	0.4	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7
(8) Future Sales Contracts (Item 7-G)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(9) **Total Average Daily Demand** [sum (6) thru (8)]	13.2	16.0	19.2	22.6	26.5	29.8	31.8	34.6	34.7	34.7	34.7
(10) Demand as Percent of Supply [(9) / (5)] x 100	54%	65%	91%	108%	127%	142%	152%	165%	165%	165%	165%
(11) **Supply Needed to maintain 80% [(9) / 0.8] - (5)**	16.5	20.0	24.0	28.3	33.3	37.3	39.9	43.4	43.4	43.4	43.4
Additional Information for Jordan Lake Allocation											
(12) Sales Under Existing Contracts	0.4	0.4	0.5	0.5	0.6	0.6	0.6	0.6	0.7	0.7	0.7
(13) Expected Sales Under Future Contracts	0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
(14) Demand in each planning period [(6)+(12)+(13)]	13.2	16.0	19.2	22.6	26.5	29.8	31.8	34.6	34.7	34.7	34.7
(15) Supply minus Demand [(5) - (14)]	11.0	8.5	1.8	-1.6	-5.6	-8.8	-10.9	-13.6	-13.7	-13.7	-13.7

8-B. Does Line 10 above indicate that demand will exceed 80% of available supply before the year 2030? F No ☒ Yes

If yes, your Jordan Lake Water Supply Storage Allocation Application should include the following items:

(1) Alternatives for obtaining additional water supply to meet future demands. Use the following tables to summarize the various future water supply alternatives available to your system. Attach a detailed description of each water supply project shown in each alternative. The sooner the additional supply will be needed, the more specific your plans need to be.

(2) A demand management program to ensure efficient use of your available water supply. A program should include: conducting water audits at least annually to closely monitor water use; targeting large water customers for increased efficiency; modifying water rate structures; identifying and reducing the amount of leaks and unaccounted-for water; and reusing reclaimed water for non-potable uses.

(3) Restrictive measures to control demand if the additional supply is not available when demand exceeds 80% of available supply, such as placing a moratorium on additional water connections until the additional supply is available or amending or developing your water shortage response ordinance to trigger mandatory water conservation as water demand approaches the available supply.

Future Supply Alternative List the components of each alternative scenario including the planning period when each component will come online.

(#1)	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
(1) Line (15) from Table 8-A "Existing Supply – Demand"	11.0	8.5	1.8	-1.6	-5.6	-8.8	-10.9	-13.6	-13.7	-13.7	-13.7
(2) Available supply from Project 1 (Jordan Lake Allocation)		13.0	13.0	13.0	13.0	23.0	23.0	23.0	23.0	23.0	23.0
Available supply from Project 2 (describe)											
Available supply from Project 3 (describe)											
(3) Supply available for future needs [(1) + (2)]	11.0	21.5	14.8	11.4	7.4	14.2	12.1	9.4	9.3	9.3	9.3
(4) Total discharge to Source Basin	0.0	0.0	1.9	4.8	7.1	10.6	13.9	17.1	17.1	17.1	17.1
(5) Consumptive Use in Source Basin	1.8	2.4	3.1	3.8	4.6	5.6	6.3	6.8	6.8	6.8	6.8
(6) Total discharge to Receiving Basin	9.0	10.9	11.1	10.5	11.0	9.4	7.5	6.0	6.1	6.1	6.1
(7) Consumptive Use in Receiving Basin	2.4	2.7	3.1	3.5	3.9	4.2	4.2	4.7	4.7	4.7	4.7
(8) Amount not returned to Source Basin [(6) + (7)]	11.4	13.6	14.2	14.0	14.9	13.6	11.7	10.7	10.8	10.8	10.8

List details of the future supply options include in this alternative in the table below.

Future Source or Facility Name	PWSID (if purchase)	Surface water or Ground water	Sub-Basin of Source	Water Quality Classification	Additional Supply (MGD)	Development Time years	Year Online
Jordan Lake Allocation		Surface		WS IV B NSW	23	5	2005

Future Supply Alternative List the components of each alternative scenario including the planning period when each component will come online.

(#2)	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
(1) Line (15) from Table 8-A "Existing Supply - Demand"	11.0	8.5	1.8	-1.6	-5.6	-8.8	-10.9	-13.6	-13.7	-13.7	-13.7
(2) Available supply from Project 1 (Cape Fear River)		13.0	13.0	13.0	13.0	23.0	23.0	23.0	23.0	23.0	23.0
Available supply from Project 2 (Jordan Lake Allocation)											
Available supply from Project 3 (describe)											
(3) Supply available for future needs [(1) + (2)]	11.0	21.5	14.8	11.4	7.4	14.2	12.1	9.4	9.3	9.3	9.3
(4) Total discharge to Source Basin	0.0	0.0	1.9	4.8	7.1	10.6	13.9	17.1	17.1	17.1	17.1
(5) Consumptive Use in Source Basin	1.8	2.4	3.1	3.8	4.6	5.6	6.3	6.8	6.8	6.8	6.8
(6) Total discharge to Receiving Basin	9.0	10.9	11.1	10.5	11.0	9.4	7.5	6.0	6.1	6.1	6.1
(7) Consumptive Use in Receiving Basin	2.4	2.7	3.1	3.5	3.9	4.2	4.2	4.7	4.7	4.7	4.7
(8) Amount not returned to Source Basin [(6) + (7)]	11.4	13.6	14.2	14.0	14.9	13.6	11.7	10.7	10.8	10.8	10.8

List details of the future supply options include in this alternative in the table below.

Future Supply Sources

Future Source or Facility Name	PWSID (if purchase)	Surface water or Ground water	Sub-Basin of Source	Water Quality Classification	Additional Supply (MGD)	Development Time years	Year Online
Cape Fear River		Surface		WS IV	10	6	2006
Jordan Lake Allocation		Surface		WS IV B NSW	13	5	2005

Attach additional pages as needed to summarize all alternatives.

Future Supply Alternative List the components of each alternative scenario including the planning period when each component will come online.

(#3)	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
(1) Line (15) from Table 8-A "Existing Supply – Demand"	11.0	8.5	1.8	-1.6	-5.6	-8.8	-10.9	-13.6	-13.7	-13.7	-13.7
(2) Available supply from Project 1 (Jordan Lake Allocation)		13.0	13.0	13.0	13.0	23.0	23.0	23.0	23.0	23.0	23.0
Available supply from Project 2 describe)											
Available supply from Project 3 (describe)											
(3) Supply available for future needs [(1) + (2)]	11.0	21.5	14.8	11.4	7.4	14.2	12.1	9.4	9.3	9.3	9.3
(4) Total discharge to Source Basin	0.0	0.0	1.9	4.8	7.1	10.6	13.9	17.1	17.1	17.1	17.1
(5) Consumptive Use in Source Basin	1.8	2.4	3.1	3.8	4.6	5.6	6.3	6.8	6.8	6.8	6.8
(6) Total discharge to Receiving Basin	9.0	10.9	11.1	10.5	11.0	9.4	7.5	6.0	6.1	6.1	6.1
(7) Consumptive Use in Receiving Basin	2.4	2.7	3.1	3.5	3.9	4.2	4.2	4.7	4.7	4.7	4.7
(8) Amount not returned to Source Basin [(6) + (7)]	11.4	13.6	14.2	14.0	14.9	13.6	11.7	10.7	10.8	10.8	10.8

List details of the future supply options include in this alternative in the table below.

Future Source or Facility Name	PWSID (if purchase)	Surface water or Ground water	Sub-Basin of Source	Water Quality Classification	Additional Supply (MGD)	Development Time years	Year Online
Jordan Lake Allocation		Surface	Haw	WS IV B NSW	23.0	5	2005

Future Supply Alternative List the components of each alternative scenario including the planning period when each component will come online.

(#4)	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
(1) Line (15) from Table 8-A "Existing Supply - Demand"	11.0	8.5	1.8	-1.6	-5.6	-8.8	-10.9	-13.6	-13.7	-13.7	-13.7
(2) Available supply from Project 1 (Jordan Lake Allocation)		13.0	13.0	13.0	13.0	23.0	23.0	23.0	23.0	23.0	23.0
Available supply from Project 2 (describe)											
Available supply from Project 3 (describe)											
(3) Supply available for future needs [(1) + (2)]	11.0	21.5	14.8	11.4	7.4	14.2	12.1	9.4	9.3	9.3	9.3
(4) Total discharge to Source Basin	0.0	0.0	1.9	4.8	7.1	10.6	13.9	17.1	17.1	17.1	17.1
(5) Consumptive Use in Source Basin	1.8	2.4	3.1	3.8	4.6	5.6	6.3	6.8	6.8	6.8	6.8
(6) Total discharge to Receiving Basin	9.0	10.9	11.1	10.5	11.0	9.4	7.5	6.0	6.1	6.1	6.1
(7) Consumptive Use in Receiving Basin	2.4	2.7	3.1	3.5	3.9	4.2	4.2	4.7	4.7	4.7	4.7
(8) Amount not returned to Source Basin [(6) + (7)]	11.4	13.6	14.2	14.0	14.9	13.6	11.7	10.7	10.8	10.8	10.8

Future Supply Sources

Future Source or Facility Name	PWSID (if purchase)	Surface water or Ground water	Sub-Basin of Source	Water Quality Classification	Additional Supply (MGD)	Development Time years	Year Online
Jordan Lake Allocation		Surface	Haw	WS IV B NSW	23.0	5	2005

Future Supply Alternative List the components of each alternative scenario including the planning period when each component will come online.

(#5a)	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
(1) Line (15) from Table 8-A "Existing Supply – Demand"	11.0	8.5	1.8	-1.6	-5.6	-8.8	-10.9	-13.6	-13.7	-13.7	-13.7
(2) Available supply from Project 1 (Kerr Lake)						10.0	10.0	10.0	10.0	10.0	10.0
Available supply from Project 2 (Jordan Lake Allocation)		13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0
Available supply from Project 3 (describe)											
(3) Supply available for future needs [(1) + (2)]	11.0	21.5	14.8	11.4	7.4	14.2	12.1	9.4	9.3	9.3	9.3
Total discharge to Roanoke Basin						0.0	0.0	0.0	0.0	0.0	0.0
Consumptive Use in Roanoke Basin (WTP Process)						0.8	0.8	0.8	0.8	0.8	0.8
(4) Total discharge to Haw Basin	0.0	0.0	1.9	4.8	7.1	10.6	13.9	17.1	17.1	17.1	17.1
(5) Consumptive Use in Haw Basin	1.8	2.4	3.1	3.8	4.6	5.6	6.3	6.8	6.8	6.8	6.8
(6) Total discharge to Neuse Basin	9.0	10.9	11.1	10.5	11.0	8.6	6.7	5.2	5.3	5.3	5.3
(7) Consumptive Use in Neuse Basin	2.4	2.7	3.1	3.5	3.9	4.2	4.2	4.7	4.7	4.7	4.7
(8) Amount not returned to Roanoke Basin						9.2	9.2	9.2	9.2	9.2	9.2
(8) Amount not returned to Haw Basin [(6) + (7)]	11.4	13.6	14.2	14.0	14.9	3.6	1.7	0.7	10.1	10.1	10.1

List details of the future supply options include in this alternative in the table below.

Future Source or Facility Name	PWSID (if purchase)	Surface water or Ground water	Sub-Basin of Source	Water Quality Classification	Additional Supply (MGD)	Development Time years	Year Online
Jordan Lake Allocation		Surface		WS IV B NSW	13.0	5	2005
Kerr Lake		Surface		WS III B	10	22	2022

Future Supply Alternative List the components of each alternative scenario including the planning period when each component will come online.

(#5b)	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
(1) Line (15) from Table 8-A "Existing Supply – Demand"	11.0	8.5	1.8	-1.6	-5.6	-8.8	-10.9	-13.6	-13.7	-13.7	-13.7
(2) Available supply from Project 1 (Kerr Lake)						10.0	10.0	10.0	10.0	10.0	10.0
Available supply from Project 2 (Jordan Lake Allocation)		11.0	11.0	11.0	11.0	14.0	14.0	14.0	14.0	14.0	14.0
Available supply from Project 3 (describe)											
(3) Supply available for future needs [(1) + (2)]	9.8	18.2	11.6	8.2	4.3	13.9	12.0	9.3	9.2	9.2	9.2
Total discharge to Roanoke Basin						9.2	9.2	9.2	9.2	9.2	9.2
Consumptive Use in Roanoke Basin (WTP Processes)						0.8	0.8	0.8	0.8	0.8	0.8
(4) Total discharge to Haw Basin	0.0	0.0	1.9	4.8	7.1	10.0	11.4	13.1	13.2	13.2	13.2
(5) Consumptive Use in Haw Basin	1.8	2.4	3.1	3.8	4.6	5.6	6.3	6.8	6.8	6.8	6.8
(6) Total discharge to Neuse Basin	9.0	10.9	11.1	10.5	11.0	0	0	0	0	0	0
(7) Consumptive Use in Neuse Basin	2.4	2.7	3.1	3.5	3.9	4.2	4.2	4.7	4.7	4.7	4.7
(8) Amount not returned to Roanoke Basin						0.0	0.0	0.0	0.0	0.0	0.0
(8) Amount not returned to Haw Basin [(6) + (7)]	11.4	13.6	14.2	14.0	14.9	4.2	4.2	4.7	4.7	4.7	4.7

List details of the future supply options include in this alternative in the table below.

Future Source or Facility Name	PWSID (if purchase)	Surface water or Ground water	Sub-Basin of Source	Water Quality Classification	Additional Supply (MGD)	Development Time years	Year Online
Jordan Lake Allocation		Surface		WS IV B NSW	13.0	5	2005
Kerr Lake		Surface	Roanoke	WS III B	10	22	2022

Future Supply Alternative List the components of each alternative scenario including the planning period when each component will come online.

(#6)	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
(1) Line (15) from Table 8-A "Existing Supply – Demand"	11.0	8.5	1.8	-1.6	-5.6	-8.8	-10.9	-13.6	-13.7	-13.7	-13.7
(2) Available supply from Project 1 (Harris Lake)				11.0	11.0	11.0	11.0	11.0	11.0	11.0	11.0
Available supply from Project 2 (Jordan Lake Allocation)		4.0	4.0	4.0	4.0	13.0	13.0	13.0	13.0	13.0	13.0
Available supply from Project 3 (describe)											
(3) Supply available for future needs [(1) + (2)]	9.8	11.2	4.6	12.2	8.3	13.9	12.0	9.3	9.2	9.2	9.2
(4) Total discharge to Source Basin	0.0	0.0	1.9	4.8	7.1	10.6	13.9	17.1	17.1	17.1	17.1
(5) Consumptive Use in Source Basin	1.8	2.4	3.1	3.8	4.6	5.6	6.3	6.8	6.8	6.8	6.8
(6) Total discharge to Receiving Basin	9.0	10.9	11.1	10.5	11.0	9.4	7.5	6.0	6.1	6.1	6.1
(7) Consumptive Use in Receiving Basin	2.4	2.7	3.1	3.5	3.9	4.2	4.2	4.7	4.7	4.7	4.7
(8) Amount not returned to Source Basin [(6) + (7)]	11.4	13.6	14.2	14.0	14.9	13.6	11.7	10.7	10.8	10.8	10.8

List details of the future supply options include in this alternative in the table below.

Future Source or Facility Name	PWSID (if purchase)	Surface water or Ground water	Sub-Basin of Source	Water Quality Classification	Additional Supply (MGD)	Development Time years	Year Online
Harris Lake		Surface		WS IV B NSW	11	6	2015
Jordan Lake Allocation		Surface	Haw	WS IV B NSW CA	13	5	2005

Future Supply Alternative List the components of each alternative scenario including the planning period when each component will come online.

(#7)	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
(1) Line (15) from Table 8-A "Existing Supply - Demand"	11.0	8.5	1.8	-1.6	-5.6	-8.8	-10.9	-13.6	-13.7	-13.7	-13.7
(2) Available supply from Project 1 (Middle Creek Reservoir)						10	10	10	10	10	10
Available supply from Project 2 (Jordan Lake Allocation)		13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0	13.0
Available supply from Project 3 (describe)											
(3) Supply available for future needs [(1) + (2)]	9.8	21.2	14.6	11.2	7.3	13.9	12.0	9.3	9.2	9.2	9.2
(4) Total discharge to Haw Basin	0.0	0.0	1.9	4.8	7.1	10.6	13.9	17.1	17.1	17.1	17.1
(5) Consumptive Use in Haw Basin	1.8	2.4	3.1	3.8	4.6	5.6	6.3	6.8	6.8	6.8	6.8
(6) Total discharge to Neuse Basin	9.0	10.9	11.1	10.5	11.0	9.4	7.5	6.0	6.1	6.1	6.1
(7) Consumptive Use in Neuse Basin	2.4	2.7	3.1	3.5	3.9	4.2	4.2	4.7	4.7	4.7	4.7
(8) Amount not returned to Haw Basin [(6) + (7)]	11.4	13.6	14.2	14.0	14.9	0.4	1.7	0.7	0.8	0.8	0.8

List details of the future supply options include in this alternative in the table below.

Future Supply Sources

Future Source or Facility Name	PWSID (if purchase)	Surface water or Ground water	Sub-Basin of Source	Water Quality Classification	Additional Supply (MGD)	Development Time years	Year Online
Middle Creek Reservoir		Surface	Neuse	WS IV CA	10	22	2022
Jordan Lake Allocation		Surface	Haw	WS IV B NSW	13	5	2005

Future Supply Alternative List the components of each alternative scenario including the planning period when each component will come online.

(#8)	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
(1) Line (15) from Table 8-A "Existing Supply – Demand"	11.0	8.5	1.8	-1.6	-5.6	-8.8	-10.9	-13.6	-13.7	-13.7	-13.7
(2) Available supply from Project 1 (Lake Michie Expansion)				11	11	11	11	11	11	11	11
Available supply from Project 2 (Interim Purchase from City of Durham)		0	4.3	0	0	0	0	0	0	0	0
Available supply from Project 3 (Jordan Lake Allocation)		2.0	2.0	2.0	2.0	12	12	12	12	12	12
(3) Supply available for future needs [(1) + (2)]	9.8	9.2	6.9	10.2	6.3	13.9	12.0	9.3	9.2	9.2	9.2
(4) Total discharge to Source Basin	0.0	0.0	1.9	4.8	7.1	10.6	13.9	17.1	17.1	17.1	17.1
(5) Consumptive Use in Source Basin	1.8	2.4	3.1	3.8	4.6	5.6	6.3	6.8	6.8	6.8	6.8
(6) Total discharge to Receiving Basin	9.0	10.9	11.1	10.5	11.0	9.4	7.5	6.0	6.1	6.1	6.1
(7) Consumptive Use in Receiving Basin	2.4	2.7	3.1	3.5	3.9	4.2	4.2	4.7	4.7	4.7	4.7
(8) Amount not returned to Source Basin [(6) + (7)]	11.4	13.6	14.2	14.0	14.9	0.4	1.7	0.7	0.8	0.8	0.8

List details of the future supply options include in this alternative in the table below.

Future Source or Facility Name	PWSID (if purchase)	Surface water or Ground water	Sub-Basin of Source	Water Quality Classification	Additional Supply (MGD)	Development Time years	Year Online
Jordan Lake Allocation		Surface	Haw	WS IV B NSW	12	5	2005
Lake Michie		Surface	Neuse	WS III NSW	11	22	2022
Purchase from City of Durham	3-32-010	Surface	Neuse		4.3	0	2001

8-C. Are peak day demands expected to exceed the water treatment plant capacity by 2010? ☒ No F Yes
If yes, what are your plans for increasing water treatment capacity?

Ongoing construction of upgrades at Cary/Apex WTP, when complete, should provide adequate peak day water supply thru about 2015.

8-D. Does this system have an interconnection with another system capable of providing water in an emergency? F No ☒ Yes If not, what are your plans for interconnecting (or please explain why an interconnection is not feasible or not necessary).

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8-E. Has this system participated in regional water supply or water use planning? F No ☒ Yes Please describe.

Apex has participated in numerous regional water supply initiatives for both water supply, efficient use and wastewater treatment and disposal, including feasibility studies for water supply alternatives to Jordan Lake Allocations and regional WRF discharging to Cape Fear River

8-F. List the major water supply reports or studies used for planning.

Town of Cary Range Water Supply Plan (2000); Interbasin Transfer Environmental Impact Statement (2000)

SECTION 9: TECHNICAL ASSISTANCE NEEDS

Is technical assistance needed:

9-A.	to develop a local water supply plan?	☒ No F Yes
9-B.	with a leak detection program?	☒ No F Yes
9-C.	with a demand management or water conservation program?	☒ No F Yes
9-D.	with a water shortage response plan?	☒ No F Yes
9-E.	to identify alternative or future water supply sources?	☒ No F Yes
9-F.	with a capacity development plan?	☒ No F Yes
9-G.	with a wellhead or source water protection plan?	☒ No F Yes
9-H.	with water system compliance or operational problems?	☒ No F Yes
9-I.	with Consumer Confidence Reports?	☒ No F Yes

9-J. Please describe any other needs or issues regarding your water supply sources, any water system deficiencies or needed improvements (storage, treatment, etc.), or your ability to meet present and future water needs. Include both quantity and quality considerations, as well as financial, technical, managerial, permitting, and compliance issues.

_____

1. Increase Jordan Lake Water Supply Allocation

This option increases the allocation for withdrawals through the Towns' existing raw water intake on the east bank of Jordan Lake. To satisfy water demand for the Cary/Apex service area and applying a 80 percent of available capacity threshold, the required Cary/Apex average water allocation would be at least 45 mgd in 2030.

In the short term, all wastewater from Cary and Apex will be discharged to the Neuse River Basin, resulting in an interbasin transfer. The Towns have requested an increase in the transfer amount from 16 mgd to 27 mgd. Construction of a new WWTP in the Cape Fear River basin, with an initial capacity of 9 mgd, is planned to limit IBT. Future water demands will be offset by increased discharges to the Cape Fear River Basin in order to keep interbasin transfer from exceeding the requested 27-mgd maximum day amount.

The water intake screens and intake piping can handle a maximum flow of 50 mgd. Since the projected combined peak demands of Cary and Apex (with reserve capacity) will exceed 50 mgd by about 2021, this alternative requires replacement of the existing intake screens with larger screens and modification of the backwash air system. Also, the existing Cary/Apex WTP would be expanded incrementally to meet increased demands in the study period, and the distribution system would be upgraded to accommodate future demands.

2. Cape Fear River Supply and Increase in Jordan Lake Water Supply Allocation

Harnett County operates a water treatment plant in Lillington, with an intake on the Cape Fear River. The plant has a capacity of 12 mgd, and Harnett County has initiated a pilot-testing program to re-rate the plant's capacity to 18 mgd. This option expands the Harnett County water plant to 48 mgd, ultimately, at its present site. A maximum yield of 10 mgd is available under this option. This option would be implemented as a form of indirect reuse, increasing the water available for withdrawal at the Harnett County WTP through discharges to the Cape Fear River basin from a Cape Fear River regional WWTP. There is no net interbasin transfer for this arrangement. This option relies on a Cape Fear River regional WWTP.

This option utilizes the proposed finished water pipeline from the Harnett County WTP to Holly Springs as well as an existing interconnection with the Cary water distribution system, which could then provide the water to Morrisville. To supplement this water supply so that the Cary/Apex demand is met throughout the planning period, an additional Jordan Lake allocation would be needed. The details of this additional project can be seen in the explanation of Alternative 1.

3. Increase Jordan Lake Reservoir Full Pool Elevation

This option increases the available water supply pool for Jordan Lake Reservoir by modifying the Army Corps of Engineers (USACE) operating rules to raise the top of the conservation pool elevation from its present 216 ft. By preliminary evaluation of stage-storage relations for Jordan Lake, an additional 4.50 billion gallons (bg) of water supply pool could be created by raising the permanent pool elevation by 1 ft. This quantity of additional water supply pool could increase the safe yield from the lake by as much as 30 mgd. In addition to potential environmental impacts that would be addressed by an EIS or EA, recreational facilities at the lake would be impacted by the change in top of pool elevation.

Scenarios to modify the lake's operating rules would require a USACE Section 216 Study process before the Corps would assent to the proposed change. Raising the permanent pool would also decrease available flood storage in the reservoir. According to DWR staff, USACE approval to raise the permanent pool of Jordan Lake is not assured, and such an application could take several years.

4. Convert a Portion of Jordan Lake Sediment Storage to Water Supply Storage and Increase in Jordan Lake Water Supply Allocation

This option increases the Jordan Lake water supply pool by reclassifying a portion of the 24.3 bg of existing lake volume allocated to sediments. If 10 percent of present sediment storage were converted to water supply pool, the estimated additional water supply storage volume which could be obtained in this manner is 2.43 bg, which may increase the safe yield of the reservoir by as much as 16 mgd.

This option will require USACE involvement and concurrence to change the reservoir's operating rules. This option may be linked to Section 216 Studies and to implementation of additional best management practices to reduce rate of sedimentation. The USACE might require these practices to be adopted by all local governments which discharge stormwater to Jordan Lake to justify reclassification of sediment storage pool to water supply pool.

Regulatory approval to convert a portion of the sediment storage of Jordan Lake to water supply pool is not assured, and such an application could take several years. To supplement this water supply so that the Cary/Apex demand is met throughout the planning period, an additional Jordan Lake allocation would be needed. The details of this additional project can be seen in the explanation of Alternative 1.

5. Utilize Kerr Lake as Water Supply Resource and Increase in Jordan Lake Water Supply Allocation

This option draws water supply from the Kerr Lake reservoir. This option would construct a new WTP from a new intake structure. After treatment, the finished water would be provided to Cary, and then on to RTP South. Unless a corresponding quantity of treated effluent is returned to the Roanoke basin, this option includes an interbasin transfer.

Obtaining a municipal water supply allocation from Kerr Lake would require a USACE study process. USACE approval to obtain the Kerr Lake allocation is not assured due to competing users, and such an application could take several years.

To supplement this water supply so that the Cary/Apex demand is met throughout the planning period, particularly since a Kerr Lake supply would not be in place until 2022, an additional Jordan Lake allocation would be needed. The details of this additional project can be seen in the explanation of Alternative 1.

6. Utilize Harris Lake as Water Supply Source and Increase in Jordan Lake Water Supply Allocation

Harris Lake was developed by Carolina Power and Light (CP&L) as a reservoir for the storage of cooling water for its Shearon Harris nuclear power plant. At present, it is used for this, as well as some recreational uses.

Harris Lake is not presently classified as a water supply reservoir. According to permitting documents for the Shearon Harris plant, the storage volume between the normal and minimum lake levels contains approximately 15.4 bg and the safe yield of Harris Lake exceeds 11 mgd.

This option would classify Harris Lake as a water supply reservoir and utilize the lake as a Cary/Apex water source. Tritium is apparently present in Harris Lake, in quantities less than state water quality limits, so an evaluation of the lake prior to reclassification as a water supply will have to consider whether the quality of the Harris Lake water is safe.

This option includes construction of raw water intake facilities at Harris Lake and a new 10 to 15 mile raw water transmission main to the Cary/Apex WTP, depending on the intake location. To supplement this water supply so that the Cary/Apex demand is met throughout the planning period, particularly since this option could not be in effect until 2015, an additional Jordan Lake allocation would be needed. The details of this additional project can be seen in the explanation of Alternative 1.

7. Construct New Middle Creek Reservoir and Increase in Jordan Lake Water Supply Allocation

This option would develop a new Middle Creek reservoir as a joint venture with local governments in Wake County and Johnston County. Cary/Apex would have a 28 percent share in the safe yield from the new reservoir.

This option would include construction of a new dam, spillway and intake facilities; relocation of existing roads and bridges, including SR 1330 and possibly Interstate 40; construction of an approximately 30 mile raw water transmission pipeline from the intake to the Cary/Apex WTP and other regional partners; and expansion of the existing Cary/Apex WTP. To supplement this water supply so that the Cary/Apex demand is met throughout the planning period, particularly since this option could not be in effect until about 2022, an additional Jordan Lake allocation would be needed. The details of this additional project can be seen in the explanation of Alternative 1.

New or increased point source wastewater discharges by Cary and Fuquay-Varina to Middle Creek may affect the use of the creek for water supply. The creek has been given a biologic rating of "fair" to "poor" by DENR due to past nonpoint and point source wastewater discharges.

8. Participate in Expansion of Durhan's Lake Michie Reservoir and Interim Purchase from the City of Durham

Durham is considering raising the Lake Michie Dam to increase its water supplies. The study *Evaluation of Alternative Reservoirs on the Flat River and Little River* (Hazen and Sawyer, 1988), estimated that the 20-year safe yield of Lake Michie could be increased by 33 mgd if the dam is raised to elevation 380 ft. Durham has acquired approximately one-half of the 2,160 acres that would be submerged if Lake Michie were expanded to the 380 ft elevation.

This option would partner Cary/Apex with Durham to raise the Lake Michie Dam to 380 ft, with the additional safe yield translating to an average treated water supply of about 11 mgd from Durham. Cary/Apex would pay 33 percent of the project costs for a 33 percent share in the increased safe yield. Cary/Apex would contract with Durham to treat the water, would obtain the water through upgraded interconnections with Durham.

Since this option is located within the Neuse River basin, it has the potential to substantially reduce the quantity of interbasin transfer for Cary's water supply. To supplement this water supply so that the Cary/Apex demand is met throughout the planning period, water will be purchased from the City of Durham in the interim.

Attachment C

Alternative Cost Estimates

Alternative 1
Increase Jordan Lake Water Supply Allocation
23 MGD Allocation

	Unit	Quantity	Unit Cost	Item Cost
Pipeline Construction				
Open-Cut Pipe	LF	31,000	$123	$3,804,000
Pump/Booster Station Pump Systems				
Raw Water Intake Structure Modification	EA	1	$1,534,030	$1,534,000
WTP Expansion (40 mgd to 57 mgd)	EA	1	$18,510,625	$18,511,000
Mobilization/Demobilization			(7% of Construction Cost)	$1,669,000
Contingency			(10% of Construction Cost)	$2,385,000
Contractor's OH and Profit			(15% of Construction Cost)	$3,577,000
			Construction Costs (total)	$31,480,000
Engineering Design and Administration			(10% of Construction Cost)	$3,148,000
Legal and Administrative Costs			(5% of Construction Cost)	$1,574,000
Cost of Regulatory Requirements			(5% of Construction Cost)	$1,574,000
DWR Allocation Payment	EA	1	$600,000	$600,000
			Jordan Lake Capital Cost	$38,376,000
			Net Present Value of O&M Costs	$4,972,000
			Total Jordan Lake Costs	$43,348,000
			Incremental Supply (mgd)	23
			Unit Cost ($/gpd)	$1.88

Alternative 2
A Cape Fear River Supply and Increase in Jordan Lake Water Supply Allocation
23 MGD Total Supply

Cape Fear River Supply	**Unit**	**Quantity**	**Unit Cost**	**Item Cost**
Pipeline Construction				
Open-Cut Pipe	LF	72,000	$147	$10,603,000
Pump/Booster Station Pump Systems				
Finished Water Booster Pump Station	/mgd	16	$71,588	$1,145,000
Mobilization/Demobilization			(7% of Construction Cost)	$822,000
Contingency			(10% of Construction Cost)	$1,175,000
Contractor's OH and Profit			(15% of Construction Cost)	$1,762,000
			Construction Costs (Total)	$15,507,000
Engineering Design and Administration			(10% of Construction Cost)	$1,551,000
Legal and Administrative Costs			(5% of Construction Cost)	$775,000
Cost of Regulatory Requirements			(5% of Construction Cost)	$775,000
Capacity Payment to Harnett County			(for 16 mgd)	$14,400,000
			Cape Fear Capital Costs	$33,008,000
Net Present Value of O&M Costs (Includes Capacity Use Fees to Harnett County)				$102,438,000
			Total Cape Fear Costs	$135,446,000
Jordan Lake Water Supply				
WTP Expansion (40 mgd to 57 mgd)	EA	1	$18,510,625	$18,511,000
Raw Water Intake Structure Modification	EA	1	$1,534,030	$1,534,000
Raw Water Transmission Piping (add 24" line)	LF	31,000	$123	$3,804,000
Mobilization/Demobilization			(7% of Construction Cost)	$1,669,000
Contingency			(10% of Construction Cost)	$2,385,000
Contractor's OH and Profit			(15% of Construction Cost)	$3,577,000
Engineering Design and Administration			(10% of Construction Cost)	$3,148,000
Legal and Administrative Costs			(5% of Construction Cost)	$1,574,000
Cost of Regulatory Requirements			(5% of Construction Cost)	$1,574,000
DWR Allocation Payment		1	$600,000	$600,000
			Jordan Lake Capital Costs	$38,376,000
			Net Present Value of O&M Costs	$4,972,000
			Total Jordan Lake Costs	$43,348,000
			Total Net Present Value	$178,794,000
			Incremental Supply (mgd)	23
			Unit Cost ($/gpd)	$7.77

Alternative 3
Increase Jordon Lake Reservoir Full Pool Elevation
23 MGD Allocation

	Unit	Quantity	Unit Cost	Item Cost
Pipeline Construction				
Open-Cut Pipe	LF	31,000	$123	$3,804,000
Pump/Booster Station Pump Systems				
Raw Water Intake Structure Modification	EA	1	$1,534,030	$1,534,000
WTP Expansion (40 mgd to 57 mgd)	EA	1	$18,510,625	$ 18,511,000
Mobilization/Demobilization			(7% of Construction Cost)	$1,669,000
Contingency			(10% of Construction Cost)	$2,385,000
Contractor's OH and Profit			(15% of Construction Cost)	$3,577,000
			Construction Costs (total)	$31,480,000
Engineering Design and Administration			(20% of Construction Cost)	$6,296,000
Legal and Administrative Costs			(10% of Construction Cost)	$3,148,000
Cost of Regulatory Requirements			(10% of Construction Cost)	$3,148,000
DWR Allocation Payment		1	$600,000	$600,000
			Jordan Lake Capital Cost	$44,672,000
			Net Present Value of O&M Costs	$4,972,000
			Total Jordan Lake Costs	$49,644,000
			Incremental Supply (mgd)	23
			Unit Cost ($/gpd)	$2.16

Alternative 4
Convert a Portion of Jordan Lake Sediment Storage to Water Supply Storage and Increase in Jordan Lake Water Supply Allocation
23 MGD Allocation

	Unit	Quantity	Unit Cost	Item Cost
Pipeline Construction				
Open-Cut Pipe	LF	**31,000**	$123	$3,804,000
Pump/Booster Station Pump Systems				
Raw Water Intake Structure Modification	EA	1	$1,534,030	$1,534,000
WTP Expansion (40 mgd to 57 mgd)	EA	1	$18,510,625	$ 18,511,000
Mobilization/Demobilization		(7% of Construction Cost)		$1,669,000
Contingency		(10% of Construction Cost)		$2,385,000
Contractor's OH and Profit		(15% of Construction Cost)		$3,577,000
		Construction Costs (total)		$31,480,000
Engineering Design and Administration		(20% of Construction Cost)		$6,296,000
Legal and Administrative Costs		(10% of Construction Cost)		$3,148,000
Cost of Regulatory Requirements		(10% of Construction Cost)		$3,148,000
DWR Allocation Payment		1	$600,000	$600,000
			Jordan Lake Capital Cost	$44,672,000
			Net Present Value of O&M Costs	$4,972,000
			Total Jordan Lake Costs	$49,644,000
			Incremental Supply (mgd)	23
			Unit Cost ($/gpd)	$2.16

Alternative 5a
Utilize Kerr Lake as Water Supply Resource and Increase in Jordan Lake Water Supply Allocation
23 MGD Total Supply

	Unit	Quantity	Unit Cost	Item Cost
Kerr Lake Supply				
Pipeline Construction				
Open-Cut Pipe	LF	306,000	$172	$52,574,000
Open-Cut Pipe	LF	5,000	$172	$859,000
			Subtotal	$53,433,000
Pump/Booster Station Pump Systems				
Raw Water Intake and Pump Station	EA	1	$2,045,373	$2,045,000
Raw Water Booster Pump Station	/mgd	50	$71,588	$3,579,000
Finished Water Booster Pump Station	/mgd	3@50 mgd	$71,588	$10,738,000
			Subtotal:	$16,362,000
New Water Treatment Plant (50 mgd)	EA	1	$43,658,485	$ 43,658,000
Cary's Percentage of Above Costs		25%		$28,363,000
Cary-Only Costs Related to Kerr Lake				
WTP Expansion (40 mgd to 48 mgd)	EA	1	$10,983,653	$10,984,000
Raw Water Transmission Piping (add 24" line)	LF	31,000	$98	$3,044,000
Mobilization/Demobilization			(7% of Construction Cost)	$2,967,000
Contingency			(10% of Construction Cost)	$4,239,000
Contractor's OH and Profit			(15% of Construction Cost)	$6,359,000
			Construction Costs (total)	$55,956,000
Engineering Design and Administration			(20% of Construction Cost)	$11,191,200
Legal and Administrative Costs			(10% of Construction Cost)	$5,595,600
Cost of Regulatory Requirements			(10% of Construction Cost)	$5,595,600
Land/Easement Acquisition			(25% share of 300 acres at $10,000/acre)	$750,000
			Kerr Lake Capital Costs	$79,088,400
			Net Present Value of O&M Costs	$7,771,000
			Total Kerr Lake Costs	$86,859,400
Jordan Lake Water Supply				
Raw Water Intake Modification	EA	1	$1,534,030	$1,534,000
Mobilization/Demobilization			(7% of Construction Cost)	$107,000
Contingency			(10% of Construction Cost)	$153,000
Contractor's OH and Profit			(15% of Construction Cost)	$230,000
Engineering Design and Administration			(10% of Construction Cost)	$202,000
Legal and Administrative Costs			(5% of Construction Cost)	$101,000
Cost of Regulatory Requirements			(5% of Construction Cost)	$101,000
DWR Allocation Payment				$600,000
			Jordan Lake Capital Costs	$3,028,000
			Net Present Value of O&M Costs	$729,000
			Total Jordan Lake Costs	$3,757,000
			Total Net Present Value	$90,616,400
			Incremental Supply (mgd)	23
			Unit Cost ($/gpd)	$3.94

Alternative 5b
Utilize Kerr Lake as Water Supply Resource and Increase in Jordan Lake Water Supply Allocation
23 MGD Total Supply

Kerr Lake Supply					
Pipeline Construction	Unit	Quantity	Unit Cost		Item Cost
Open-Cut Pipe	LF	306,000	$172		$52,574,000
Open-Cut Pipe	LF	5,000	$172		$859,000
			Subtotal		$53,433,000
Pump/Booster Station Pump Systems					
Raw Water Intake and Pump Station	EA	1	$2,045,373		$2,045,000
Raw Water Booster Pump Station	/mgd	50	$71,588		$3,579,000
Finished Water Booster Pump Station	/mgd	3@50 mgd	$71,588		$10,738,000
			Subtotal:		$16,362,000
IBT Effluent Return Pipeline					
Effluent Transfer Pipeline (54-inch)	LF	274,560	$266		$73,005,000
Effluent Transfer Pipeline (42-inch)	LF	44,400	$192		$8,537,000
Effluent Transfer Pipeline (36-inch)	LF	69,700	$172		$11,975,000
Pump Station 1/Raleigh	mgd	13	$204,537		$2,659,000
Pump Station 2/Durham	mgd	17	$204,537		$3,477,000
Pump Station 3/Cary	mgd	10	$204,537		$2,045,000
Junction PS	mgd	40	$204,537		$8,181,000
Pipeline Clear and Grub (incl. easement preparation)	acres	10	$2,045		$20,000
Add for Rock Excavation (applied to 25% of total pipe length)	LF	97,165	$51		$4,968,000
Street/RR Crossings (Bore/Jack)	LF	2,000	$1,023		$2,045,000
Air Release Valves	EA	40	$39,885		$1,595,000
Street Repair (Asphalt Pavement Patch, 20% of total pipe length)	LF	77,732	$51		$3,975,000
Easement/Right of Way Restoration (80% of total pipe length)	LF	310,928	$6		$1,908,000
Traffic Control (applied to total project length in Street/ROW)	LF	77,732	$15		$1,192,000
			Subtotal:		$124,390,000
New Water Treatment Plant (50 mgd)	EA	1	$43,658,485	$	43,658,000
Cary's Percentage of Above Costs		25%			$59,461,000
Cary-Only Costs Related to Kerr Lake					
WTP Expansion (40 mgd to 48 mgd)	EA	1	$10,983,653		$10,984,000
Raw Water Transmission Piping (add 24" line)	LF	31,000	$98		$3,044,000
Mobilization/Demobilization			(7% of Construction Cost)		$5,144,000
Contingency			(10% of Construction Cost)		$7,349,000
Contractor's OH and Profit			(15% of Construction Cost)		$11,023,000
			Construction Costs (total)		$82,977,000
Engineering Design and Administration			(20% of Construction Cost)		$16,595,400
Legal and Administrative Costs			(10% of Construction Cost)		$8,297,700
Cost of Regulatory Requirements			(10% of Construction Cost)		$8,297,700
Land/Easement Acquisition		(25% share of 305 acres at $10,000/acre)			$762,500
Wetland Mitigation	acre	10	25,000		$250,000
			Kerr Lake Capital Costs		$117,180,300
			Net Present Value of O&M Costs		$13,323,000
			Total Kerr Lake Costs		$130,503,300
Jordan Lake Water Supply					
Raw Water Intake Modification	EA	1	$1,534,030		$1,534,000
Mobilization/Demobilization			(7% of Construction Cost)		$107,000
Contingency			(10% of Construction Cost)		$153,000
Contractor's OH and Profit			(15% of Construction Cost)		$230,000
Engineering Design and Administration			(10% of Construction Cost)		$202,000
Legal and Administrative Costs			(5% of Construction Cost)		$101,000
Cost of Regulatory Requirements			(5% of Construction Cost)		$101,000
DWR Allocation Payment		1	$600,000		$600,000
			Jordan Lake Capital Costs		$3,028,000
			Net Present Value of O&M Costs		$729,000
			Total Jordan Lake Costs		$3,757,000
			Total Net Present Value		$134,260,300
			Incremental Supply (mgd)		23
			Unit Cost ($/gpd)		$5.84

Alternative 6
Utilize Harris Lake as Water Supply Reservoir
23 MGD Total Supply

	Unit	Quantity	Unit Cost	Item Cost
Harris Lake Supply				
Pipeline Construction				
Open-Cut Pipe	LF	68,600	$123	$8,419,000
Pump/Booster Station Pump Systems				
Raw Water Intake and Pump Station	EA	1	$2,045,373	$2,045,000
Cary WTP Expansion (40 mgd to 57 mgd)	EA	1	$18,510,625	$18,511,000
Mobilization/Demobilization			(7% of Construction Cost)	$2,028,000
Contingency			(10% of Construction Cost)	$2,898,000
Contractor's OH and Profit			(15% of Construction Cost)	$4,346,000
			Construction Costs (total)	$38,247,000
Engineering Design and Administration			(20% of Construction Cost)	$7,649,000
Legal and Administrative Costs			(10% of Construction Cost)	$3,825,000
Cost of Regulatory Requirements			(10% of Construction Cost)	$3,825,000
			Harris Lake Capital Costs	$53,546,000
			Net Present Value of O&M Costs	$6,333,000
			Total Harris Lake Costs	$59,879,000
Jordan Lake Water Supply				
Raw Water Intake Structure Modification	EA	1	$1,534,030	$1,534,000
Raw Water Transmission Piping (add 24" line)	LF	31,000	$123	$3,804,000
Mobilization/Demobilization			(7% of Construction Cost)	$374,000
Contingency			(10% of Construction Cost)	$534,000
Contractor's OH and Profit			(15% of Construction Cost)	$801,000
			Construction Costs (total)	$7,047,000
Engineering Design and Administration			(10% of Construction Cost)	$705,000
Legal and Administrative Costs			(5% of Construction Cost)	$352,000
Cost of Regulatory Requirements			(5% of Construction Cost)	$352,000
			Jordan Lake Capital Costs	$8,456,000
			Net Present Value of O&M Costs	$1,453,000
			Total Jordan Lake Costs	$9,909,000
			Total Net Present Value	$69,788,000
			Incremental Supply (mgd)	23
			Unit Cost ($/gpd)	$3.03

Alternative 7
Construct New Middle Creek Reservoir
23 mgd Total Supply

	Unit	Quantity	Unit Cost	Item Cost
Middle Creek Reservoir				
I. Dam and Reservoir Construction				
Reservoir Site Preparation/Clearing	Acres	1,600	$3,068	$4,909,000
New Dam	cubic yard	187,200	$128	$23,931,000
Electrical/I&C Allowance (8% of Dam cost)	EA	1	$1,914,480	$1,914,000
Water Quality/Sediment Control	EA	1	$1,000,000	$1,000,000
Access Roads	EA	1	$520,000	$520,000
Finishes (Site Work,Piezometers, etc -10% of Dam Cost)	EA	1	$2,340,000	$2,340,000
Road and Bridge Relocations/Replacement	EA	1	$7,000,000	$7,000,000
			Subtotal	$41,614,000
II. Finished Water Transmission				
FW Transmission Line (30 inch)	LF	33,900	$127	$4,299,000
FW Transmission Line (24 inch)	LF	119,612	$102	$12,233,000
FW Booster Pump Station 1 (Cary)	mgd	15	$204,537	$3,068,000
Pipeline Clear and Grub (incl. easement preparation)	Acres	10	$2,045	$20,000
Add for Rock Excavation (applied to 25% of pipe length)	LF	38,378	$51	$1,962,000
Street/RR Crossings (Bore/Jack)	LF	600	$511	$307,000
Air Release Valves	EA	20	$2,045	$41,000
Street Repair (Asphalt Patch, 20% of total pipe length)	LF	30,702	$36	$1,099,000
Easement/ROW Restoration (80% of pipe length)	LF	122,810	$5	$628,000
Traffic Control (applied to project length in Street/ROW)	LF	153,512	$15	$2,355,000
			Subtotal	$26,012,000
III. Water Treatment Plant with Raw Water Intake and Conveyance				
New Middle Creek Regional WTP	EA	1	$53,339,236	$53,339,000
RW Intake Structure	EA	1	$3,857,751	$3,858,000
RW Transmission Piping (dual 54 inch lines)	LF	10,560	$221	$2,333,000
			Subtotal	$59,530,000
Cary's Percentage of Above Costs		29%		$36,875,000
Mobilization/Demobilization			(7% of Construction Cost)	$2,581,000
Contingency			(10% of Construction Cost)	$3,688,000
Contractor's OH and Profit			(15% of Construction Cost)	$5,531,000
			Construction Costs, Total	$48,675,000
Engineering Design and Administration			(20% of Construction Cost)	$9,735,000
Legal and Administrative Costs			(10% of Construction Cost)	$4,868,000
Cost of Regulatory Requirements			(10% of Construction Cost)	$4,868,000
Land/Easement Acquisition (29% Share)	Acres	1,600	$10,000	$4,640,000
Wetland Mitigation (29% Share)	Acres	2,280	$30,000	$19,836,000
			Middle Creek Capital Costs	$92,622,000
			Net Present Value of O&M Costs	$5,060,000
			Total Middle Creek Costs	$97,682,000
Jordan Lake Water Supply				
WTP Expansion (40 mgd to 49 mgd)	EA	1	$12,354,053	$12,354,000
Raw Water Intake Structure Modification	EA	1	$1,534,030	$1,534,000
Raw Water Transmission Piping (add 24" line)	LF	31,000	$98	$3,044,000
Expand Cary/Apex WTP (49 mgd to 57 mgd)	EA	1	$12,292,691	$12,293,000
Mobilization/Demobilization			(7% of Construction Cost)	$2,046,000
Contingency			(10% of Construction Cost)	$2,923,000
Contractor's OH and Profit			(15% of Construction Cost)	$4,384,000
			Construction Costs (total)	$38,578,000
Engineering Design and Administration			(10% of Construction Cost)	$3,858,000
Legal and Administrative Costs			(5% of Construction Cost)	$1,929,000
Cost of Regulatory Requirements			(5% of Construction Cost)	$1,929,000
DWR Allocation Payment				$600,000
			Jordan Lake Capital Costs	$46,894,000
			Net Present Value of O&M Costs	$5,476,000
			Total Jordan Lake Costs	$52,370,000
			Total Net Present Value	$150,052,000
			Incremental Supply (mgd)	23
			Unit Cost ($/gpd)	$6.52

Alternative 8
Participate in Expansion of Durham's Lake Michie Reservoir
23 MGD

Expand Lake Michie				
	Unit	**Quantity**	**Unit Cost**	**Item Cost**
Dam Site Preparation	EA	1	$1,354,037	$1,354,000
Dam Embankment	EA	1	$5,583,868	$5,584,000
Principal Spillway	EA	1	$16,477,524	$16,478,000
Diversion Conduit	EA	1	$4,820,944	$4,821,000
Intake Tower	EA	1	$2,540,353	$2,540,000
Pumping Station	EA	1	$3,796,212	$3,796,000
Decommissioning of Existing Facility	EA	1	$281,239	$281,000
Access Roads	EA	1	$576,795	$577,000
Site Work	EA	1	$727,130	$727,000
Electrical	EA	1	$1,381,649	$1,382,000
Reservoir Clearing	EA	1	$661,678	$662,000
Road Relocations	EA	1	$5,829,313	$5,829,000
Modifications to Existing Utilities	EA	1	$607,476	$607,000
Cary's Portion of the Above Costs:		36%		$16,259,000
Mobilization/Demobilization			(7% of Construction Cost)	$1,138,000
Contingency			(10% of Construction Cost)	$1,626,000
Contractor's OH and Profit			(15% of Construction Cost)	$2,439,000
			Construction Cost (total)	$21,462,000
Engineering Design and Administration			(20% of Construction Cost)	$4,292,000
Legal and Administrative Costs			(10% of Construction Cost)	$2,146,000
Cost of Regulatory Requirements			(10% of Construction Cost)	$2,146,000
Land/Easement Acquisition			(Cary's Portion of 1070 acres at $10,000/acre)	$3,897,000
			Lake Michie Capital Costs	$33,943,000
			Net Present Value of O&M Costs	$2,782,000
			Net Present Value of Costs for Interim Water Purchases from Durham	$7,951,000
			Total Lake Michie Costs	$44,676,000

Jordan Lake Water Supply				
Pipeline Construction	LF	31,000	$123	$3,804,000
Raw Water Intake Structure Modification	EA	1	$1,534,030	$1,534,000
WTP Expansion (40 mgd to 57 mgd)	EA	1	$18,510,625	$18,511,000
Mobilization/Demobilization			(7% of Construction Cost)	$1,669,000
Contingency			(10% of Construction Cost)	$2,385,000
Contractor's OH and Profit			(15% of Construction Cost)	$3,577,000
			Total Construction Costs:	$31,480,000
Engineering Design and Administration			(10% of Construction Cost)	$3,148,000
Legal and Administrative Costs			(5% of Construction Cost)	$1,574,000
Cost of Regulatory Requirements			(5% of Construction Cost)	$1,574,000
DWR Allocation Payment				$600,000

Jordan Lake Capital Costs	$38,376,000
Net Present Value of O&M Costs	$4,972,000
Total Jordan Lake Costs	$43,348,000
Total Net Present Value	$88,024,000
Incremental Supply (mgd)	23
Unit Cost ($/gpd)	$3.83

Attachment D

Maps of Service Areas and Facilities

Attachment E

Cary Conservation Ordinance

Attachment F

Apex Conservation Ordinance

Attachment G

Draft Jordan Lake Water Quality Monitoring Plan