Jordan Lake Water Supply Storage Allocation Application

Town of Morrisville

Prepared for

Town of Morrisville

Post Office Box 166
Morrisville, North Carolina 27560

MAY 2001

Prepared By

CH2MHILL

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TOWN OF MORRISVILLE
P.O. Box 166
Morrisville, NC 27560
919-469-1426

May 29, 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

Dear Mr. Morris:

SUBJECT: Jordan Lake Water Supply Allocation Application - Round 3

The Town of Morrisville, in preparing to meet future potable water demands, is submitting this application for an increased allocation from Jordan Lake. Morrisville is prepared to enter into a 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 Town of Morrisville requests approval of the following allocations:

Level I:	4 mgd (includes current 2.5 mgd recommended allocation)
Level II:	1 mgd

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

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. Morrisville is committed to abiding by our requested interbasin transfer through the 2050 planning period.

Please note that Morrisville has cooperated with Wake County/Research Triangle Park and the towns of Cary and Apex 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.

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

Respectfully,

David P. Hodgkins
Town Manager

Introduction

The Town of Morrisville is located strategically between Raleigh, Durham, and Cary in western Wake County. The Town limits are adjacent both to the Research Triangle Park (RTP) and the Raleigh/Durham International Airport. As the RTP region continues to prosper, Morrisville has experienced tremendous growth as support industries wishing to be close to RTP and the airport locate there.

An important element of water resource planning is identifying a dedicated water source for Morrisville to meet forecasted demands. As a part of this process, the Town of Morrisville is applying for a water supply allocation from Jordan Lake. Currently, Morrisville buys its water from the Town of Cary, though an allocation for 2.5 mgd was recommended by the Division of Water Resources (DWR) in the second round of the Jordan Lake water supply storage allocation process. Morrisville plans to continue its contract with Cary for treatment and transmission of its allocation from Jordan Lake.

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 - Local Water Supply Plan
Attachment B - Map of the Morrisville service area
Attachment C – Alternative Cost Estimates
Attachment D - Morrisville Conservation Ordinance
Attachment E - Draft Water Quality Monitoring Plan

1. Water Demand Forecast

1.1 Methodology

The forecasted water demand for the Morrisville 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), *Town of Apex Land Use Plan Update* (1996), *Town of Cary Growth Management Plan* (2000) and projections by the Town of Morrisville staff. Growth and development projections were also based on population and socioeconomic data provided by the Capital Area Metropolitan Planning Organization (CAMPO) to develop the 2025 Transportation Plan. The growth and development projections assume the Urban Services Area (USA) as the basis of the ultimate municipal water and sewer services area.

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

- Residential
- Non-Residential
- 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 (MG) and the usage per account is expressed in gallons per day (gpd). The Town of Morrisville maintains a single residential account classification. For Morrisville, the residential designation applies to all individually-metered residential accounts, whether they are detached dwellings or apartment/condominium units, and includes irrigation for residential accounts. Approximately 1,900 apartment units in master metered apartment complexes were included in the commercial category in approximately 155 accounts. For the purposes of this application, domestic water use for apartments metered in commercial accounts is accounted for under the residential use sector and is not included in the non-residential use sector demand projections. Non-domestic uses at the master-metered apartment complexes, such as landscape irrigation or recreation, remain in the non-residential use sector.

Table 1-1 summarizes water use by the residential sector in the Town of Morrisville from 2000. Per-unit and per capita estimates of water use in the residential sector was based upon the combined uses of individually-metered and master-metered residences (3,985 units in year 2000). Water use in the master-metered apartments was assumed to be 75 gpd per capita or 122 gpd per apartment unit (based on regional averages for similar uses. The presumed multi-meter apartment unit factor was multiplied by 1,900 and deducted from the

historic commercial water use, so that the residential water use sector could reflect all residential use in the Town. The resulting 2000 unit water usage for the residential sector was 128 gpd per residential account or 79 gpd per capita, comparable with regional benchmarks for residential water use. Though the year-end population for Morrisville is about 7,000 persons, the mid-year population of 6,500 is more representative for establishment of an average residential use factor.

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

Year	Residential Housing Units	Residential Water Use (MG)[1]	Unit Water use (gpd per housing unit)	Average Usage per Capita (gpcd)[2]
2000	3,985	187.4	128	72 (year-end population) 79 (mid-point population)

Source: Town of Morrisville.

[1] Includes water use for 1,900 master-metered apartment units, which are in approximately 155 customer accounts.

[2] Per-capita water use based on year-end 2000 population of 7,000, and mid-year population of 6,500

1.2.2 Non-Residental Use Sector

The Non-residential water demand forecasts were based on employment and account information for Morrisville. Non-residential accounts by Morrisville are not disaggregated. However, an evaluation of year 2000 data indicates that water use by three industrial accounts accounted for an average day demand of 0.11 mgd, or 32 percent of the total non-residential demand. These three industrial accounts were each in the Town's top 10 water users for year 2000. Unfortunately, since non-residential accounts are not disaggregated, a full accounting of commercial, industrial and institutional accounts could not be performed.

The non-residential use sector includes water use by businesses, including retail, service, industry, offices, churches, golf courses, health care, hotels, restaurants, commercial irrigation, common area uses in master-metered apartment complexes, and car washes. The non-residential use sector also includes irrigation use by non-residential customers. The growth in the non-residential 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. Industrial water use is less directly linked to population growth, but constitutes a minority of non-residential water use in Morrisville.

As indicated in Table 1-2, overall non-residential usage in Morrisville averaged about 537 gpd per account and 47 gpd per employee in 2000.

Since disaggregated data is not available for the Morrisville non-residential use sector, the Commercial, Industrial and Institutional use factors appear to be a suitable regional alternative for the purposes of estimating future water demand, provided certain distinctive aspects of Morrisville's industrial community are considered. Commercial development in

Morrisville is expected to be similar to Cary's, which has remained a consistent 77 gpd per commercial employee over 1998 and 1999.

Cary's industrial water use factor was 19 gpd per industrial employee based on 1998 and 1999 data; this use factor appears appropriate for most future growth, but does not adequately address heavy water-use industrial accounts in Morrisville. As noted earlier, 3 industrial accounts with about 200 employees and year 2000 average water use totalling 0.11 mgd are among Morrisville's top ten water users. The use of Cary's 19 gpd per employee factor is multiplied by Morrisville's TAZ-estimated 1,883 industrial employees to yield a year 2000 projection of industrial water use of about 36,000 gpd. To more accurately project Morrisville's future industrial water demand, the present needs of these facilities must be set aside, with their employment, and the Cary use factor applied to the remaining Morrisville industrial employment estimate from TAZ.

Cary's institutional sector use factor was based upon evaluation of 1995 through 1999 data for its *Town of Cary Water System Master Plan*. This factor will be applied to estimate Morrisville's institutional sector use.

TABLE 1-2
Historical Non-Residential Water Usage - Town of Morrisville
Jordan Lake Water Supply Storage Allocation Application

Year	Non-Residential Accounts	Non-Residential Water Use (MG)	Usage per Account (gpd)	Non-Residential Usage per capita (gpd)	Non-Residential Employment (TAZ Estimate)	Non-Residential Usage per Employee (gpd)
2000	641	125.65	537	53	7,352	47

Source: Town of Morrisville, Employment estimates from CAMPO

1.2.3 Process Water

Since the water used by Morrisville is purchased by contract from the Town of Cary, the Morrisville system has no record of process water losses. Based on process water loss data from the Cary/Apex Water Treatment Plant (WTP) for 1997-2000, a 9 percent allowance for process water losses is included in the allocation request.

1.2.4 Unaccounted-For Water

Based on an analysis of 1993 through 2000 data, unaccounted-for water averaged approximately 6 percent of the Morrisville water system demand.

1.2.5 Summary of Historic Water Use

Table 1-3 summarizes historic water use factors for Morrisville and the combined system. Year 2000 water use factors will be used to determine future water demand, except where non-historic water use factors are justified by substantive changes to the historic conditions.

TABLE 1-3
Population and Account Growth Forecasts

	Morrisville Use Factor
Residential	**79 gpcd**
Non-Residential	
Commercial Subcategory	**77 gpd per employee**
Industrial Subcategory	**19 gpd per employee (3 existing industrial accounts with year 2000 demand of 0.11 mgd are provided separate allocation)**
Institutional Subcategory	**2% of residential use**
Process Water	**9 %**
Unaccounted-For Water	**6 %**

1.3 Population Projections

Historic population data shows that Morrisville has increased in population from a rural community of 222 in 1960 to a year 2000 population of 7,000. A primary driver for the growth of western Wake County has been development linked to the Research Triangle Park, which brought an influx of technical and business professionals to the area.

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, up-to-date 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 Town staff through year 2000.

Growth in the number of residential accounts is projected based on the Town of Morrisville's estimates of population growth during the 2000-2050 planning horizon. The Town anticipates its population will grow to buildout capacity during the planning horizon. Based on data provided by the Town of Morrisville, Table 1-4 shows anticipated populations and corresponding residential account "meter equivalents" through 2050. The service area population is expected to increase from 7,000 in 2000 (6,500 mid-year population is used for water use forecasts, for consistency with use factor derivation) to 27,000 in 2030, then stabilize at this population for the period 2030 through 2050. This represents an increase of approximately 315% in combined service area population, and an average annual rate of increase of 10%. The year 2000 average of about 0.61 residential meter equivalents per capita is used. Institutional water demand is estimated to grow as 2% of residential demand.

For purposes of forecasting water demands, the non-residential water usage was disaggregated into commercial and industrial demands from the available employment projections in the TAZ data. Water water demand in these sectors is estimated to grow in proportion to employment growth in each sector, as projected in TAZ data. TAZ employment projections are included in Table 1-4.

1.4 Water Demand Forecasts

Average day water demand forecasts are based upon the methods presented in Section 1.1 and are summarized in Table 1-5. Average day water demands for the Morrisville service area are expected to increase from about 1 mgd in 2000 to about 3.7 mgd in 2050.

TABLE 1-4
Population and Account Growth Forecasts - Morrisville

Year	Morrisville Population Forecast	Total Residential Account "Meter Equivalents"	TAZ Employment Projections		
			Commercial	Industrial	Total Employment
2000	7,000 (year-end)	3,965	5,469	1,883	7,352
2005	14,700	8,967	6,231	2,450	8,681
2010	17,750	10,828	7,831	3,364	11,196
2015	20,800	12,688	9,432	4,279	13,711
2020	23,900	14,579	11,399	5,845	17,244
2025	27,000	16,470	13,366	7,411	20,777
2030	27,000	16,470	13,366	7,411	20,777
2035	27,000	16,470	13,366	7,411	20,777
2040 and beyond	27,000	16,470	13,366	7,411	20,777

Source: Town of Morrisville

TABLE 1-5
Projected Average Daily Water Demand – Morrisville Service Area (in million gallons per day)

	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Residential	0.50	1.13	1.36	1.60	1.84	2.08	2.08	2.08	2.08	2.08	2.08
Commercial	0.42	0.49	0.60	0.73	0.88	1.03	1.03	1.03	1.03	1.03	1.03
Industrial	0.14	0.15	0.17	0.19	0.22	0.25	0.25	0.25	0.25	0.25	0.25
Institutional	0.01	0.02	0.03	0.03	0.04	0.04	0.04	0.04	0.04	0.04	0.04
Process Water Losses	0.10	0.16	0.20	0.23	0.27	0.31	0.31	0.31	0.31	0.31	0.31
Unaccounted-for Water	0.06	0.11	0.13	0.15	0.18	0.20	0.20	0.20	0.20	0.20	0.20
Projected Water Conservation Savings	(0.00)	(0.06)	(0.10)	(0.12)	(0.15)	(0.17)	(0.17)	(0.17)	(0.17)	(0.17)	(0.17)
Total Service Area Demand	1.21	2.00	2.39	2.80	3.27	3.73	3.71	3.71	3.71	3.71	3.71

2. Conservation and Demand Management

Morrisville has demonstrated its commitment to water conservation to reduce water demands and increase the efficient utilization and protection of existing natural resources. The anticipated increase in projected water demands for Morrisville will exceed limits on the water purchase agreement with the Town of Cary, which is also experiencing rapid growth and water demands which exceed the existing capacity of the Cary/Apex WTP. To help in maintaining an adequate supply, both Cary and Morrisville are pursuing reductions in demand, including the actions and ordinances described below.

- **Communicating with Customers.** The Town distributes a monthly newsletter to all water utility customers. The newsletter conveys public education information such as water-wise irrigation tips, indoor water conservation advice, and the like.
- **Water Conservation Policy.** In 2000, the Town instituted water use restrictions for Odd-Even Day outdoor watering during the growing season. The Town intends these restrictions to be instituted yearly.
- **Rain Gauges.** The Town distributed rain gauges for irrigation systems as a means of encouraging water-wise residential and commercial irrigation.

In its conservation goals for Round 2 of the Jordan Lake allocation application process, Morrisville anticipated that the combined impact of proposed water conservation programs would yield a 2 percent reduction by year 2000, increasing to 10 percent in the year 2005 and 14 percent in the year 2010. Estimated conservation impact for the the 2015-2050 planning horizon was expected to approach a 20 percent reduction in per capita water use. The baseline for these estimates was the 1997-1998 average of overall per-capita water use (total water demand divided by the population), which was 204 gpcd. The target for Morrisville's overall per-capita demand was 170 gpcd, a 20% reduction. Construction of of water-conserving irrigation and residential water systems has reduced the overall per-capita water demand significantly, so that year 2000 overall per-capita demand was 131 gpcd.

Morrisville anticipates further reductions in water demand beyond the returns to date, as its conservation programs yield changes in water use patterns and as water-conserving housing and irrigation systems increase and existing residences are retrofitted with water-conserving plumbing fixtures. An additional 5% reduction in overall water demand is anticipated.

Reuse of treated wastewater effluent is a desirable means for Morrisville to reduce its water demand, but since its wastewater treatment operations and disposal are contracted with the Town of Cary, and Cary's recent *Water Reuse Plan* does not identify the Town of Morrisville for reuse projects, Morrisville is not presently in a position to commit to a reuse program. Morrisville will continue to discuss reuse options with its water service provider, and will cooperate should extension of the reuse program into Morrisville should this be proposed by Cary.

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

Reduction in Water Demand	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Residential	0.01	0.02	0.05	0.06	0.06	0.07	0.07	0.07	0.07	0.07	0.07
Non-residential	0.01	0.03	0.05	0.07	0.09	0.10	0.12	0.12	0.12	0.12	0.12
Water Reuse	0	0	0	0	0	0	0	0	0	0	0
Total Reduction	0.02	0.05	0.10	0.13	0.15	0.17	0.19	0.19	0.19	0.19	0.19

3. Current Water Supply

Morrisville's current water source is Jordan Lake, through the treatment and distribution facilities of the Town of Cary. The Cary water contract provides for delivery of up to 1 mgd from Cary to Morrisville. The water is treated at the Cary/Apex Water Treatment Plant (WTP) and is delivered to Morrisville through the Town of Cary's transmission system and three metered interconnections. The Town of Cary has agreed to plan for supplying Morrisville with water, but advised that an allocation from Jordan Lake would be needed.

The Town of Morrisville has a secondary contract for water from the City of Durham, which is provided from the Town of Cary metered interconnection with Durham and through the Town of Cary's transmission system and the three metered interconnections with Morrisville.

Details of the current water supply source are shown in Table 3-1.

TABLE 3-1
Current Water Supply Sources
Town of Morrisville

Source Name	Source Location		Source Type (surface, ground, purchase)	Estimated Yield	Water Quality (excellent, good, poor)
	County	River Basin			
Cary (Jordan Lake)	Chatham	Cape Fear (Haw River Sub-Basin)	purchase	1.0 mgd [a]	good
Durham (Lake Michie)	Durham	Neuse	Purchase	1.8 mgd [a]	good

[a] Contracted amount.

4. Future Water Supply Needs

Based on the water demand forecasts presented in Section 1 and the water supply allocation of 2.5 mgd (upon completion of the pending Round 2 Interbasin Transfer certificate process), the future water supply needs for the Town of Morrisville service area are summarized in Table 4-1. Morrisville will have a water supply deficit when average day demands exceed the allocation, beginning in 2017.

Due to continued growth within the service area of Morrisville, average day water demands are projected to increase to approximately 3.7 mgd by 2025 and to remain at this level through 2050. Morrisville is pursuing several alternatives for expanding its water supply capacity, including the water conservation efforts described in Section 2. The water supply deficit based on the projected 2.5 mgd Round 2 water supply allocation is estimated to be 2.1 mgd for 2030 through 2050, on the expectation that supply should be sufficient such that demand not exceed 80 percent of average day demand.

TABLE 4-1
Future Water Supply Needs
Morrisville 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	0	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
(2) Existing Ground Water Supply	0	0	0	0	0	0	0	0	0	0	0
(3) Existing Purchase Contracts	2.8	1.8	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	2.8	4.3	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Average Daily Demand											
(6) Service Area Demand	1.0	2.1	2.5	2.9	3.3	3.7	3.7	3.7	3.7	3.7	3.7
(7) Existing Sales Contracts	0	0	0	0	0	0	0	0	0	0	0
(8) Future Sales Contracts	0	0	0	0	0	0	0	0	0	0	0
(9) Total Average Daily Demand	1.0	2.1	2.5	2.9	3.3	3.7	3.7	3.7	3.7	3.7	3.7
(10) Demand as Percent of Supply	36%	49%	100%	116%	132%	148%	148%	148%	148%	148%	148%
(11) Supply Needed to Maintain 80%	1.2	2.6	3.1	3.6	4.1	4.7	4.6	4.6	4.6	4.6	4.6
Additional Information for Jordan Lake Allocation											
(12) Sales Under Existing Contracts	0	0	0	0	0	0	0	0	0	0	0
(13) Sales Under Future Contracts	0	0	0	0	0	0	0	0	0	0	0
(14) Demand in Each Planning Period	1.0	2.1	2.5	2.9	3.3	3.7	3.7	3.7	3.7	3.7	3.7
(15) Supply Minus Demand	1.8	2.2	0.0	-0.4	-0.8	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2

5. Alternative Water Supplies

Morrisville has 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) and are also included in the Cary/Apex water supply allocation application. Morrisville would implement these alternatives in cooperation with Cary/Apex through pro-rated purchase of capacity in expanded treatment and transmission facilities. 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 an initial 2.5 mgd Morrisville allocation of Jordan Lake water supply storage, is a basis of all Morrisville water supply alternatives.

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

Water Supply Alternative	Description
1	a) Implement Water Conservation/Reuse Programs b) Increase Jordan Lake Water Supply Allocation to 5 mgd
2	a) Implement Water Conservation/Reuse Programs b) Obtain Water Supply from Cape Fear River
3	a) Implement Water Conservation/Reuse Programs b) Obtain additional Jordan Lake Water Supply Allocation by Raising Lake Permanent Pool Elevation
4	a) Implement Water Conservation/Reuse Programs b) Obtain additional Jordan Lake Water Supply Allocation by Converting a Portion of Lake Sediment Storage Pool to Water Supply Pool
5	a) Implement Water Conservation/Reuse Programs b) Utilize Kerr Lake as a Water Supply c) Increase Jordan Lake Water Supply Allocation to 5 mgd
6	a) Implement Water Conservation/Reuse Programs b) Utilize Harris Lake as a Water Supply
7	a) Implement Water Conservation Programs b) New Reservoir on Middle Creek c) Increase Jordan Lake Water Supply Allocation to 5 mgd
8	a) Implement Water Conservation Programs b) Raise Lake Michie Water Surface Elevation c) Increase Jordan Lake Water Supply Allocation to 5 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. Summaries of each alternatives follow.

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

	Alternatives			
Alternative Number	**1**	**2**	**3**	**4**
Alternative Description	**Jordan Lake**	**Cape Fear River/Harnett**	**Change Jordan Lake Operating Rules**	**Convert Jordan Lake Sediment Storage**
Total Supply (MGD)	2.5	2.5	2.5	2.5
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)	none	none	none	none
Regional Partnerships	yes	yes	yes	yes
Technical Complexity	complex	complex	complex	complex
Institutional Complexity	complex	complex	very complex	very complex
Political Complexity	complex	complex	very complex	very complex
Public Benefits	no	no	few	no
Consistency with Local Plans	yes	yes	yes	yes
Total Capital Cost ($ Millions)	$3.85	$15.89	$4.41	$4.41
Unit Cost (NPV/SY-50, $/gpd)	$1.54	$6.36	$1.76	$1.76

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

	Alternatives			
	5	**6**	**7**	**8**
Alternative Description	**Kerr Lake**	**Harris Lake**	**Middle Creek**	**Expand Lake Michie**
Total Supply (MGD)	2.5	2.5	2.5	2.5
Environmental Impacts	worse	worse	worse	worse
Water Quality Classification	WS III B	WS V	C NSW	WS III NSW
Interbasin Transfer (MGD)	(a) 1 mgd	none	none	none
	(b) 0 mgd			
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	yes	yes	yes	yes
Total Capital Cost ($ Millions)	(a) $8.06	$6.26	$13.13	$7.83
	(b) $13.66			
Unit Cost (NPV/SY-50, $/gpd)	(a) $3.22	$2.50	$5.25	$3.13
	(b) $5.46			

The costs cited in Tables 5-2A and 5-2B 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.

1. Increase Jordan Lake Water Supply Allocation

This option increases the allocation for withdrawals through the Cary/Apex WTP existing raw water intake on the east bank of Jordan Lake. To satisfy water demand for the Morrisville service area in accordance with Table 4-1, the required water allocation would be at least 4 mgd in 2025.

In the short term, water withdrawn by Cary from Jordan Lake is discharged as wastewater into the Neuse River basin, so the ongoing interbasin transfer (IBT) application to DENR supports the Jordan Lake allocation increase approach. Construction of a new WWTP in the Cape Fear River basin, with an initial capacity of 9 mgd, is planned to mitigate the IBT within 5 years. Subsequent increases in water demand could be offset by corresponding increases in Cape Fear River discharge of effluent.

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 by about 8 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 Morrisville is $3.85 million. The unit cost is $1.54 per gallon of additional water supply. Costs include capital and O&M costs for the construction of facilities.

	Comments
Available Supply	2.5 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 IBT with corresponding expansion of Cape Fear WWTP.
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 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, as well as allocation costs.

2. Cape Fear River Supply

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 of 16 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 an equivalent quantity of 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.

Total Net Present Value of this alternative for Morrisville is $15.89 million. The unit cost is $6.36 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	2.5 mgd
Environmental Impacts	No adverse impact on environment anticipated.
Water Quality Classification	WS IV CA
Timeliness	Harnett County WTP expansion online about 2006. West Cary WWTP completed in 2010.
Interbasin Transfer	No increase in IBT with corresponding expansion of Cape Fear WWTP.
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 4.50 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/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.

Total Net Present Value of this alternative for Morrisville is $4.41 million. The unit cost is $1.76 per gallon of additional water supply. Costs include capital and O&M costs for the construction of facilities.

	Comments
Available Supply	2.5 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 IBT with corresponding expansion of Cape Fear WWTP.
Regional Partnerships	Raising Jordan Lake permanent pool creates a larger water supply pool, and other regional utilities may desire allocation increases. Coordination with other utilities is necessary to develop regional water supply approach for Jordan Lake which 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 existing Cary/Apex raw water supply intake.
Institutional Complexity	Option 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 Morrisville portion of 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.

Total Net Present Value of this alternative for Morrisville is $4.41 million. The unit cost is $1.76 per gallon of additional water supply. Costs include capital and O&M costs for the construction of facilities.

	Comments
Available Supply	2.5 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 27 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

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 Morrisville. 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 Morrisville 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 Morrisville is $8.06 million, with a unit cost of $3.22 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 $13.66 million and a unit cost of $5.46 per gallon of additional water supply. Costs include capital and O&M costs for the construction of facilities.

	Comments
Available Supply	2.5 mgd maximum
Environmental Impacts	No adverse impact on environment anticipated as a result of new intake and pipeline. Impoundment near proposed intake site 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, 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 Cary, Durham and Raleigh as part of a regional approach. In addition, use of Kerr Lake will involve interstate coordination, as NC/VA municipalities rely on Kerr Lake as water source.
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 between Morrisville, Cary, Raleigh and Durham.
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

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. The reservoir's average annual flow yield is about 0.4 cfs/mi^2, measured downstream of the lake. 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 WTP water source. Tritium is apparently present in Harris Lake, in quantities less than state water quality limits. 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 compatible with that use.

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. Interim Jordan Lake allocation is required, since Kerr Lake supply would not be in place until 2015.

Total Net Present Value of this alternative for Morrisville is $6.26 million. The unit cost is $2.50 per gallon of additional water supply. Costs include capital and O&M costs for the construction of facilities.

	Comments
Available Supply	2.5 mgd
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, but 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 IBT with corresponding expansion of Cape Fear WWTP.
Regional Partnerships	Reclassifying Harris Lake as a water supply reservoir creates a water supply pool, but CP&L as well as other regional utilities may desire an allocation.
Technical Complexity	This option would not alter the dam facilities or reservoir permanent pool. 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, 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

Middle Creek is a tributary of the Neuse River in southern Wake County. This option would develop a new Middle Creek reservoir as a joint venture with local governments in Wake County and Johnston County. 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 new raw water transmission facilities approximately 30 miles from the intake to the Cary/Apex WTP and other regional partners; and expansion of the existing Cary/Apex WTP. Interim Jordan Lake allocation is required, since Middle Creek supply would be in place no earlier than 2022.

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.

Total Net Present Value of this alternative for Morrisville is $13.13 million. The unit cost is $5.25 per gallon of additional water supply. Costs include capital and O&M costs for the construction of facilities.

	Comments
Available Supply	2.5 mgd
Environmental Impacts	Potential impacts to existing wetlands and uplands from submergence. Water withdrawal from Neuse River may have impact upon 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	This does not involve IBT if sufficient wastewater discharged to Neuse Basin.
Regional Partnerships	Increasing Cary/Apex WTP water supply from Neuse River basin may reduce the yield available to downstream regional utilities. Coordination with Smithfield/Johnston County, Goldsboro, Kinston and others may be necessary to develop regional water supply approach for Neuse River.
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; Difference in Middle Creek water quality from existing Jordan Lake quality may require modification of treatment approach.
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
Consistency with Local Plans	N/A
Cost	Capital expenditures for land acquisition and construction of a new dam and reservoir, intake facilities, 30 mile raw water transmission main from intake to Cary/Apex WTP, expansion of WTP treatment capacity and distribution system, as well as permitting costs.

8. Expansion of Durham's Lake Michie Reservoir

Durham is considering increasing the safe yield of its water supplies by raising the Lake Michie Dam. 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 19 mgd if the dam is raised from its present 341 ft elevation to elevation 365 ft, and 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 and Morrisville 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/Morrisville/RTP South would pay 36 percent of the project costs for a 36 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, and provide the water to RTP South customers.

Since this option is located within the Neuse River basin, it has the potential to substantially reduce the quantity of interbasin transfer for Morrisville's water supply. Total Net Present Value of this alternative for Morrisville is $7.83 million. The unit cost is $3.13 per gallon of additional water supply. Costs include capital and O&M costs for the construction of facilities.

	Comments
Available Supply	2.5 mgd
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 to 20 years for reservoir permitting and construction.
Interbasin Transfer	This does not involve IBT if sufficient wastewater discharged to Neuse Basin.
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 Raleigh and others 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, relocation of existing roads and bridges present significant 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

Morrisville is applying for a 4 mgd Level I and an additional 1 mgd Level II allocation from the Jordan Lake water supply pool to meet its long-term water demands. If a water supply allocation is granted, Morrisville will work with Cary and Apex to expand existing facilities accordingly. The expanded facilities will also serve 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.

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

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

Activity	Expected Date
Complete Expansion of Cary/Apex WTP to 40 mgd	2001
Construct WWTP with discharge to Cape Fear Basin	2009
Complete Expansion of Cary/Apex WTP to 60 mgd	2015

Attachment A

Local Water Supply Plan

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 as Consultant to Town of Morrisville Date: December 28, 2000

SECTION 1: GENERAL INFORMATION

1-A. Water System: Morrisville 1-B. PWS Identification #: 3-92-075

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

1-D. County(s): Wake

1-E. Contact Person: Mike Koivisto Title: Assistant Town Manager

1-F. Mailing Address: PO Box 166 CITY Morrisville ZIP 27560

1-G. Phone: 919.469.1426 1-H. Fax: 919.481-2907 1-I. E-mail: mkoivisto@ci.morrisville.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 7,000

Seasonal (if applicable) _____ For Months of _____

2-B. Total Water Use for 2000 including all purchased water: 313.4 Million Gallons (MG)

2-C. Average Annual Daily Water Use in 2000: 0.85 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	2028	0.51			0.51
(2) Commercial	486	0.34			0.34
(3) Industrial					
(4) Institutional					
(5) Sales to other Systems					0
(6) System Processes					0.10
(7) Subtotal [sum (1) thru (6)]					0.95
(8) Average Annual Daily Water Use [Item 2-C]					0.85

*Note: Insufficient data available from Cary water metering to Morrisville to evaluate unaccounted-for water independently from Cary's

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	0.513			May	0.925			Sep	1.039		
Feb	0.792			Jun	1.139			Oct	0.884		
Mar	0.547			Jul	0.899			Nov	0.957		
Apr	0.700			Aug	0.149			Dec	0.761		

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
Bristol Meyers-Squibb	0.062	Adams Products	0.009
Thomas Concrete	0.029	Holiday Inn Express	0.009
Prime Outlets	0.029	Microtel Inn	0.007
RMC Carolina Materials	0.019	Fairfield Inn	0.004
Days Inn	0.011	Extended Stay America	0.003

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*
Water System	PWSID	MGD	# of Days	MGD	Expiration Date	Inches	R or E
N/A							

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

2-H. What is the Total Amount of Sales Contracts for Regular Use? _____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		
N/A												
								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) _____

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? ___1.20___ MGD

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	
Town of Cary, NC	3-92-020	.372	365	1.0	2018	16	R
City of Durham	3-32-010			1.8	2008	Via Cary	E

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

3-E. What is the Total Amount of Purchase Contracts available for Regular Use? ____2.8_____MGD (Do not include emergency use connections in total)

SYSTEM NAME Morrisville PWSID 3-92-075

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 Morrisville PWSID 3-92-075

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 WTP	16	Jordan Lake
Cary/Apex WTP Capacity Expansion	40	Jordan Lake (to be completed 2001)

3-K. What is the system's finished water storage capacity? _____0_____ Million Gallons

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	0.672	Apr	0.627	Jul	0.652	Oct	0.694
Feb	0.717	May	0.600	Aug	0.747	Nov	0.728
Mar	0.614	Jun	0.622	Sep	0.771	Dec	0.678

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
Reference Cary LWSP						

SYSTEM NAME Morrisville PWSID 3-92-075

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	3-92-075	Town of Cary	3-92-020	0.677	365	2.0

4-D. Number of sewer service connections: 2514

4-E. Number of water service connections with septic systems: _____ (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 – Cary/Apex and Morrisville, with others, plan to construct wastewater treatment facilities discharging 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? 39 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			4” – 16”		4” – 8”	
Estimated % of lines			88%		12%	

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

5-D. Were any new water mains added in 2000? F No ☒ Yes 37,700 linear feet

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

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

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 implemented in 1999 in accordance with Water conservation ordinance

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

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? ☒ 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? ☒ 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 F Yes ☒ N/A due to water being purchased

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

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

5-S. How many meters were replaced in 2000? 200 meters

5-T. How old are the oldest meters in the system? 13+ 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 _____

5-W. Does this system use reclaimed water or plan to use it within the next five years? ☒ No F Yes # of connections _____ ; _____ 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: Mike Koivisto Date: 5/31/01

WATER SYSTEM: Town of Morrisville PWSID: 3-92-075

SECTION 7: WATER DEMAND PROJECTIONS

7-A. Population to be Served	2000	2005	2010	2015	2020	2025	2030	2035	2040	2045	2050
Year-Round	6,500	14,700	17,750	20,800	23,900	27,000	27,000	27,000	27,000	27,000	27,000
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	0.50	0.99	1.12	1.21	1.38	1.57	1.57	1.57	1.57	1.57	1.57
(2) Commercial	0.23	0.46	0.53	0.54	0.62	0.68	0.68	0.68	0.68	0.68	0.68
(3) Industrial	0.11	0.14	0.20	0.25	0.34	0.44	0.44	0.44	0.44	0.44	0.44
(4) Institutional											
(5) System Processes	0.08	0.16	0.20	0.23	0.27	0.31	0.31	0.31	0.31	0.31	0.31
(6) Unaccounted-for water	0.05	0.12	0.13	0.16	0.18	0.21	0.21	0.21	0.21	0.21	0.21
(7) Total Service Area Demand [sum (1) thru (6)]	0.95	1.87	2.18	2.39	2.80	3.21	3.21	3.21	3.21	3.21	3.21

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

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
Reference Cary LWSP							

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

7-E. What is the Total Amount of Future Supplies available for Regular Use? ____2.5__ 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? _____ MGD

SYSTEM NAME __Morrisville_____ PWSID ___3-92-075___

SECTION 8: FUTURE WATER SUPPLY NEEDS

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	215	2020	2025	2030	2035	2040	2045	2050
(1) Existing Surface Water Supply (Item 3-B)	0	2.5	2.5	25	2.5	2.5	2.5	2.5	2.5	2.5	2.5
(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)	2.8	1.8	2.5	25	2.5	2.5	2.5	2.5	2.5	2.5	2.5
(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)]	2.8	4.3	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Average Daily Demand, MGD											
(6) Service Area Demand (Item 7-B, Line 7)	1.0	2.1	2.5	2.9	3.3	3.7	3.7	3.7	3.7	3.7	3.7
(7) Existing Sales Contracts (Item 2-H)	0	0	0	0	0	0	0	0	0	0	0
(8) Future Sales Contracts (Item 7-G)	0	0	0	0	0	0	0	0	0	0	0
(9) **Total Average Daily Demand** [sum (6) thru (8)]	1.0	2.1	2.5	2.9	3.3	3.7	3.7	3.7	3.7	3.7	3.7
(10) Demand as Percent of Supply [(9) / (5)] x 100	36%	49%	100%	116%	132%	148%	148%	148%	148%	148%	148%
(11) **Supply Needed to maintain 80% [(9) / 0.8] - (5)**	1.2	2.6	3.1	3.6	4.1	4.7	4.6	4.6	4.6	4.6	4.6
Additional Information for Jordan Lake Allocation											
(12) Sales Under Existing Contracts	0	0	0	0	0	0	0	0	0	0	0
(13) Expected Sales Under Future Contracts	0	0	0	0	0	0	0	0	0	0	0
(14) Demand in each planning period [(6)+(12)+(13)]	1.0	2.1	2.5	2.9	3.3	3.7	3.7	3.7	3.7	3.7	3.7
(15) Supply minus Demand [(5) - (14)]	1.5	2.2	0.0	-0.4	-0.8	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2

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

SYSTEM NAME __Morrisville_____ PWSID ___3-92-075___

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"	1.5	2.2	0.0	-0.4	-0.8	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2
(2) Available supply from Project 1 (JL Allocation)	0.0	1.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5	2.5	2.5
Available supply from Project 2 (describe)											
Available supply from Project 3 (describe)											
(3) Supply available for future needs [(1) + (2)]	1.5	3.7	1.5	1.1	0.7	1.3	1.3	1.3	1.3	1.3	1.3
(4) Total discharge to Source Basin	0.06	0.12	0.14	0.16	0.19	0.21	0.21	0.21	0.21	0.21	0.21
(5) Consumptive Use in Source Basin	0.01	0.09	0.17	0.22	0.27	0.33	0.36	0.36	0.36	0.36	0.36
(6) Total discharge to Receiving Basin	0.73	1.49	1.78	2.06	2.34	2.61	2.61	2.61	2.61	2.61	2.61
(7) Consumptive Use in Receiving Basin	0.2	0.4	0.41	0.46	0.5	0.55	0.52	0.52	0.52	0.52	0.52
(8) Amount not returned to Source Basin [(6) + (7)]	0.93	1.89	2.19	2.52	2.84	3.16	3.13	3.13	3.13	3.13	3.13

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	03-92-020	Surface	Haw	WS IV B NSW CA	2.5	6	2007

SYSTEM NAME __Morrisville_____ PWSID ___3-92-075___

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"	1.5	2.2	0.0	-0.4	-0.8	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2
(2) Available supply from Project 1 (Harnett Co)	0.0	1.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5	2.5	2.5
Available supply from Project 2 (describe)											
Available supply from Project 3 (describe)											
(3) Supply available for future needs [(1) + (2)]	1.5	3.7	1.5	1.1	0.7	1.3	1.3	1.3	1.3	1.3	1.3
(4) Total discharge to Source Basin	0.06	0.12	0.14	0.16	0.19	0.21	0.21	0.21	0.21	0.21	0.21
(5) Consumptive Use in Source Basin	0.01	0.09	0.17	0.22	0.27	0.33	0.36	0.36	0.36	0.36	0.36
(6) Total discharge to Receiving Basin	0.73	1.49	1.78	2.06	2.34	2.61	2.61	2.61	2.61	2.61	2.61
(7) Consumptive Use in Receiving Basin	0.2	0.4	0.41	0.46	0.5	0.55	0.52	0.52	0.52	0.52	0.52
(8) Amount not returned to Source Basin [(6) + (7)]	0.93	1.89	2.19	2.52	2.84	3.16	3.13	3.13	3.13	3.13	3.13

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	03-92-020	Surface	Haw	WS IV CA	2.5	6	2007

Attach additional pages as needed to summarize all alternatives.

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.

SYSTEM NAME __Morrisville_____ PWSID ___3-92-075___

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"	1.5	2.2	0.0	-0.4	-0.8	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2
(2) Available supply from Project 1 (JL Allocation)	0.0	1.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5	2.5	2.5
Available supply from Project 2 (describe)											
Available supply from Project 3 (describe)											
(3) Supply available for future needs [(1) + (2)]	1.5	3.7	1.5	1.1	0.7	1.3	1.3	1.3	1.3	1.3	1.3
(4) Total discharge to Source Basin	0.06	0.12	0.14	0.16	0.19	0.21	0.21	0.21	0.21	0.21	0.21
(5) Consumptive Use in Source Basin	0.01	0.09	0.17	0.22	0.27	0.33	0.36	0.36	0.36	0.36	0.36
(6) Total discharge to Receiving Basin	0.73	1.49	1.78	2.06	2.34	2.61	2.61	2.61	2.61	2.61	2.61
(7) Consumptive Use in Receiving Basin	0.2	0.4	0.41	0.46	0.5	0.55	0.52	0.52	0.52	0.52	0.52
(8) Amount not returned to Source Basin [(6) + (7)]	0.93	1.89	2.19	2.52	2.84	3.16	3.13	3.13	3.13	3.13	3.13

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
Jordan Lake Allocation	03-92-020	Surface	Haw	WS IV CA	2.5	6	2007

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"	1.5	2.2	0.0	-0.4	-0.8	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2
(2) Available supply from Project 1 (JL Allocation)	0.0	1.5	1.5	1.5	1.5	2.5	2.5	2.5	2.5	2.5	2.5
Available supply from Project 2 (describe)											
Available supply from Project 3 (describe)											
(3) Supply available for future needs [(1) + (2)]	1.5	3.7	1.5	1.1	0.7	1.3	1.3	1.3	1.3	1.3	1.3
(4) Total discharge to Source Basin	0.06	0.12	0.14	0.16	0.19	0.21	0.21	0.21	0.21	0.21	0.21
(5) Consumptive Use in Source Basin	0.01	0.09	0.17	0.22	0.27	0.33	0.36	0.36	0.36	0.36	0.36
(6) Total discharge to Receiving Basin	0.73	1.49	1.78	2.06	2.34	2.61	2.61	2.61	2.61	2.61	2.61
(7) Consumptive Use in Receiving Basin	0.2	0.4	0.41	0.46	0.5	0.55	0.52	0.52	0.52	0.52	0.52
(8) Amount not returned to Source Basin [(6) + (7)]	0.93	1.89	2.19	2.52	2.84	3.16	3.13	3.13	3.13	3.13	3.13

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
Jordan Lake Allocation	03-92-020	Surface	Haw	WS IV CA	2.5	6	2007

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"	1.5	2.2	0.0	-0.4	-0.8	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2
(2) Available supply from Project 1 (Kerr Lake)						0.75	0.75	0.75	0.75	0.75	0.75
Available supply from Project 2 (JL Allocation)	0.0	1.5	1.5	1.5	1.5	1.75	1.75	1.75	1.75	1.75	1.75
Available supply from Project 3 (describe)											
(3) Supply available for future needs [(1) + (2)]	1.5	3.7	1.5	1.1	0.7	1.3	1.3	1.3	1.3	1.3	1.3
(4) Total discharge to Source Basin (Roanoke)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
(5) Consumptive Use in Source Basin (Roanoke)	0.0	0.0	0.0	0.0	0.0	0.03	0.03	0.03	0.03	0.03	0.03
Total discharge to Source Basin (Haw)	0.06	0.12	0.14	0.16	0.19	0.18	0.34	0.34	0.34	0.34	0.34
Consumptive Use in Source Basin (Haw)	0.01	0.09	0.17	0.22	0.27	0.27	0.29	0.29	0.29	0.29	0.29
(6) Total discharge to Receiving Basin (Neuse)	0.73	1.49	1.78	2.06	2.34	2.78	2.62	2.62	2.62	2.62	2.62
(7) Consumptive Use in Receiving Basin (Neuse)	0.2	0.4	0.41	0.46	0.5	0.44	0.42	0.42	0.42	0.42	0.42
(8) Amount not returned to Source Basin (Haw)	0.93	1.89	2.19	2.52	2.84	2.5	2.32	2.32	2.32	2.32	2.32
Amount not returned to Source Basin (Roanoke)	0	0	0	0	0	0.72	0.72	0.72	0.72	0.72	0.72

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
Kerr Lake Water Supply	03-92-020	Surface	Roanoke	WS IV CA	0.5	22	2022
Jordan Lake Allocation	03-92-020	Surface	Haw	WS IV CA	1.75	6	2007

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"	1.5	2.2	0.0	-0.4	-0.8	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2
(2) Available supply from Project 1 (Kerr Lake)						0.75	0.75	0.75	0.75	0.75	0.75
Available supply from Project 2 (JL Allocation)	0.0	1.5	1.5	1.5	1.5	1.75	1.75	1.75	1.75	1.75	1.75
Available supply from Project 3 (describe)											
(3) Supply available for future needs [(1) + (2)]	1.5	3.7	1.5	1.1	0.7	1.3	1.3	1.3	1.3	1.3	1.3
(4) Total discharge to Source Basin (Roanoke)	0.0	0.0	0.0	0.0	0.0	0.72	0.72	0.72	0.72	0.72	0.72
(5) Consumptive Use in Source Basin (Roanoke)	0.0	0.0	0.0	0.0	0.0	0.03	0.03	0.03	0.03	0.03	0.03
Total discharge to Source Basin (Haw)	0.06	0.12	0.14	0.16	0.19	0.18	0.34	0.34	0.34	0.34	0.34
Consumptive Use in Source Basin (Haw)	0.01	0.09	0.17	0.22	0.27	0.27	0.29	0.29	0.29	0.29	0.29
(6) Total discharge to Receiving Basin (Neuse)	0.73	1.49	1.78	2.06	2.34	2.06	1.9	1.9	1.9	1.9	1.9
(7) Consumptive Use in Receiving Basin (Neuse)	0.2	0.4	0.41	0.46	0.5	0.44	0.42	0.42	0.42	0.42	0.42
(8) Amount not returned to Source Basin (Haw)	0.88	1.99	2.29	2.72	3.04	2.5	2.32	2.32	2.32	2.32	2.32
Amount not returned to Source Basin (Roanoke)	0	0	0	0	0	0	0	0	0	0	0

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
Kerr Lake Water Supply	03-92-020	Surface	Roanoke	WS IV CA	0.5	22	2022
Jordan Lake Allocation	03-92-020	Surface	Haw	WS V A	0.75	6	2007

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"	1.5	2.2	0.0	-0.4	-0.8	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2
(2) Available supply from Project 1 (Harris Lake)				1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
Available supply from Project 2 (Jordan Lake)		1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5	1.5
Available supply from Project 3 (describe)											
(3) Supply available for future needs [(1) + (2)]	1.5	3.7	1.5	1.1	0.7	1.3	1.3	1.3	1.3	1.3	1.3
(4) Total discharge to Source Basin	0.06	0.12	0.14	0.16	0.19	0.21	0.21	0.21	0.21	0.21	0.21
(5) Consumptive Use in Source Basin	0.01	0.09	0.17	0.22	0.27	0.33	0.36	0.36	0.36	0.36	0.36
(6) Total discharge to Receiving Basin	0.73	1.49	1.78	2.06	2.34	2.61	2.61	2.61	2.61	2.61	2.61
(7) Consumptive Use in Receiving Basin	0.2	0.4	0.41	0.46	0.5	0.55	0.52	0.52	0.52	0.52	0.52
(8) Amount not returned to Source Basin [(6) + (7)]	0.93	1.89	2.19	2.52	2.84	3.16	3.13	3.13	3.13	3.13	3.13

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
Lake Harris Water Supply Intake	03-92-020	Surface	Haw	WS V	1	15	2015
Jordan Lake Allocation	03-92-020	Surface	Haw	WS IV CA	1.5	6	2007

SYSTEM NAME __Morrisville_____ PWSID ___3-92-075___

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"	1.5	2.2	0.0	-0.4	-0.8	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2
(2) Available supply from Project 1 (Middle Creek)						0.75	0.75	0.75	0.75	0.75	0.75
Available supply from Project 2 (JL Allocation)	0.0	1.5	1.5	1.5	1.5	1.75	1.75	1.75	1.75	1.75	1.75
Available supply from Project 3 (describe)											
(3) Supply available for future needs [(1) + (2)]	1.5	3.7	1.5	1.1	0.7	1.3	1.3	1.3	1.3	1.3	1.3
(4) Total discharge to Source Basin (Neuse)	0.73	1.49	1.78	2.06	2.34	2.61	2.61	2.61	2.61	2.61	2.61
(5) Consumptive Use in Source Basin	0.2	0.4	0.41	0.46	0.5	0.55	0.52	0.52	0.52	0.52	0.52
(6) Total discharge to Receiving Basin (Haw)	0.06	0.12	0.14	0.16	0.19	0.21	0.21	0.21	0.21	0.21	0.21
(7) Consumptive Use in Receiving Basin	0.01	0.09	0.17	0.22	0.27	0.33	0.36	0.36	0.36	0.36	0.36
(8) Amount not returned to Source Basin [Neuse]						-2.41	-2.38	-2.38	-2.38	-2.38	-2.38
Amount not returned to Source Basin [Haw]	0.93	1.89	2.19	2.52	2.84	2.41	2.38	2.38	2.38	2.38	2.38

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 New Reservoir	03-92-020	Surface	Neuse/Middle Creek	WS IV CA	0.75	22	2022
Jordan Lake Allocation	03-92-020	Surface	Haw	WS IV CA	1.75	6	2007

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"	1.5	2.2	0.0	-0.4	-0.8	-1.2	-1.2	-1.2	-1.2	-1.2	-1.2
(2) Available supply from Project 1 (Lake Michie)						0.75	0.75	0.75	0.75	0.75	0.75
Available supply from Project 2 (JL Allocation)	0.0	1.5	1.5	1.5	1.5	1.75	1.75	1.75	1.75	1.75	1.75
Available supply from Project 3 (describe)											
(3) Supply available for future needs [(1) + (2)]	1.5	3.7	1.5	1.1	0.7	1.3	1.3	1.3	1.3	1.3	1.3
(4) Total discharge to Source Basin	0.73	1.49	1.78	2.06	2.34	2.61	2.61	2.61	2.61	2.61	2.61
(5) Consumptive Use in Source Basin	0.2	0.4	0.41	0.46	0.5	0.55	0.52	0.52	0.52	0.52	0.52
(6) Total discharge to Receiving Basin	0.06	0.12	0.14	0.16	0.19	0.21	0.21	0.21	0.21	0.21	0.21
(7) Consumptive Use in Receiving Basin	0.01	0.09	0.17	0.22	0.27	0.33	0.36	0.36	0.36	0.36	0.36
(8) Amount not returned to Source Basin [Neuse]						-2.41	-2.38	-2.38	-2.38	-2.38	-2.38
Amount not returned to Source Basin [Haw]	0.93	1.89	2.19	2.52	2.84	2.41	2.38	2.38	2.38	2.38	2.38

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
Expand Lake Michie	03-92-020	Surface	Neuse	WS IV CA	0.75	22	2022
Jordan Lake Allocation	03-92-020	Surface	Haw	WS IV CA	1.75	6	2007

8-E. Has this system participated in regional water supply or water use planning? F No ☒Yes Please describe. Participated with Cary in its Water Supply Plan; participated in review of Cape Fear River

8-F. List the major water supply reports or studies used for planning. Town of Cary Long-Range Water Supply plan (2000); Town of Morrisville Water Supply plan (1996)

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

Project 1. Increase Jordan Lake Water Supply Allocation

This option increases the allocation for withdrawals through the Cary/Apex existing raw water intake on the east bank of Jordan Lake. To satisfy water demand for the Morrisville service area and applying a 80 percent of available capacity threshold, the required average water allocation would be at least 5 mgd in 2030.

In the short term, water withdrawn by Cary from Jordan Lake is discharged as wastewater into the Neuse River basin, so the ongoing interbasin transfer (IBT) application to DENR supports the Jordan Lake allocation increase approach. Construction of a new West Cary WWTP in the Cape Fear River basin, with an initial capacity of 9 mgd, is planned to mitigate the IBT within 5 years.

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 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

Project 1. Cape Fear River Supply

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 of 16 mgd is available under this option, subject to water availability. This option would be implemented as a form of indirect reuse, increasing the water available for withdrawal at the Harnett County WTP through an equivalent quantity of discharges to the Cape Fear River basin from a West Cary WWTP. There is no net interbasin transfer for this arrangement. This option relies on a West Cary 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 Apex water distribution system. These existing interconnections would be upgraded as Cary's supply from the Harnett County WTP increases toward the maximum.

3. Increase Jordan Lake Reservoir Full Pool Elevation

Project 1. 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.

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

Project 1. 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. DWR owns the water supply pool and manages the water quality pool. This option may be linked to Section 216 Studies and to implementation of additional best management practices to reduce rate of sedimentation (sediment traps, buffer zones, local ordinances, etc.). The USACE would probably require these practices to be adopted by all local governments which discharge stormwater to Jordan Lake, in order to justify reclassification of sediment storage pool to water supply pool.

5. Utilize Kerr Lake as Water Supply Resource

Project 1. Utilize Kerr Lake as Water Supply Resource

This option draws water supply from Kerr Lake reservoir on the North Carolina-Virginia line. This option would deliver raw water to either Raleigh or Durham via pipeline or construct a new WTP from a new intake structure. After treatment, the finished water would be provided to Cary, then on to Morrisville, either through an interconnection with Raleigh or Durham or direct pipeline from the new WTP. Obtaining a municipal water supply allocation from Kerr Lake would require a USACE study process. A pipeline could convey the raw water from the intake along highway right-of-way to Lake Michie, a Durham raw water supply reservoir.

Project 2. Due to the long lead time to implement a Kerr Lake water supply, a Jordan Lake water supply allocation is required to address demands through 2022.

6. Utilize Harris Lake as Water Supply Source

Project 1. Utilize Harris Lake as Water Supply Source

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. The reservoir's average annual flow yield is about 0.4 cfs/mi^2, measured downstream of the lake. 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.

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. Since Harris Lake is located in the Cape Fear River Basin, use of this reservoir for water supply will involve an interbasin transfer.

7. Construct New Middle Creek Reservoir

Project 1. Construct New Middle Creek Reservoir

Middle Creek is a tributary of the Neuse River in southern Wake County. This option would develop a new Middle Creek reservoir as a joint venture with local governments in Wake

County and Johnston County. Morrisville would have a 0.75 mgd 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; construction of a new approximately 30 mile raw water transmission facilities from the intake to the Cary/Apex WTP and other regional partners; and expansion of the existing Cary/Apex WTP.

Project 2. Due to the long lead time to implement a Middle Creek water supply, a Jordan Lake water supply allocation is required to address demands through 2022.

8. Participate in Expansion of Durhan's Lake Michie Reservoir

Project 1. Participate in Expansion of Durhan's Lake Michie Reservoir

Durham is considering increasing the safe yield of its water supplies by raising the Lake Michie Dam. 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 19 mgd if the dam is raised from its present 341 ft elevation to elevation 365 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 14 mgd from Durham. Cary/Apex would pay 42 percent of the project costs for a 42 percent share in the increased safe yield. Cary/Apex would contract with Durham to treat the water, and would obtain the water through upgraded interconnections with Durham.

Project 2. Due to the long lead time to implement modifications to Lake Michie dam, a Jordan Lake water supply allocation is required to address demands through 2022.

Attachment B

Map of Service Area and Facilities

Attachment C

Alternative Cost Estimates

Alternative 1
Increase Jordan Lake Water Supply Allocation
2.5 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
Morrisville's Percentage of the Above Costs		9%		$2,120,000
Mobilization/Demobilization		(7% of Construction Cost)		$148,000
Contingency		(10% of Construction Cost)		$212,000
Contractor's OH and Profit		(15% of Construction Cost)		$318,000
		Construction Costs (total)		$2,798,000
Engineering Design and Administration		(10% of Construction Cost)		$280,000
Legal and Administrative Costs		(5% of Construction Cost)		$140,000
Cost of Regulatory Requirements		(5% of Construction Cost)		$140,000
DWR Allocation Payment	EA	9%	$600,000	$53,000
			Jordan Lake Capital Cost	$3,411,000
			Net Present Value of O&M Costs	$442,000
			Total Jordan Lake Costs	$3,853,000
			Incremental Supply (mgd)	2.5
			Unit Cost ($/gallon)	$1.54

Alternative 2
A Cape Fear River Supply and Increase in Jordan Lake Water Supply Allocation
2.5 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
Morrisville's Percentage of the Above Costs		9%		$1,044,000
Mobilization/Demobilization			(7% of Construction Cost)	$73,000
Contingency			(10% of Construction Cost)	$104,000
Contractor's OH and Profit			(15% of Construction Cost)	$157,000
			Construction Costs (total)	$1,378,000
Engineering Design and Administration			(10% of Construction Cost)	$138,000
Legal and Administrative Costs			(5% of Construction Cost)	$69,000
Cost of Regulatory Requirements			(5% of Construction Cost)	$69,000
Capacity Payment to Harnett County			9% of 16 mgd Capacity Payment	$1,280,000
			Cape Fear Capital Costs	$2,934,000
Net Present Value of O&M Costs (Includes Capacity Use Fees to Harnett County)				$9,106,000
			Total Cape Fear Costs	$12,040,000
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
Morrisville's Percentage of the Above Costs		9%		$2,120,000
Mobilization/Demobilization			(7% of Construction Cost)	$148,000
Contingency			(10% of Construction Cost)	$212,000
Contractor's OH and Profit			(15% of Construction Cost)	$318,000
			Construction Costs (total)	$2,798,000
Engineering Design and Administration			(10% of Construction Cost)	$280,000
Legal and Administrative Costs			(5% of Construction Cost)	$140,000
Cost of Regulatory Requirements			(5% of Construction Cost)	$140,000
DWR Allocation Payment		9%	$600,000	$53,000
			Jordan Lake Capital Cost	$3,411,000
			Net Present Value of O&M Costs	$442,000
			Total Jordan Lake Costs	$3,853,000
			Total Net Present Value	$15,893,000
			Incremental Supply (mgd)	2.5
			Unit Cost ($/gpd)	$6.36

Alternative 3
Increase Jordan Lake Reservoir Full Pool Elevation
2.5 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
Morrisville's Percentage of the Above Costs		9%		$2,120,000
Mobilization/Demobilization			(7% of Construction Cost)	$148,000
Contingency			(10% of Construction Cost)	$212,000
Contractor's OH and Profit			(15% of Construction Cost)	$318,000
			Construction Costs (total)	$2,798,000
Engineering Design and Administration			(20% of Construction Cost)	$559,600
Legal and Administrative Costs			(10% of Construction Cost)	$279,800
Cost of Regulatory Requirements			(10% of Construction Cost)	$279,800
DWR Allocation Payment		9%	$600,000	$53,000
			Jordan Lake Capital Cost	$3,970,200
			Net Present Value of O&M Costs	$442,000
			Total Jordan Lake Costs	$4,412,200
			Incremental Supply (mgd)	2.5
			Unit Cost ($/gpd)	$1.76

Alternative 4
Convert a Portion of Jordan Lake Sediment Storage to Water Supply Storage and Increase Jordan Lake Water Supply Allocation
2.5 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
Morrisville's Percentage of the Above Costs		9%		$2,120,000
Mobilization/Demobilization		(7% of Construction Cost)		$148,000
Contingency		(10% of Construction Cost)		$212,000
Contractor's OH and Profit		(15% of Construction Cost)		$318,000
		Construction Costs (total)		$2,798,000
Engineering Design and Administration		(20% of Construction Cost)		$559,600
Legal and Administrative Costs		(10% of Construction Cost)		$279,800
Cost of Regulatory Requirements		(10% of Construction Cost)		$279,800
DWR Allocation Payment		9%	$600,000	$53,000
			Jordan Lake Capital Cost	$3,970,200
			Net Present Value of O&M Costs	$442,000
			Total Jordan Lake Costs	$4,412,200
			Incremental Supply (mgd)	2.5
			Unit Cost ($/gpd)	$1.76

Alternative 5a
Utilize Kerr Lake as Water Supply Resource and Increase in Jordan Lake Water Supply Allocation
2.5 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	$71,588	$10,738,000
			Subtotal:	$16,362,000
New Water Treatment Plant (50 mgd)	EA	1	$43,658,485	$ 43,658,000
Morrisville's Percentage of the Above Costs (9% of Cary's 25%)		2%		$2,521,000
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
Morrisville's Percentage of the Above Costs		9%		$1,247,000
Mobilization/Demobilization			(7% of Construction Cost)	$264,000
Contingency			(10% of Construction Cost)	$377,000
Contractor's OH and Profit			(15% of Construction Cost)	$565,000
			Construction Costs (total)	$4,974,000
Engineering Design and Administration			(20% of Construction Cost)	$995,000
Legal and Administrative Costs			(10% of Construction Cost)	$497,000
Cost of Regulatory Requirements			(10% of Construction Cost)	$497,000
Land/Easement Acquisition			(2% share of 300 acres at $10,000/acre)	$67,000
			Kerr Lake Capital Costs	$7,030,000
			Net Present Value of O&M Costs	$691,000
			Total Kerr Lake Costs	$7,721,000
Jordan Lake Water Supply				
Raw Water Intake Modification	EA	1	$1,534,030	$1,534,000
Morrisville's Percentage of the Above Cost		9%		$136,000
Mobilization/Demobilization			(7% of Construction Cost)	$10,000
Contingency			(10% of Construction Cost)	$14,000
Contractor's OH and Profit			(15% of Construction Cost)	$20,000
			Construction Costs (total)	$180,000
Engineering Design and Administration			(10% of Construction Cost)	$18,000
Legal and Administrative Costs			(5% of Construction Cost)	$9,000
Cost of Regulatory Requirements			(5% of Construction Cost)	$9,000
DWR Allocation Payment		9%	$600,000	$53,000
			Jordan Lake Capital Cost	$269,000
			Net Present Value of O&M Costs	$65,000
			Total Jordan Lake Costs	$334,000
			Total Net Present Value	$8,055,000
			Incremental Supply (mgd)	2.5
			Unit Cost ($/gpd)	$3.22

Alternative 5b
Utilize Kerr Lake as Water Supply Resource and Increase in Jordan Lake Water Supply Allocation
2.5 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	$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
Morrisville's Percentage of the Above Costs (9% of Cary's 25%)		2%		$5,285,000
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
Morrisville's Percentage of the Above Costs		9%		$1,247,000
Mobilization/Demobilization			(7% of Construction Cost)	$457,000
Contingency			(10% of Construction Cost)	$653,000
Contractor's OH and Profit			(15% of Construction Cost)	$980,000
			Construction Costs (total)	$8,622,000
Engineering Design and Administration			(20% of Construction Cost)	$1,724,000
Legal and Administrative Costs			(10% of Construction Cost)	$862,000
Cost of Regulatory Requirements			(10% of Construction Cost)	$862,000
Land/Easement Acquisition		(2% share of 305 acres at $10,000/acre)		$68,000
Wetland Mitigation	acre	9% of 10 acres	$25,000	$6,000
			Kerr Lake Capital Costs	$12,144,000
			Net Present Value of O&M Costs	$1,184,000
			Total Kerr Lake Costs	$13,328,000
Jordan Lake Water Supply				
Raw Water Intake Modification	EA	1	$1,534,030	$1,534,000
Morrisville's Portion of the Above Cost		9%		$136,000
Mobilization/Demobilization			(7% of Construction Cost)	$10,000
Contingency			(10% of Construction Cost)	$14,000
Contractor's OH and Profit			(15% of Construction Cost)	$20,000
			Construction Costs (total)	$180,000
Engineering Design and Administration			(10% of Construction Cost)	$18,000
Legal and Administrative Costs			(5% of Construction Cost)	$9,000
Cost of Regulatory Requirements			(5% of Construction Cost)	$9,000
DWR Allocation Payment		9%	$600,000	$53,000
			Jordan Lake Capital Cost	$269,000
			Net Present Value of O&M Costs	$65,000
			Total Jordan Lake Costs	$334,000
			Total Net Present Value	$13,662,000
			Incremental Supply (mgd)	2.5
			Unit Cost ($/gpd)	$5.46

Alternative 6
Utilize Harris Lake as Water Supply Reservoir and Increase in Jordan Lake Water Supply Allocation
2.5 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
Morrisville's Percentage of the Above Costs		9%		$2,576,000
Mobilization/Demobilization			(7% of Construction Cost)	$180,000
Contingency			(10% of Construction Cost)	$258,000
Contractor's OH and Profit			(15% of Construction Cost)	$386,000
			Construction Costs (total)	$3,400,000
Engineering Design and Administration			(20% of Construction Cost)	$680,000
Legal and Administrative Costs			(10% of Construction Cost)	$340,000
Cost of Regulatory Requirements			(10% of Construction Cost)	$340,000
			Harris Lake Capital Costs	$4,760,000
			Net Present Value of O&M Costs	$563,000
			Total Harris Lake Costs	$5,323,000
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
Morrisville's Percentage of the Above Costs		9%		$474,000
Mobilization/Demobilization			(7% of Construction Cost)	$33,000
Contingency			(10% of Construction Cost)	$47,000
Contractor's OH and Profit			(15% of Construction Cost)	$71,000
			Construction Costs (total)	$625,000
Engineering Design and Administration			(10% of Construction Cost)	$63,000
Legal and Administrative Costs			(5% of Construction Cost)	$31,000
Cost of Regulatory Requirements			(5% of Construction Cost)	$31,000
DWR Allocation Payment		9%	$600,000	$53,000
			Jordan Lake Capital Cost	$803,000
			Net Present Value of O&M Costs	$129,000
			Total Jordan Lake Costs	$932,000
			Total Net Present Value	$6,255,000
			Incremental Supply (mgd)	2.5
			Unit Cost ($/gpd)	$2.50

Alternative 7
Construct New Middle Creek Reservoir and Increase in Jordan Lake Water Supply Allocation
2.5 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, Riprap, 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 total 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 Pavement Patch, 20% of total pipe length)	LF	30,702	$36	$1,099,000
Easement/Right of Way Restoration (80% of total pipe length)	LF	122,810	$5	$628,000
Traffic Control (applied to total project length in Street of adjacent 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
Morrisville's Percentage of the Above Costs (9% of Cary's 29%)		3%		**$3,229,000**
Mobilization/Demobilization			(7% of Construction Cost)	$226,000
Contingency			(10% of Construction Cost)	$323,000
Contractor's OH and Profit			(15% of Construction Cost)	$484,000
			Construction Costs (total)	$4,262,000
Engineering Design and Administration			(20% of Construction Cost)	$852,000
Legal and Administrative Costs			(10% of Construction Cost)	$426,000
Cost of Regulatory Requirements			(10% of Construction Cost)	$426,000
Land/Easement Acquisition	Acres	3% of 1,600 acres	$10,000	$406,000
Wetland Mitigation	Acres	3% of 2,280 acres	$30,000	$1,737,000
			Middle Creek Capital Costs	$8,109,000
			Net Present Value of O&M Costs	$368,000
			Total Middle Creek Costs	$8,477,000
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 56 mgd)	EA	1	$12,292,691	$12,293,000
Morrisville's Percentage of the Above Costs		9%		$2,598,000
Mobilization/Demobilization			(7% of Construction Cost)	$182,000
Contingency			(10% of Construction Cost)	$260,000
Contractor's OH and Profit			(15% of Construction Cost)	$390,000
			Construction Costs (total)	$3,430,000
Engineering Design and Administration			(10% of Construction Cost)	$343,000
Legal and Administrative Costs			(5% of Construction Cost)	$172,000
Cost of Regulatory Requirements			(5% of Construction Cost)	$172,000
DWR Allocation Payment		9%	$600,000	$53,000
			Jordan Lake Capital Cost	$4,170,000
			Net Present Value of O&M Costs	$487,000
			Total Jordan Lake Costs	$4,657,000
			Total Net Present Value	$13,134,000
			Incremental Supply (mgd)	2.5
			Unit Cost ($/gpd)	$5.25

Alternative 8

Expansion of Durham's Lake Michie Reservoir, Purchase from the City of Durham, and Increase in Jordan Lake Water Supply Allocation
2.5 MGD Total Supply

	Unit	Quantity	Unit Cost	Item Cost
Expansion of Lake Michie				
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
Morrisville's Percentage of the Above Costs (9% of Cary's 36%)		3%		$1,445,000
Mobilization/Demobilization			(7% of Construction Cost)	$101,000
Contingency			(10% of Construction Cost)	$145,000
Contractor's OH and Profit			(15% of Construction Cost)	$217,000
			Construction Costs (total)	$1,908,000
Engineering Design and Administration			(20% of Construction Cost)	$382,000
Legal and Administrative Costs			(10% of Construction Cost)	$191,000
Cost of Regulatory Requirements			(10% of Construction Cost)	$191,000
Land/Easement Acquisition	Acre	3% of 1,070 acres	$10,000	$346,000
			Lake Michie Capital Costs	$3,018,000
			Net Present Value of O&M Costs	$247,000
			Total Lake Michie Costs	$3,265,000
Purchase from the City of Durham				
*This project solely includes the cost of purchasing water; the infrastructure is already in place for this purchase.				
Net Present Value for Interim Water Purchases from Durham (9% of Cary's Cost)				$707,000
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
Morrisville's Percentage of the Above Costs		9%		$2,120,000
Mobilization/Demobilization			(7% of Construction Cost)	$148,000
Contingency			(10% of Construction Cost)	$212,000
Contractor's OH and Profit			(15% of Construction Cost)	$318,000
			Construction Costs (total)	$2,798,000
Engineering Design and Administration			(10% of Construction Cost)	$280,000
Legal and Administrative Costs			(5% of Construction Cost)	$140,000
Cost of Regulatory Requirements			(5% of Construction Cost)	$140,000
DWR Allocation Payment		9%	$600,000	$53,000
			Jordan Lake Capital Cost	$3,411,000
			Net Present Value of O&M Costs	$442,000
			Total Jordan Lake Costs	$3,853,000
			Total Net Present Value	$7,825,000
			Incremental Supply (mgd)	2.5
			Unit Cost ($/gpd)	$3.13

Attachment D

Morrisville Water Conservation Ordinance and Program Description

Attachment E

Draft Jordan Lake Water Quality Monitoring Plan