ORANGE COUNTY
NORTH CAROLINA

JORDAN LAKE ALLOCATION APPLICATION

Orange County is seeking an allocation of 1.5 million gallons per day from Jordan Lake to secure water supply for areas within the County which are slated for development in the coming years.

November 14, 2014

ORANGE COUNTY
NORTH CAROLINA
COUNTY MANAGER'S OFFICE

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November 14, 2014

Tom Fransen
Water Resources Management Section Chief
North Carolina Division of Water Resources
1611 Mail Service Center
Raleigh, NC 27699-1611

Dear Mr. Fransen:

This Jordan Lake Allocation Application being submitted by Orange County represents a request for storage allocation needed to meet Orange County's planning needs for additional water supply through 2045. This Application constitutes a request for water supply that makes up a portion of a Regional Water Supply Plan (RWSP) that has been developed by the Jordan Lake Partnership (JLP), a collection of 13 local governments and water systems that was created to collaboratively plan for the future of water supply in the Triangle Region, including for the future use of Jordan Lake.

The JLP's RWSP is built with the intention of meeting needs for all JLP members while keeping impacts on other water users (including downstream water systems), the environment, and rate payers at acceptable levels. Additionally, it is a goal of JLP to present a set of coordinated allocation requests for Jordan Lake water supply storage that result neither in over allocating the storage pool nor a situation in which water systems will have to compete for allocation.

As such, all Jordan Lake Allocation requests submitted by the Jordan Lake Partnership member entities have been made transparent to other partners, and should match the designated allocation requests that are presented in the JLPs RWSP.

As such, Orange County affirms that this request for a 1.5% Level 2 allocation is recognized to be:

☒	IN AGREEMENT	☐	NOT IN AGREEMENT

with the JLPs RWSP.

Orange County currently holds a 1% (approximately 1 million gallons per day) Level 2 allocation from Jordan Lake, so this application represents an increase over our current allocation. As will be shown in the following documents, Orange County is anticipating growth along major

transportation corridors in three distinct areas of the County. These have been designated on the County's Land Use Plan as areas in which urban density growth is appropriate. This allocation request represents Orange County's efforts to procure a reliable source of water supply for these areas in advance of the anticipated growth over the next 30 years.

Because Orange County holds an allocation currently, we are familiar with the financial requirements necessary to maintain the allocation. The County understands and is committed to the financial responsibility that comes along with the granting of our allocation request. Thank you for the opportunity to apply for this additional allocation from Jordan Lake. County staff looks forward to working with both the State and the Environmental Management Commission throughout this application process.

Sincerely,

Bonnie Hammersley,
County Manager

ORANGE COUNTY
NORTH CAROLINA

Jordan Lake Allocation Application

Executive Summary

January 9, 2015

Introduction

This application for a Round Four Allocation of Jordan Lake Water Supply Storage is on behalf of Orange County. The documentation contained within the application supports the requested allocation to meet expected demand through 2045. Orange County currently has a 1% Level II allocation from Jordan Lake and is applying for an additional 0.5% Level II allocation. The County is unique among those applying for a Round Four Allocation in that it does not own or operate its own water distribution utility. The allocation the County currently has and the additional allocation requested are intended to bolster the water supplies of the Town of Hillsborough and the City of Durham, who will be the municipalities serving two economic development areas within the County.

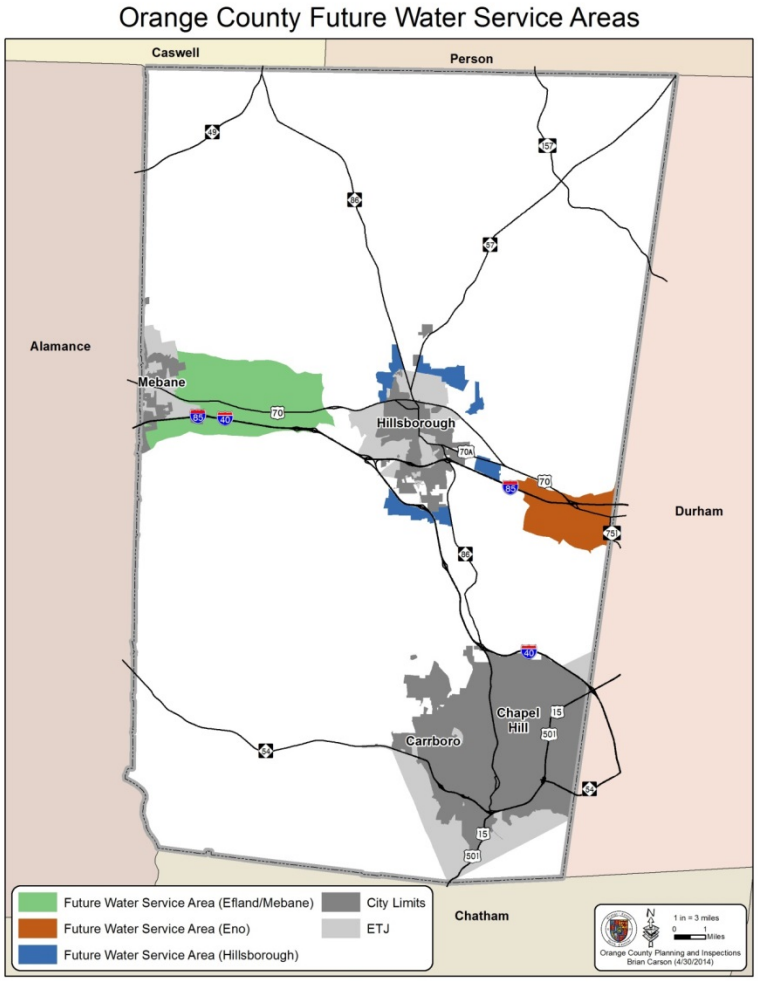

Figure 1

Water Supply Needs

Orange County has three economic development areas centered on Interstates 40 and 85 and US Highway 70, which run east to west across the middle of the County. As shown in **Figure 1** on the previous page, there is one area on the western border of the County adjacent to the City of Mebane, one on the eastern border adjacent to the City of Durham and one in roughly the center of the County adjacent to the Town of Hillsborough. These areas of the County are currently only partially served by public utilities.

Water demand through 2045 was estimated using the current proposed land uses for the three areas as described in the County's most recent land use plan, *Orange County, North Carolina, 2030 Comprehensive Plan,* adopted November 2008. Data from other municipalities' experience of water use associated with the various land use designations as well as engineering studies of potential demand for residential, commercial and industrial use categories was used to estimate the future water demand. In addition, the County's demand estimates were peer reviewed by members of the Jordan Lake Partnership (mentioned and described more fully within the application) and have been incorporated into the *Triangle Regional Water Supply Plan,* which was commissioned by the Jordan Lake Partnership and compiled by the Triangle J Council of Governments staff. The projected water demands for all three development areas and across all sectors are shown in **Figure 2** on the following page. The Total Demand is given as a number within the graph at the top of the demand bar for each time frame. This Total Demand takes into account the "negative" demand created by estimated additional conservation/efficiency efforts in the future.

Water Supply Alternatives

Orange County has considered two alternatives as part of this allocation application. The preferred alternative due to cost, efficiency and maximization of currently available distribution infrastructure is to request a Jordan Lake allocation large enough to cover the water supply needs for the central and eastern development areas through 2045, a total of approximately 1.5% of the available Jordan Lake supply pool, estimated to yield approximately 1.5 million gallons per day. This allocation would be used in support of the available water supplies of the Town of Hillsborough and the City of Durham, respectively, to provide for the future water demand in the development areas they will serve. There is currently distribution infrastructure in place by which water can be drawn from Jordan Lake and piped to the distribution network of the City of Durham and the Town of Hillsborough. Such infrastructure does not exist to get

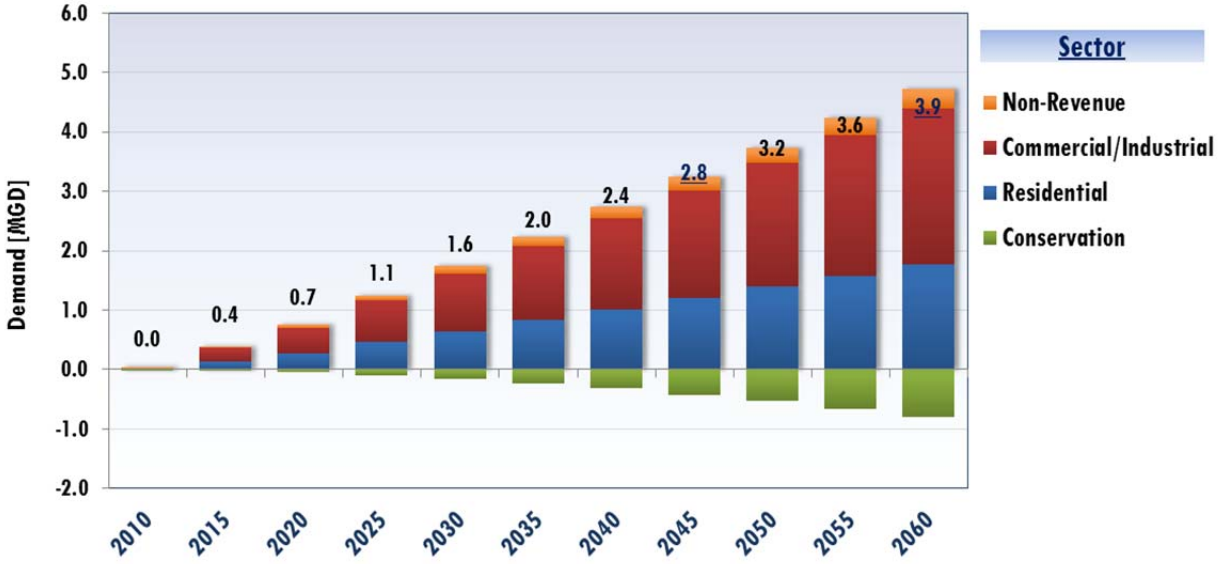

Figure 2

water from Jordan Lake to the City of Mebane. Therefore, the City of Mebane's water supply would be used to provide for the estimated future demand in the western development area.

Realistic Expectation of Future Growth

As mentioned earlier, the projected water use in the three development areas for the various sectors and for the projected population growth have been peer-reviewed and found to be reasonable. However, given that the three developments areas have been defined for over a decade and are still very sparsely developed, one may wonder whether the expectations of growth in the County's three development areas are reasonable. There are at least two factors, in addition to the generally strong growth seen in both the Triad and Triangle areas, that support the idea that the expectations of growth are realistic.

Orange County was successful in passing a quarter-cent sales tax several years ago when the option was made available to Counties by the State. The additional sales tax revenue has been designated for several specific purposes, one of which is development of infrastructure to support economic development. Given this new source of revenue, the County has begun an aggressive campaign to extend "backbone" water and sewer infrastructure into the western, central and eastern development areas where such infrastructure has not existed in the past. Infrastructure has been designed and installed in the western development area, engineering

studies are underway in the eastern area and planned for the central area. The belief is that by making the vital water and sewer infrastructure more readily available, the development areas will be more attractive for potential growth.

The second indication that the growth expectations are realistic is the early success of the above policy. In 2014, Orange County completed installation of several miles of water and sewer infrastructure in the western development area, adjacent to the City of Mebane. Before the project was completed, it was announced that the Morinaga Candy Company would be locating a production facility in the western development area and tying on to the sewer infrastructure that had just been constructed. Construction of the Morinaga plant has begun and they are targeting full-scale production by the summer of 2015. Without the infrastructure installed as part of the County's strategic plan, this area would not have been as attractive and this development project would likely have chosen another location.

Regional Partnerships

This application is consistent with the *Triangle Regional Water Supply Plan* (TRWSP) developed by the Jordan Lake Partnership in conjunction with the Triangle J Council of Governments. Orange County is one of the members of the Jordan Lake Partnership, which consists of 13 local governments and water systems collaboratively planning for the water supply future of the Triangle region in a sustainable and responsible manner. Importantly, the TRWSP presents a plan for meeting the water supply needs of the Triangle Region through the year 2060 without compromising the water supply needs of downstream communities and without over-allocating the Jordan Lake water supply storage pool.

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INTRODUCTION

The Jordan Lake Partnership (JLP) has been working collaboratively since 2009 to plan for the future of the Triangle Region's water supply. They have developed a draft Triangle Regional Water Supply Plan (TRWSP) to meet the 50-year water needs of the thirteen partners listed below:

- ***Town of Apex***
- ***Town of Cary***
- ***Chatham County (North water system)***
- ***City of Durham***
- ***Town of Hillsborough***
- ***Town of Holly Springs***
- ***Town of Morrisville***
- ***Orange Water and Sewer Authority (OWASA)***
- ***Orange County***
- ***Town of Pittsboro***
- ***City of Raleigh and Merger Partners***
- ***City of Sanford***
- ***Wake County (Research Triangle Park - South)***

The draft Triangle Regional Water Supply Plan has been provided to DWR by the JLP as an accompanying document to this Jordan Lake Allocation request. The TRWSP details the planning process used to develop the regional water supply plan, and the preferred regional alternative includes projected requests for Jordan Lake water supply allocation by several of the JLP members. This introduction briefly presents the preferred regional alternative, thus providing the regional context of Orange County's allocation request.

As part of the regional water supply planning process, JLP members collaborated to develop demand projections, identify water source options, construct and evaluate alternatives, and present a mutually-supported plan for meeting the future water supply needs of the Triangle Region. In doing so, JLP members supported each other through a careful peer review of each other's demand projections; through shared information about conservation and water use efficiency efforts; through inter-utility infrastructure planning efforts (e.g. a regional distribution system interconnection study and hydraulic model and a feasibility study for a new intake and water treatment plant on the western side of Jordan Lake); and by expanding the pool of potential water supply source options.

The 2060 future water service areas of the JLP members are shown in Figure 1.

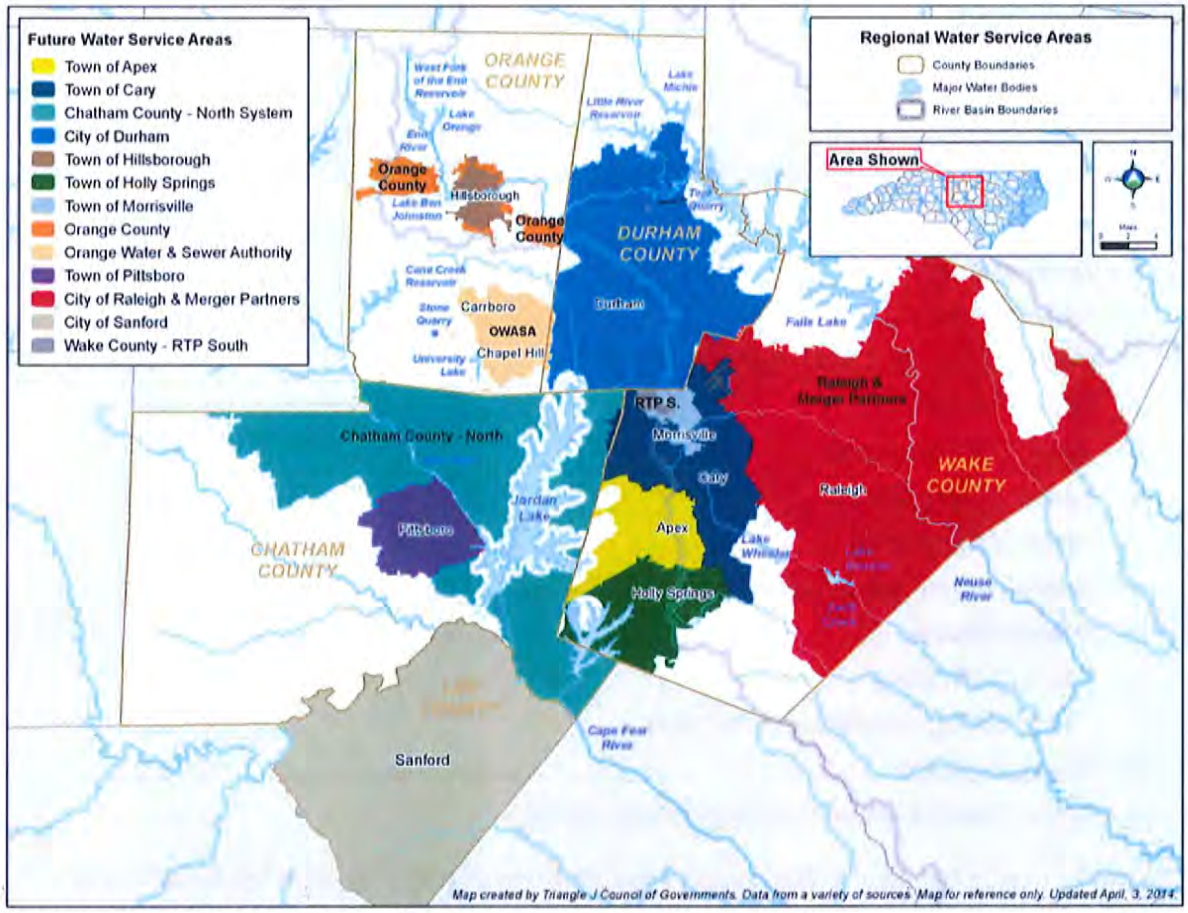


Figure 1. Future (2060) water service areas of the Jordan Lake Partners.

Developing the Regional Water Supply Plan

The TRWSP has two basic components: 1) identification of regional waters need through 2060, and 2) a plan for meeting those needs. The *Triangle Regional Water Supply Plan: Volume I – Water Needs Assessment* (May 2, 2012) presented the demand projections and initial estimates of water supply needs for all of the JLP members. The *Triangle Regional Water Supply Plan: Volume II – Regional Water Supply Alternatives Analysis* (Draft, April 18, 2014) presented the methodology used to create and evaluate regional water supply alternatives and the details of the preferred alternative and regional water supply plan. These documents should be consulted for more information. The following information summarizes the regional needs, recommended regional water supply alternative, and proposed Jordan Lake allocations requests.

Water Demand Projections and Projected Need

Figure 2 illustrates the total regional water demand projections as compared to the current available water supply (horizontal line) of 199 MGD for the thirteen JLP members. Each of the partners developed its own initial projections, which were then reviewed and scrutinized by the

other partners, and subsequently revised. The revised, peer-reviewed demand projections were approximately 10-15% lower than the initial projections, as shown by the red shaded boxes in the figure below, and represent an historic consensus among local water system professionals about the present status and long-term needs of the Triangle Region's water supply resources.

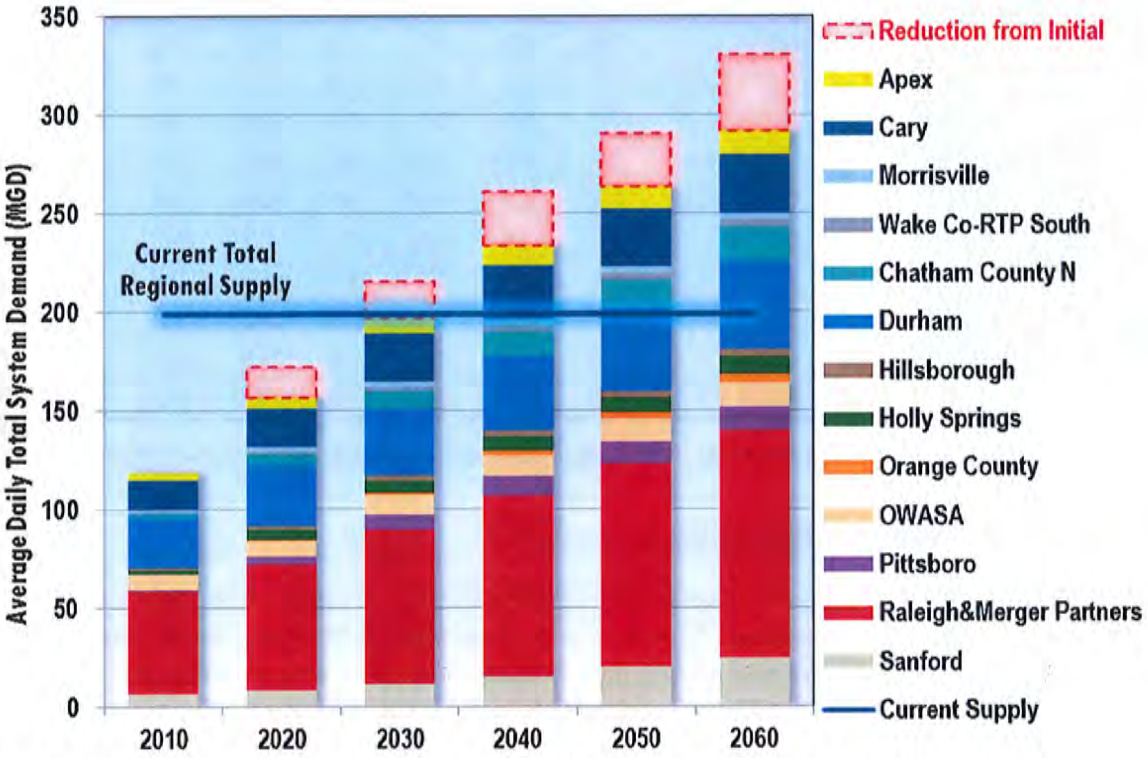


Figure 2. Regional demand projections, current supply, and reductions due to peer review.

Each water system's *need* is presented as the *average day demand minus the operational yield of its existing water supply sources (including existing Level I and Level II Jordan Lake allocations)*. Based on demand projections and existing supply, the need for each partner was computed for the 2010 -2060 planning period at five year intervals as shown in Table 1. The italicized columns for 2045 and 2060 highlight the key planning years for the Round 4 Jordan Lake Allocation process and the 50-year TRWSP, respectively.

Table 1. Projected Water Supply Need (MGD) by Partner.

Partner	2010	2015	2020	2025	2030	2035	2040	*2045*	2050	2055	*2060*
Apex *	0.0	0.0	0.0	0.0	0.0	**0.3**	**1.4**	***2.1***	**2.5**	**2.8**	***3.1***
Cary *	0.0	0.0	0.0	0.0	**0.8**	**2.5**	**3.9**	***5.1***	**6.3**	**6.3**	***6.3***
Morrisville *	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**	**0.1**	***0.1***
Wake Co. (RTP S.) *	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Chatham County N *	0.0	0.0	0.0	**0.8**	**2.3**	**4.1**	**5.9**	***7.0***	**8.2**	**10.1**	***12.1***
Durham *	0.0	0.0	0.0	0.0	0.0	0.0	**0.2**	***2.1***	**4.0**	**5.2**	***6.5***
Hillsborough	0.0	0.0	0.0	0.0	**0.1**	**0.3**	**0.4**	***0.6***	**0.8**	**0.9**	***1.1***
Holly Springs *	0.0	0.0	0.0	0.0	0.0	0.0	**0.1**	***0.6***	**1.1**	**1.6**	***2.1***
Orange County *	0.0	**0.1**	**0.5**	**0.9**	**1.3**	**1.8**	**2.2**	***2.6***	**3.0**	**3.3**	***3.7***
OWASA *	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Pittsboro	0.0	0.0	**1.3**	**3.6**	**5.8**	**6.9**	**8.1**	***8.4***	**8.8**	**9.3**	***9.8***
Raleigh & Merger	0.0	0.0	0.0	0.0	**0.9**	**7.5**	**14.0**	***19.7***	**25.4**	**31.6**	***37.7***
Sanford	0.0	0.0	0.0	0.0	0.0	**1.3**	**3.2**	***5.8***	**8.4**	**10.6**	***12.8***
Total	**0.0**	**0.1**	**1.8**	**5.3**	**11.2**	**24.7**	**39.4**	***54.0***	**68.4**	**81.8**	***95.2***

**** "Need" assumes that existing Level I and Level II Jordan Lake allocations are fully utilized***

Recommended Regional Alternative

The JLP evaluated a multitude of regional water supply alternatives that could meet the Region's needs as presented in Table 1. The *Triangle Regional Water Supply Plan: Volume II – Regional Alternatives Analysis* presents the methodology and analyses used to create and evaluate those alternatives. A preferred regional alternative for meeting the future needs of all partners through 2060 emerged from this effort and is referred to hereinafter as the "JLP Recommended Alternative."

Table 2 presents new water supply sources that would be brought online as part of the JLP Recommended Alternative. The Projected New Supply column lists the estimated yield of supply sources in addition to existing yields currently available. These sources may include either new supply sources or the expansion of existing sources.

The City of Raleigh's preferred source options remain uncertain with regard to timing and order of implementation, but include four priority sources, any of which could provide approximately 13.7 MGD of additional yield. These include 1) a new Little River Reservoir in eastern Wake County, 2) a reallocation of Falls Lake storage to increase the available water supply pool, 3) a direct withdrawal from the Neuse River upstream of Raleigh's Neuse River Wastewater Treatment Plant, and 4) a quarry reservoir adjacent to the Neuse River near Richland Creek. Under the JLP Recommended Alternative, Raleigh would meet its future demands from a combination of these Neuse Basin sources and would not require a Jordan Lake allocation.

Table 2. JLP Recommended Alternative sources to be constructed.

Partner	Source Name	Basin	Type	Year Online	Projected New Supply [MGD]
Multiple	Jordan Lake – Round 4	Haw	Storage Allocation	2015	28.2
Multiple	Jordan Lake – Future Rounds	Haw	Storage Allocation	2025 – 2045	8.2
Sanford	Cape Fear River Withdrawal	Cape Fear	River Withdrawal	2025, 2045	12.8
Pittsboro	Haw River Withdrawal	Haw	River Withdrawal	2015, 2020	4.0
Hillsborough	W. Fork Eno Reservoir Expansion	Neuse	Reservoir Expansion	2015	1.2
OWASA	Stone Quarry Expansion	Haw	Quarry Reservoir	2035	2.1
Orange County	Town of Mebane Purchase	Haw	Purchase	2015-2020	2 (0.5 – 2.5)
Raleigh	Neuse Basin Option 1	Neuse	TBD	2025	13.7 (9-15)
Raleigh	Neuse Basin Option 2	Neuse	TBD	2035-2045	13.7 (9-15)
Raleigh	Neuse Basin Option 3	Neuse	TBD	2050-2055	13.7 (9-15)
TOTAL	**All New Sources**				**96.2-100**

In total, the JLP Recommended Alternative provides approximately 100 MGD of additional supply by 2060, which would meet the Region's projected cumulative need of 95.2 MGD. The timing and sequence of bringing the new sources online would reduce the risk of a supply deficit for any partner during the planning period.

Jordan Lake Allocations proposed in JLP Recommended Alternative

The JLP Recommended Alternative includes new or expanded Jordan Lake Allocations for multiple partners, both in this current Round 4 and in future allocation cycles, to meet needs through 2060. Currently, 63% of Jordan Lake's water supply pool has been allocated, and a 1% storage allocation is assumed to yield approximately 1 MGD of average day supply. All existing allocations are currently held by Jordan Lake Partnership members, and the JLP Recommended Alternative proposes that all of these either be maintained or increased.

Table 3 presents current allocations, the proposed Round 4 allocation requests, and future proposed allocation requests through 2060. Round 4 requests would meet water supply needs through 2045; future allocations would meet 2060 needs. Table 3 indicates the total allocation amounts for each partner, who are expected to distinguish between Level I and Level II requests in their respective Round 4 allocation applications.

Table 3 includes all thirteen JLP members, even though Raleigh and Sanford are not expected to request Jordan Lake Allocations. The Towns of Apex and Cary currently hold a combined allocation that meets the needs of both communities. The Town of Cary also has finalized long-term agreements to serve the Town of Morrisville and the Wake County – RTP South service areas and is expected to make a joint allocation request. Table 3, therefore, includes the combined amount of the proposed allocation request, but it also shows the individual partners' amounts.

Table 3. JLP Recommended Alternative proposed Jordan Lake Allocations by Partner (MGD).

Partner	Current	Round 4 Requests	Future Rounds (2060 Need)
Apex	8.5	10.6	11.6
Cary	23.5	28.6	29.8
Morrisville	3.5	3.5	3.6
Wake County (RTP South)	3.5	3.5	3.5
Chatham County - N	6	13	18.2
Durham	10	16.5	16.5
OWASA	5	5	5
Orange County	1	1.5	2
Holly Springs	2	2	2.2
Hillsborough	0	1	1
Pittsboro	0	6	6
Raleigh & Merger Partners	0	0	0
Sanford	0	0	0
TOTAL JLP	63	91.2	99.4

Moving toward implementation

The JLP Recommended Alternative is the result of more than four years of collaborative planning by the Partnership. The water supply needs of the thirteen partners have been vetted through multiple rounds of peer review and represent the most complete long-term picture of the Region's demands compiled to date. A thorough regional water supply alternatives analysis determined that the JLP Recommended Alternative would be most acceptable in terms of implementability, environmental and community impacts, customer costs, and overall acceptance by local governments and the general public.

The JLP efforts constituted the successful collaboration – including an unprecedented level of mutual trust and respect – among local entities planning, coordinating, and moving toward implementation of a water supply plan that will meet the long-term needs of the entire Triangle Region. Individual partners will continue to operate their own systems, but the success of this regional water supply plan will depend on each partner being able to implement its respective additional water supply sources as recommended.

The partners investigated the various impacts of the JLP Recommended Alternative – including effects on the environment, downstream water users, and the general public – and found these impacts to be acceptable and preferable to those of the other options. Hydrologic effects of the JLP Recommended Alternative were modeled with the recently updated Cape Fear-Neuse Basin OASIS model. Preliminary results indicate the proposed alternative will meet long term

demands without creating downstream shortages; is considered to be the most implementable from a regulatory and political perspective; and provides for coordinated allocation requests among JLP members.

The remainder of this document presents the allocation request for Orange County.

SECTION I. WATER DEMAND FORECAST

Orange County does not operate a water system. However, the County is committed to ensuring adequate future water supply to support development in the three geographic service areas (shown below in Figure I.1) designated as development districts identified in the County's Comprehensive Plan.. The Efland-Mebane Service Area, the Hillsborough Service Area and the Eno Service Area are not currently fully served by public water systems. A portion of the Hillsborough Service Area is currently served by the Town of Hillsborough, a portion of the Efland-Mebane Service Area is served by the Town of Mebane, and a portion of the Eno Service Area is currently served by the City of Durham. Orange County does not plan to operate their own water system in the future, but is committed to providing additional water service to these areas through agreements with other public water systems. Agreements for water provision have been finalized with the Town of Mebane and the City of Durham. Orange County currently has a 1% Level II allocation from Jordan Lake estimated to yield 1 million gallons per day (MGD).

Without the benefit of having historical customer usage information, Orange County has instead used a land use planning approach to estimate future water demand.

User Sectors

The available land area slated for development to be served via public water system in Orange County was broken down into three geographic areas: Efland-Mebane, Hillsborough, and Eno. Each of these areas was divided into corresponding "Residential "and "Commercial/Industrial" use sectors and further divided into sub-sectors as shown below in Table I.1. Water Use Sectors.

Orange County's key metrics include:

- 75% of non-residential acreage is developable and 50-75% of residential acreage is developable
- 2.35 persons per household
- 2 or 4 households per acre for low- and high-density residential areas, respectively
- 70 gallons per person per day for residential acreage
- 1,000 gallons per acre per day for non-residential acreage
- 95% of service areas will be developed by the year 2060
- Water conservation and efficiency gains will result in a 2.85% decrease per decade in residential and non-residential use rates
- The amount of non-revenue water (distribution system process and other non-revenue water) is fixed as 7.5 percent of revenue water

Figure I.1. Map of Service Areas.

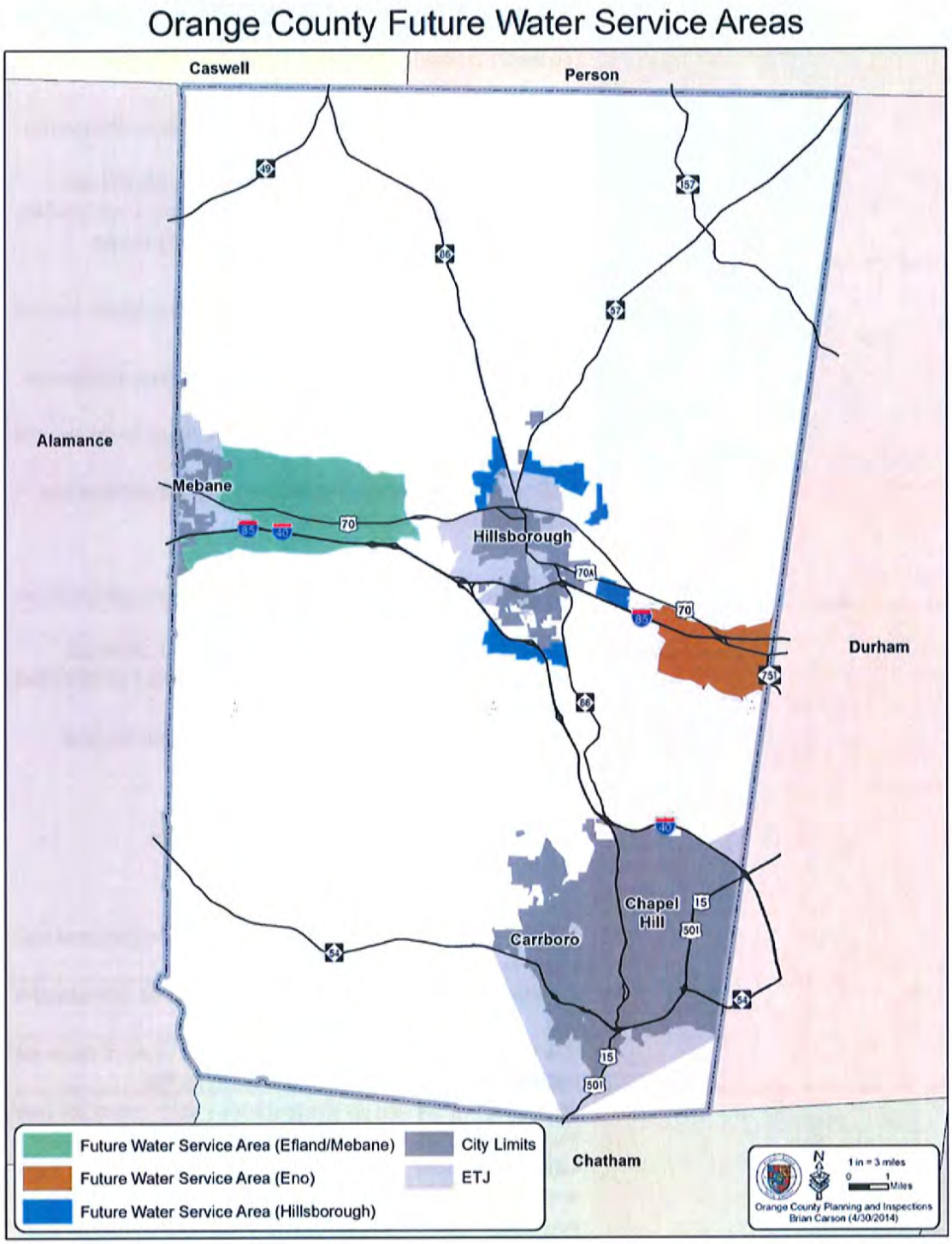


Table I.1. Water Use Sectors.

Use Sector	Use Sub-sector	Description
Residential (Efland-Mebane)	Transition (Res.)	Low density residential. Established via Comprehensive Plan.
	Reserve Area	Low density residential. Established via Water and Sewer Management Planning and Boundary Agreement.
	Mixed Use – HD Res.	Includes a mix of high density residential and non-residential uses. Established via Comprehensive Plan and Efland-Mebane Small Area Plan.
Residential (Hillsborough)	OC Urbanizing Areas – HD Res.	High density residential. Established via Interlocal Agreement.
Residential (Eno)	Transition	Low density residential. Established via Durham Urban Growth Area and Comprehensive Plan.
	Primary Service Area	Low density residential. Established via Water and Sewer Management Planning and Boundary Agreement.
	UGA – Primary Service Area	Low density residential. Established via Durham Urban Growth Area and Comprehensive Plan.
Commercial/ Industrial (Efland-Mebane)	CIN	Commercial Industrial Node. A mix of commercial and industrial uses. Established via Comprehensive Plan.
	EDD	Economic Development District. A mix of commercial and industrial uses. Established via Comprehensive Plan.
	Mixed Use - EDD	Mixed Use – Economic Development District. A mix of commercial, industrial, and high density residential uses. Established via Efland-Mebane Small Area Plan and Comprehensive Plan.
Commercial/ Industrial (Hillsborough)	OC Urbanizing Areas – Non-Res Mixed Use	A mix of commercial and industrial uses. Established via Interlocal Agreement.
Commercial/ Industrial (Eno)	CN	Commercial Node. Established via Comprehensive Plan.
	EDD	Economic Development District. A mix of commercial and industrial uses. Established via Comprehensive Plan.
	UGA-CN	Urban Growth Area – Commercial Node. Established via Comprehensive Plan.
	UGA-EDD	Urban Growth Area- Economic Development District. A mix of commercial and industrial uses. Established via Comprehensive Plan.
Non-Revenue	All Non-Revenue	While Orange County does not plan to operate a water system, the County's projections do include allowance for non-revenue water. This was done because non-revenue water will be attributable to Orange County's service area due to leakage and flushing (and to a lesser extent, WTP process water used by another utility to treat the water sold to customers in the Orange County service area). Orange County assumed a rate of 7.5% of total residential and non-residential demand would be non-revenue water. All types of non-revenue water are grouped together.

While Orange County does not plan to operate a water system, the County's projections do include allowance for non-revenue water. This was done because non-revenue water will be attributable to Orange County's service area due to leakage and flushing (and to a lesser extent, WTP process water used by another utility to treat the water sold to customers in the Orange County service area). Orange County assumed a rate of 7.5% of total residential and non-residential demand would be non-revenue water. All types of non-revenue water are grouped together in these projections.

Sector Projections

The following section summarizes the land use planning approach used to estimate future water demand.

Population Estimates

Orange County prepared population estimates for its use sectors by performing a land use analysis to determine the total potential population at build-out based on available acreage. In general, the available land area slated for development was broken down into three service areas: Efland-Mebane, Hillsborough, and Eno. Each of these areas was divided into corresponding "Residential "and "Commercial/Industrial" use sectors and further divided into sub-sectors, which are blocks of land with a relatively homogeneous land use.

Population estimates were based on capacity assumptions, which were made for the available area in the residential sectors. In total, 10,248 acres were contained in a total of seven residential sub-sectors. Within each sub-sector, a percentage of the total area was deemed "not developable" to accommodate the space needed for transportation infrastructure, utilities, open space, etc. The percentage of each sub-sector which remained available for development varied but ranged from 50% to 75%.

After the amount of developable land was calculated, the number of households was then determined for each sub-sector. The amount of developable land area was then multiplied by an assumed household density of two households per acre for low-density residential areas and four households per acre for high-density residential areas. Once the number of households was estimated, the population could then be determined.

Population was calculated by multiplying the number of households by an assumed average of 2.35 persons per household (2010 United States Census data) for areas of high-density and low-density housing. The resulting population was determined to be the total population at build-out.

Orange County determined the population at ten-year increments by assuming the percentage of build-out achieved at each interval. In 2010, the population was estimated at 0.5% of the built-out population. By 2020, it was assumed the population would reach 15% of build-out. Each subsequent forecast year (ten-year increments) increased the percentage of build-out by

20%, starting with 35% in 2030 and culminating in 95% of the total built-out population being present in 2060.

Water Demand Projections

A similar land use analysis was also used to project future water use. Water demand was first calculated at build-out, and subsequent forecast year demand projections were calculated based on the percentages of build-out reached. Future water demand was projected at ten-year increments by assuming the percentage of the built-out water demand achieved at each of these intervals. In 2010, water demand was estimated at 0.5% of the built-out water demand. By 2020, it was assumed that water demand would reach 15% of the built-out water demand. Each subsequent forecast year (ten-year increments) increased the percentage of the built-out water demand by 20%, starting with 35% in 2030 and culminating in 95% of the built-out water demand occurring in 2060.

Residential sector demands were based on the projected population and a per capita usage rate. Population projections are described in the population estimates section above. The assumed per capita water use rate utilized for this analysis was 70 gallons per person day. This use rate was derived by reviewing the per capita use rate which other systems use for future water use estimation, as well as a recent report completed for the County by CDM Smith for the Eno Service Area. Non-residential demand was calculated on a per area basis. Each of the three geographic service areas (Efland-Mebane, Hillsborough, and Eno) include non-residential and commercial/industrial use sectors. Each sector includes sub-sectors, such as Economic Development District (EDD), Commercial Node (CN), Commercial Industrial Node (CIN), Urban Growth Area (UGA), among other designations. As with the residential sectors, Orange County again assumed that 75% of the non-residential area would ultimately be developed. Based on the CDM Smith water demand study mentioned above, the range of non-residential usage rates varies widely among area water systems studied, from 245 – 3,000 gpd/ac. The study recommended using 750 gpd/ac for commercial development and between 1,000 and 2,000 gpd/ac for industrial development. Orange County assigned a non-residential use rate of 1,000 gallons per day per acre (gpd/ac) of developable land to all of the non-residential sectors, which strikes a balance between the recommended amounts for commercial and industrial.

Demand Projections

Table I.2. Population projection totals for the three service areas.

2010	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060
100	2,050	4,000	6,650	9,300	11,900	14,500	17,150	19,800	22,450	25,100

Table I.3. Water Demand Projections by Sector (MGD).

Sector	Subsector	2010	2020	2030	2040	2050	2060
Residential (Efland-Mebane)	Transition (Res.)	0.00	0.06	0.13	0.21	0.29	0.36
	Reserve Area	0.00	0.07	0.17	0.26	0.36	0.45

	Mixed Use – HD Res.	0.00	0.01	0.02	0.04	0.05	0.07
Residential (Hillsborough)	OC Urbanizing Areas – HD Res.	0.00	0.08	0.18	0.29	0.40	0.50
Residential (Eno)	Transition	0.00	0.00	0.00	0.00	0.00	0.00
	Primary Service Area	0.00	0.06	0.13	0.20	0.28	0.35
	UGA-Primary Service Area	0.00	0.00	0.01	0.02	0.02	0.03
Commercial/Industrial (Efland-Mebane)	CIN	0.00	0.08	0.18	0.28	0.39	0.49
	EDD	0.00	0.09	0.22	0.34	0.47	0.59
	Mixed Use-EDD	0.00	0.03	0.08	0.12	0.16	0.20
Commercial/Industrial (Hillsborough)	OC Urbanizing Areas – Non-Res Mixed Use	0.00	0.12	0.28	0.44	0.60	0.76
Commercial/Industrial (Eno)	CN	0.00	0.00	0.00	0.00	0.00	0.00
	EDD	0.00	0.02	0.04	0.06	0.09	0.11
	UGA-CN	0.00	0.02	0.04	0.07	0.10	0.12
	UGA-EDD	0.00	0.06	0.13	0.21	0.28	0.36
Non-Revenue	All Non-Revenue	0.00	0.05	0.12	0.19	0.26	0.33
Conservation and Efficiency	Across all Sectors	0.00	-0.04	-0.15	-0.31	-0.53	-0.81
TOTAL		0.0	0.70	1.60	2.40	3.20	3.90

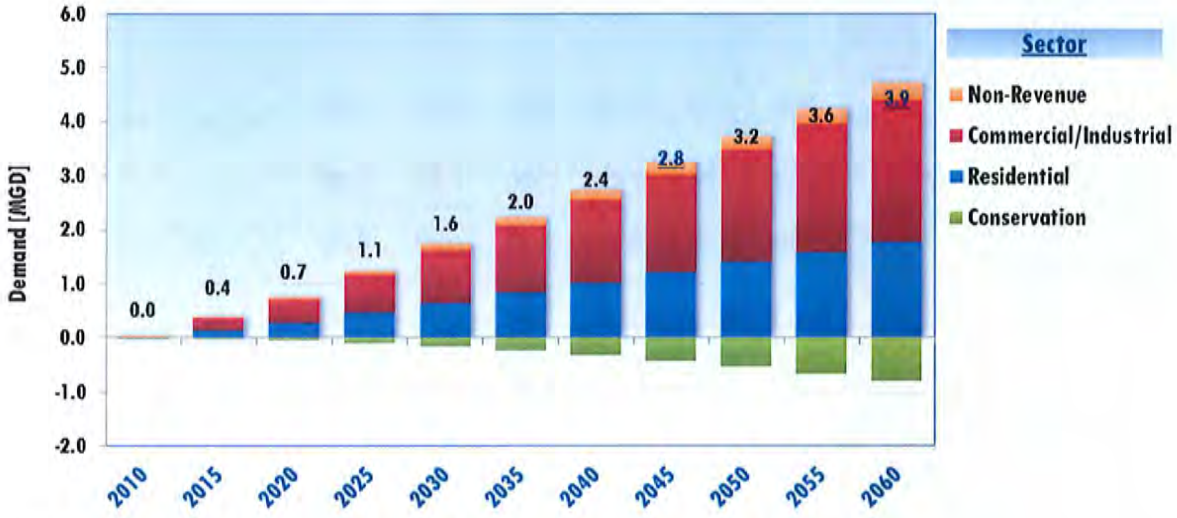


Figure I.2. Demand Projections by Sector.

NOTE: The total demand for each time period is labeled at the top of the column and takes into account the "Conservation" amount, shown as negative demand for each time period.

References

Orange County, 2008. *Orange County, North Carolina: 2030 Comprehensive Plan.* Orange County Planning and Inspections Department. Adopted 18 November 2008.

United States Census Bureau, 2010. *2010 United States Census.*

Orange County, Town of Hillsborough, Orange Water and Sewer Authority, Town of Carrboro, Town of Chapel Hill. *Water and Sewer Management, Planning and Boundary Agreement*, 2010. As Amended 5 October 2010.

Town of Hillsborough and Orange County, 2014. *Hillsborough-Orange Interlocal Land Management Agreement, Central Orange Coordinated Area.*

CDM Smith, 2013. *Eno Economic Development District Water and Sewer System Project: Draft Master Plan Report.* Submitted November 2013.

SECTION II. CONSERVATION AND DEMAND MANAGEMENT

Orange County's projections include significant reductions in per capita water demand as a result of improvements in water efficiency. As noted earlier, demand projections completed by Orange County forecast average water use rates for all users to decrease by 2.85% every decade through 2065. This means residential customers are projected to reduce their average usage from 70 gallons per person per day to 58 gallons per person per day by 2065. There would be a corresponding projected decrease in the commercial/industrial sector from 1000 gallons per acre per day to 829 gallons per acre per day.

Several factors influenced this decreasing use rate. Residential and commercial water fixtures and processes are continually being improved to use less water to accomplish the same task. As the price of water inevitably increases, there will be even more incentive to reduce water use through the use of more efficient processes or simply through conservation. In addition, as will be described in the next section, Orange County is committed to public education on the importance of reasonable, conservative use of potable water.

Orange County has a long-standing commitment to water conservation as well as to the protection of water quality. This is demonstrated by the County's buffer rules for new development, County-defined Water Supply Watershed Critical Areas that exceed those established by the State, zoning rules that limit the impact of growth in selected areas of the county, and limitations placed on the expansion of water and sewer service areas in the county that also limit population growth, and as a result, water demand.

Current water conservation actions

Despite the fact that Orange County does not operate a water system, the Orange County Board of Commissioners adopted a resolution in October 2007 encouraging all County citizens to conserve water and supporting water conservation restrictions by those water systems operating in the county. This action was a result of the extreme drought of 2007-2008, and was intended to support all water providers in the county,

For several years, County staff have conducted programs designed to educate citizens of the importance of water conservation as well as water quality protection. These ongoing efforts include providing handouts and presentations geared toward children and adults to encourage the reasonable use of potable water, whether it comes from public or private sources.

Planned future water conservation measures

The County intends to partner with existing neighboring jurisdictions to provide water service to limited, defined areas of economic development. The use of partner utilities means that the existing and future conservation and demand management strategies and regulations of these systems will extend into those areas of the county connected with each water system. The County is planning to utilize the City of Mebane to provide water and sewer service to the Efland-Mebane service area (western), the Town of Hillsborough to provide water and sewer

service to the Hillsborough service area (central), and the City of Durham to provide water and sewer service to the Eno service area (eastern). Highlights of the water conservation and demand management strategies and policies for each of these systems are included below.

Mebane

The City of Mebane approved a Water Shortage Response Plan in 2010 that describes measures the City would take once its water supply reaches an available limit of 150 days. Mebane has a leak detection program that works to reduce the loss of finished and raw water. The City of Mebane also has a water conservation education program aimed to educate the customers to reduce their demand for water. Finally, as a result of the 2007-2008 drought, Mebane revised its billing structure from a decreasing block rate to a uniform rate to encourage water conservation.

Hillsborough

The Town of Hillsborough has taken extensive measures to reduce water loss by completing a system-wide leak detection program, which has been followed by periodic leak detection efforts by the NC Rural Water Association. These efforts have resulted in a dramatic reduction in the quantity of water lost through leaks in the Hillsborough system. The Town also conducts an annual water audit that, in combination with the leak detection work discussed above, has reduced the system's unaccounted-for water from 24% in 1998 to 6.5% in 2012. Hillsborough has also implemented a rebate program to encourage customers to install more efficient appliances, adopted requirements that restrict the use of potable water for irrigation, and provides water conservation kits to customers at no cost. Finally, it is likely that the high cost of Hillsborough water also serves as a deterrent to customers to consume excess water.

Durham

The City of Durham has conducted a water conservation education program since 1993. The severe drought of 2001-2002 served to institute a stronger conservation ethic amongst water customers in Durham, leading to permanent changes in appliances and water-use practices. These efforts were reinforced by public education and expanded rebate programs designed to replace appliances with more efficient models. As a result, total water usage for the City of Durham decreased by 12% between 1999 and 2010. This time interval included a second major drought, from 2007 into 2008. This most recent drought resulted in many additional steps being undertaken to further reduce water usage in Durham, including the following:

- Bulk Reclaimed Water Program
- DurhamSavesWater.org marketing/advertising/education campaign
- Tiered water rates
- Toilet Rebate/Credit Program for residential customers

- Year-round Irrigation Schedule
- Rain/Moisture Sensor requirement for all new irrigation systems
- Water Waste Ordinance
- Water Shortage Response Plan
- Consistent moderate increases in water and sewer rates and charges each year as a part of the annual budget/CIP process
- Automated Meter Reading Program
- Expanded Toilet Rebate/Credit Program to Non-Residential Customers
- Expanded Leak Detection/Water Loss Program

Impact of Water Conservation Plans on Demand Projections

Orange County does not have control over the efficiency of the water plant (or plants) that will treat the water used by Orange County customers. The County will design and install a water distribution system that will, in-turn, be incorporated into another water system. One consequence of this process will be that the water lines installed in the Orange County service areas will all be recently installed. No older or outdated water lines will be present in the Orange County service areas. This will help to reduce water leakage from the system, and as a result, the County projects distribution system processed water and other non-revenue usage will be equivalent to 7.5% of revenue water.

Additional Water Conservation Information

In general, Orange County has had a strong, long-standing commitment to water conservation and watershed protection. In 1981, Orange County became the first county in North Carolina to adopt watershed protection zoning. Since then, watershed protection measures have been refined and increased repeatedly, incorporating technical watershed studies and new State minimum standards as they were developed. As a result, Orange County watershed protection standards meet, and in most cases exceed, the State minimum measures.

In 1987 Orange County was also the first county in North Carolina to adopt a Sedimentation and Erosion Control Ordinance (now known as the Erosion Control and Stormwater Ordinances). This ordinance helps protect water quality by regulating erosion control and stormwater practices on construction sites.

The County has conducted technical studies of nearly all of the ten water supply watersheds within the county. The ultimate result of these technical studies, in combination with the state watershed rules, is that much of the county's land area is comprised of small- to medium-sized water supply watersheds, which by their nature require special protection measures. The

limited potential for future water supply sources makes increased protection of the existing sources all the more critical.

The County's overall approach to watershed protection is through the use of non-structural measures. This involves protection of water quality at the source, by using land use controls to limit impervious surface, the number of housing units (and hence wastewater systems), the infiltration of stormwater on-site, and the protection of stream buffers to further filter water as it moves from the watershed to stream corridors.

Minimum lot size and impervious surface limits are used widely to help reduce sheet flow runoff into streams and encourage infiltration into the soil.

Orange County's stream buffer provisions are another key component of the County's watershed protection approach. Implemented through the Unified Development Ordinance, the overall size and width of protected stream buffers are based on a calculation that takes into consideration the slope of the land and the existing vegetative cover along an identified water body. At a minimum, stream buffers are required to be fifty (50) feet in width along both sides of a stream, with an additional fifteen (15) or thirty (30) feet of protected buffer required based on severity of slope. Protected stream buffers are measured from the edge of the stream's 100-year flood plain, if identified, or from the edge of the stream's bank. Connected and isolated wetlands in Orange County are also buffered for fifty (50) feet from the defined edge of the wetland.

Orange County policies are designed to deliberately focus urban-level development in areas where it makes the most sense, i.e. along major transportation corridors which link population centers. The three service areas mentioned earlier demonstrate this principle clearly. Even though the demand in our future service areas as described in this report is similar to other developed areas of similar size, the demand for public water in Orange County will be less county-wide than what would be needed in a county of comparable size. In addition, the services provided should be more efficient due to their concentration.

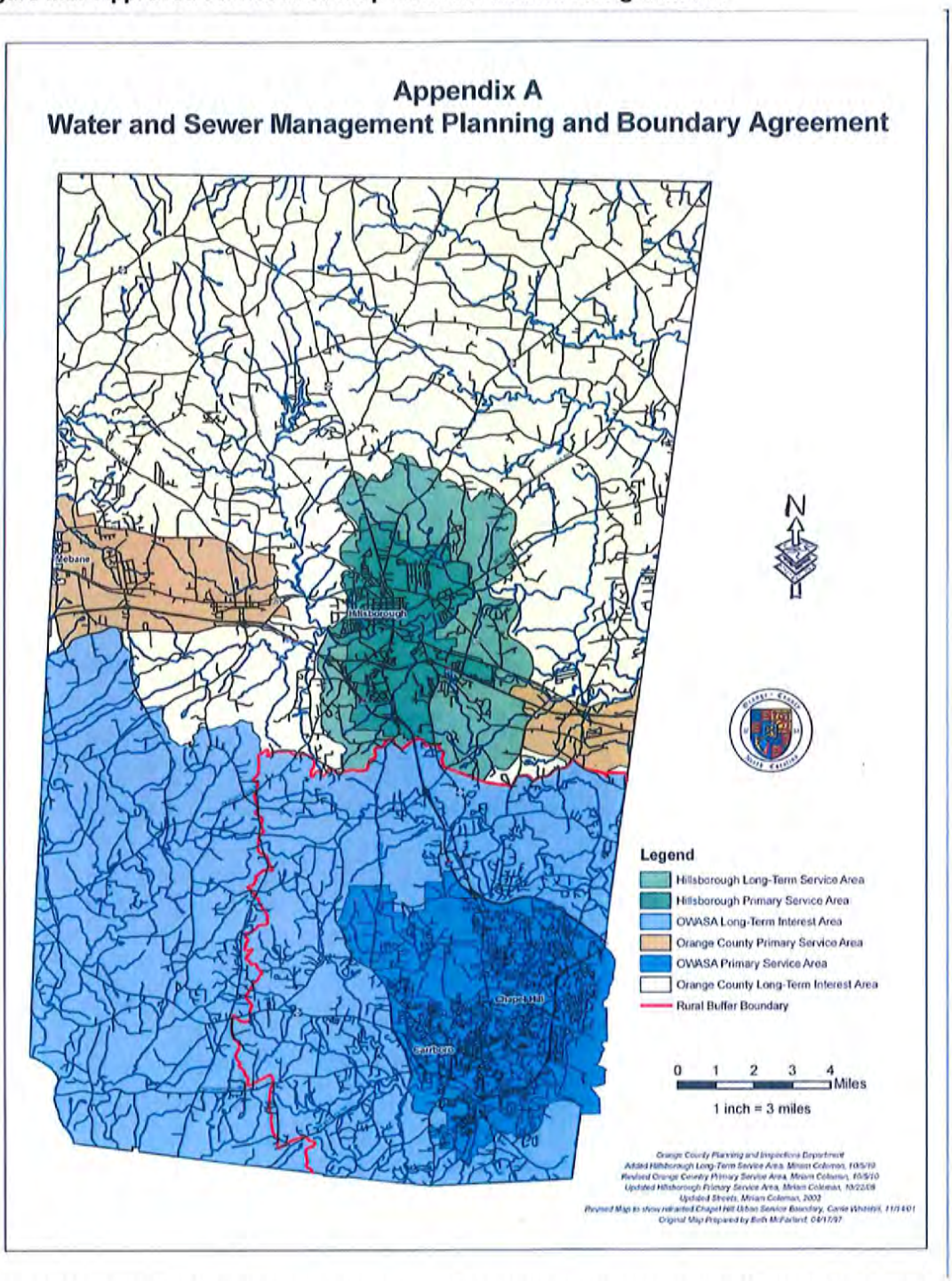
When recruiting potential development to the designated growth areas, the County has consistently focused on low to medium level water users. Because Orange County is situated at the headwaters of several streams, water supply is a concern. Recognizing that there is a limited supply of water, the County has been looking to recruit development that provides a healthy balance of economic benefit when compared to the development's water demand.

Following many years of discussion among the local governments located in Orange County and the Orange Water and Sewer Authority (OWASA), a county-wide Water and Sewer Management, Planning and Boundary Agreement (WSMPBA) was developed and signed in 2001. The agreement provides a comprehensive, county-wide system of utility service areas upon which the signatory entities rely when making decisions related to issues such as planning, land use, annexation, zoning, and growth management.

WSMPBA was originally in effect for 10 years and now renews automatically unless a signatory party provides a notice of intent to withdraw by following a process outlined in the agreement. All parties must approve any changes to the service boundaries shown on the WSMPBA map.

Figure II.1 is the WSMPBA map approved by the signatory parties. Primary Service Areas shown on the map are those areas where water and/or sewer service is now provided, or might reasonably be provided in the future. Long-Term Interest Areas are those areas within which public water and/or sewer service is not anticipated to be provided, but if such services were to be provided for "emergency" purposes due to private system failures, the designated party would be the service provider.

Figure II.1. Approved Service Area Map from the WASMPBA Agreement.



One of the two service areas within which the County plans to utilize Jordan Lake water to boost appropriate future development is located in an area designated in WSMPBA as an Orange County Primary Service Area (Eno). The other is in the Hillsborough Primary Service Area, but the Town has not included any land area from the County's Hillsborough EDD or other

sections shown in the service area map from the previous section in their Jordan Lake allocation application (Figure I.1) . In order to insure the availability of water for future development in the County's Hillsborough service area, Orange County is including a request for water to serve this area in the future.

The long-standing conservation ethic and watershed protection policies in the county, along with the conservation practices of the three utilities with whom the County is planning to partner within the EDDs, ensures that reasonable growth and effective water conservation will continue into the near future in Orange County.

References

Orange County, 2008. *Orange County, North Carolina: 2030 Comprehensive Plan.* Orange County Planning and Inspections Department. Adopted 18 November 2008.

Orange County, Town of Hillsborough, Orange Water and Sewer Authority, Town of Carrboro, Town of Chapel Hill. *Water and Sewer Management, Planning and Boundary Agreement*, 2010. As Amended 5 October 2010.

Town of Hillsborough and Orange County, 2014. *Hillsborough-Orange Interlocal Land Management Agreement, Central Orange Coordinated Area.*

Orange County, 2011. *Orange County, NC: Code of Ordinances, Appendix A: Unified Development Ordinance.* Adopted 5 April 2011, Last amended 19 March 2014.

SECTION III. CURRENT WATER SUPPLY

Available Supply

As previously mentioned, the Orange County water supply situation is unique among the Jordan Lake Partners in that the County does not own, operate or maintain any of its own water supply resources. Therefore, the currently available water supply is that of our partners who will be providing water to the three development areas identified earlier in this application and the County's 1% Level II allocation estimated to yield 1 million gallon per day (MGD) from Jordan Lake. Since both the City of Durham and the Town of Hillsborough will be applying for additional Jordan Lake allocation in this round, the current water supply for these systems will be discussed in more detail in their respective applications. The City of Mebane is not applying for a water allocation from Jordan Lake, so more emphasis will be placed on their current water supply in this section.

The City of Mebane has contracted with the City of Graham for a portion of the yield from their water supply reservoir (Graham-Mebane Reservoir). Mebane currently has a contract for one-third of the reservoir's 12 million gallon per day (MGD) 20-year sustainable yield. Mebane also pays one-third of the operating costs for the water treatment plant used to treat this water. According to Mebane's local water supply plan (LWSP), they are currently using approximately 30% of their 4 MGD allocation.

In 2004, Orange County first signed a Utility Service Agreement with the City of Mebane. This agreement identified areas in the western portion of the County, generally centered on the interstate 85/40 corridor, where Mebane agreed to provide water and sewer service. This agreement was amended in 2012, with additional service areas and a provision for a water and sewer allocation from Mebane. Orange County agreed to pay annually for a standing allocation of 0.25 MGD of water and sewer service for the first ten years of the agreement. After that, the City of Mebane will provide water and sewer to the area as needed.

As shown in our demand forecasts, there is currently very little usage in the County's identified service areas. The forecast future demand across all service areas is approximately 3.0 MGD in 2045, with approximately half of this demand expected to come from the area serviced by the City of Mebane. The remaining half (approximately 1.5 MGD) is split between the areas to be serviced by Hillsborough and Durham in the central and western portions of the County, respectively, and is the basis for this application of a 1.5 MGD allocation from Jordan Lake. Note that in Table III.1 below, the County's current 1% Level II allocation is included as part of the available supply. However, because Triangle Regional Water Supply Plan counts Level II allocations as potential supply, the future water needs calculated in Section IV. does not include the existing allocation.

Table III.1. Existing Source Summary, Available Supply.

Source	PWSID	SW or GW	Basin	WQ Classification	Available Supply (MGD)
Jordan Lake	n/a	SW	Haw (2-1)	WS IV B NSW CA	1.0
City of Mebane	02-01-018	SW	Haw (2-1)	WS-II	0.25
TOTAL					1.25

References

City of Mebane and Orange County, 2012. *Utility Service Agreement Amendment.* Adopted 9 July 2012.

SECTION IV. FUTURE WATER SUPPLY NEEDS

Orange County has very little demand currently in the areas it is committed to serve in the future. These areas have been designated as economic development areas of various types and the future needs have been estimated based on usage data obtained from others for a similar mix of uses. The Demand Projections presented in Section I have been peer-reviewed by the Jordan Lake Partnership, and represent the best available estimate of the future demand for Orange County for average day demand over the planning horizon.

The total projected demand across all sectors is shown below in Table IV.1. Our currently available water supply from the City of Mebane is shown in the table as 0.25 MGD. This is based on the 2012 agreement between the City and Orange County, which reserves 0.25 MGD for the next ten years. After the initial ten year period, the City of Mebane will provide the water necessary in the County's western most service area. This demand is estimated to represent roughly half of the future water supply demand shown in the table below (1.5 MGD from Mebane in 2045, 2.0 MGD from Mebane by 2060).

The table below does not take into account Orange County's currently held 1% Level II Jordan Lake allocation. The table is intended to show the total future demand without Jordan Lake. These quantities will be used in subsequent sections of the draft application to differentiate between possible supply alternatives that include Jordan Lake to varying degrees. In all of the supply alternatives, the proposed Jordan Lake supply quantities represent the total allocation Orange County would need in that scenario to meet demand. The figure below (Figure IV.1) represents the information from the Table IV.1 graphically.

Table IV.1. Projected Water Needs (5-year increments).

	2010	2015	2020	2025	2030	2035	2040	2045	2050	2055	2060
Demand	0.0	0.4	0.7	1.1	1.6	2.0	2.4	2.8	3.2	3.6	3.9
Supply	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25
Demand % of Supply	*10%*	*146%*	*282%*	*459%*	*637%*	*803%*	*970%*	*1125%*	*1280%*	*1424%*	*1567%*
Need	**0.0**	**0.1**	**0.5**	**0.9**	**1.3**	**1.8**	**2.2**	**2.6**	**3.0**	**3.3**	**3.7**

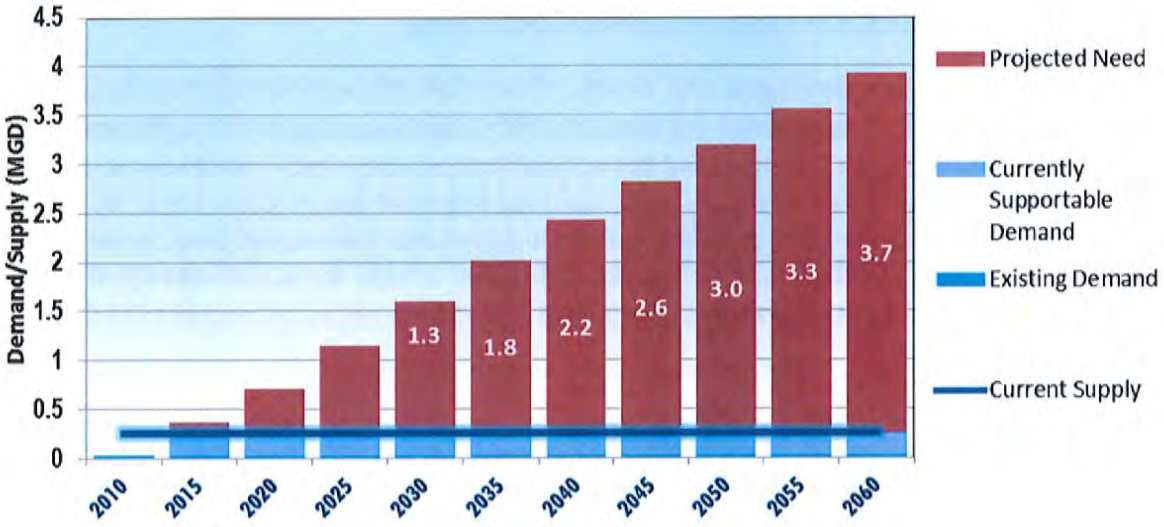


Figure IV.1. Projected Demand and Need relative to Current Supply.

References

Triangle J Council of Governments. *Triangle Regional Water Supply Plan, Volume 1: Regional Needs Assessment.* As corrected 8 March 2012.

SECTION V. ALTERNATIVE WATER SUPPLY OPTIONS

To meet the future anticipated demand, Orange County will rely on two major sources, listed below in more detail. Though there are many potential methods of distributing the water to the County's service areas, the source of the supply remains the same. The following section will introduce the County's two future supply sources and offer two possible scenarios for supplying the future water demand. This section includes alternatives designed to meet both the 2045 and 2060 projected need for the County's three service areas, even though the application is only requesting projected Jordan Lake allocation necessary to meet the 2045 projected water need.

Source Options

As shown in the table below, Table V.1, Orange County has two supply source options for the future. The Jordan Lake Allocation could be available as soon as 2015, assuming our allocation request is granted. Because the County does not operate a distribution system, routing a Jordan Lake allocation to the three service areas would involve partnering with the City of Durham, Town of Hillsborough, City of Mebane and Orange-Alamance Water System. If Jordan Lake water was used to serve the future demand of all three service areas, the amount needed by 2060 is estimated at 4.0 MGD.

The City of Mebane has agreed to provide the water to Orange County's western service area. The County pays an annual fee for a 0.25 MGD allocation of water and sewer from the City. This annual fee is paid for ten years from the time of the agreement (2012), so the last payment will be in 2022. At that point, water service to the area will be met by the City as needed. The available supply listed in the table under Mebane Supply would be enough to satisfy the anticipated demand in the County's western service district in the year 2060. The supply range listed covers the range between our current contractual agreement and the 2060 anticipated demand in the area served by Mebane.

Table V.1. Source Options Descriptions.

Source	Type	Basin	WQ Classification	Year Online (earliest)	Available Supply (MGD)	Supply Range (MGD)
Jordan Lake Allocation	Jordan Lake	Haw (2-1)	WS IV B NSW CA	2015	4.0	2.0-4.0
Mebane Supply	Other	Haw (2-1)	WS-II	2012	2.0	0.25-2.0

Supply Alternatives Summary

The table below gives a brief summary of each supply alternative considered as part of this application. Essentially, the only viable solutions for Orange County to supply water to its

service areas are to rely on Jordan Lake for all future water supply needs or use a Jordan Lake allocation to provide water supply for the eastern and central service areas and the City of Mebane water supply for the western service area.

Table V.2. Alternatives Description.

Alternative	Alternative Description
Alternative 1	This alternative is the preferred alternative and was developed in collaboration with, and is supported by the Jordan Lake Partnership. This option includes requesting a Jordan Lake allocation to cover the future demand from the eastern and central service areas only, which would be served by the distribution systems of City of Durham and Town of Hillsborough, respectively. The water supply to serve the western service area would come from the City of Mebane.
Alternative 2	This alternative assumes that 100% of future need is provided through a Jordan Lake allocation. This would involve a significant investment in upgrading the infrastructure needed to get our allocation to the western service area, along with coordination and interconnection agreements with more water systems than Alternative 1.

In both alternatives listed in Table V.2, the supply and demand projections remain the same. In Table V.3 below, the Total Projected Need represents the projected demand for the given year minus the currently available supply. The amount of water attributed to each source in the two alternatives represents the projected amount needed to satisfy the 2060 need. The County currently holds a 1 % Level II allocation from Jordan Lake. This allocation is included in the amount of water attributed to "Jordan Lake Allocation" in both scenarios. In other words, where the table shows an amount of 2.0 MGD from Jordan Lake Allocation, this represents the County's current 1% Level II allocation, plus an additional 1% Level II allocation requested through this application.

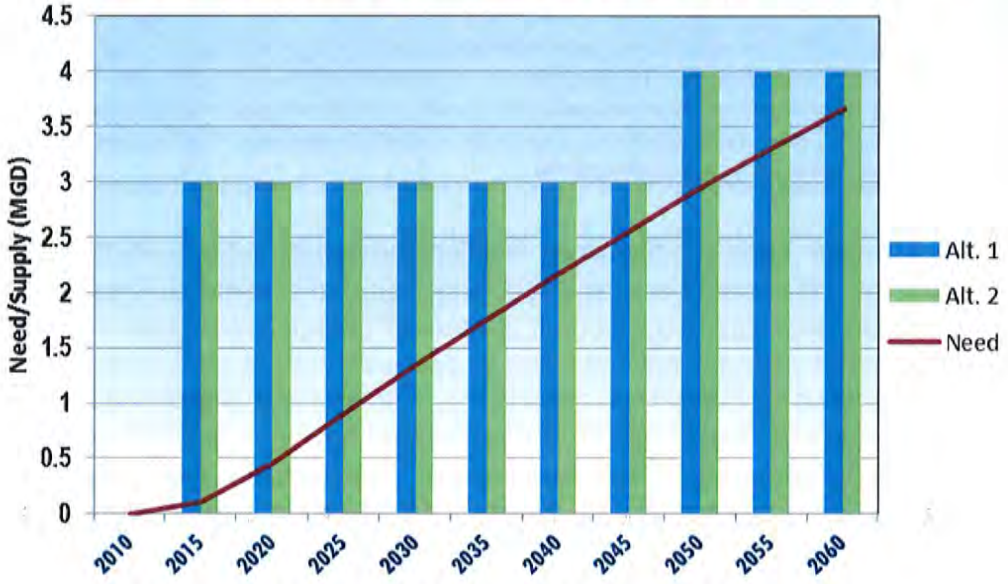
Table V.3. Source Composition of Supply Alternatives (MGD).

Need and Source Options	Alternative 1	Alternative 2
Total Projected Need (2045)	2.6	2.6
Total Projected Need (2060)	3.7	3.7
Sources:		
Jordan Lake Allocation	2.0	4.0
City of Mebane Supply	2.0	0.0
Total New Supply (MGD)	4	4

The table above gives the expected water supply required from each source to satisfy the Total Projected Need for 2060, as was required by the application directions. However, this application for a Jordan Lake allocation is only to satisfy Total Projected Need through Year 2045. Orange County's projected demand in all service areas through 2045 is approximately 2.85 MGD (Total Projected Need for 2045 is shown above as 2.6 MGD because the County

currently has a 0.25 MGD allocation from the City of Mebane). The new supply necessary to satisfy the 2045 need in the two alternatives given above would be approximately 3.0 MGD. In Alternative 1, each source amount would be reduced by 0.5 MGD for a total of 3.0 MGD through 2045. For Alternative 2, the Jordan Lake Allocation total would be reduced by 1.0 MGD for a total of 3.0 MGD through 2045. At some point in the future, the County would need to request an additional allocation of 0.5 MGD or 1.0 MGD from Jordan Lake to support the expected demand through 2060 for Alternative 1 and Alternative 2, respectively. This need vs. supply concept is illustrated graphically throughout the period of interest in Figure V.1 below.

Figure V.1. Alternatives - Timeline of need versus new water supply.



Alternatives Analysis

In Table V.4, which follows, there is a brief comparison of the two alternatives. The table describes the alternative based on the year 2045 supply and demands. Alternative 1 is the County's preferred alternative. Each alternative is described in detail below, along with the various metrics used to compare them.

Table V.4. Water Supply Alternative Ratings Through 2045.

Classification	Alternative 1	Alternative 2
Allocation Request (% of storage)	1.5	3.0
Total Supply (MGD)	3.0	3.0

Environmental Impacts	Less Than	More Than
Water Quality Classification	WS IV B NSW CA	WS IV B NSW CA
Timeliness	2015	2015
Interbasin Transfer (MGD)	0.8	0.8
Regional Partnerships	Yes, JLP	Yes
Technical Complexity	Not Complex	Not Complex
Institutional Complexity	Not Complex	Not Complex
Political Complexity	Complex	Very Complex
Public Benefits	Few	Few
Consistency with local plans	Yes	Yes
Total Cost ($ millions)	**2.235**	**3.135**
Unit Cost ($/1000 gallons)	**$24.80**	**$37.38**
Selected Alternative	✓	

Alternative 1 – Preferred Alternative

Orange County's preferred alternative is to use a Jordan Lake allocation as the supply source for only the central and eastern County service areas. The supply source for the County's western service area would be the City of Mebane. As shown in Table V.3 above, this alternative reduces the estimated need for a Jordan Lake Allocation by half to 1.5 MGD and 2.0 MGD based on estimated demand through both the 2045 and 2060 time periods, respectively. The Jordan Lake allocation could presumably be available in 2015, but will not likely be needed for the first several years, depending on the pace of development in these areas.

Orange County currently pays to reserve an allocation of 0.25 MGD from Mebane to serve development in the western service area for the near term, so this water is available now and has been since signing the agreement in 2012. This was set aside to allow Mebane to plan for the initial increase to their distribution system demand and to allow the County to use this known reservation of water as a recruitment tool to encourage development in these designated areas. Going forward, Mebane has agreed to serve the water needs of the western service area, as needed, and has adequate water supply to do so.

Jordan Lake Allocation Request

Orange County currently holds a 1.0% Level II allocation from Jordan Lake. The preferred alternative would require an additional 0.5% allocation estimated to yield an additional 0.5 MGD from Jordan Lake to supply the 2045 need for a total allocation of 1.5% To cover the projected 2060 need, Orange County would need an additional 0.5% allocation above this, for a

total of a 2.0% allocation Because of our unique situation with respect to water distribution and treatment, the allocation may not have to be converted to a Level I status for the first decade. It is projected that the municipalities distributing water to Orange County's central and eastern service areas, Hillsborough and Durham, will have adequate water supplies to cover demand in the area until that time. However, as time goes on, Orange County's allocation will be converted to Level I, which will offset the supply demands from our service areas on Durham's and Hillsborough's water supply.

Available Supply

This alternative will be able to supply our entire projected demand through 2060, approximately 4 MGD. It will also satisfy the water supply needs through 2045, approximately 3.0 MGD.

Environmental Impacts

Our preferred alternative has relatively few and minor environmental impacts. The service areas are not yet developed, so there will be impact from installing the necessary interior distribution lines to individual parcels and developments. However, the main raw and finished water distribution network is already in existence in most cases. For instance, the City of Durham has a way to obtain water from Jordan Lake now, so they would be able to use that infrastructure to withdraw the portion of Orange County's allocation needed to supply our eastern service area. The Town of Hillsborough already has an interconnect with the City of Durham. Durham can wheel water from the County's allocation to Hillsborough to provide the water supply for our central service area. The City of Mebane already has major service lines at the edges of the County's western service area. The County has constructed a backbone of water lines off of these Mebane service lines to which development can attach, but this would have to happen under any supply alternative.

Water Quality Classification

The Jordan Lake supply is classified as a WS IV, Class B primary recreation, Nutrient Sensitive Water. This is the highest water classification of the two supply sources in the County's preferred alternative. The water supply for the City of Mebane is the Graham-Mebane Reservoir, classified as a WS II water supply.

Timeliness

The timeliness of this alternative is rated as Good. The water should be accessible in the quantities needed at the appropriate times, based on our current projections.

Interbasin Transfer

Accessing a Jordan Lake allocation will involve an interbasin transfer from the Haw River Basin to the Neuse River Basin. The water from Jordan Lake that is sent to the Town of Hillsborough for Orange County's central service area will be processed in their treatment plant, which

discharges to a tributary of the Eno River. The estimated demand in this area is approximately 0.8 MGD by 2045 and 1.1 MGD by 2060.

The portion of Jordan Lake allocation which flows to the City of Durham for the County's eastern service area will flow to the South Durham Treatment Plant, which is discharged back into the Haw River Basin.

Regional Partnerships

This alternative was developed in coordination with the Jordan Lake Partnership, and is supported by other JLP members.

Technical Complexity

The Technical Complexity is rated as Not Complex for this alternative. The intake and transmission lines needed to deliver a Jordan Lake Allocation to the County's central and eastern service areas are already in place, due to an existing interconnection between the City of Durham and the Town of Hillsborough. Because the central and eastern service areas are essentially undeveloped now, a distribution network will need to be constructed over time in order to deliver water to specific parcels. While there does need to be some sensitivity to properly phasing the development of this distribution network, this is a common engineering situation and not terribly complex relative to other options.

Institutional Complexity

The Institutional Complexity is rated as Not Complex for this alternative. The most complex components will be this application for the Jordan Lake allocation itself and the transition to a Level I allocation in the future.

Political Complexity

The Political Complexity is rated as Complex for this alternative. In order for this alternative to work, there will have to be coordination with at least three municipalities to get water to our service areas. In general, this coordination will involve work on the staff level of all the municipalities and Orange County to draft and approve an agreement for distribution of water. In addition, Orange County will have to help broker deals between municipalities to wheel water through their jurisdictions so that our central and eastern service areas can be served. This will be the background work that takes place before presentation to each municipalities' elected boards, who will also have to approve the agreements. They may have questions or raise concerns that would have to be considered and addressed in the agreement, making the process iterative in nature as the versions bounce back and forth between the entities involved. There are no known issues which would prevent this collaboration from occurring, but with the number of elected boards involved, the complex rating seems justified.

Public Benefits

This alternative will generate Few public benefits. There are no anticipated direct public benefits, such as an opportunity for recreation. However, there are a few indirect but tangible public benefits associated with the ability to deliver water to the County's three service areas. The development of more commercial tax base in the County will reduce the burden on the residential tax base. Development in our service areas will mean the availability of local jobs for our citizens. Mixed use developments with residential components will also provide more housing options for citizens, including potentially more affordable multi-family housing.

Consistency with local plans

This alternative is consistent with Orange County's local land use plan and the Water and Sewer Management Planning and Boundary Agreement (WASMPBA), to which Orange County is a signatory. These service areas are regions of the County where public water and sewer are considered appropriate and/or are shown as Orange County's Prime Service Area on the WASMPBA County map. In addition, the Jordan Lake Partnership has reviewed and approved this preferred alternative, which is consistent with the Triangle Regional Water Supply Plan commissioned by the Partnership. To the extent that joint planning occurs between Orange County and the City of Mebane, City of Durham or Town of Hillsborough, this alternative is consistent, as well.

Total Cost ($ millions)

The total anticipated cost of this Alternative through 2045 is estimated to be approximately $2,235,000. This is a very rough estimate and attempts to take into account not only the cost of the requested 1.5% Jordan Lake allocation, but also the ancillary cost to implement this alternative, such as reserving capacity with the municipalities whose distribution networks will be used to supply water to our service areas. This may include incremental cost sharing for increases in treatment plant capacity in the intervening years. This incremental cost is unknown and will likely depend on many factors outside of Orange County's ability to control or estimate, such as the size of expansion and the rate at which the partnering municipality is expanding.

Unit Cost

The annualized unit cost for this alternative is estimated to be approximately $24.80 per 1000 gallons through 2045. This unit cost is derived by first calculating the annual cost. The total anticipated cost is divided by the period of interest (2015-2045 = 30 years) to determine the annual cost. Total anticipated cost is the sum of the $2,000,000 above, plus the current capital cost of a Level I Jordan Lake allocation ($88,071 per 1% allocation), plus the current annual maintenance and operation cost for a Jordan Lake allocation ($2,219 per 1% allocation). Note that the current annual maintenance and operation cost is already annualized and is not divided by the number of years in the period of interest. Once the anticipated annual cost is determined, this is divided by the anticipated yield of this alternative expressed in terms of

1000 gallons per day. The anticipated yield for this alternative is 3.0 MGD in 2045 and 4.0 MGD in 2060. The unit cost of $24.80 per 1000 gallons per day noted above and in Table V.4 is based on the period 2015-2045. This unit cost would be less if calculated through 2060 due to increased yield and more years to distribute the anticipated capital cost.

Alternative 2 – Jordan Lake Only

A secondary alternative is to use a Jordan Lake allocation as the sole supply source for all three of the County's service areas. As has been mentioned earlier in the application, even though Jordan Lake would be the supply source, the finished water would be provided to the service areas by Mebane, Hillsborough and Durham, respectively. Essentially, the Jordan Lake allocation held by Orange County would be used to augment the otherwise available supply for each water system as needed to supply water to development in Orange County's service areas. As shown in Table V.3 above, this alternative would require twice the estimated Jordan Lake Allocation as the County's preferred alternative, approximately 3.0% and 4.0% through the 2045 and 2060 time periods, respectively. The Jordan Lake allocation could presumably be available in 2015, but will not likely be needed for the first several years, depending on the pace of development in these areas.

Orange County currently pays to reserve an allocation of 0.25 MGD from Mebane to serve development in the western service area for the near term, so this water is available now and has been since signing the agreement in 2012. This was set aside to allow Mebane to plan for the initial increase to their distribution system demand and to allow the County to use this known reservation of water as a recruitment tool to encourage development in the western service area. Beyond 2022, when the County's contractual 0.25 MGD reservation expires, Mebane would continue to serve as the utility provider for the western service area. In a manner similar to the central and eastern service areas, the County would make available a portion of its Jordan Lake allocation under this alternative to the City of Mebane to supplement their existing water supply as development occurs in the western service area.

Jordan Lake Allocation Request

Orange County currently holds a 1.0% Level II allocation from Jordan Lake. This alternative would require an additional 2.0% allocation from Jordan Lake to supply the 2045 need for a total allocation of 3.0% To cover the projected 2060 need, Orange County would need an additional 1.0% allocation above this, for a total of 4.0%. Because of our unique situation with respect to water distribution and treatment, the allocation may not have to be converted to a Level I status for the first decade. It is projected that the municipalities distributing water to Orange County's three service areas will have adequate water supplies to cover demand in the area until that time. However, as time goes on, Orange County's allocation will be converted to Level I, which will offset the supply demands from our service areas on our partnering utilities' water supplies.

Available Supply

This alternative will be able to supply our entire projected demand through 2060, approximately 4 MGD. It will also satisfy the water supply needs through 2045, approximately 3.0 MGD.

Environmental Impacts

This alternative has more environmental impact than the preferred alternative. Like the preferred alternative, the service areas are not yet developed, so there will be impact from installing the necessary interior distribution lines to individual parcels and developments. In the central and eastern service areas, the main raw and finished water distribution network is already in existence in most cases. For instance, the City of Durham has a way to obtain water from Jordan Lake now, so they would be able to use that infrastructure to withdraw the portion of Orange County's allocation needed to supply our eastern service area. The Town of Hillsborough already has an interconnect with the City of Durham. Durham can wheel water from the County's allocation to Hillsborough to provide the water supply for our central service area.

To get a Jordan Lake Allocation to our western service area, an interconnecting pipeline will have to be improved to handle the volume of water which needs to be moved. According to Volume I of the Triangle Regional Water Supply Plan (2012), there is currently an interconnection between Hillsborough and Orange-Alamance Water System (OAWS). OAWS is a private water provider that would be an intermediary utility through which Jordan Lake water could flow to Mebane's distribution system. The current interconnection between OAWS and Hillsborough is only rated to handle approximately 200,000 gallons per day. This line would have to be improved to handle at least 1.5 MGD in order to adequately supply enough Jordan Lake water to the City of Mebane to handle the projected 2045 demand in Orange County's western service area. The line would ultimately have to transmit at least 2.0 MGD for the projected 2060 demand in that region. Installing this line is an added environmental impact which is unique to this alternative.

Water Quality Classification

The Jordan Lake supply is classified as a WS IV, Class B primary recreation, Nutrient Sensitive Water. This is the only supply source for this alternative.

Timeliness

The timeliness of this alternative is rated as Good. The water should be accessible in the quantities needed at the appropriate times, based on our current projections. Even though a pipeline would have to be built to get a Jordan Lake allocation to the western service area, it is anticipated that this could be done well before the water is needed by Mebane to service the demand in that area.

Interbasin Transfer

Accessing a Jordan Lake allocation will involve an interbasin transfer from the Haw River Basin to the Neuse River Basin. The water from Jordan Lake that is sent to the Town of Hillsborough for Orange County's central service area will be processed in their treatment plant, which discharges to a tributary of the Eno River. The estimated demand in this area is approximately 0.8 MGD by 2045 and 1.1 MGD by 2060.

The portion of Jordan Lake allocation which flows to the City of Durham for the County's eastern service area will flow to the South Durham Treatment Plant, which discharges back into the Haw River Basin. The portion of Jordan Lake allocation which flows to the City of Mebane for the County's western service area will flow to the Graham-Mebane Treatment Plant, which deposits back into the Haw River Basin.

Regional Partnerships

This alternative was developed in coordination with the Jordan Lake Partnership, but is not the preferred alternative supported by either Orange County or its Jordan Lake Partnership colleagues. The success of this alternative will depend on partnering with the City of Mebane, City of Durham, Town of Hillsborough and the Orange-Alamance Water System to distribute water to the County's service areas.

Technical Complexity

The Technical Complexity is rated as Not Complex for this alternative. The intake and transmission lines needed to deliver a Jordan Lake Allocation to the County's central and eastern service areas are already in place, due to an existing interconnection between the City of Durham and the Town of Hillsborough. An interconnection between Hillsborough and OAWS will have to be developed, but designing a water transmission line is not complex. Because the three service areas are essentially undeveloped now, a distribution network will need to be constructed over time in order to deliver water to specific parcels. While there does need to be some sensitivity to properly phasing the development of this distribution network, this is a common engineering situation and not terribly complex. However, this alternative will be more complex than the preferred alternative.

Institutional Complexity

The Institutional Complexity is rated as Not Complex for this alternative. The most complex components will be this application for the Jordan Lake allocation itself and the transition to a Level I allocation in the future.

Political Complexity

The Political Complexity is rated as Very Complex for this alternative. In order for this alternative to work, there will have to be coordination with at least three municipalities and a Board of Directors for a private water system to get water to our service areas. In general, this

coordination will involve work on the staff level of all the utilities and Orange County to draft and approve an agreement for distribution of water. In addition, Orange County will have to help broker deals between public and private utilities to wheel water through their jurisdictions so that our three service areas can be served. This will be the background work that takes place before presentation to each board, who will also have to approve the agreements. They may have questions or raise concerns that would have to be considered and addressed in the agreement, making the process iterative in nature as the versions bounce back and forth between the entities involved. There are no known issues which would prevent this collaboration from occurring, but with the number of elected boards and a private water system board involved, the Very Complex rating seems justified.

Public Benefits

This alternative will generate Few public benefits. There are no anticipated direct public benefits, such as an opportunity for recreation. However, there are a few indirect but tangible public benefits associated with the ability to deliver water to the County's three service areas. The development of more commercial tax base in the County will reduce the burden on the residential tax base. Development in our service areas will mean the availability of local jobs for our citizens. Mixed use developments with residential components will also provide more housing options for citizens, including potentially more affordable multi-family housing.

Consistency with local plans

The Jordan Lake Partnership group has seen this alternative, but it is not the preferred alternative. However, this alternative is consistent with Orange County's local land use plan and the Water and Sewer Management Planning and Boundary Agreement (WASMPBA), to which Orange County is a signatory. These service areas are regions of the County where public water and sewer are considered appropriate and/or are shown as Orange County's Prime Service Area on the WASMPBA County map. Also, to the extent that joint planning occurs between Orange County and the City of Mebane, City of Durham or Town of Hillsborough, this alternative is consistent.

Total Cost ($ millions)

The total anticipated cost of this Alternative through 2045 is estimated to be approximately $3,135,000. This is a very rough estimate and attempts to take into account the cost of the Jordan Lake allocation itself, in addition to the necessary transmission pipeline between Hillsborough and the OAWS distribution system and the ancillary cost to implement this alternative. These ancillary costs might include reserving capacity with the municipalities whose distribution networks will be used to supply water to our service areas or incremental cost sharing for increases in treatment plant capacity in the intervening years. These costs are unknown at this time and will likely depend on many factors outside of Orange County's ability to control or estimate, such as the size of any given necessary expansion and the rate at which the partnering municipality is expanding.

Unit Cost

The annualized unit cost for this alternative is estimated to be approximately $37.38 per 1000 gallons through 2045. This unit cost is derived by first calculating the annual cost. The total anticipated cost is divided by the period of interest (2015-2045 = 30 years) to determine the annual cost. Total anticipated cost is the sum of the $2,900,000 above, plus the current capital cost of a Level I Jordan Lake allocation ($88,071 per 1% allocation), plus the current annual maintenance and operation cost for a Jordan Lake allocation ($2,219 per 1% allocation). Note that the current annual maintenance and operation cost is already annualized and is not divided by the number of years in the period of interest. Once the anticipated annual cost is determined, this is divided by the anticipated yield of this alternative expressed in terms of 1000 gallons per day. The anticipated yield for this alternative is 3.0 MGD in 2045 and 4.0 MGD in 2060. The unit cost of $37.38 per 1000 gallons per day noted above and in Table V.4 is based on the period 2015-2045. This unit cost would be less if calculated through 2060 due to increased yield and more years to distribute the anticipated capital cost.

Selected Alternative

As stated earlier in this section, the County's preferred alternative is Alternative 1. The preferred alternative makes the best use of the existing distribution systems which are situated near our three service areas. It will not require the added expense and environmental impact of a new transmission line or the added complexity of negotiating an agreement with OAWS to wheel water from Hillsborough to Mebane.

In addition, this alternative is in agreement with the JLP's TRWSP. As such, any changes to the allocation request in this alternative could have an impact on the ability of other partners to meet their needs. This alternative represents a regional alternative for which allocation requests have been coordinated, and to the best knowledge of the partners, will not have a substantial negative impact on either the ability of Jordan Lake to meet all applicants' requests for water or downstream users and the environment.

SECTION VI. PLANS TO USE JORDAN LAKE

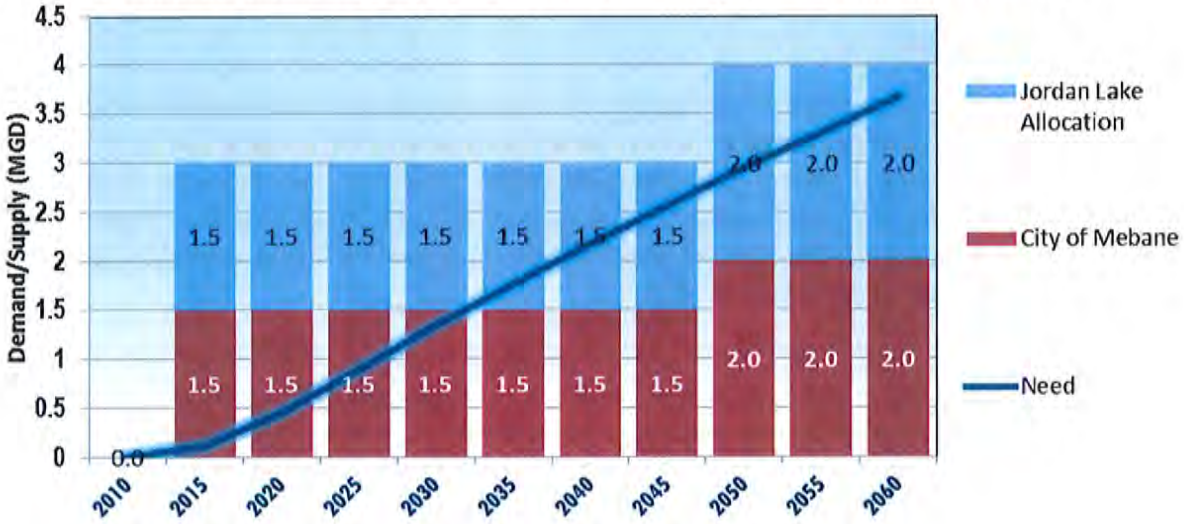
Based on the need demonstrated in Section IV, and the alternatives analysis presented in Section V, Orange County is planning to implement Alternative 1. Accordingly, this application includes a request for Jordan Lake Water Supply Storage in the amount of a 1.5% Level II Allocation. This represents an increase of 0.5% from the existing 1.0% Level II Allocation. The future projected 2060 need is for a 2.0%] allocation.

Implementation Plan and Timeline

Orange County will access our Jordan Lake allocation through interlocal agreements with municipalities or utility providers within or adjacent to Orange County. These entities include the City of Mebane, Town of Hillsborough and City of Durham, as has been mentioned in earlier sections of this application. Existing interlocal agreements for provision of water and sewer service are already in place with the City of Mebane and the City of Durham. Discussions are underway with the Town of Hillsborough as the County and Town have completed a 'joint' strategic plan in and around the Hillsborough area where public water and sewer is consistent with the land use plan.

Interlocal agreements will include aspects of reservation, allocation assignment, share or cost of facilities, including transmission or treatment infrastructure. Since the schedule of development of the necessary distribution lines and associated infrastructure is uncertain, the capital cost schedule is also uncertain. Orange County has shared in the regional interconnection study as an active participant in the Jordan Lake Partnership. Although the planning period is long-term, Orange County has already begun investing designated water infrastructure dollars within appropriate growth zones noted on county land use maps. These master water trunk systems will be part of the conveyance system necessary to supply water from both Jordan Lake and the City of Mebane to the County's service areas. The speed of development of the service areas and their subsequent water demand will depend on the economic conditions going forward and the success of the County's efforts to attract new growth.

Table VI.1. Selected alternative implementation timeline (Need vs. Sources available).



Access to Jordan Lake

As noted in the previous section, Orange County will access the lake through existing and proposed interlocal agreements. It is likely that Orange County will arrange to receive our Jordan Lake allocation from the City of Durham, which currently accesses Jordan Lake water through an interconnection with the Town of Cary. The City of Durham and several other members of the Jordan Lake Partnership have begun studying the possibility of an intake on the western side of Jordan Lake. Should this western intake prove feasible and be constructed, the City of Durham would have an alternate means to access Jordan Lake water, which would only serve to increase the resiliency of the County's access to our Jordan Lake allocation.

Raw and Finished Water Quality Monitoring Plan

This monitoring will be in accordance with the requirements of the North Carolina Department of Environment and Natural Resources, Division of Water Resources – Public Water Supply Section, and the United States Environmental Protection Agency.

Orange County will be installing surface water resource monitoring stations on streams within the County which ultimately flow to Jordan Lake. Orange County has some of the highest watershed standards in the state and will continue to protect headwaters and regulate development consistent with State stormwater rules. The Water Quality Monitoring Plan will be the responsibility of the water purveyor as noted in the interlocal agreement.

Estimate of Costs

Jordan Lake Costs

Jordan Lake was financed and constructed by the federal government through the US Army Corps of Engineers. Storage space for municipal and industrial water supply was included at the request of state and local officials with the understanding that the costs associated with this water supply storage would be paid for by the actual users. The result of that arrangement is that the management plan for Jordan Lake dedicates 33 percent of the conservation pool, or 45,800 acre feet, for water supply storage.

North Carolina General Statute 143-215.38 authorized the State, acting through the Environmental Management Commission (EMC), to assume repayment responsibilities for the costs associated with providing water supply storage in Jordan Lake. These costs fall into three basic categories: capital costs including interest, operating costs, and administrative costs. The total cost for each percent of water supply allocated from Jordan Lake varies with a number of parameters, the key ones being when the allocation is granted and when water is expected to be withdrawn. The rules governing allocation of water supply storage require the state to recover the complete federal capital and interest costs associated with a Level I allocation by 2012. Thereafter, the cost of future Level I allocations will be based on the initial capital cost and accrued interest as well as the accrued operating expenses associated with the percent of storage.

Capital and Interest Costs

Capital costs are based on the Jordan Lake construction costs of approximately $89 million, excluding funds budgeted specifically for recreational lands and facilities. Since the project's cost is shared among several project purposes, the Corps estimated that 4.6% of the construction cost is attributable to water supply. Including interest accrued during project construction, $4.388 million represents the original investment cost for the water supply provided by the reservoir. Based on this figure, the initial capital cost is $43,880 for each one percent of supply storage.

In 1992, the State began making interest payments at a rate of 3.225% on the unallocated portion of the Jordan Lake water supply. As stated above, all of these interest payments will be passed on to the eventual holders of the water supply storage.

For example, the cost of a new Level I allocation made in 2014, based on capital cost and accrued interest, is estimated to be $75,013 per percent of water supply storage. In future years entities that receive a new Level I allocation in this round of allocations will be billed for operation and maintenance expenses based on the percentage of storage in the allocation.

Holders of Level II allocations are required to make the annual interest payments on the capital costs associated with the allocation percentage, along with a similar proportion of operating expenses, until their allocation is converted to Level I.

Orange County has paid for 1% Level II contributions for 22 years. If the County's additional allocation request is approved, the County will budget for the larger 1.5% Level II allocation in upcoming years and monitor the water supply needs of the three service areas along with our partnering municipalities to estimate the timeframe for conversion to a Level I allocation.

Operating Costs

In addition to the costs incurred to construct the project, there are continuing expenses for operation and maintenance (O&M), and periodic expenses for replacement and rehabilitation of facilities at the reservoir. Current and future allocation holders are required to pay a proportional share of these operating expenses. Allocation holders must also reimburse the State for payments made to cover operating expenses since the Corps started charging for these operating expenses in 1992. The estimated accrued operating expenses for a new Level I allocation of one percent made in 2014 is $13,034 which would be added to the capital and interest payment.

The water supply proportional share of operation and maintenance costs is estimated by the Corps to be 5.4% of the total expenses. For example, in 2011 $109,258 was attributed to annual operation and maintenance costs associated with water supply. Thus, $1,092.58 was attributed to each one percent of water supply storage. The average annual O&M cost for 2007-2011 is $777 per percent of storage. Since 1992, the Corps has been charging the State the full 5.4% of operation and maintenance costs associated with water supply storage. Future allocation holders must reimburse the State for the actual operation and maintenance charges for their allocations since 1992.

Replacement Costs

The proportional share of replacement costs attributed to water supply is estimated by the Corps to be 2.8% of the total expense. These costs are more difficult to budget because they are not incurred on a regular basis. The Corps estimated an annual equivalent project replacement expense of approximately $66,000.[1] The proportion of these annual replacement costs charged against water supply amounts to approximately $1,800 total, or $18 per percent of storage. Until the Corps starts incurring replacement costs and passing these costs on to the State (they have not through 2011), allocation holders will not have any additional reimbursement costs associated with replacement costs.

Rehabilitation Costs

The proportional share of major rehabilitation costs attributed to water supply is also estimated by the Corps to be 2.8% of the total expense. Annual rehabilitation costs can be estimated at about $30,092.86 based on costs incurred in 1995 and 1996. At this rate the proportion of these annual rehabilitation costs charged against water supply amounts to approximately $843 or $8.43 per percent of storage. Future allocation holders must reimburse the State for the

[1] It is important to note that replacement costs will fluctuate from year to year based on actual expenses incurred by the Corps.

actual rehabilitation payments made on their allocations since 1992. The Corps has not billed the state for any rehabilitation expenses since 1996. When rehabilitation expenses are incurred in the future they will be distributed proportionally to allocation holders.

Cost Summary

Based in the figures presented in the discussions above, a new one percent Level I allocation of water supply storage made in 2014 is estimated to cost the holder $88,071. This figure includes: $43,880 of capital cost, $31,133 in accrued interest, $12,998 in accrued O&M costs, $34 in accrued rehabilitation costs, and $26 estimated costs for annual rehabilitation and replacement costs. In addition, a fixed $250 administration fee is added to each bill. Based on the figures used for these estimates, in subsequent years the cost of a one percent Level I allocation can be expected to be in the neighborhood of $2,200 based on historical O&M and interest costs.

The cost of a new one percent Level II allocation made in 2014 is also estimated to be about $2,200 annually, based on the same figures. At the time a Level II allocation is converted to a Level I allocation, the holder can expect to make a payment of at least $88,071 for each one percent of storage included in their allocation. This covers the capital cost and accrued expense up to the time the Level II allocation is made. After that date, the allocation holder will be paying the O&M and interest payments annually. These estimates are presented as a table below.

Table VI.1. Example of Payment Responsibilities for Allocation Holders (per percent of storage allocated).

Estimates for Year	2014		2014
	New 1% Level I		New 1% Level II
Allocation Level	I	I	II
	1st Year	Subsequent Years	1 st Year
Capital Cost [1]	$ 43,880.00	$ -	$ -
Accrued Interest on Capital [2]	$ 31,132.86	$ -	$ -
Total Capital Cost [3]	$ 75,012.86	$ -	$ -
Interest Portion of Capital Payments [4]	$ -	$ 1,415.13	$ 1,415.13
Annual O&M Cost [5]	$ 777.30	$ 777.30	$ 777.30
Accrued O&M Costs [6]	$ 12,220.47	$ -	
Annual Rehabilitation Cost [7]	$ 8.43	$ 8.43	$ 8.43
Accrued Rehabilitation Costs [8]	$ 33.98		
Replacement Cost [9]	$ 18.00	$18.00	$18.00
Total Cost per PERCENT [10]	$ 88,071.03	$ 2,218.85	$ 2,218.85
Additional Fixed Cost per Acct. [11]	$ 250.00	$ 250.00	$ 250.00

Notes:

1. *$4,388,000 for 45,800 acre-feet of storage.*
2. *3.225% interest paid annually on the original capital cost for the years 1992-2014, compounded annually.*
3. *Total Capital Cost = Capital Cost + Accrued Interest on Capital.*
4. *The interest on $43,880 at 3.225% interest rate.*
5. *The estimated annual O&M (operation and maintenance) cost, based on an average of actual O&M costs for the years 2007-2011.*
6. *The total of actual O&M costs for the years 1992-2011 and estimates for 2012, 2013 and 2014.*
7. *The estimated annual rehabilitation cost, based on an average of actual rehabilitation costs for the years 1995-1996.*
8. *The total of actual rehabilitation costs for the years 1992-1999. Payback assumes either a lump sum, or 20 equal annual payments at a 3.225% interest rate.*
9. *Replacement cost is based on the Corps estimate of the average annual replacement cost. Note that there is no accrued replacement cost, as the State has not been billed for such as of year 2011.*
10. *Total Cost per percent of storage = (Total Capital Cost or Interest Portion of Capital Payments) + Annual O&M Cost + Accrued O&M Cost + Annual Rehabilitation Cost + Accrued Rehabilitation Costs + Replacement Cost.*
11. *An additional administrative charge of $250 is added to each allocation holder's bill.*

Other Capital Costs

As mentioned in the previous section, there will likely be other costs associated with the provision of water to the County's three service areas. These costs are estimated at $2,000,000 for the preferred alternative through 2045. With three different water utility providers, there are many factors determining the cost which are which are outside of the County's control or ability to estimate well.

The operating cost of the distribution infrastructure along with any future rehabilitation/repair necessary will be the responsibility of the water service providers and will not represent a cost center to Orange County.

Cost Summary

The overall cost of the preferred alternative would be the estimated capital cost to develop the supply, plus the capital cost incurred to obtain a Level I Jordan Lake allocation, plus the annual cost of Jordan Lake maintenance and repair. Using the numbers for Jordan Lake costs from Table VI.1 above, the estimated cost through 2045 would be:

$2,000,000 + ($88,071 x 1.5% allocation) + ($2,219 x 1.5% allocation x 30 years)

= $2,231,962

Discussion

This alternative is preferred by both Orange County and the JLP. It makes the best use of the existing infrastructure of each partner utility to efficiently get water to where it is needed in the

County's three service areas. In addition, this alternative requires less Jordan Lake allocation than our other option. Last but not least, because our secondary alternative would require additional infrastructure and more Jordan Lake allocation, the cost to implement this preferred alternative is lower.

References

Cost data for a Jordan Lake Allocation provided by the North Carolina Division of Environment and Natural Resources and the United States Army Corps of Engineers

APPENDICES

APPENDIX A. DENR JORDAN LAKE WATER SUPPLY WORKBOOK

See attached excel workbook file titled “Orange County JLA4_Workbook_JLP_v2_041414.xlsx”.