Environmental Assessment

FOR THE TOWNS OF CARY, APEX AND MORRISVILLE AND WAKE COUNTY

Interbasin Transfer Certificate Modification

PREPARED FOR

NCDENR

Division of Water Resources
512 N. Salisbury Dr., Raleigh, NC 27604

PREPARED BY

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DECEMBER 2014

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December 17, 2014

Mr. Harold Brady
NC Department of Environment and Natural Resources
Division of Water Resources
512 N. Salisbury Dr.
Raleigh, NC 27604

Subject: Environmental Assessment for the Towns of Cary, Apex, and Morrisville, and Wake County Interbasin Transfer Certificate Modification

Dear Mr. Brady:

Please find enclosed 2 hard copies and 9 CD's of the Environmental Assessment for the Towns of Cary, Apex, and Morrisville, and Wake County Interbasin Transfer Certificate Modification for submittal to the State Environmental Review Clearinghouse.

If you have any questions, please contact me at 919.760.1772, or by email at adam.sharpe@ch2m.com.

Sincerely,

CH2M HILL

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Project Manager

Cc: Leila Goodwin, Town of Cary
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Acronyms and Abbreviations

AQI	Air Quality Index
B	Primary Recreation, Fresh Water (water classification)
BI	Biotic Index
C	Aquatic Life, Secondary Recreation, Fresh Water (water classification)
CA	Critical Area (water classification)
CAWTF	Cary/Apex Water Treatment Facility
CFNRBHM	Cape Fear-Neuse River Basin Hydrologic Model
CNRM	calibrated nutrient response model
cfs	cubic foot per second
dBA	decibel (A-weighted scale)
DWR	Division of Water Resources
DWQ	Division of Water Quality
EA	environmental assessment
EIS	environmental impact statement
EMC	Environmental Management Commission
EPT	Ephemeroptera, Plecoptera, and Trichoptera
FEMA	Federal Emergency Management Agency
FIRM	Flood Insurance Rate Map
FSC	Federal Species of Concern
GIS	geographical information system
GS	North Carolina General Statute
IBT	interbasin transfer (unless otherwise stated, calculated as the daily average of a calendar month)
JLP	Jordan Lake Partnership
Jordan Lake	B. Everett Jordan Lake
LRWRP	*Long Range Water Resource Plan*
mi^2	square miles
mgd	million gallons per day
mg/L	milligrams per liter
ml	milliliter
NCDENR	North Carolina Department of Environment and Natural Resources
NCNHP	North Carolina Natural Heritage Program
NCWRC	North Carolina Wildlife Resources Commission
NLCD	National Land Cover Database

NPDES	National Pollutant Discharge Elimination System
NPL	National Priorities List
NRHP	National Register of Historic Places
NSW	Nutrient Sensitive Waters (water classification)
NWI	National Wetland Inventory
O&M	operations and maintenance
OWASA	Orange Water and Sewer Authority
PCB	polychlorinated biphenyl
RDU Airport	Raleigh–Durham International Airport
ROD	Record of Decision
RTP South	Research Triangle Park
SAESH	Significant Aquatic Endangered Species Habitat
SCI	secondary and cumulative impacts
SCIMMP	*Secondary and Cumulative Impacts Master Management Plan*
SNHA	Significant Natural Heritage Area
State	State of North Carolina
SR	state road
TMDL	total maximum daily load
Towns	Apex, Cary, and Morrisville
TP	total phosphorus
Triangle WWTP	Durham County Triangle Wastewater Treatment Plant
USACE	United States Army Corps of Engineers
USDA	United States Department of Agriculture
USEPA	United States Environmental Protection Agency
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UT	Unnamed Tributary
WRF	Water Reclamation Facility
WS-III	Water Supply III – Moderately Developed (water classification)
WS-IV	Water Supply IV – Highly Developed (water classification)
WSRP	water shortage response plan
WWTP	Wastewater Treatment Plant
WWRWRF	Western Wake Regional Water Reclamation Facility

Executive Summary

Since the mid-1990s the Towns of Apex, Cary, and Morrisville (Towns) and Wake County (on behalf of the Wake County portion of Research Triangle Park [RTP South]) have been cooperatively working to develop and manage their water resources. The Towns, Wake County, and RTP South cooperate under various organizational arrangements for raw water supply, water treatment, water distribution, wastewater collection, wastewater treatment, reclaimed water distribution, and interbasin transfer (IBT). Together, the Towns and Wake County have been planning for a secure long-range future water supply for their customers and responsible water management, including IBT.

The Towns and Wake County are subject to an IBT certificate issued by the Environmental Management Commission (EMC) on July 12, 2001 ("2001 IBT Certificate"). An IBT certificate is required by North Carolina law, because wastewater discharges and consumptive uses occur in receiving basins that differ from the Towns' water supply source basin, the Haw River subbasin of the Cape Fear River basin. The 2001 IBT Certificate limits transfers from the Towns' water supply source basin, the Haw River subbasin (Jordan Lake), to the Neuse River basin to 24 million gallons per day (mgd) on a maximum day basis.

The Towns have maintained compliance with the 2001 IBT Certificate since it was issued, including the maximum day limit and eight additional conditions. Compliance with the transfer limit and certificate conditions is detailed in annual reports submitted to the Division of Water Resources (DWR). In addition, no impacts have been identified as a result of the ongoing transfers. This is consistent with both the *2000 Environmental Impact Statement (EIS) for RTP South and the Towns of Cary, Apex and Morrisville in Wake County for the Increase in Interbasin Transfer for the Haw River Basin to the Neuse River Basin* (CH2M HILL, 2000) and the 2001 Record of Decision (ROD), which predicted no significant direct impacts and are the basis for the 2001 IBT Certificate.

The Towns and Wake County are requesting a modification of the 2001 IBT Certificate to meet three objectives:

1. Modify the basis of the IBT limit from a maximum day IBT calculation to IBT calculated as the daily average of a calendar month in accordance with the changes to GS 143-215.22L (regulation of surface water transfers) based on Session Law 2013-388. (*Note: otherwise stated, IBT in this document means IBT calculated as the daily average of a calendar month*)
2. Include, at the request of DWR, transfers to the Cape Fear River subbasin (consumptive uses in the Town of Apex utility service area) so that the modified certificate addresses transfers from the Haw River subbasin to both the Neuse and Cape Fear River subbasins.
3. Base the certificate on an updated 30-year planning period to address the Towns' and Wake County's IBT needs through 2045 (the 2001 IBT Certificate was based on a 30-year planning period ending in 2030).

As has been reviewed with DWR, there are no alternatives included in the EA to modifying the 2001 IBT Certificate to meet the first two objectives listed above: (1) comply with new law and (2) satisfy the request from DWR. These modifications are consistent with the 2013 revisions to GS 143-215.22L and reflect a change in perspective by DWR regarding the inclusion of consumptive transfers to the Cape Fear River basin that in and of themselves are below the threshold required for an IBT certificate. It is assumed that a "Updated 2001 IBT Certificate" would limit IBT to 22 mgd (now measured as the average day of a calendar month), equivalent to the 24 mgd maximum day IBT limit, from the Haw River subbasin to the Neuse River or Cape Fear River subbasins, based on the same 2030 expected conditions as the 2001 IBT Certificate. In the context of this EA, references to the proposed IBT certificate modification mean proposed changes to the Updated 2001 IBT Certificate. References to "no increase in IBT" means no increase from the Updated 2001 IBT Certificate. To meet the third objective – supplying water needs through 2045 - the Towns and

Wake County are requesting an IBT certificate modification that would allow increased transfers up to 33 mgd from the Haw River subbasin.

This Draft Environmental Assessment (EA) identifies and discusses the direct effects of the proposed IBT certificate modification on both the source and receiving basins, and the Towns' Utility Service Areas. Potential direct effects on water resources, soils, wildlife resources, aquatic resources, land cover, agricultural land and prime farmland, forested resources, public lands and scenic and natural areas, archaeological and historic resources, air quality, noise levels, and toxic substances were evaluated. Also evaluated were the project alternatives ranging from no action (continuing under the Updated 2001 IBT Certificate) to the proposed IBT certificate modification (increase in IBT from the Updated 2001 IBT Certificate), and alternatives to avoid an increase in IBT.

This EA concludes that the direct effects of the proposed IBT certificate modification on both the source and receiving basins would be insignificant. The proposed IBT certificate modification will not significantly change Jordan Lake elevations, water quality or water supply pool storage volumes, downstream flows, downstream users' water supply availability, or downstream water quality in the source or receiving basins. Based on the hydrologic modeling, there are noticeable changes in a number of the reviewed hydrologic indicators, but primarily as a result of future water withdrawals within the Cape Fear River basin and full utilization of the Jordan Lake water supply pool. The Towns' existing discharges or permits in the receiving basins will not be expanded as a result of the proposed IBT certificate modification. No significant direct effects to environmental resources are expected. This EA includes a summary of Towns' mitigation programs in place to minimize the effect of their IBT.

The proposed increase in IBT will support growth and development that is expected to occur in the source and receiving basins, consistent with the Towns' land use plans. The assessment of secondary and cumulative impacts (SCI) is presented in the Towns' Secondary and Cumulative Impact Master Management Plan (SCIMMP), which is currently being updated. The SCIMMPs include a comprehensive description of mitigation programs to avoid or minimize SCI to environmental resources that could occur with the Towns' land use plans and implementation of projects in the Towns' infrastructure master plans. The proposed increase in IBT is consistent with the plans addressed in the SCIMMPs.

SECTION 1

Background and Project Description

1.1 Background

Since the mid-1990s the Towns of Apex, Cary, and Morrisville and Wake County (on behalf of the Wake County portion of Research Triangle Park [RTP South]) have been cooperatively working to develop and manage their water resources. The Towns, Wake County, and RTP South cooperate under various organizational arrangements for raw water supply, water treatment, water distribution, wastewater collection, wastewater treatment, reclaimed water distribution, and interbasin transfer (IBT). Together, the Towns and Wake County have been planning for a secure long-range future water supply for their customers and responsible water management, including IBT.

The water and wastewater utility systems serving customers throughout the Towns and RTP South are managed by the Towns of Apex and Cary. Apex is responsible for service within its own urban service area, and Cary is responsible for service provision for its own urban service area as well as that of Morrisville (merged its utility with the Town of Cary in 2006), RTP South and Raleigh–Durham International Airport (RDU Airport). The Town of Morrisville and RTP South no longer hold public water system identification codes with the North Carolina Department of Environment and Natural Resources (NCDENR), Division of Water Resources (DWR).

Exhibit 1-1 presents the Towns' long range urban service areas, which are split between the Cape Fear and Neuse River basins, with the Cape Fear River basin further divided into the Haw River and Cape Fear River subbasins, in accordance with North Carolina General Statute (GS) 143-215.22G. Exhibit 1-2 illustrates water movement within the service areas and how these movements relate to the basin boundaries defined in GS 143-215.22G.

1.1.1 Water Supply

The water supply for the Towns and RTP South is B. Everett Jordan Lake (Jordan Lake) on the Haw River in the Haw River subbasin of the Cape Fear River basin. The Towns of Apex and Cary jointly have a water supply allocation issued by the Environmental Management Commission (EMC). In addition, the Town of Cary administers the individual water supply allocations of the Town of Morrisville and Wake County. The allocations for the Towns and Wake County by the EMC total 39 percent of the water supply pool (with an assumed safe yield of 39 million gallons per day [mgd] based on DWR's current calculation) and have individual allocations as follows:

- Cary/Apex – 32 mgd (23.5 mgd/8.5 mgd as subdivided by the Towns, respectively)
- Morrisville – 3.5 mgd
- Wake County for RTP South – 3.5 mgd

1.1.2 Water Treatment and Distribution

The Towns of Apex and Cary jointly own the Cary/Apex Water Treatment Facility (CAWTF), which has a current maximum day treatment capacity of 40 mgd. Operated by the Town of Cary, the plant meets the water needs of the entire combined service area. The combined 2012 raw water demand of the Towns' service area was approximately 20 mgd on an annual average day basis and 30 mgd on a maximum day basis.

An expansion of the CAWTF to 56 mgd is currently under construction and will be supported by current Jordan Lake water supply allocations. The expanded facility is expected to be online in 2016. An environmental assessment (EA) has been completed for this expansion and a Finding of No Significant Impact received.

The Towns distribute this water supply from the Haw River subbasin to customers throughout their service areas in the Haw River and Cape Fear River subbasins and the Neuse River basin. The Town of Cary serves customers in both the Haw River subbasin of the Cape Fear River basin and the Neuse River basin. The service area for the Town of Apex includes portions of all three basins (Exhibit 1-1).

1.1.3 Wastewater Collection and Discharge

The Towns currently discharge wastewater into the Neuse River basin and transfer wastewater back to the Haw River subbasin via the Durham County Triangle Wastewater Treatment Plant (Triangle WWTP). The Western Wake Regional Water Reclamation Facility (WWRWRF) has begun operations and by 2015 all flow will be redirected from the Triangle WWTP to the WWRWRF, as discussed below. These facilities are shown in Exhibit 1-1; how water is moved to these facilities and where they discharge is illustrated in Exhibit 1-2:

- Town of Cary:
  - North Cary Water Reclamation Facility (WRF) (National Pollutant Discharge Elimination System [NPDES] Permit: NC0048879) – permitted and built capacity of 12 mgd; discharges to Crabtree Creek in the Neuse River basin
  - South Cary WRF (NPDES Permit: NC0065102) – permitted capacity of 16 mgd with built capacity of 12.8 mgd; discharges to Middle Creek in the Neuse River basin
- Town of Apex:
  - Apex WRF (NPDES Permit: NC0064050) – permitted and built capacity of 3.6 mgd; discharges to Middle Creek
- Towns of Apex, Cary and Morrisville (joint ownership as Western Wake Partners; Cary owns the portion serving Morrisville):
  - WWRWRF (NPDES Permit: NC0088846) – currently beginning operation with a design capacity of 18 mgd and permitted capacity to 30 mgd; began discharging to the Cape Fear River in August 2014.

The wastewater flows generated from Cary's portion of the WWRWRF service area were directed to the Triangle WWTP for treatment and discharge pending the construction of the WWRWRF. The yearly average flow sent to the Triangle WWTP is estimated at approximately 2.2 mgd. By late 2014, flows from this service area will no longer be pumped to the Triangle WWTP; instead, the flows will go to the WWRWRF for treatment and discharge to the Cape Fear River and the Towns' agreement with Durham County for wastewater treatment will expire.

All wastewater flows within the Town of Apex's wastewater service area were directed to the Apex WRF prior to the WWRWRF coming online, but a portion of the flows will be sent to the WWRWRF by 2015. This shifts a portion of the Town's wastewater discharge from the Neuse River basin to the Cape Fear River subbasin.

1.1.4 Reclaimed Water

The Towns of Apex and Cary have permits for reclaimed water, although the Town of Apex has not had the opportunity to use it to date. Reclaimed water programs will continue to be a critical element of the Towns' water resources management portfolio to meet current and future water supply needs, to extend the life span of the CAWTF capacity by reducing potable water demands, and to reduce nutrient discharges into streams.

The Town of Cary is permitted to divert up to 5 mgd of treated effluent to its reclaimed water system. Currently, the Town provides approximately 0.3 mgd on an annual average day basis and in excess of 1 mgd on a seasonal peak day. The system, as illustrated in Exhibit 1-2, consists of the following:

- South Cary Reclaimed Water Service Area: Located in the Neuse River basin and fed with reclaimed water from the South Cary WRF.
- North Cary Reclaimed Water Service Area:
  - Eastern distribution system: Located in the Neuse River basin and fed with reclaimed water from the North Cary WRF.
  - Western distribution system: Located in the Haw River subbasin, serving facilities in RTP South and western Cary; the system is being extended farther south to Thomas Brooks Park. This system will eventually be connected with the eastern distribution system and fed by the North Cary WRF; currently, reclaimed water is supplied to this system from the Triangle WWTP.

1.1.5 Interbasin Transfer

The Towns of Apex, Cary, Morrisville, and Wake County (for RTP South), are subject to an IBT certificate issued by the EMC in 2001 ("2001 IBT Certificate"). This certificate is required by North Carolina law, because wastewater discharges and consumptive uses occur in receiving basins that differ from the Towns' water supply source basin, the Haw River subbasin of the Cape Fear River basin. The 2001 IBT Certificate limits transfers from the Towns' water supply source basin, the Haw River subbasin (Jordan Lake), to the Neuse River basin to 24 mgd on a maximum day basis. The Towns' 2001 IBT Certificate is included in **Appendix A**.

The Towns have maintained compliance with the 2001 IBT Certificate since it was issued, including the maximum day limit and eight additional conditions. Compliance with the transfer limit and certificate conditions is detailed in each *Annual Report on Interbasin Transfers for RTP South and the Towns of Apex, Cary, and Morrisville*, which is submitted to the DWR annually. A copy of the Towns' 2013 annual report is included in **Appendix B**. No impacts have been identified as a result of the ongoing transfers. This is consistent with both the 2000 environmental impact statement (EIS) (CH2M HILL, 2000) and the 2001 Record of Decision (ROD), which predicted no significant direct impacts and are the basis for the 2001 IBT Certificate.

Condition 1 of the 2001 IBT Certificate required the Towns, after 2010, to return a portion of the water transferred from the Haw River subbasin to the Neuse River basin back to either the Haw River or Cape Fear River subbasins in accordance with a formula in the 2001 IBT Certificate. The Towns met this condition from 2011 through late 2014 by Cary transferring wastewater to the Triangle WWTP (2.2 mgd on average day basis) per an Interlocal Agreement between Cary and Durham County. The Triangle WWTP discharges to Northeast Creek in the Jordan Lake watershed (Haw River subbasin), as illustrated in Exhibit 1-1. Beginning in 2014 with the startup of the WWRWRF, Apex, Cary, and Morrisville (Western Wake Partners) have continued meeting this condition with the discharge of wastewater from the WWRWRF directly to the Cape Fear River.

The 2001 IBT Certificate does not address IBT from the Haw River subbasin to the Cape Fear River subbasin, because the amount of that transfer has not reached the threshold requiring a need for a certificate, and based on DWR approaches to IBT when that certificate was issued. A transfer – entirely due to consumptive use – is occurring, because a portion of the Town of Apex's service area is within the Cape Fear River subbasin. The current transfer levels are still significantly lower than the level in GS 143-215.22(l)(1)(a) that would necessitate an IBT certificate (2 mgd, calculated as a daily average of a calendar month, or 3 mgd as a daily maximum). However, based on the cumulative IBT reporting requirements outlined in G.S. 143-215.22L DWR has now requested that this transfer be included in a modified IBT certificate.

1.1.6 Regional Water Supply Planning

The Towns have for many years worked together to plan for water supply and other water resources management needs. Most recently, the Jordan Lake Regional Water Supply Partnership (also known as the Jordan Lake Partnership [JLP]) was created in 2009 by jurisdictions and water systems in the Triangle region

for the primary purpose of jointly planning for the expanded use of available water supply in Jordan Lake. Members of the JLP include the Towns of Apex, Cary, and Morrisville; the Cities of Durham, Raleigh, and Sanford; the Towns of Hillsborough, Holly Springs, and Pittsboro; Chatham, Durham, and Wake Counties; and the Orange Water and Sewer Authority (OWASA). The *Triangle Region Water Supply Plan* (Triangle J Council of Governments, 2012) compiled by the JLP identifies existing and future service areas for the region's water systems, identifies future water supply demands, examines current water supply sources and yields, and evaluates strategies for meeting future needs. The information in the *Triangle Region Water Supply Plan* is used in this EA to quantify expected future need and effect of the alternatives. In addition to the regional water supply plan, the JLP is also investigating the interconnectivity of all members' water systems to allow water supply sharing on a regular or emergency basis.

The Triangle J Council of Governments facilitates the Regional Water Conservation and Efficiency Committee, which includes the Cities of Raleigh and Durham, the Towns of Apex and Cary, and OWASA. The group began meeting in 2009 to discuss increasing regional consistency in both year-round water conservation measures and water shortage response plans. Participants adopted the same water shortage response framework, and while there are some differences in specific programs, many adopted similar year-round conservation measures.

The Towns' continued planning efforts and participation in regional planning efforts demonstrates the Towns' commitment to the long-term viability of the region's water supply for all communities.

1.2 Project Description

The Towns and Wake County are requesting a modification of the 2001 IBT Certificate for three primary purposes:

1. Modify the basis for the IBT limit from a maximum day IBT calculation to IBT calculated as the daily average of a calendar month, in accordance with the changes to GS 143-215.22L (regulation of surface water transfers) based on Session Law 2013-388.
2. Include, at the request of DWR, transfers to the Cape Fear River subbasin (consumptive uses in the Town of Apex service area) so that the modified certificate addresses transfers from the Haw River subbasin to both the Neuse and Cape Fear River subbasins.
3. Base the certificate term on an updated 30-year planning period to address the Towns' and Wake County's IBT needs through 2045 (the 2001 IBT Certificate is based on a 30-year planning period ending in 2030).

The Towns are requesting that the proposed IBT certificate modification allow transfers up to 33 mgd from the Haw River subbasin. Concurrent with the certificate modification, the Towns will be applying for increased water supply allocations from Jordan Lake and requesting that the allocations assigned to the Town of Morrisville and Wake County to be assigned to the Town of Cary as the owner of all water, wastewater, and reclaimed water infrastructure in these areas. The Towns and Wake County have been actively involved in the Round 4 Jordan Lake Allocation process. The requested increases in allocations will also be based on a 30-year planning horizon, through 2045. The Towns intend to use their three existing WRFs and the new WWRWRF to treat wastewater and to continue significant water resources planning, conservation efforts, and the development of management tools to reduce IBT.

As has been reviewed with DWR, there are no alternatives included in the EA to modifying the 2001 IBT Certificate to meet the first two objectives listed above: (1) comply with new law and (2) satisfy the request from DWR. These modifications are consistent with the 2013 revisions to GS 143-215.22L and reflect a change in perspective by DWR regarding the inclusion of consumptive transfers to the Cape Fear River basin that in and of themselves are below the threshold required for an IBT certificate. It is assumed that an "Updated 2001 IBT Certificate" would limit IBT to 22 mgd (now measured as the average day of a calendar month) from the Haw River subbasin to the Neuse River or Cape Fear River subbasins, based on the same

2030 expected conditions as the 2001 IBT Certificate. In the context of this EA, references to the proposed IBT certificate modification mean proposed changes to the Updated 2001 IBT Certificate. References to "no increase in IBT" means no increase from the Updated 2001 IBT Certificate. ***To meet the third objective – supplying water needs through 2045 - the Towns and Wake County are requesting an IBT certificate modification that would allow increased transfers up to 33 mgd from the Haw River subbasin.***

1.2.1 Study Area

This EA provides the supporting documentation for an IBT certificate modification for the identified Study Area focusing on the direct environmental effects of the water transfer. The Towns' water supply source basin, receiving basins (within the Towns' service areas), and downstream water bodies are included in the Study Area defined in Exhibit 1-3. This Study Area is generally described as follows:

- Source Basin:
  - Haw River subbasin (source basin): Includes Jordan Lake and the watershed areas of 03-06-05 and 03-06-06, and the Haw River Arm of Jordan Lake. Downstream, the Study Area includes the Haw and Cape Fear Rivers from the Jordan Lake Dam to the Town of Lillington. Within this reach, the WWRWRF discharges into the Cape Fear River, reducing IBT, per administrative rule 15A North Carolina Administrative Code (NCAC) 02E.401(b).
- Receiving Basin(s):
  - Neuse River basin (receiving basin): The area contained within the outer boundary of the Towns' utility service areas and facilities (North Cary, South Cary, and Apex WRFs) contributing to IBT. Crabtree Creek and Middle Creek extending from the Towns' service area boundaries to their individual confluences with the Neuse River are also included.
  - Cape Fear River subbasin (receiving basin): The area contained within the outer boundary of the Town of Apex's urban service area contributing to IBT.

This Study Area is generally the same as that used in the 2000 EIS (CH2M HILL, 2000) prepared for the 2001 IBT Certificate with the addition of the Cape Fear River subbasin (area south of U.S. 1) and an area in the Neuse River basin directly north of the South Cary WRF. In addition, the water and wastewater facilities presented in the 2000 EIS and its associated ROD, which are the bases of the 2001 IBT Certificate, are exactly the same as those in the future water supply and IBT scenarios presented in Exhibits 1-1 and 1-3.

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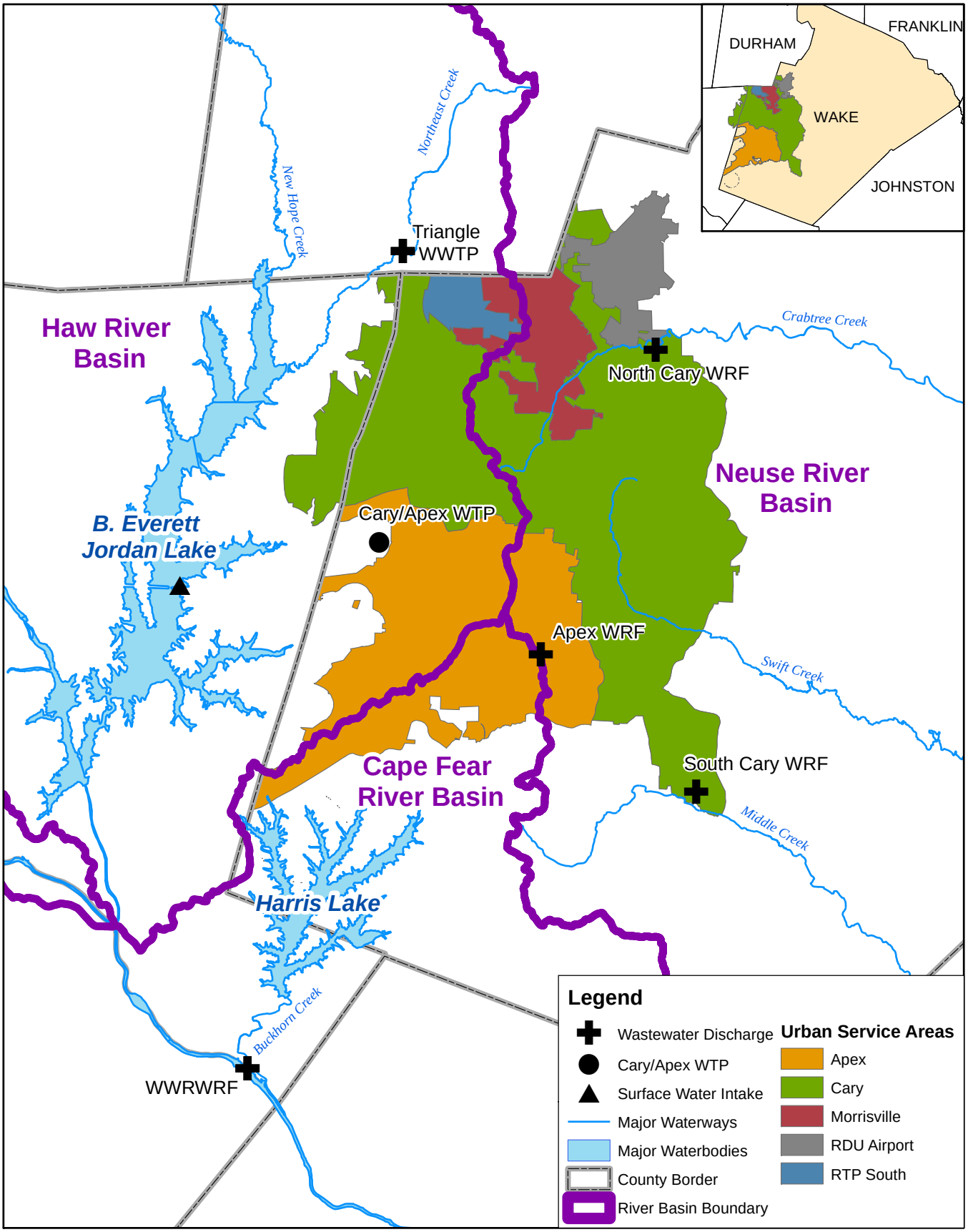

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EXHIBIT 1-1
Service Area Map
Interbasin Transfer (IBT) Environmental Assessment

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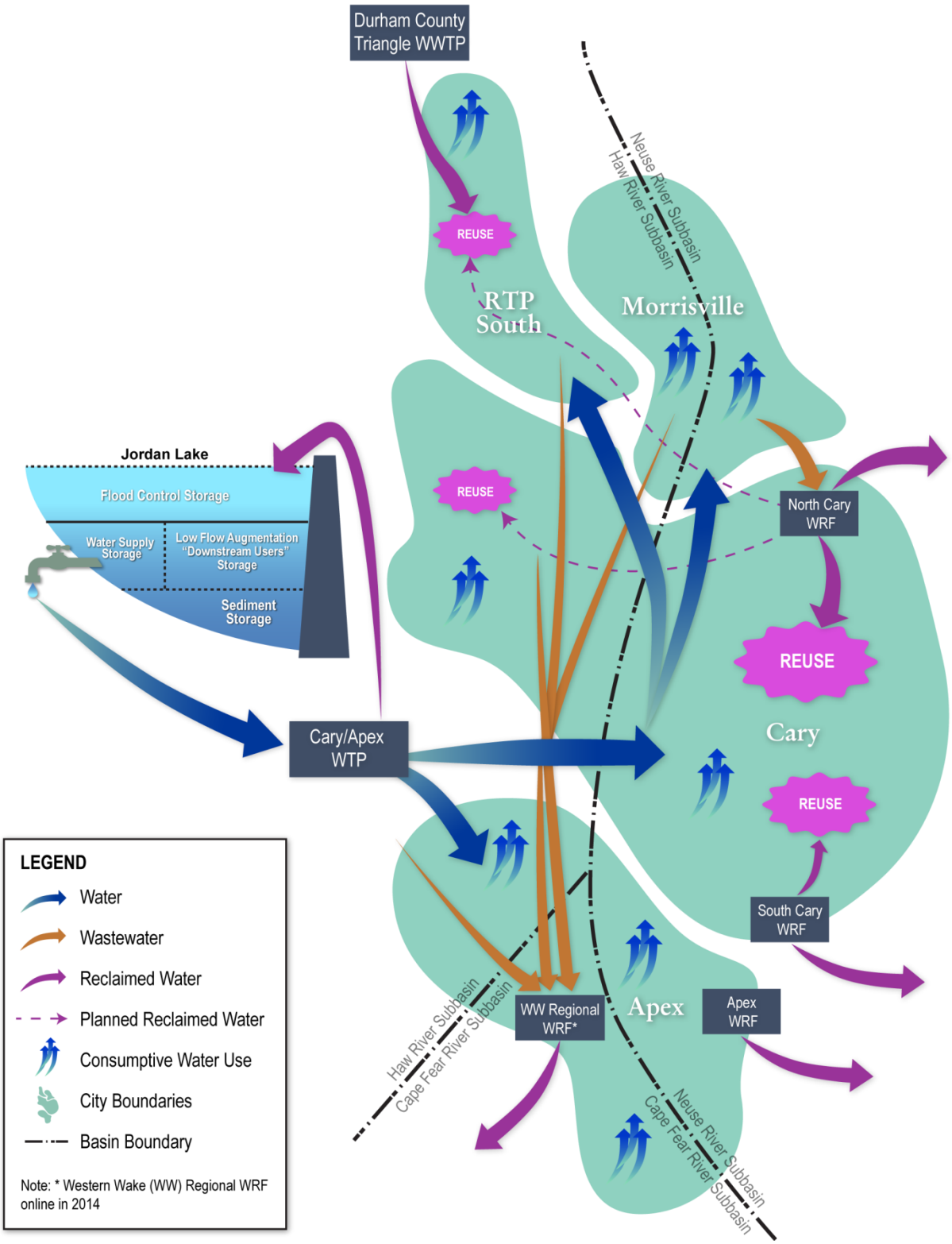
EXHIBIT 1-2
Water Movement Illustration



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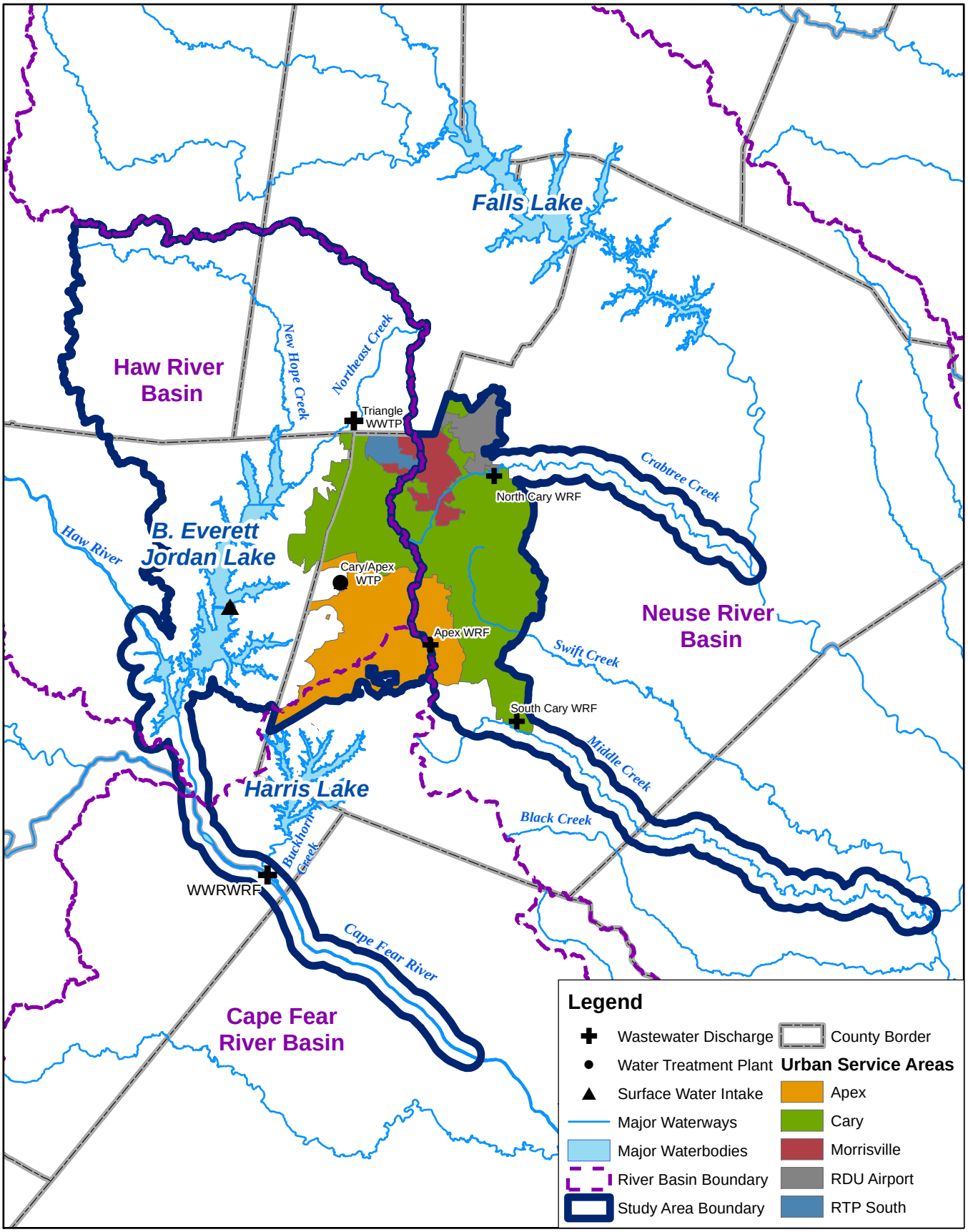

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EXHIBIT 1-3
Study Area Map
Interbasin Transfer (IBT) Environmental Assessment

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SECTION 2

Project Purpose and Need

2.1 Historical Growth in Population and Water Demand

Past population growth and water demand trends of the Towns of Apex, Cary and Morrisville, and RTP South have been a result of strong, sustained growth driven by the area's thriving business climate, technology environment, major universities, and attractive quality of life. The Towns' growth and water usage profile reflects the economic drivers and quality of life desired by each community's residents. Changes to this profile may occur over short periods of time, because of economic or demographic shifts (such as the recent recession) and droughts (e.g., 2002, 2007–2008), but the long-term trends indicate a steadily rising population and water demand.

The Towns recognize that understanding the water usage patterns of its customers is necessary to understand the potential implications of changing trends. Both Towns have completed (individually and collectively) several studies to understand customer water usage and project future water demand, as documented in the Towns' *Long Range Water Resource Plan* (LRWRP) (CH2M HILL and Brown and Caldwell, 2013).

Exhibit 2-1 presents historical population estimates from 2001 through 2012 for the Towns of Apex, Cary, and Morrisville. RTP South has no residential population.

EXHIBIT 2-1
Historical Population Estimates, 2001-2012

Year	Town of Apex[a]	Town of Cary[b]	Town of Morrisville[c]
2001	25,136	101,465	9,736
2002	26,919	104,144	10,489
2003	28,139	107,418	11,736
2004	29,372	108,880	12,981
2005	30,381	112,804	14,235
2006	31,254	118,709	14,955
2007	33,780	126,958	15,593
2008	34,766	133,788	16,189
2009	3,5054	138,672	16,463
2010	37,886	137,979	18,447
2011	38,728	140,849	20,797
2012	40,003	143,423	21,223

[a] Data source: Town of Apex, 2012

[b] Data source: Town of Cary, 2012

[c] Data source: Town of Morrisville, 2012a

Exhibit 2-2 summarizes the historical annual average daily raw and finished water demand for the Town of Cary's service area, inclusive of the Town of Morrisville, RTP South, and RDU Airport, and the Town of Apex's water service area from 2001 through 2013.

EXHIBIT 2-2
Historical Annual Average Daily Raw and Finished Water Demand for the Towns of Apex and Cary, 2001–2013

Year	Annual Average Daily Raw Water Demand (mgd) [a]	Annual Average Daily Finished Water Demand (mgd) [a]
2001	16.3[b]	14.2
2002	16.9	14.9
2003	15.9	13.9
2004	17.0	14.8
2005	18.4	15.6
2006	17.6	15.7
2007	19.8	17.9
2008	18.7	16.1
2009	19.5	16.1
2010	20.9	17.1
2011	20.0	17.2
2012	19.3	16.5
2013	18.5	16.3

[a] Data source: Town of Cary, 2014

[b] In 2001 the Town of Cary purchased finished water from the Cities of Raleigh and Durham; therefore, raw water demand has been estimated for this year based on an assumed ratio of raw water demand to finished water demand.

2.2 Future Population and Water Demand Forecast

2.2.1 Future Population Forecast

The population forecast presented in Exhibit 2-3 represents the portion of the population within each Town's utility service area that will be provided utility services through the year 2045. The projections do not include the portion of the population within each Town's service area that is currently on and will remain on private water well and septic systems through 2045. Each Town is planning for all residences with a well and septic system to be connected over time to the centralized utility system from 2020 through 2060. These population forecasts were an input to (Apex) or developed from (Cary) the future water demand forecast, which is described in Section 2.2.2. The population projections included for Morrisville (included in Cary's service area) correspond with the Town of Morrisville's land use plan and Planning Department projections, which are based on State Demographers Certified Estimates (Town of Morrisville, 2012b).

EXHIBIT 2-3
Utility Service Area Population Forecast, 2015–2045

Year	Town of Apex Utility Service Area [a]	Town of Cary Utility Service Area (including Morrisville) [b]
2015	45,400	170,360
2020	53,100	188,340
2025	63,750	206,000
2030	74,400	221,330
2035	87,450	235,200
2040	100,500	242,760
2045	104,850	249,930

[a] Data source: CH2M HILL and Brown and Caldwell, 2013

[b] Data source: CH2M HILL and Brown and Caldwell, 2013 (Cary); Town of Morrisville, 2012b (Morrisville)

2.2.2 Water Demand Forecast

2.2.2.1 Calculations and Methodology

The following summarizes the basis of each Town's water demand forecast methodology:

- Town of Cary:
  - Projected water demands were developed for existing and future conditions based on water meter billing data and parcel-level future development and land use information, respectively. The total future system finished water demand consists of the existing demand (based on 2010 water meter data), projected future demand, future non-revenue water, operational requirements, and bulk water sales. The projections were developed for the Town's water system service area, which is defined as the combination of the Towns of Cary and Morrisville urban service areas, RDU Airport, and RTP South. Demand projections for RTP South were provided by Wake County. All existing reclaimed water customers, reclaimed water system expansion customers (construction of reclaimed water pipelines is underway to supply these customers who are currently using potable water), and all of RTP South irrigation demand are excluded from projections of future potable water demand.
- Town of Apex:
  - Projected water demands were developed for existing and future conditions based on Town-developed population projections, spatially distributed based on Capital Area Metropolitan Planning Organization traffic analysis zone data. For areas within the Town's urban service area where no Town-derived population projections exist, a land capacity analysis was completed based on future land use. For non-residential development projections, the projection of future land use types and acreages was used. Unit consumption factors were used with the population and land use projections to develop projected water demand. In addition, projections of future non-revenue water and operational requirements were included in the total future system finished water demand.

The water demand forecasts developed are representative of the influence each Town's current water resources management programs and policies have on water demand, based on the assumption that they will continue in the future absent of any influence of major technology or regulatory changes. Given the significance of the historical investments and successes achieved with the current programs and policies,

these forecasts do not consider new programs or policies in the future. The Towns remain committed to implementing new programs, as they are determined to be effective and appropriate in the future, as recommended in the LRWRP; these programs will increase the reliability with which the Towns can meet customer demands and comply with a modified IBT certificate. Further details regarding the forecasting calculations and methodology can be found in the LRWRP (CH2M HILL and Brown and Caldwell, 2013).

Variability is an inherent part of water demand and uncertainty is inherent in any type of forecast. With an understanding of the variables that influence the need for future water supply and future IBT, the Towns incorporated several factors to represent both variability and uncertainty in the forecast of future water demand as part of the development of the LRWRP. These factors included the following:

- Growth rate (rate at which new development occurs)change
- Annual variability in water use due to weather (change in average annual use)
- Amount of process water used during the treatment process
- Non-revenue water (percentage of total finished water demand)
- Maximum day peaking factors (maximum day versus annual average daily)

Further details regarding the forecasting analysis can be found in Section 2 and Appendix A3 of the LRWRP.

2.2.2.2 Water Demand Forecast

Exhibit 2-4 presents 2012 and 2013 data as well as the annual average raw water demand expected values, 2015 through 2045, that were a result of the forecasting. Expected values are a statistical measure of the likely outcome under conditions of future variability and uncertainty, reflecting expected average future conditions.

The increase in water demand from the actual data for 2012 and 2013 to the 2015 raw water demand projection is related to the inclusion of the demands associated with approved site plans. Once the Towns' have committed water supply to developments through the site plan approval process, it necessary to assume that the demand could come online as soon as possible for the purposes of water supply planning.

EXHIBIT 2-4
Annual Average Daily Raw Water Demand Forecast Expected Values, 2012–2045

	Annual Average Daily Raw Water Demand (mgd)								
	2012 [a]	**2013 [a]**	**2015 [b]**	**2020 [b]**	**2025 [b]**	**2030 [b]**	**2035 [b]**	**2040 [b]**	**2045 [b]**
Towns of Cary and Morrisville, RDU Airport, and RTP South	15.9	15.3	19.7	23.5	27.0	29.7	32.3	33.7	34.5
Town of Apex	3.4	3.2	4.4	5.6	6.5	7.6	8.8	10.0	10.6
Total Demand	**19.3**	**18.5**	**24.1**	**29.1**	**33.6**	**37.3**	**41.2**	**43.7**	**45.1**

Note: Numbers may not sum because of rounding.

[a] 2012 and 2013 data represent actual flow data at the CAWTF.

[b] Data source: CH2M HILL and Brown and Caldwell, 2013

2.2.3 Future Wastewater Flow Forecast

The methodology used to derive the wastewater flow forecast was based on the same basic methodology for both the Town of Apex and Town of Cary service areas: wastewater flows returned to the various WRFs

as a percentage of the respective water demands. Further detail regarding the wastewater flow forecast can be found in the LRWRP (CH2M HILL and Brown and Caldwell, 2013).

Exhibit 2-5 presents the forecast annual average daily wastewater flow expected values for each WRF, outlined in Section 1, and discharge basin for 2015 through 2045.

EXHIBIT 2-5
Annual Average Daily Wastewater Flow Forecast Expected Values by Town and WRF Service Area, 2015–2045

	WRF Service Area	Discharge Basin	2015 [a] (mgd)	2020 [a] (mgd)	2025 [a] (mgd)	2030 [a] (mgd)	2035 [a] (mgd)	2040 [a] (mgd)	2045 [a] (mgd)
Towns of Cary and Morrisville, RDU Airport, and RTP South	North Cary	Neuse	8.0	9.2	10.1	10.9	11.6	12.0	12.4
	South Cary	Neuse	5.3	5.8	6.4	6.9	7.4	7.7	8.1
	Western Wake	Cape Fear	2.9	4.0	5.0	5.7	6.5	7.0	7.3
	Subtotal		**16.2**	**19.0**	**21.5**	**23.5**	**25.5**	**26.7**	**27.8**
Town of Apex	Middle Creek	Neuse	1.0	1.1	1.3	1.5	1.7	1.8	1.9
	Western Wake	Cape Fear	2.1	2.9	3.5	4.0	4.7	5.3	5.7
	Subtotal		**3.1**	**4.8**	**5.5**	**6.4**	**7.1**	**7.9**	**7.6**
Total Flow			**19.3**	**23.0**	**26.3**	**29.0**	**31.9**	**33.8**	**35.4**

Note: Values may not sum because of rounding.

[a] Data source: CH2M HILL and Brown and Caldwell, 2013

2.2.4 Interbasin Transfer

At the time it was issued, the 2001 IBT Certificate was projected to be sufficient for transfers through 2030. However, guidance from DWR at that time included a methodology for estimating future IBT requiring a number of assumptions including: the timing and magnitude of future water demands in the Haw River subbasin, wastewater discharges to the Cape Fear River subbasin, timing and magnitude of consumptive use in the Haw, Cape Fear, and Neuse River subbasins, potable water offsets from reclaimed water usage, and the percentage of reuse in the Haw River subbasin. Subsequent monitoring using daily data has provided better understanding of these assumptions, indicating that the methodology and assumptions used for calculating the maximum day IBT for the current certificate significantly under-estimated the IBT value. Exhibit 2-6 presents the estimated annual average and maximum day IBT for 2001 through 2013 compiled from daily monitoring data (Town of Cary, 2014).

EXHIBIT 2-6
Historical IBT Estimates for the Towns of Apex and Cary, 2001–2013

Year	Annual Average IBT (mgd)	Maximum Day IBT (mgd)
2001	6.8	15.0
2002	13.5	22.5
2003	13.4	17.8
2004	14.2	22.6
2005	145	19.6

EXHIBIT 2-6
Historical IBT Estimates for the Towns of Apex and Cary, 2001–2013

Year	Annual Average IBT (mgd)	Maximum Day IBT (mgd)
2006	14.3	20.8
2007	15.9	23.5
2008	14.1	20.9
2009	14.0	20.4
2010	14.4	22.3
2011	14.1	21.7
2012	13.9	22.7
2013	13.8	19.2

Data source: Town of Cary, 2014

In accordance with the recent legislative changes to GS 143-215.22L, the forecast of IBT is calculated as a daily average of a calendar month (instead of on a maximum day basis) and, for the month in which IBT is expected to be highest, is generally described by the following formula:

$$IBT_x = Withdrawal\ from\ Source\ basin_x - Return\ to\ Source\ basin_x$$

$$Return\ to\ Source\ Basin_x = (Total\ Consumptive\ Use_x * \%\ of\ Total\ Demand\ in\ Source\ River\ Basin_x) + Source\ River\ Basin\ Wastewater\ Discharge_x$$

$$Total\ Consumptive\ Use_x = 50\%\ of\ the\ daily\ average\ of\ a\ calendar\ month$$

In which 'x' represents a future year
NOTE: The Return to Source Basin calculation could include reclaimed water use in the source basin. Reclaimed water usage has not been included in the IBT projection since reclaimed water use is less predictable than potable water use and there are limits on its availability during emergencies.

Exhibit 2-7 presents the forecast of future IBT for the transfer from the Haw River subbasin to the Neuse River basin through 2045. Exhibit 2-8 presents the forecast of future IBT for the transfer from the Haw River subbasin to the Cape Fear River subbasin. Exhibit 2-9 presents the total IBT from the Haw River subbasin to both the Neuse River basin and the Cape Fear River subbasin. The IBT forecast presented in each of these tables is the maximum daily average of a calendar month (the maximum average day IBT as compared to all months in a calendar year), referred to as the maximum month average day. The future IBT forecast is based on the WWRWRF operation beginning in 2014 and on continuation of the Towns' current water resources management policies and programs.

Exhibits 2-7, 2-8, and 2-9 present transfers developed from the forecast analyses under conditions driven by weather and usage patterns that deviate from average, or expected value, conditions. IBT forecasts based on average future conditions would not accurately reflect the range of transfers that can be reasonably be anticipated to occur under the full range of anticipated conditions. Because an IBT certificate limit cannot ever be exceeded, the maximum IBT has been calculated as the transfer resulting from conditions outside the average which could reasonably be expected to occur.

EXHIBIT 2-7
Forecast of IBT from the Haw River Subbasin to the Neuse River Basin, 2012–2045, Maximum Month Average Day

	2012[a]	2013 [a]	2015	2020	2025	2030	2035	2040	2045
IBT (mgd)	17.0	16.0	19.4	22.1	25.2	27.5	29.8	30.7	31.0

[a] 2012 and 2013 IBT based on actual IBT monitoring data

EXHIBIT 2-8
Forecast of IBT from the Haw River Subbasin to the Cape Fear River Subbasin, 2012–2045, Maximum Month Average Day

	2012[a]	2013 [a]	2015	2020	2025	2030	2035	2040	2045
IBT (mgd)	<0.1	<0.1	0.4	0.7	0.9	1.2	1.4	1.7	2.0

[a] 2012 and 2013 IBT based on actual IBT monitoring data

EXHIBIT 2-9
Forecast of IBT from the Haw River Subbasin to the Neuse River Basin and Cape Fear River Subbasin, 2012–2045, Maximum Month Average Day

	2012[a]	2013 [a]	2015	2020	2025	2030	2035	2040	2045
IBT (mgd)	17.1	16.1	19.8	22.8	26.1	28.7	31.1	32.4	33.0

[a] 2012 and 2013 IBT based on actual IBT monitoring data

According to the forecasts of future raw water supply needs and IBT, with the continuation of Jordan Lake as the Towns' primary water supply, the LRWRP identified the need to petition the State of North Carolina (State) for a modification of the 2001 IBT Certificate. Subsequently, the IBT law was modified. The Towns submitted a notice to the EMC on October 17, 2013 of the intent to request modification of the IBT certificate in accordance with NCGS 143-215.22L, as amended by Session Law 2013-388. A copy of the Notice of Intent is included in **Appendix C**.

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SECTION 3

Alternatives Evaluation

3.1 Description of Alternatives

For the purposes of this EA, there is no alternative to modifying the 2001 IBT Certificate to meet two of the three objectives outlined in Section 1.2: complying with changes in law (including change from maximum day to calendar month basis for IBT limit) and satisfying the request from DWR to include transfers from the Haw River subbasin to the Cape Fear River subbasin. Accordingly, in this section when alternatives are described and compared, it is assumed the Towns would at a minimum receive a "Updated 2001 IBT Certificate" including the following, which satisfy those two objectives under the conditions presented in the EIS on which the 2001 IBT Certificate is based:

- Maximum transfer from the Haw River subbasin to the Neuse River basin of 20 mgd.
- Maximum transfer from the Haw River subbasin to the Cape Fear River subbasin is less than 2 mgd (through 2030).
- Total maximum transfer from the Haw River subbasin to the Neuse and Cape Fear River subbasins of 22 mgd.

Several alternatives to the proposed project were defined and evaluated for their ability to meet the Towns' water supply needs through 2045 (the third objective for modifying the current certificate). The following three categories of alternatives, with a total of eight water supply alternatives, were evaluated:

1. No action (Updated 2001 IBT Certificate; 22 mgd total IBT)
2. Increase IBT:
   - 2a – Increase in IBT to meet 2045 demands (Proposed IBT Certificate Modification; 33 mgd total IBT)
   - 2b – Increase in IBT to meet 2045 demands and use current permitted wastewater capacity (44 mgd total IBT)
3. Avoid IBT increase (Updated 2001 IBT Certificate; 22 mgd total IBT):
   - 3a – Transfer of untreated wastewater from the Neuse River basin to the WWRWRF, which discharges to the Cape Fear River basin
   - 3b – Transfer of treated wastewater effluent from the Neuse River basin to the Cape Fear River basin
   - 3c – Use a water supply source in the Neuse River basin
   - 3d – Use groundwater as a water supply source
   - 3e – Use additional water resources management tools

Secondary and cumulative impacts (SCI) associated with each of the alternatives that meet the purpose and need, and mitigation plans for these impacts, are discussed in the *Secondary and Cumulative Impacts Master Management Plan* (SCIMMP) for each Town (CH2M HILL, 2005a, 2005b, 2005c, 2014a, 2014b, and 2014c).

3.2 No Action (Alternative 1)

Under Alternative 1, no actions designed to meet projected demands through 2045 would be undertaken; the Towns would receive an Updated 2001 IBT Certificate limiting transfers from the Haw River subbasin to 22 mgd. The Towns would limit future development and utility services so that no additional water would be transferred to the Neuse River basin above 20 mgd, essentially stopping all development and any

increase in water use after 2016. Additional transfer to the Cape Fear River subbasin would remain less than 2 mgd.

This alternative is not considered feasible because the Towns would be unable to meet future water needs of their customers. It is also unlikely that already-permitted development could be legally halted in order to prevent an increase in water use and a possible exceedance of the Updated 2001 IBT Certificate without significant and costly management measures.

3.3 Increase in Interbasin Transfer to Meet 2045 Demands (Alternative 2a) - Proposed IBT Certificate Modification

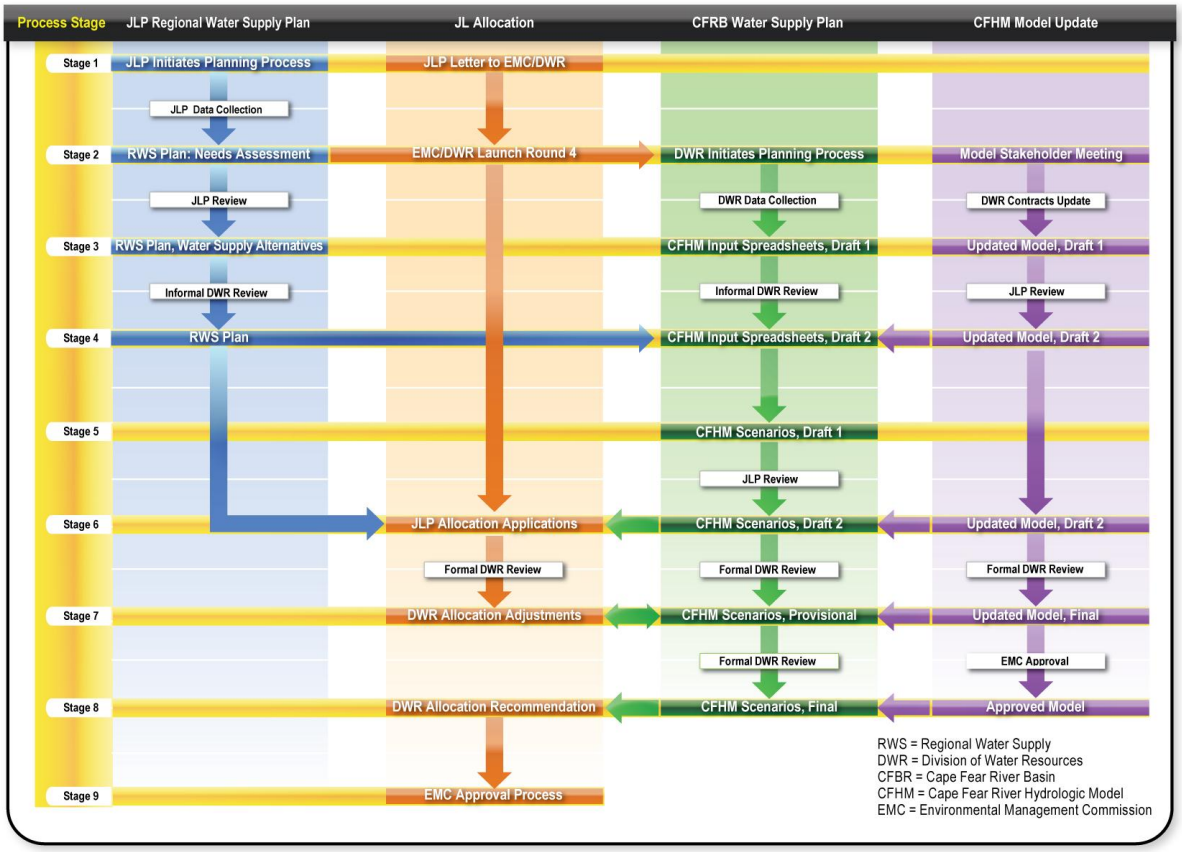
Under Alternative 2a, the Towns would increase their Jordan Lake withdrawal consistent with future water demand projections for 2045 (pending the separate Round 4 allocation process) and update the IBT certificate to address IBT through the 30-year planning period ending in 2045 (the previous IBT certificate was based on a 30-year planning period ending in 2030).

Alternative 2a would meet the demands through 2045 by transferring up to 33 mgd from the Haw River subbasin (Jordan Lake); expanding the CAWTF to 72 mgd; using existing wastewater treatment facilities; and continuing water resources management measures to minimize IBT. The Towns intend to continue to use their existing WRFs (North Cary, South Cary, Apex, and WWRWRF) to treat wastewater. The WWRWRF discharge returns treated wastewater effluent to the Cape Fear River basin, thereby reducing IBT. Exhibit 1-3 illustrates the Towns' treatment facility locations and the Haw River, Cape Fear River and Neuse River subbasin boundaries.

The LRWRP (CH2M HILL and Brown and Caldwell, 2013) estimates that by 2045, the WWRWRF will discharge about 12 mgd on an annual average day basis to the Cape Fear River basin. In addition to increase the reliability of IBT compliance, the Towns would continue using management tools such as expanding reclaimed water infrastructure to reduce both potable water demand and wastewater discharges in the Neuse River basin, and continuing water resources planning and conservation/ efficiency efforts.

Concurrent with the certificate modification process, the Towns will apply for increased water supply allocations from Jordan Lake through the DWR Round 4 Jordan Lake Allocation process. The procedures to be followed in allocating the Jordan Lake storage are outlined in 15A NCAC 2G.0500. Exhibit 3-1 provides an overview of the Round 4 Jordan Lake Allocation process, Cape Fear River basin water supply planning, and a Cape Fear River Hydrologic Model update, relative to the JLP regional water supply planning work. The requested increases in allocations will be based on 2045 needs - a 30-year planning horizon. Updates to the Cape Fear River Basin Hydrologic Model have been made and the draft 2002 *Cape Fear River Basin Water Supply Plan* (NCDENR, 2002a) is also being updated as part of the Round 4 Jordan Lake Allocation process.

EXHIBIT 3-1
Planned Process for DWR Round 4 Jordan Lake Allocation



Source: CH2M HILL and Brown and Caldwell, 2013

Alternative 2a is considered the most viable and preferred alternative, and will be analyzed further in this EA.

3.4 Increase in Interbasin Transfer to Meet 2045 Demands and Use Current Permitted Wastewater Capacity (Alternative 2b)

Under Alternative 2b, the Towns would increase their Jordan Lake withdrawal consistent with future water demand projections for 2045 (pending the separate Round 4 allocation process) and update the IBT certificate to address IBT through the 30-year planning period ending in 2045 (the previous IBT certificate was based on a 30-year planning period ending in 2030).

Alternative 2b would meet the 2045 demands by transferring up to 44 mgd from the Haw River subbasin (Jordan Lake); expanding the CAWTF to 72 mgd; and continuing water resources management measures to minimize IBT. In contrast to Alternative 2a, wastewater treatment would occur through expansion of the South Cary WRF from 12.8 mgd to its permitted discharge capacity of 16 mgd, as well as continue use of existing facilities (North Cary, Apex and Western Wake WRFs.)

Alternative 2b represents the maximum IBT that could occur within the Town's current NPDES permit limits. This alternative would meet the long-term demand by requesting to transfer up to 44 mgd from the Haw River subbasin (Jordan Lake), 11 mgd greater than Alternative 2a. Under Alternative 2a, the *Long Range Water Resources Plan* projects that the South Cary WRF will have about 3 mgd of unused capacity on a

maximum month average day basis (compared to the current facility capacity of 12.8 mgd). In this alternative, the South Cary WRF permitted capacity of 16 mgd is fully utilized in 2045, with a corresponding increase in IBT, because the South Cary WRF discharges into Middle Creek within the Neuse River basin.

As with Alternative 2a, WWRWRF discharges of treated wastewater effluent to the Cape Fear River basin would reduce IBT, though the quantity of return/discharge to the Cape Fear River basin would be less, due to the increased utilization of South Cary WRF. Under this alternative, the WWRWRF would discharge about 5 mgd on an average day basis to the Cape Fear River basin by 2045. In addition, the Towns would continue using management tools to reduce IBT such as expanding reclaimed water infrastructure to reduce both potable water demand and wastewater discharges in the Neuse River basin, and continuing water resources planning and conservation/efficiency efforts.

While this alternative fully utilizes existing treatment facilities and existing permitted discharges, it would require additional pipeline infrastructure to route a larger portion of the wastewater collection system to the South Cary WRF. Because Alternative 2b would increase both costs and IBT above Alternative 2a levels, Alternative 2a is preferred.

3.5 Avoid Interbasin Transfer Increase by Sending Additional Untreated Wastewater to the WWRWRF (Alternative 3a)

Under Alternative 3a, the Towns would increase their Jordan Lake withdrawal consistent with future water demand projections for 2045.

Alternative 3a would meet the 2045 demands by transferring up to 22 mgd (no change from the Updated 2001 IBT Certificate) from the Haw River subbasin (Jordan Lake); expanding the CAWTF to 72 mgd; and continuing water resources management measures to minimize IBT. In contrast to Alternatives 2a and 2b, wastewater treatment would occur through expansion of the WWRWRF, as well as use of existing facilities (North Cary, South Cary and Apex WRFs.)

Wastewater generated in both the Neuse River basin and in the Cape Fear subbasin would be pumped to the new WWRWRF for treatment; the treated effluent would then be discharged into the Cape Fear River via the WWRWRF's outfall. Ultimately, an average of approximately 9 mgd of additional untreated wastewater (in addition to the future flows already within the areas defined for the WWRWRF service area) would need to be pumped from the North Cary WRF, South Cary WRF, or Apex WRF service areas (or some combination of these service areas) into the WWRWRF influent collection infrastructure to avoid the need to increase IBT.

By 2045, the additional inflows to the WWRWRF would result in treatment and discharge of about 24 mgd on an annual average day basis to the Cape Fear River basin from the WWRWRF. In addition, the Towns would continue using management tools to reduce IBT such as expanding reclaimed water infrastructure to reduce both potable water demand and wastewater discharges in the Neuse River basin, and continuing water resources planning and conservation/efficiency efforts.

Alternative 3a would require the construction of major raw wastewater pumping facilities and wastewater conveyance infrastructure to transfer raw wastewater from the Neuse River basin into the Cape Fear subbasin. While the existing infrastructure may initially be sufficient to handle the additional flows, expansion of the WWRWRF influent wastewater pumping facilities and pipelines would be required for the modified build-out capacity requirement.

This alternative would require the expansion of the WWRWRF to be online in approximately 2029, much earlier than currently projected, and would result in already-built capacity and investment at the Apex WRF and North Cary WRF being underutilized.

Because of the significant cost increase of Alternative 3a compared to Alternative 2a and the underutilization of existing facility capacity, this alternative is not considered fiscally responsible and will not be further evaluated.

3.6 Avoid Interbasin Transfer Increase by Discharging Additional Treated Wastewater Effluent to the Cape Fear River Basin (Alternative 3b)

Under Alternative 3b, the Towns would increase their Jordan Lake withdrawal consistent with future water demand projections for 2045.

Alternative 3b would meet the 2045 demands by transferring up to 22 mgd (no change from the Updated 2001 IBT Certificate) from the Haw River subbasin (Jordan Lake); expanding the CAWTF to 72 mgd; and continuing water resources management measures to minimize IBT. This alternative would use existing wastewater conveyance infrastructure and the Towns' existing WRFs (North Cary, South Cary, Apex and WWRWRFs). The wastewater treatment capacities of the Towns' WRFs would be the same as under Alternative 2a.

Wastewater produced in the Neuse River basin would be treated at the WRFs currently used for the Towns' wastewater service areas, and a portion of the effluent from the WRFs would be pumped into the Haw River or Cape Fear River subbasins for discharge. Ultimately, approximately 9 mgd of additional treated wastewater effluent (in addition to the WWRWRF effluent discharge defined for the WWRWRF service area) would need to be pumped from the North Cary WRF, South Cary WRF, or Apex WRF (or some combination of these service areas) into the Haw or Cape Fear subbasins to avoid increasing IBT above the 2001 IBT Certificate. Because of the relative proximity of the South Cary WRF and Apex WRF to the Cape Fear River basin, compared with the North Cary WRF, transfer of effluent from these facilities appears more cost effective.

This alternative would require the construction of major pumping facilities to transfer treated effluent from the Apex WRF and/or South Cary WRF. A new discharge outfall would be constructed on the Cape Fear River, because of the longer distance to the WWRWRF effluent pumping facility and because the WWRWRF effluent pipeline capacity is not sufficient for both the current WWRWRF build-out capacity and the additional effluent flow. It is feasible to parallel the 14.5-mile WWRWRF effluent pipeline, although costs would be significantly higher than other discharge options. Alternative 3b could result in additional treatment requirements at the Apex WRF and South Cary WRF, because neither facility is designed to meet the effluent total phosphorus (TP) limits in the current WWRWRF NPDES permit. In addition, more stringent limits for nutrients than those included in the WWRWRF NPDES permit may be required, because of nutrient impact concerns related to new discharges in the Middle Cape Fear River basin

Because of the significant cost increase of Alternative 3b compared to Alternative 2a, this alternative is not considered fiscally responsible and will not be further evaluated.

3.7 Avoid Interbasin Transfer Increase by Using a Water Source in the Neuse River Basin (Alternative 3c)

Under Alternative 3c, the Towns would use a water source in the Neuse River basin to meet future water demands and comply with the Updated 2001 IBT Certificate. The current Jordan Lake Allocation would not be increased, and IBT would not be increased above the Updated 2001 IBT Certificate. This would be accomplished by (1) the Towns developing a new water supply source or (2) purchasing finished water and water supply capacity from another system in the Neuse River basin. To accomplish this, approximately 10 to 12 mgd of supply from the Neuse River basin is needed.

3.7.1 New Water Supply Source Development

The LRWRP (CH2M HILL and Brown and Caldwell, 2013) evaluated the feasibility of pumping raw water from Crabtree Creek and storing the water in the existing Wake Stone Corporation Triangle Quarry, which is located north of the Interstate 40/Harrison Boulevard interchange, as shown in Exhibit 3-2. The raw water would be treated at a new WTP that would need to be constructed nearby and distributed to customers through the existing water system.

The quarry has the potential to provide up to 4.6 billion gallons of raw water storage at the projected final excavated volume, although the available volume would be less if quarry mining operations were not completed at the time this alternative would need to be initiated. Costs of the lost revenue from the unmined rock would likely be added to the Towns' purchase cost for the quarry. The State of North Carolina has first right of refusal for the quarry parcel when mining is complete, so the state would have to relinquish that right for this alternative to be implemented.

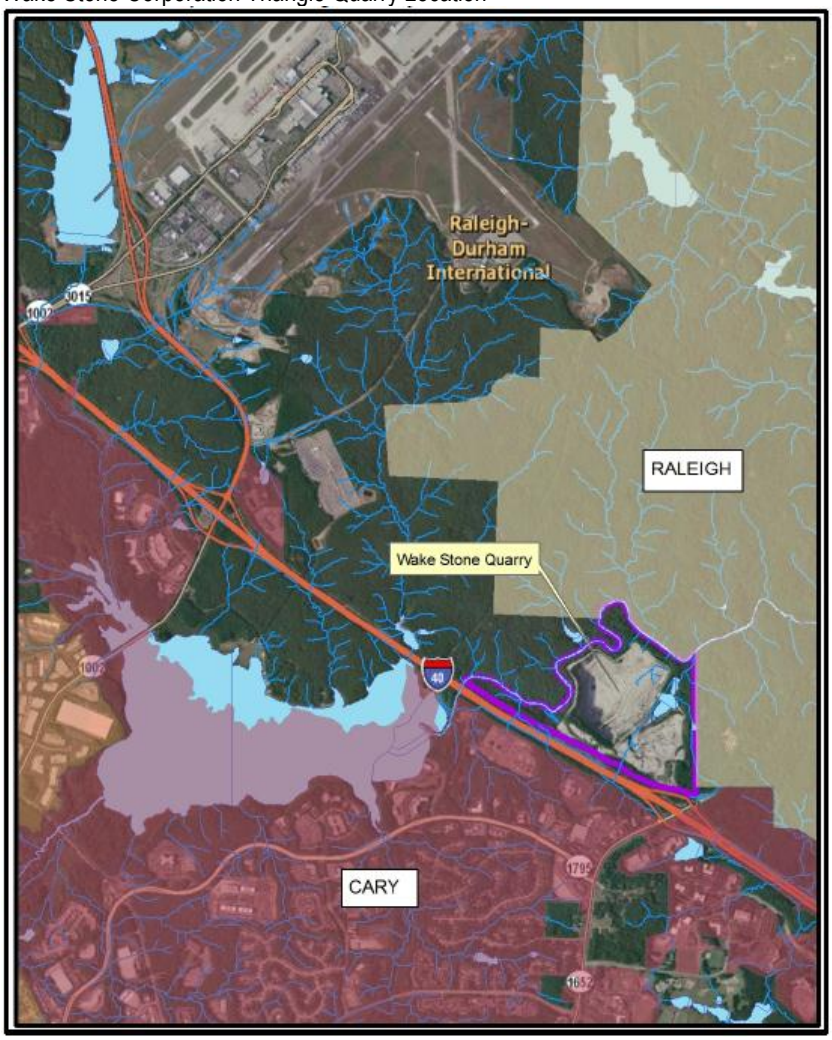
Raw water would be withdrawn under operational guidelines based on the available flows in Crabtree Creek; the developed guidelines are not based on any specific guidance from DWR but do reflect previous experience working with DWR on a similar supply system in the Triangle area. Based on an initial evaluation:

- Water would be withdrawn only when flows in the creek are above approximately 17 mgd.
- The maximum withdrawal capacity would be 30 mgd.
- The difference between daily water withdrawn and daily demand would refill the quarry.
- When the quarry reaches 100 percent storage capacity, withdrawals from the creek would return to average day demand (when flows in the creek are above approximately 17 mgd).

Based on these guidelines, an average annual yield of 10 mgd is projected for this alternative. During summer peak demand months, up to 12 mgd could be provided from quarry storage.

This option would require a new WTP. The possibility of pumping 13 miles from the quarry to the existing CAWTF was considered, but the pipeline would need to be routed exclusively through developed portions of the Towns of Cary and Apex, resulting in significant expense and construction impacts.

EXHIBIT 3-2
Wake Stone Corporation Triangle Quarry Location



The following factors affect the feasibility of this option:

- Uncertainty about the timing for the quarry to be available for conversion to water supply use.
- The potential for direct impacts caused by the withdrawals from Crabtree Creek, including ability to maintain minimum flows to meet habitat and water quality requirement.
- Whether the highly urbanized Crabtree Creek watershed could be reclassified as a water supply watershed.
- If the watershed were reclassified as a water supply watershed, the resulting burden of development and use restrictions on not only the Town of Cary, but also the Town of Morrisville, the Cities of Raleigh and Durham, Wake County, and Durham County.
- The presence of a Superfund site in the headwaters of Crabtree Creek.

Because of the uncertain feasibility of this option, it is an unreliable solution to meet the Towns' 2045 water demands.

3.7.2 Finished Water Capacity Purchase from a Neuse River Basin Utility

Finished water and water supply capacity could potentially be purchased from another system in the Neuse River basin. Several utilities in the Triangle region with water withdrawals in the Neuse River basin have constructed new water supply and WTPs in the last decade to meet anticipated growth. However, because of the economic conditions and lingering effects of the 2007–2008 drought, their actual demands have lagged behind projections. Several utilities appear to have sufficient treatment capacity to consider at least a short-term sale of finished water to the Towns of Apex and Cary. It is likely that three or four interconnections would be necessary for the Towns to access a potential cumulative finished water supply of up to 11 mgd on an average day basis, assuming 2 to 4 mgd are available from each interconnection. Existing mutual aid interconnections with other regional utilities are not sufficient for regular supplies of this quantity, so in addition to the costs of capacity purchase and water treatment costs, additional water transmission pumping and pipeline infrastructure would be required for Alternative 3c.

Without a long-term water capacity purchase agreement, this option would be an unreliable source for the Towns' customers. An option for the long-term would be to develop a joint-venture project to expand existing water supplies or develop new water supply sources. Neighboring utilities are also investigating alternatives for expanding future water supplies.

Because of the prohibitive cost of purchasing finished water capacity and constructing additional water transmission pumping and pipeline infrastructure, concerns about potential environmental impacts from construction activities, and the likelihood that increasing demands in the region would limit the potential for long-term capacity purchase agreements from existing sources in the Neuse River basin, this option is not considered feasible.

3.8 Avoid Interbasin Transfer Increase by Using Groundwater as a Source (Alternative 3d)

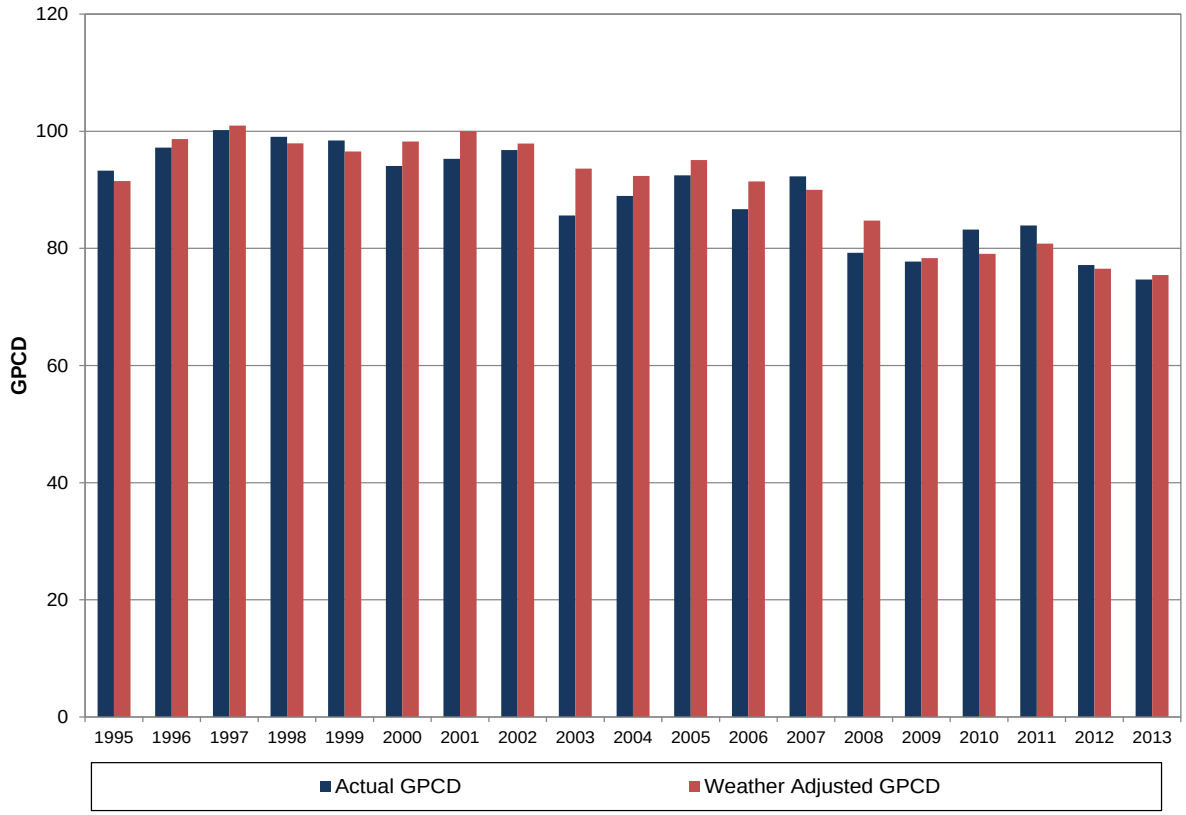
Under Alternative 3d, new groundwater wells would be installed to supply the Towns with the additional water needed to meet 2045 demands and to comply with a Updated 2001 IBT Certificate (IBT does not apply to groundwater sources). According to the *Wake County Comprehensive Groundwater Investigation Final Report* (CDM, 2003), iron and manganese concentrations in Wake County groundwater are typically high, resulting in high treatment costs. This alternative would require 45 to 65 new wells withdrawing at an average of 100 to 150 gallons per minute, and the wells would need to be placed at ¼- to ½-mile intervals. This "well-field" approach, with multiple wells on a single property, would be impractical because of the requirement for at least about 5 square miles of undeveloped property. Further investigation, including test wells, would be required to determine the technical feasibility and yield of a groundwater public water supply. Such a well system is expected to be cost prohibitive because of the area of land that would be required, the length of the raw water transmission line that would be needed, the operations and maintenance (O&M) challenges associated with numerous wells, and water quality concerns due to expected iron and manganese concentrations. Also, there is no information to indicate whether the required yield could be sustained. New water treatment facilities for groundwater would be required; the current water treatment facilities at the CAWTF were designed for Jordan Lake's surface water quality. Alternative 3d is not considered feasible.

3.9 Avoid Interbasin Transfer Increase by Using Additional Water Resources Management Tools (Alternative 3e)

The Towns have implemented proactive water resources management tools for more than 15 years to encourage conservation and wise water use practices. Through these efforts, the Towns have been successful in creating an awareness among customers of the value of wise water use practices. Alternative 3e would continue and expand the Towns' programs with the implementation of additional water resources management tools to reduce future water demands and comply with the Updated 2001 IBT Certificate. These management tools could include new educational programs, new policies and regulations, new financial incentives such as rate structure modifications, new system operating practices including peak load management, additional development planning, expanded reclaimed water use, and new water efficiency improvements.

Because of the success of the existing water resources management strategies and tools, the Towns do not expect that implementing additional water resources management tools alone would reliably and predictably reduce future potable water supply demands enough to avoid an increase in IBT. Exhibit 3-3 provides an example from the Town of Cary water billing (usage) data of changes in overall (combined residential and nonresidential) water use for Town customers between 1995 and 2013. These billing data are only for the Town of Cary where water management strategies have been in place for years and do not include RDU Airport and RTP South. Analysis using billing data, which does not include non-revenue water, allows for the review of the effectiveness of the Town's programs on influencing customer behavior. The weather-adjusted overall gallons per capita per day (GPCD) declined approximately 20 percent during this period. A detailed analysis of consumption indicates single-family residential customer class' unit consumption values have decreased the most significantly over this period (CH2M HILL and Brown and Caldwell, 2013).

EXHIBIT 3-3
Annual Average Overall Water Use by Town of Cary Customers, 1995–2013



The Catawba-Wateree Water Management Group Benchmarking Survey of Water Demand Management Programs (Maddaus Water Management (Maddaus, 2009) provides a review of 28 of the longest standing and successful water conservation programs in the country, inclusive of the Town of Cary's program. A comparison of GPCD values from study participants indicates that the Town's overall GPCD ranked second lowest out of the 24 that provided data, and well below the national average of 160 GPCD (AWWA, 2001).

The Towns' conservation and reclaimed water programs have been driving factors in the reduction in customer demand. This declining trend in consumption took place even as greater numbers of residential irrigation systems have been installed in the area. The increased prevalence of these systems would have the potential to increase peak season water demands, but this has not occurred to date.

The Towns anticipate continuing existing water resources management tools and implementing new programs in the future, as they are determined to be effective and appropriate for the communities, as recommended in the LRWRP (CH2M HILL and Brown and Caldwell, 2013). These programs will increase the reliability with which the Towns can meet customer demands and comply with a modified IBT certificate. However, Alternative 3e is not considered feasible as a means to meet projected growth needs while reducing the Towns' long-term water demand and comply with the Updated 2001 IBT Certificate.

3.10 Selection of the Preferred Alternative

Alternative 2a (increase IBT to meet 2045 demand) appears to be the most appropriate alternative to meet the long-range water supply needs through the year 2045 for the Towns of Apex and Cary. Alternative 2a is the Towns' preferred alternative. The other alternatives present significantly greater technical, environmental, and/or economic challenges. The discussion of existing environment and direct effects presented in the following sections focus in detail on the preferred alternative.

Exhibit 3-4 provides a summary of the alternatives and evaluation criteria. The following criteria were considered in selecting the preferred alternative:

- **Project Purpose and Need.** "Yes" or "No" is assigned to indicate the ability to provide the Towns with sufficient water supply to meet long-term demands and comply with IBT rules.
- **Jordan Lake Water Supply Allocation Increase.** "Yes" or "No" is assigned to indicate the need for the Towns to increase their Jordan Lake water supply storage allocations in the Round 4 Jordan Lake Allocation process.
- **Amount of IBT.** Amount of IBT for each alternative, expressed as the average day in a calendar month.
- **Existing Treatment Capacity Fully Utilized.** "Yes" or "No" is assigned to indicate whether implementation of the alternative would result in maximizing the use of existing water and wastewater treatment capacity.
- **New Treatment or Conveyance Infrastructure Needed.** "Yes" or "No" is assigned to indicate whether the implementation of this alternative would require construction of new water or wastewater treatment facilities or conveyance infrastructure.
- **Anticipated Cost Relative to the Preferred Alternative (2a).** "Higher" or "Lower" is assigned to indicate the cost relative to the Preferred Alternative (Alternative 2a).
- **Technical Feasibility.** "Yes" or "No" is assigned to indicate whether the alternative would be technically feasible to implement based on considerations such as land requirements, constructability, or reliability.
- **Potential Environmental Impacts from Construction or Operation.** The table lists potential impacts on the environment that would be expected to occur as a result of implementation of the alternative.

EXHIBIT 3-4
Summary of Alternatives

Alternative	Meets Project Purpose and Need?	Increase Allocation from Jordan Lake?	Amount of IBT	Fully Utilizes Existing Treatment capacity?	Requires New Infrastructure?	Anticipated Cost Relative to the Preferred Alternative (2a)	Technical Feasibility	Potential Environmental Impact from Construction/ Operation [a]
1 – No Action	No	No	22 mgd; current planned development projects could result in exceeding this IBT.	No	No	Lower	Yes	None Likely
2a – Increase in IBT to Meet 2045 Demands - Proposed IBT Certificate Modification	Yes	Yes	33 mgd	Yes	No	N/A	Yes	None Likely
2b – Increase in IBT to Meet 2045 Demands and Use Current Permitted Wastewater Capacity	Yes	Yes	44 mgd	No	Yes; new pipelines to convey wastewater to South Cary WRF	Higher	Yes	Pipeline construction
3a – Avoid IBT Increase by Sending Additional Untreated Wastewater Effluent to the WWRWRF	Yes	Yes	22 mgd	No	Yes; new pump stations and pipelines to convey untreated wastewater to WWRWRF	Higher	Yes	Plant/pipeline construction, increased discharge to Cape Fear River
3b – Avoid IBT Increase by Discharging Additional Treated Wastewater Effluent to the Cape Fear River Basin	Yes	Yes	22 mgd	Yes	Yes; new pump stations and pipelines to convey treated effluent to Cape Fear Basin	Higher	Yes	Plant/pipeline construction, increased discharge to Cape Fear River
3c -– Avoid IBT Increase by Using a Water Source in the Neuse River Basin	Yes	No	22 mgd	No	Yes; new WTP or water transmission and pumping from Neuse Basin utility	Higher	Yes	Plant/pipeline construction, Crabtree Creek withdrawal

EXHIBIT 3-4
Summary of Alternatives

Alternative	Meets Project Purpose and Need?	Increase Allocation from Jordan Lake?	Amount of IBT	Fully Utilizes Existing Treatment capacity?	Requires New Infrastructure?	Anticipated Cost Relative to the Preferred Alternative (2a)	Technical Feasibility	Potential Environmental Impact from Construction/ Operation [a]
3d – Avoid IBT Increase by Using Groundwater as a Source	Unknown without further study	No	22 mgd	No	Yes; numerous new wells, WTP, transmission infrastructure	Higher	Yes	Well/plant/pipeline construction; groundwater withdrawal
3e – Avoid IBT Increase by Using Additional Water Resources Management Tools	No	No	22 mgd; but, unpredictable and possibly could result in non-compliance with Updated 2001 IBT Certificate	No	No	Lower	Unpredictable	None

[a] SCI are considered same for all alternatives that meet the purpose and need.

Alternative 1 includes taking no action. This alternative would fail to meet water demands before 2045 and would not meet the project purpose and need.

Alternative 2a (Proposed IBT Certificate Modification) would meet the project purpose and need through use of Jordan Lake and a corresponding increase in IBT from 22 to 33 mgd to meet 2045 demands. This alternative is considered technically feasible. IBT would increase compared with the Updated 2001 IBT Certificate, it would be minimized by the discharge of effluent from the WWRWRF into the Cape Fear River basin. The infrastructure to implement this alternative is in place, and the corresponding cost to implement this alternative would be lower than other alternatives.

Alternative 2b would increase the Towns' IBT to meet 2045 demands while fully utilizing the Towns' permitted WRF capacity. This alternative is considered feasible and would meet the purpose and need of providing water to meet 2045 demands. However, this alternative would not minimize IBT to the extent of other alternatives, including Alternative 2a.

Alternative 3a would avoid an increase in IBT by transferring a portion of the Towns' untreated wastewater from the Neuse River Basin to be treated at the WWRWRF and then discharged to the Cape Fear River Basin. This alternative would meet the project purpose and need, but the pumping and pipeline infrastructure required to transfer additional wastewater to the WWRWRF for treatment and discharge would increase the capital and O&M costs and inefficiencies of this alternative. Furthermore, this alternative would result in underutilization of existing permitted and constructed treatment facility capacity and conveyance infrastructure and would require earlier expansion of the WWRWRF. The additional infrastructure would also lead to the potential for additional temporary and permanent environmental impacts. This alternative is considered less viable than other alternatives.

Alternative 3b would avoid an increase in IBT by transferring a portion of the Towns' treated wastewater effluent from the South Cary WRF and/or Apex WRF (in the Neuse River basin) to a discharge location in the Cape Fear River basin. This alternative would meet the project purpose and need, but the major effluent pumping facilities and pipeline infrastructure required to transfer additional treated WRF effluent through developed areas to the Cape Fear River basin for treatment and discharge would increase the capital and O&M costs and inefficiencies of this alternative. In addition, this alternative would require additional treatment for nutrients, especially TP, to meet the same limits imposed in the WWRWRF NPDES permit. More stringent limits could be imposed because of nutrient impact concerns related to new discharges in the Middle Cape Fear River basin. This additional infrastructure would also lead to the potential for additional temporary and permanent environmental impacts. This alternative is considered less viable than other alternatives.

Alternative 3c would avoid an increase in IBT by using a water supply source in the Neuse River basin to offset use of Jordan Lake. The infrastructure to treat and convey water supply from the Neuse River basin would need to be permitted and constructed, which would be a substantial additional cost compared with other alternatives. In addition, this approach does not fully utilize existing water treatment and distribution infrastructure. The quarry water supply is technically feasible, but the timing for the quarry to be available for conversion to water supply use is uncertain. There are also significant costs to the Towns and other government entities to implement development and land use restrictions to comply with a new water supply watershed designation for the highly urbanized Crabtree Creek watershed. This alternative also has the potential for significant direct impacts caused by the withdrawals from Crabtree Creek, including the ability to maintain minimum flows to meet habitat and water quality requirements and potential environmental impacts from construction activities. Although technically feasible, this alternative is considered less economically and environmentally viable than other alternatives evaluated.

Alternative 3d would use groundwater as a water supply source and avoid an increase in the Towns' IBT. This alternative would meet the project purpose and need, assuming that sufficient yield is available over this planning horizon. However, the treatment costs and the number of wells required for this alternative,

along with the corresponding capital and O&M costs and inefficiencies are a significant cost factor for this alternative compared with other alternatives. Additional studies would be required to determine if this source would be a viable option. In addition, this alternative would result in underutilization of existing water treatment and distribution infrastructure, and new transmission infrastructure would be required to integrate the wellfield and new treatment plant with the Towns' existing distribution systems. This additional infrastructure would also lead to the potential for additional temporary and permanent environmental impacts. This alternative is considered less viable than other alternatives.

Alternative 3e would minimize or avoid an IBT increase by utilizing additional water resources management tools. This alternative would not fully meet the project purpose and need without the implementation of other alternatives, and there is uncertainty regarding potential future water savings. As a result, this alternative cannot reliably or predictably eliminate the need for increased use of water from Jordan Lake or an increased IBT. The Towns do intend to continue implementing water resources management tools as part of their overall water supply strategy, in accordance with the recommendation in the LRWRP (CH2M HILL and Brown and Caldwell, 2013).

The evaluations documented in Exhibit 3-4 and summarized above support selection of Alternative 2a (Proposed IBT Certificate Modification) as the preferred alternative.

SECTION 4

Existing Environmental Conditions in the Study Area

The existing environment is described for the study area as defined in Section 1. Baseline environmental conditions are necessary for the analysis of potential environmental effects related to the proposed increase in IBT. The primary effects and the SCI of the proposed increase in IBT as a whole on the study area, if any, are discussed in Section 5.

This section is organized by topic. Each basin is further described regarding the following potentially affected areas: water resources, wetlands, topography, soils, wildlife resources, aquatic resources, land use, agricultural land and prime farmland, forest resources, public lands and scenic and natural areas, archaeological and historic resources, air quality, noise levels, and toxic substances and hazardous wastes. The data were gathered through literature reviews and research, geographic information system (GIS) queries, phone conversations, letters, and meetings with various resource agencies.

4.1 Study Area Source and Receiving Basins Defined

The Study Area (Exhibit 3-1) is divided for the purposes of this discussion and addresses two areas:

- Source Basin, which includes the portions of the Cape Fear River basin from which water is withdrawn and returned via consumptive use (Haw River subbasin), as well as where water is returned via wastewater discharge (Cape Fear River subbasin). The Study Area includes both the New Hope Creek Arm and Haw River Arm of Jordan Lake, and the contributing New Hope Creek Arm watershed areas. These watershed areas include New Hope, Third Fork, and Northeast Creeks (03-06-05) and Morgan and Little Creeks (03-06-06). Also included in the Study Area are the river reaches immediately downstream of the withdrawal: the Haw River reach downstream of Jordan Lake and the Cape Fear River from the confluence of the Haw and Deep Rivers to the Town of Lillington.
- Receiving Basins, to which water is transferred from Jordan Lake via both consumptive use and wastewater discharge. The Study Area includes significant portions of the Towns' service areas where consumptive use occurs, in both the Neuse River basin (Cary and Apex) and the Cape Fear River subbasin (Apex). The Cape Fear River subbasin was not required to be included in the 2001 EIS study area, and has been added at the request of DWR in order to address all of the Towns' transfers out of the Haw River subbasin. The portion of the Cape Fear River subbasin in the Town of Apex's urban service area includes the watershed for White Oak Creek and Harris Lake. The Neuse River basin portion of the Study Area also includes Crabtree and Middle Creeks, to which wastewater effluent is discharged by Cary and Apex respectively, extending from the Towns' service area boundaries to the creeks' confluence with the Neuse River. The Neuse River portion of the Study Area also includes portions of Swift Creek.

Although outside the Study Area, potential flow effects in the Cape Fear River at Fayetteville, due to upstream withdrawal from the Haw River subbasin, as well as wastewater discharge to the Cape Fear River subbasin, are discussed in Section 5.1.1 which pertains to water resources.

4.2 Water Resources

This section includes a description of surface water, groundwater, wetlands, topography, and floodplains in the Study Area.

4.2.1 Surface Water

Both water quantity and water quality are important factors in the function of aquatic systems. Water quantity and its seasonal variability influences both in-stream and adjacent riparian and floodplain

ecosystems. Water quantity is a critical concern for those who depend on surface water for water supply and wastewater discharge; the assimilative capacity of a stream is important to protect water quality.

The Clean Water Act is the basis for water quality standards and other water quality programs. The overall goal of the Clean Water Act is for all waters to be fishable and swimmable. Water quality standards consist of the usage classification of a water body and the numeric and narrative criteria that have been set to protect that use. At a minimum, all waters are classified to protect aquatic life and secondary recreation. Other classifications may be added to reflect uses such as drinking water supply and primary recreation. In North Carolina, all water bodies used for public water supply are given a "WS" classification. Minimum statewide water supply protection standards (certain watershed development and wastewater discharge restrictions) apply to the water supply watershed areas.

Exhibit 4-1 shows major waterbodies, impaired streams, and water supply watersheds. Exhibit 4-1 also shows the location of monitoring stations discussed in this section.

4.2.1.1 Source Basin

The major surface water bodies in the Haw River subbasin, within the Cape Fear River basin, include Jordan Lake and its tributaries, including New Hope Creek and Haw River Arms (Exhibit 1-3).

JORDAN LAKE

The Jordan Lake Dam is located on the Haw River, immediately downstream of the confluence of the Haw River and New Hope Creek. Jordan Lake was developed to provide flood control and water supply, but it must also meet multiple objectives including low flow augmentation, fish propagation, and recreation. The lake must be actively managed to meet these different objectives. The major tributaries to Jordan Lake are the Haw River, Northeast Creek, New Hope Creek, and Morgan Creek (Exhibit 4-1). The reservoir is about 5 miles long on the Haw River Arm, and 18 miles long on the New Hope Creek Arm. Jordan Lake has a shoreline of approximately 200 miles. The Jordan Lake Project, initially filled in 1981 and 1982, encompasses 46,768 acres of which approximately 13,900 acres are permanently flooded to form a reservoir at 216 feet above mean sea level. At this elevation, Jordan Lake has a total capacity of about 215,100 acre-feet, a maximum depth of 66 feet, and a mean depth of about 17 feet (United States Army Corps of Engineers [USACE], 2014).

Water in Jordan Lake is considered to be in one of three storage pools: flood control storage, conservation storage, and sediment storage (Exhibit 4-2). The conservation storage pool is further split into a water supply pool and a low-flow augmentation, or water quality pool. To support aquatic life and other downstream uses, flows in the Cape Fear River are augmented by releases from the Jordan Lake Dam. These flows come from the water quality pool. Water supply withdrawals for permitted users come from the water supply pool. When full, the water quality pool contains approximately 94,600 acre-feet of water, and the water supply pool contains approximately 45,800 acre-feet of water (NCDENR, 2013a). This water supply pool is estimated to yield approximately 100 mgd, of which 32 percent (yielding 32 mgd) is allocated to the Towns of Apex and Cary (NCDENR, 2002b). However, a separate reallocation process is currently in progress.

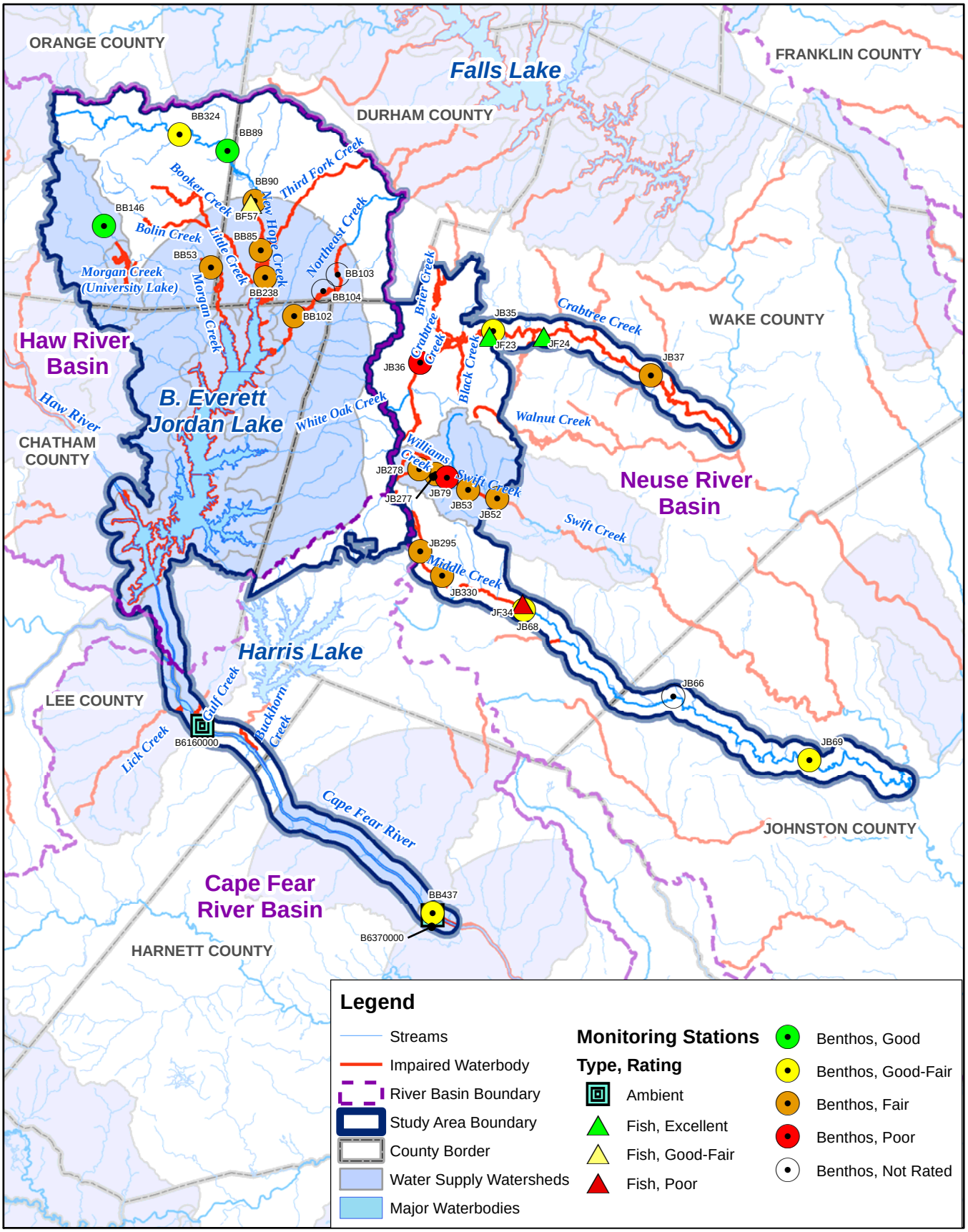


EXHIBIT 4-1
Surface Water
Interbasin Transfer (IBT) Environmental Assessment

CH2MHILL

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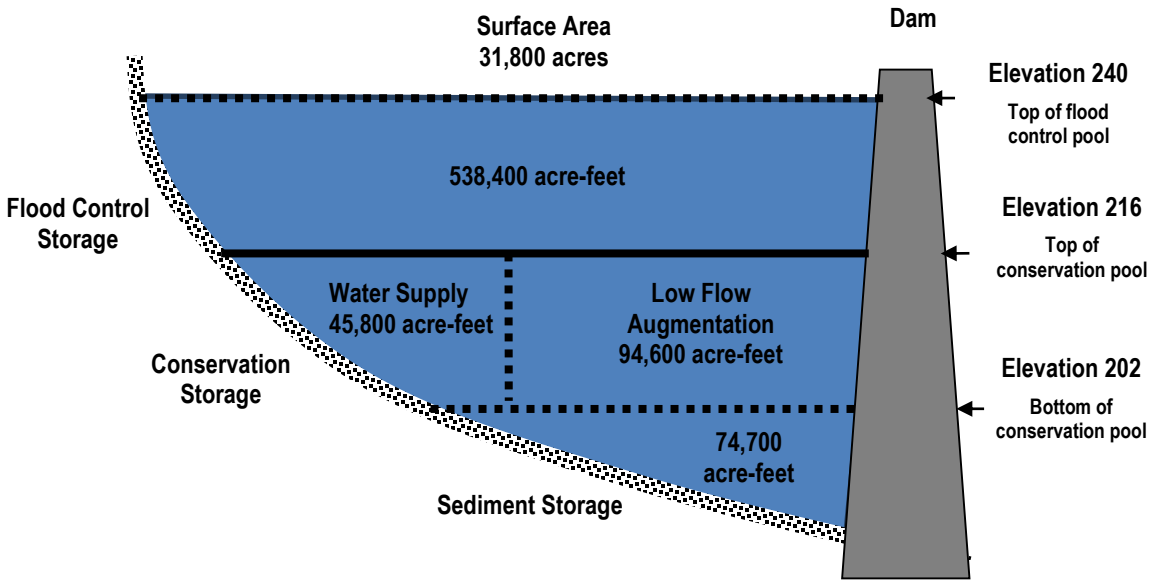
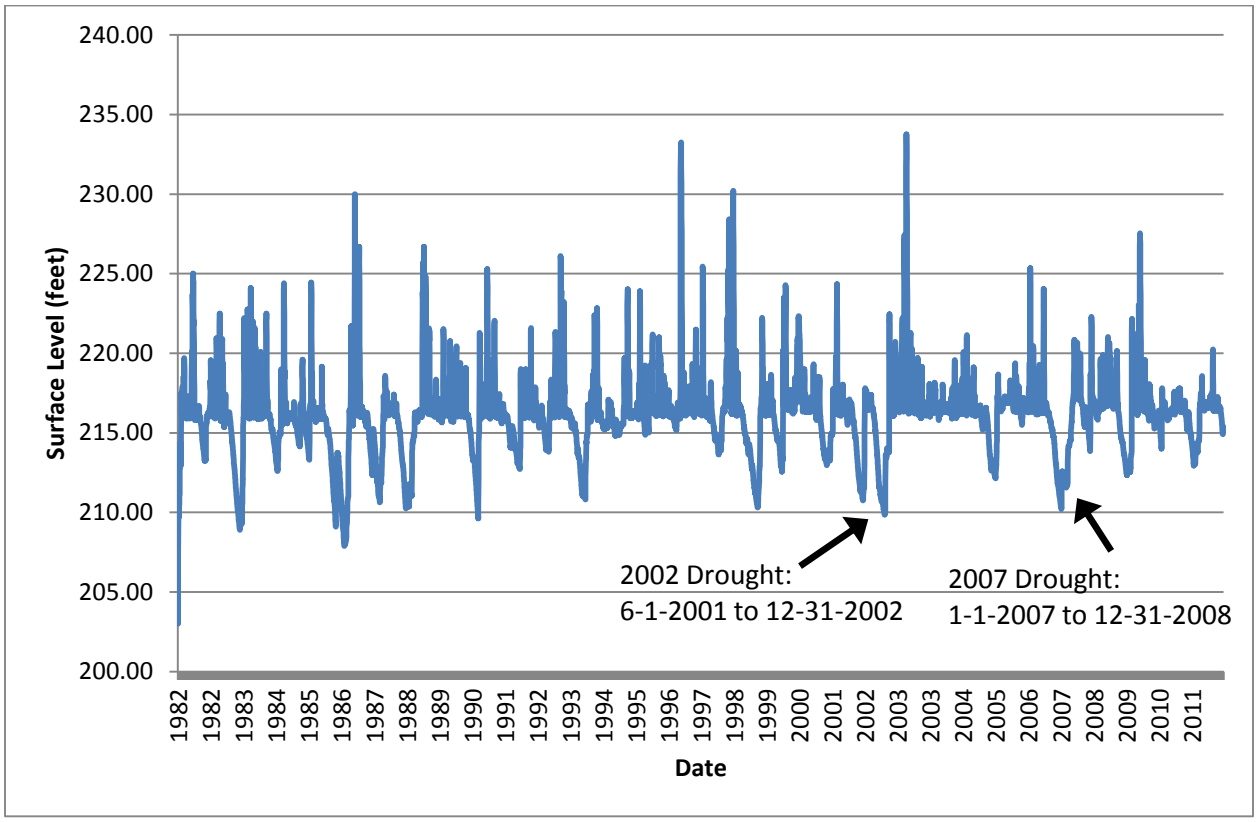
EXHIBIT 4-2
Jordan Lake's Storage Volume



SOURCE: NCDENR, 2013A

Under normal conditions, the dam is operated to maintain a target flow of 600 cubic feet per second (cfs) which is allowed to vary plus or minus 50 cfs because of the flow variability and lack of precision in managing releases to meet the downstream flow target (USACE, 1992). Exhibit 4-3 presents the lake levels since the filling of Jordan Lake started in 1981. Because of active management of the lake, the surface level has remained relatively stable over time. Exhibit 4-3 shows that even during the 2002 and 2007 droughts the lake level was effectively maintained, and it recovered to meet the different objectives of the resource.

EXHIBIT 4-3
Historical Lake Levels – Jordan Lake



SOURCE: USACE, 2014A

Jordan Lake has been eutrophic since it was filled in 1982. In 1983, the lake was classified as a combination of Class B and Class A-II (for public water supply after treatment and later changed to Class WS-IV, reflecting changes to the water supply classification system). The Jordan Lake watershed was classified as Nutrient Sensitive Waters (NSW) and the DWR (formerly the Division of Water Quality [DWQ]) implemented a watershed nutrient management strategy to control primarily phosphorus inputs from point sources and a voluntary program to control nitrogen and phosphorus from nonpoint sources. The original NSW supplemental classification required that a nutrient management strategy be implemented to protect the reservoir from water quality problems associated with nutrient enrichment. Total phosphorus (TP) limits of 2 milligrams per liter (mg/L) were required for NPDES permitted facilities with flows greater than 0.005 mgd. In 2000, all subject dischargers were meeting this limit. In addition, discharges located upstream from the Upper New Hope Arm of Jordan Reservoir received TP limits of 0.5 mg/L during from April through October.

In 1997, the General Assembly adopted GS 143-215.1(c1) to (c6), which generally required dischargers to any waters classified as NSW to meet annual mass-based effluent requirements for total nitrogen (TN) based on a concentration of 5.5 mg/L and for TP based on a concentration of 2 mg/L. The statute also allowed these limits to be varied based on the results of a calibrated nutrient response model (CNRM), and many dischargers in the Jordan Lake watershed jointly undertook the effort to hire a consultant to develop a CNRM. In 2000, DWQ continued the modeling efforts of the stakeholder group. Eventually, the Upper New Hope Arm of Jordan Lake was placed on the 2002 State 303(d) list of Impaired Waters, based on results of CNRM and additional water quality sampling. The 303(d) listing of the Upper New Hope Arm of the lake resulted in the need for a total maximum daily load (TMDL) for this portion of the lake. The Jordan Lake Nutrient management strategy was developed to meet these requirements. Since the 2002 listing for the Upper New Hope Arm, water quality in the Lower New Hope and Haw River Arms also indicated they are

Impaired, based on chlorophyll *a* levels, and are currently listed as Impaired as well (NCDENR, 2005). 303(d) listed waters are further discussed in Section 4.2.1.1.2.

A baseline study, conducted from January 2005 through September 2008 revealed that in addition to the elevated nutrient and chlorophyll *a* levels throughout Jordan Lake, 18 percent of the total observations in the Haw River Arm exceeded the state water quality standard of 40 micrograms per liter. Other water quality concerns in the Haw River Arm include high pH and high total percent dissolved oxygen saturation values, which are most likely linked to algal production. In the Upper New Hope Arm above State Road (SR) 1008, 83 percent of the chlorophyll *a* values exceeded the DWQ water quality standard. In addition, this arm of the lake had high turbidity values and low Secchi depth readings, indicating poor water clarity due to algal productivity and/or sedimentation. The Lower New Hope Creek Arm (downstream from SR 1008) was also found to be Impaired for chlorophyll *a* (23 percent of the total observations) and turbidity (26 percent of the total observations) (NCDENR, 2009a).

The Jordan Rules (as defined in 15 NCAC 02B .0262 - .0311) were developed for the purpose of implementing the TMDL and Jordan Lake nutrient management strategy. To meet the requirements of the TMDL, the Jordan Rules splits the reservoir and its drainage into three discrete areas: Haw River Arm, Upper New Hope Arm, and Lower New Hope Arm. There are specific nutrient reduction targets for each of these arms. These are expressed as loading targets as well as percent reductions compared to the estimated annual average load from 1997 through 2001. The following is a summary of the nutrient reduction targets:

- Upper New Hope Arm
  - TN – 35 percent reduction from the 1997 to 2001 baseline load of 986,186 pounds per year allocated approximately 52 percent to point sources and 48 percent to nonpoint sources
  - TP – 5 percent reduction from the 1997 to 2001 baseline load of 87,245 pounds per year allocated approximately 28 percent to point sources and 72 percent to nonpoint sources
- Lower New Hope Arm
  - TN – 0 percent reduction from the 1997 to 2001 baseline load of 221,929 pounds per year allocated approximately 3 percent to point sources and 97 percent to nonpoint sources
  - TP – 0 percent reduction from the 1997 to 2001 baseline load of 26,574 pounds per year allocated to less than 1 percent to point sources and greater than 99 percent to nonpoint sources
- Haw River Arm
  - TN – 8 percent reduction from the 1997 to 2001 baseline load of 2,790,217 pounds per year allocated approximately 35 percent to point sources and 65 percent to nonpoint sources
  - TP – 5 percent reduction from the 1997 to 2001 baseline load of 378,569 pounds per year allocated approximately 29 percent to point sources and 71 percent to nonpoint sources

The adopted Jordan Rules were comprehensive and included the following components:

- Stormwater Rules – New Development
- Stormwater Rules – Existing Development
- Riparian Buffer Rules
- Wastewater Discharge Rule
- Agricultural Rule
- Fertilizer Management Rule
- Options for Offsetting Nutrient Loads

The Jordan Rules became effective in 2009, but each of the separate rules had different implementation dates. For example, the original New Development Rule required local governments to implement their programs in 2012, while the original Wastewater Discharge Rule required WWTP to meet nitrogen requirements by 2014. Multiple session laws between 2009 and 2012 delayed the implementation dates of specific rules, and Session Law 2013-360 delayed all implementation dates that hadn't yet occurred by three years. Since the Riparian Buffer Rules, the State and Federal New Development requirements, and the WWTP discharge phosphorus requirements were already being implemented, they continue to be implemented. Local governments have until 2017 to implement their new development programs and they will not be required to implement existing development requirements until 2018 in the Upper New Hope Arm and 2021 in the Haw and Lower New Hope Arm. Implementation of the development rules is required only if monitoring shows that water quality standards are still not being met. WWTPs have until 2019 or 2021 to meet nitrogen requirements. It should be noted that the preceding information provides an overview of the implementation dates for the Jordan Rules, but is not inclusive of all specific details or schedules. Waters associated with Jordan Lake have been classified as Water Supply IV – Highly Developed (WS-IV); Nutrient Sensitive Waters (NSW), Critical Area (CA), and in some portions, Primary Recreation, Fresh Water (B) (NCDENR, 2013b). Jordan Lake serves as a current or planned future water supply for Chatham County, the City of Durham, the Towns of Apex, Cary, Hillsborough, Holly Springs, Morrisville and Pittsboro, OWASA, Orange County, and RTP South.

TRIBUTARIES TO JORDAN LAKE

303(d) Listed Waters

Section 303(d) of the Clean Water Act requires that states develop a list of waters that do not meet water quality standards or which have impaired uses. The State must prioritize these waterbodies and prepare a management strategy or TMDL. Jordan Lake's major tributaries (the Haw River, New Hope Creek, Northeast Creek, and Morgan Creek) are included in the State 303(d) list for impairments related to eutrophication such as pH, low dissolved oxygen, and chlorophyll *a*. In addition, other small streams and tributaries in the Source Basin Study Area are listed: Bolin Creek, Booker Creek, Buckhorn Creek, Gulf Creek, Lick Creek, Little Creek, and Third Fork. Most of these streams have been reported to be Impaired for ecological/biological integrity mainly due to urban runoff and land development; DWR has assigned a medium priority to most of these streams (NCDENR, 2014a).

Haw River

The Haw River at Bynum has a drainage area of 1,275 square miles (mi^2). Historical annual flows measured at United States Geological Survey's (USGS) Bynum gage (02096960) are presented in Exhibits 4-4 and 4-5. Exhibit 4-4 presents a box and whisker chart highlighting the median and average flows. The natural cycle in annual flows can be observed with the median annual flow values. Exhibit 4-5 presents the minimum, average, and maximum annual flows.

EXHIBIT 4-4
Haw River Flow, USGS Gaging Station – Bynum, North Carolina

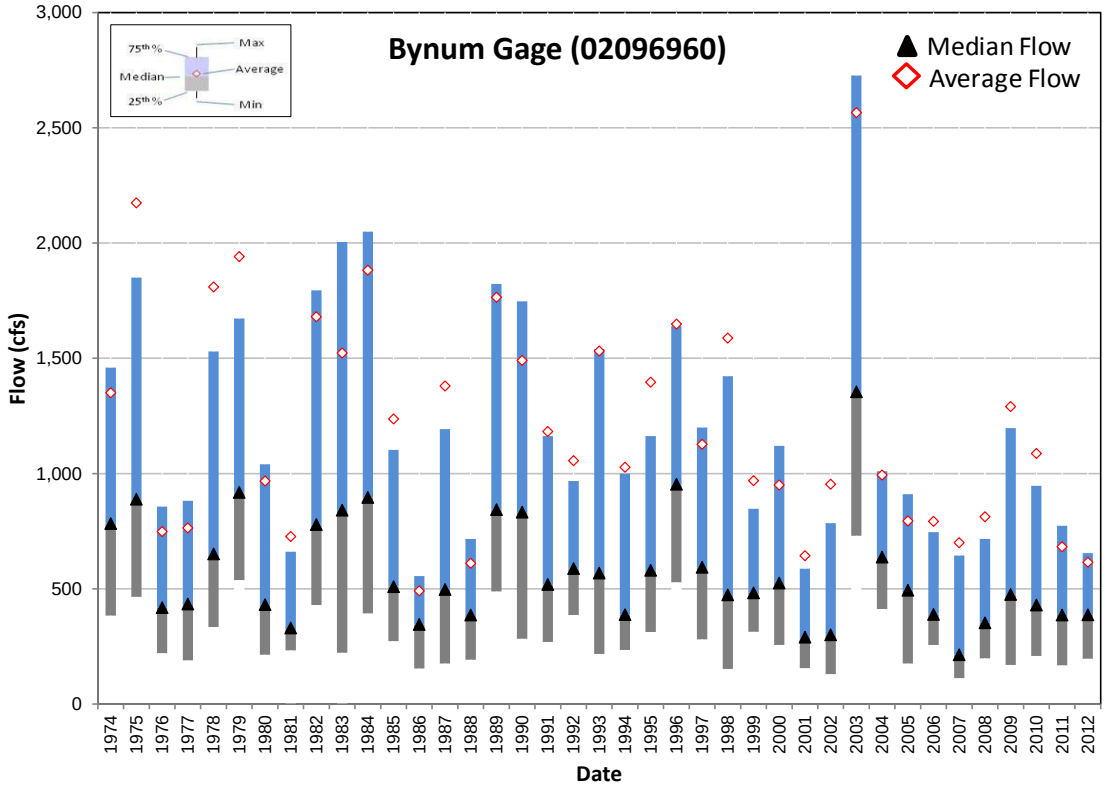
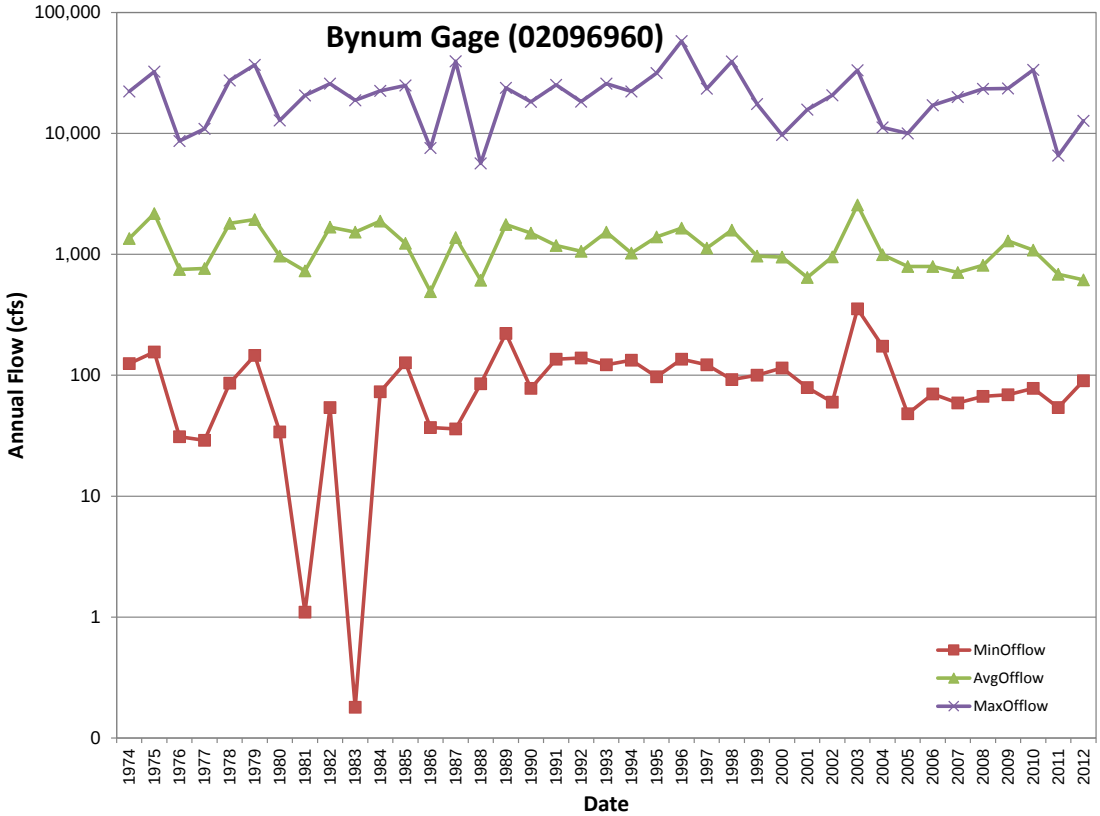


EXHIBIT 4-5
Haw River Annual Flow, USGS Gaging Station – Bynum, North Carolina



Macroinvertebrate and fish communities are sampled by NCDENR to assess water quality and habitat conditions. U.S. 64 is the last monitoring site on the Haw River before it enters Jordan Lake and is composed of multiple channels. The benthic station BB443, at U.S. 64 on the Haw River, improved to a bioclassifcation score of Excellent in 2008 for the first time since sampling on the Haw River began in 1983. This improvement is likely due, in part, to the highest Ephemeroptera, Plecoptera, and Trichoptera (EPT) richness ever recorded at this site. This station was not sampled in 2003 because of high summer flows and received a score of Good in 2002 (NCDENR, 2012a).

Northeast Creek

Northeast Creek from U.S. 55 to the Triangle WWTP (3.3 miles) is Impaired for aquatic life because of violations of standards for turbidity and dissolved oxygen. This segment is Supporting for recreation (NCDENR, 2009b). On this segment a benthic station at SR 1102 was sampled but not rated in 1998 (NCDENR, 2012a).

Northeast Creek from Triangle WWTP to Kit Creek (3.3 miles) is Impaired for aquatic life because of violations of standards for turbidity. This segment is also Impaired for recreation because of violations of standards for fecal coliform bacteria (NCDENR, 2009b). On this segment, at SR 1100, a benthic station and fish station were sampled in 1998 but were not rated (NCDENR, 2012a).

Northeast Creek from Kit Creek to downstream of Panther Creek (3.2 miles) is Impaired for aquatic life because of violations of standards for turbidity. This segment is Supporting for recreation (NCDENR, 2009b). On this segment, a benthic sampling site at SR 1731 received a rating of Fair in 1993 (NCDENR, 2012a).

DWQ developed a fecal coliform bacteria TMDL for Northeast Creek that was approved by EPA in September 2003. The TMDL recommended a 90 percent reduction in bacteria loading from urban stormwater in the City of Durham (NCDENR, 2005).

New Hope Creek

On New Hope Creek, benthic sampling site BB238, located at SR 1107, is below the City of Durham's South WRF. This site has consistently rated Fair, including as recently as 2008. Based on Biotic Index (BI) values, water quality has not changed at this site (NCDENR, 2009b).

New Hope Creek from source to Sandy Creek (17.4 miles) is Supporting for aquatic life (NCDENR, 2009b). Benthic sampling site BB324, near SR 1730 was rated Good-Fair in 2003 (NCDENR, 2012a).

New Hope Creek from Sandy Creek to SR 2220 (1.1 miles) is Supporting for aquatic life (NCDENR, 2009b). A benthic sampling site at SR 1734 received a rating of Good in 1993. Also on this segment, fish sampling site BF57, at SR 2220, was rated Good-Fair in 2003 and had no intolerant species, indicating degraded water quality (NCDENR, 2012a).

New Hope Creek from SR 2220 to I-40 (3.5 miles) is Impaired for aquatic life due to violations of standards for dissolved oxygen and turbidity. This segment is Not Rated for recreation (NCDENR, 2009b). A benthic sampling site at SR 2220 received a rating of Fair in 1987 (NCDENR, 2012a).

New Hope Creek from I-40 to SR 1107 (4 miles) is Impaired for aquatic life (NCDENR, 2009b). A benthic sampling site at I-40 received a rating of Fair in 1985 (NCDENR, 2012a).

DWQ completed a fecal coliform study in New Hope Creek in 2000 and determined that fecal coliform bacteria did not exceed the standard in this segment. This segment is Supporting for recreation because of this sampling. There are many single-family NPDES permitted discharges in this watershed that may contribute oxygen-consuming wastes as well as bacteria and nutrients (NCDENR, 2005).

Morgan Creek

A sample was collected at benthic site BB146 near NC 54 during the 2008 drought. It should not have been rated because it was collected during the drought, but it was assigned a Fair bioclassification. A year later, in

2009, the bioclassification increased from Fair to Good. The biological community was very similar to the 2003 sample and appears to have recovered from the drought. When corrected for the season, the EPT richness (23) and the BI (4.36) recorded from the 2009 collection were similar to those recorded in November 2003 (EPT = 22 and EPT BI = 4.22) (NCDENR, 2009b). A fish sampling station also near NC 54 received a rating of Good in 1994.

Further downstream, benthic sampling site BB53, below the OWASA WWTP received ratings of Fair in 1998 and 2003. A benthic sampling site upstream of the OWASA WWTP and a fish sampling site off SR 1900, were also rated Fair in 1994 and 1988 respectively. Even farther downstream, benthic sampling sites at Botanical Trail and SR 1726 received ratings of Good Fair and Fair, respectively in 1998.

HAW RIVER AND CAPE FEAR RIVER

The confluence of the Haw River and the Deep River, downstream of the Jordan Lake Dam, forms the Cape Fear River in Subbasin 03-06-07. Subbasin 03-06-07 consists mainly of the Cape Fear River and several small tributaries. The Cape Fear River at Lillington has a drainage area of 3,464 $mi^{2.}$ Historical annual flows measured at Lillington gage (02102500) are presented in Exhibits 4-6 and 4-7. Exhibit 4-6 presents a box and whisker chart highlighting the median and average flows, the natural cycles in flow can be observed. Exhibit 4-7 presents the minimum, average, and maximum annual flows.

EXHIBIT 4-6
Cape Fear River Flow, USGS Gaging Station – Lillington, North Carolina

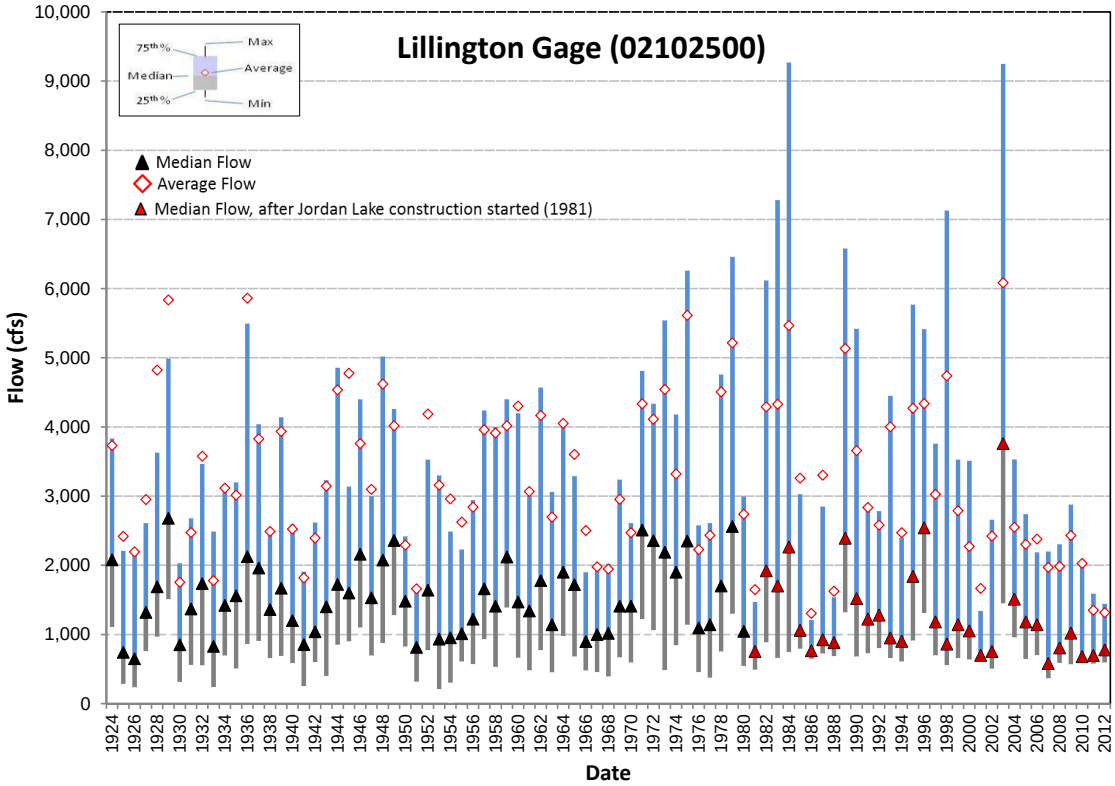
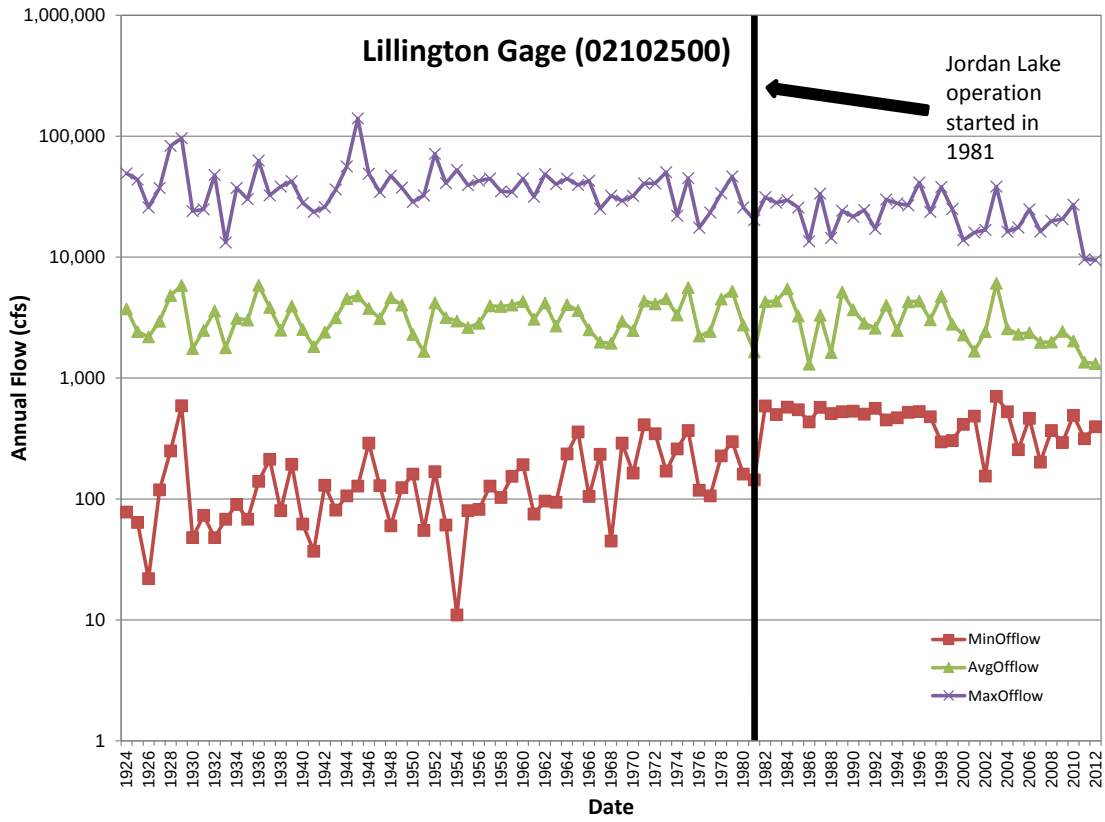


EXHIBIT 4-7
Cape Fear River Annual Flow, USGS Gaging Station – Lillington, North Carolina



Ambient stations on the Cape Fear River include Cape Fear River at NC 42 near Corinth (B6160000) and Cape Fear at US 401 near Lillington (B6370000) (Exhibit 4-1). The data from these stations have identified exceedances of the state criteria for pH, turbidity, and fecal coliform (NCDENR, 2008).

The Cape Fear River was Fully Supporting in the NCDENR 2000 Cape Fear River Water Quality Plan (NCDENR, 2000); however, the Cape Fear River from confluence of the Haw and Deep Rivers to NC 42 (3.7 miles) is now considered Impaired for aquatic life because of exceedance of the standard for chlorophyll *a*. Algal blooms have been common in this segment of the river upstream of Buckhorn Dam; pH levels were commonly elevated as well, likely as a result of the algal activity. Discharges in the Haw and Deep Rivers and nutrient laden runoff from upstream urban and agricultural land uses are contributing nutrients into this slow-moving segment. Algal activity was especially high during the summer of 2002, when flow was extremely low because of drought conditions. The Cape Fear River from downstream of Daniels Creek to the Upper Little River (19 miles) is Supporting for aquatic life (NCDENR, 2014a). Benthic sampling site BB437, near U.S. 401, received a rating of Good–Fair in 2003 (NCDENR, 2012a). Turbidity was above the water quality standard, likely due to runoff from upstream land uses in the Haw River and Deep River watersheds (NCDENR, 2005).

Approximately one-third of the segment of the Cape Fear in the Source Basin Study Area (from the dam to Lillington) is classified as WS-IV.

4.2.1.2 Receiving Basins

NEUSE RIVER SUBBASIN

The major surface water bodies in the Neuse River Subbasin, within the Neuse River Basin, include Crabtree Creek, the headwaters of Swift Creek, and Middle Creek.

The entire Neuse River Basin was classified as NSW in 1988, and the DWR implemented a basinwide nutrient management strategy to control nitrogen and phosphorus inputs from point and non-point sources.

Crabtree Creek

Crabtree Creek, Lake Crabtree, Brier Creek, Little Brier Creek, and Walnut Creek have been included in the State 303(d) list because of a fish consumption advisory related to polychlorinated biphenyls (PCBs) contamination from a Superfund site (NCDENR, 2014a).

Additional impairments in the basin include in Black Creek, Crabtree Creek, Hare Snipe Creek, Marsh Creek, Mine Creek, and Richlands Creek because of ecological evaluations; Lake Crabtree because of turbidity; the Neuse River because of copper and turbidity; and Pigeon House Creek because of zinc standards violations (NCDENR, 2014a).

The upper reach of the Crabtree Creek (upstream of Lake Crabtree Dam) and its tributaries drain urban areas in the Towns of Cary and Morrisville. The Study Area also contains the lower section of Crabtree Creek and its floodplain, downstream of the North Cary WRF. The stream flows for several miles through the William B. Umstead State Park and through the City of Raleigh before its confluence with the Neuse River.

Crabtree Creek, at the point of discharge of the North Cary WRF immediately downstream of the Lake Crabtree Dam, has a drainage area of 52 mi^2.

The USGS maintains a gage at Ebenezer Church Road, downstream of the park, and a gage at U.S. 1 (Capital Boulevard), in the lower segment of the creek before its confluence with the Neuse River. The drainage area at Ebenezer Church Road is 76 mi^2. The drainage area at U.S. 1 is 121 mi^2.

DWR ambient monitoring stations for the surface waters in the Study Area are shown in Exhibit 4-1. The ambient monitoring data collected in Crabtree Creek have revealed exceedances of the state criteria for dissolved oxygen and turbidity (NCDENR, 2012b).

Because of the lower than average flows during the 2010 basin cycle, the segment of Crabtree Creek within Umstead State Park was the only segment on Crabtree Creek that had sufficient flow to sample the benthic community. Sufficient flow at this location was most likely due to the wastewater effluent discharged from the North Cary WRF located approximately 1 mile upstream. In 2005, this site, JB35, received a Fair bioclassification, down from the Good-Fair bioclassification it had received in the previous two basin cycles (1995 and 2000). In 2010 it again received a Good-Fair bioclassification (NCDENR, 2012a).

Upstream and downstream of Umstead Park, 2005 benthic sampling ratings of Poor and Fair occurred at benthic stations JB36 at NC 54 and JB37 at U.S. 1, respectively. On Crabtree Creek, four benthic sites sampled before 2000 were rated Fair and one was rated Poor. Fish sampling stations JF23 and JF24, near and immediately downstream of Umstead, received ratings of Excellent in 2004 and 2010, respectively.

Lake Crabtree and the segment of Crabtree Creek through the park are classified as B-NSW waters. The remainder of the stream is classified as C-NSW. Point sources are allowed in B-NSW and C-NSW waters.

Swift Creek

Swift Creek and its tributary, Williams Creek, are Impaired and were included in the 2012 State 303(d) list. The impairment to ecological and biological Integrity is attributed to agriculture and urban runoff, construction, and land development (NCDENR, 2012a). A land management plan and TMDL have been developed for Swift Creek and its headwaters. These creeks are included in the draft 2014 Integrated Report as impaired with an approved TMDL for assessment parameter(NCDENR, 2014a).

A small portion of the headwaters of Swift Creek (upstream of Lake Wheeler) is contained in the Study Area. This portion of the Swift Creek watershed is within or close to the service area of the Apex, North Cary, and South Cary WRFs that receive a portion of the water being transferred. There is a USGS gage (02087580) at the downstream edge of the Study Area. The drainage area is 21 mi^2.

The ambient monitoring data collected in Swift Creek have revealed exceedances of the state criteria for dissolved oxygen (NCDENR, 2012b). Benthic sampling site JB52 on Swift Creek at SR 1152 has frequent fluctuations in discharge as a result of a high percentage of impervious surface areas upstream. The drainage area is 18.9 mi^2 and includes large portions of the Town of Cary. Including the 2009 sample, this site has been sampled seven times; each sample led to a Fair bioclassification. The consistently low EPT richness and elevated BI and EPT BI strongly suggest persistent and unfavorable physico-chemical conditions at this location. A fish community sampling site, JF91, is also located on SR 1152 on Swift Creek. This site was rated Fair and Good–Fair during two sampling events in 2000 and was rated Good–Fair when sampled in 2010 (NCDENR, 2012a).

Four additional benthic sampling sites on Crabtree Creek within the Receiving Basins Study Area have been sampled since 2000. Three of those sites were rated Fair and one was rated Poor. Farther downstream of the Study Area, a benthic site at SR 1435 was sampled in 2009 and rated Fair.

This portion of Swift Creek has been classified as Water Supply III – Moderately Developed (WS-III) and NSW. Point source discharges are allowed in WS-III-NSW waters.

Benthic sampling sites on Williams Creek at SR 1308 and U.S. 64 received ratings of Fair and Poor in 2010 and 2009, respectively.

Middle Creek

Middle Creek and an unnamed tributary to Middle Creek are on the 2012 State 303(d) list (NCDENR, 2014a).

A small portion of the headwaters of Middle Creek is also within the Receiving Basins Study Area. This portion of the Middle Creek watershed is within or close to the service area of the Apex WRF that receives a portion of the water being transferred. In addition, an unnamed tributary (UT) to Middle Creek and the mainstem of Middle Creek receive the effluent of the Apex WRF and the South Cary WRF, respectively. Therefore, the Study Area includes the UT to Middle Creek and its floodplains, downstream of the Apex WRF discharge, as well as Middle Creek and its floodplains to its confluence with the Neuse River.

USGS maintains a continuous flow recording gauge on Middle Creek at NC 50 (02088000), 2.6 miles downstream of the Cary South WRF. The drainage area at NC 50 is 83.5 mi^2.

This segment of Middle Creek is located northeast of Fuquay Varina. Benthic sampling station JB68, at SR 1375, was first sampled in 1986 and received a bioclassfication of Fair because of the high EPT BI (6.67). Since that time the EPT BI (5.86 in 2010) has remained consistently lower. In 2010, the EPT BI (16) was higher than any previous basinwide sample, suggesting a slight water quality improvement. Conductivity has remained elevated between 220 and 300 microSiemens per centimeter since 2000, suggesting some pollution inputs from upstream. This segment is located 3 miles south of the South Cary WRF (NC0065102) (NCDENR, 2012a). Fish sampling site JF34 is also at SR 1375 and was rated Excellent in 2004.

Farther upstream on Middle Creek, benthic sampling sites JB330 and JB295 were rated Fair in 2010 and 2005, respectively. Farther downstream, benthic sampling site JB66 was sampled but not rated in 2002 and JB69 was rated Good–Fair when sampled in 2005. On Middle Creek, ratings for seven benthic sites sampled before 2000 ranged from Fair to Good and Not Rated (NCDENR, 2012a).

Most of Middle Creek is classified as “C” (Aquatic Life, Secondary Recreation, Fresh Water), and NSW. Point sources are allowed in C-NSW waters.

CAPE FEAR RIVER SUBBASIN

The major surface water bodies in the Cape Fear River subbasin, within the Cape Fear River basin, include Harris Lake and its tributaries, and White Oak Creek.

Harris Lake and its Tributaries

Harris Lake and its tributaries are not included in the State 303(d) list. Buckhorn Creek, downstream of Harris Lake, is on the 303(d) list, as discussed later in this section.

The watershed containing Harris Lake and its tributaries is approximately 80 mi^2 and extends south from the Town of Apex to the Cape Fear River and east from the Chatham/Wake County line to the Town of Holly Springs (Exhibit 4-1). The watershed contains Harris Lake, which is an impoundment of Buckhorn Creek used by Duke Energy's 900-megawatt Shearon Harris Nuclear Plant for cooling water. The watershed also contains six named tributaries to Harris Lake: White Oak Creek, Little White Oak Creek, Utley Creek, Cary Branch, Thomas Creek, and Tom Jack Creek. Duke Energy is a major landowner within the watershed. Major point source dischargers in the watershed are the Town of Holly Springs (discharge to Utley Creek) and Shearon Harris Nuclear Plant.

Modeling results indicate that nutrient and sediment loadings vary greatly throughout the Study Area. Harris Lake has a strong water quality effect, because it traps significant amounts of sediment and phosphorus. Agricultural activities and channel erosion from developed areas result in some catchments with very high sediment and nutrient sources (Buck Engineering, 2003).

Earlier studies indicated the Holly Springs WWTP was a significant contributor of nutrients to Utley Creek. Because of these water quality problems, the 2000 *Cape Fear River Basinwide Water Quality Plan* recommended that the Town of Holly Springs consider other alternatives to the discharge to Utley Creek (NCDENR, 2000). It also recommended that land use planning be used to prevent further increases in nutrient loading from the developing watershed. The Town of Holly Springs has worked with DWR to identify cost effective discharge alternatives that also protect water quality. In 2012, the State granted the Town of Holly Springs a permit for an expansion of the WWTP. The permit specifies a discharge to a new location on Utley Creek near its confluence with Harris Lake and requires stringent limits on nutrient levels (NCDENR, 2012c).

Waters associated with the tributaries of Harris Lake, listed above, have been classified as "C", Aquatic Life, Secondary Recreation, Fresh Water (NCDENR, 2013b).

4.2.2 Groundwater

Because groundwater information is available for larger areas, the discussions for the existing environment for the Source Basin Study Area and Receiving Basins Study Area are combined.

The western portion of the Study Area is within the Triassic Basin of the Piedmont region of North Carolina and is characterized by a thin regolith layer, which limits groundwater storage capacity. Because of the properties of Triassic soils, infiltration is low. Septic systems may not percolate well and could become a public health hazard if not properly designed, installed, and maintained. The southeastern portion of the Study Area, including the Cape Fear River downstream of Jordan Lake, is within the Coastal Plain basement and metaigneous felsic hydrogeologic unit. The Coastal Plain Basement comprises undifferentiated crystalline basement rocks of igneous and metamorphic origin overlain by sedimentary sands, gravels, clays, and marine deposits. Hydraulic conductivity is higher in the eastern portion of the Study Area because of the greater prevalence of gneiss rock compared to the sedimentary rock in the Triassic Basin. The metaigneous, felsic hydrogeologic Unit is light-colored, massive to foliated metamorphosed bodies of varying assemblages of felsic intrusive rock types. Local shearing and jointing are common. Well yields in areas with felsic geology are average for the Piedmont whereas those in the Triassic are low. In general, well yields in the western part of the Study Area tend to be low (approximately 5 to 25 gallons per minute) with yields in the southeast being moderately higher. Some citizens within the Study Area currently obtain their water from wells and discharge waste into septic systems. These citizens could request connections if municipal water and sewer services are available to them.

There is one drought indicator well, "Chi Psi Fraternity, UNC," or OR-069, within the Study Area. The well is located in the Source Basin Study Area, within Orange County on the University of North Carolina's campus. The well has been on record for 65 years and the water level has decreased an average of 0.02 foot per year over that time (NCDENR, 2014b).

4.2.3 Wetlands

According to the United States Environmental Protection Agency (USEPA), wetlands are lands of transition between terrestrial and aquatic systems where the water table is usually at or near the surface or the land is covered by shallow water at least part of the year (Title 40 Code of Federal Regulations Part 230.3(t)). For regulatory purposes under the Clean Water Act, the term wetlands means "those areas that are inundated or saturated by surface or ground water at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." In general, wetlands share three key characteristics: wetland hydrology, hydric soils, and hydrophytic plants. Wetlands and vegetated riparian areas are valuable because they are biologically productive natural ecosystems, provide wildlife habitat, protect water quality, control erosion, and prevent flooding damage.

The type and area of wetlands within the Study Area were determined using the United States Fish and Wildlife Service (USFWS) National Wetland Inventory (NWI) maps in GIS format (USFWS, 2013). Although the NWI does not map all wetlands, it is useful in terms of classifying types of wetlands and their approximate locations within the Study Area.

Area streams tend to have relatively narrow floodplains, although broader floodplains are associated with several significant local streams in the Study Area. Within these floodplains, riverine wetlands function as storage areas for floodwaters, slowing runoff and thereby lessening flood levels downstream. These wetlands also serve as areas of deposition for sediment and other material carried by floodwaters. Riverine wetlands are common throughout the area.

Analysis of the soils mapping within the Study Area indicate the presence of hydric soils, a wetland indicator. These soils are located primarily along stream channels, concurring with NWI data indicating that wetlands within the Study Area are primarily located within riparian and floodplain areas. Small areas of emergent wetlands are present along ponds. Open water ponds have been created along many of the streams within the Study Area (United States Department of Agriculture [USDA], 2014).

4.2.3.1 Source Basin

The inventory of NWI wetlands in the Source Basin Study Area identifies 35,096 acres of wetlands (approximately 14 percent of the Source Basin Study Area). These wetlands are shown in Exhibit 4-8. The majority of wetland area in the Source Basin Study Area (51 percent) is open water lake area, primarily Jordan Lake. The largest vegetated wetland type within the Source Basin Study Area is riparian or bottomland forested/shrub wetlands associated with streams and their floodplains (42 percent).

4.2.3.2 Receiving Basins

The inventory of NWI wetlands in the Receiving Basins Study Area identifies 9,464 acres of wetlands (approximately 10 percent of the Receiving Basins Study Area). These wetlands are shown in Exhibit 4-8. The primary wetland types within the Receiving Basins Study Area are riparian or bottomland forest associated with streams and their floodplains. The major type of NWI wetlands is forested and is part of bottomland communities adjacent to larger streams within the Study Area.

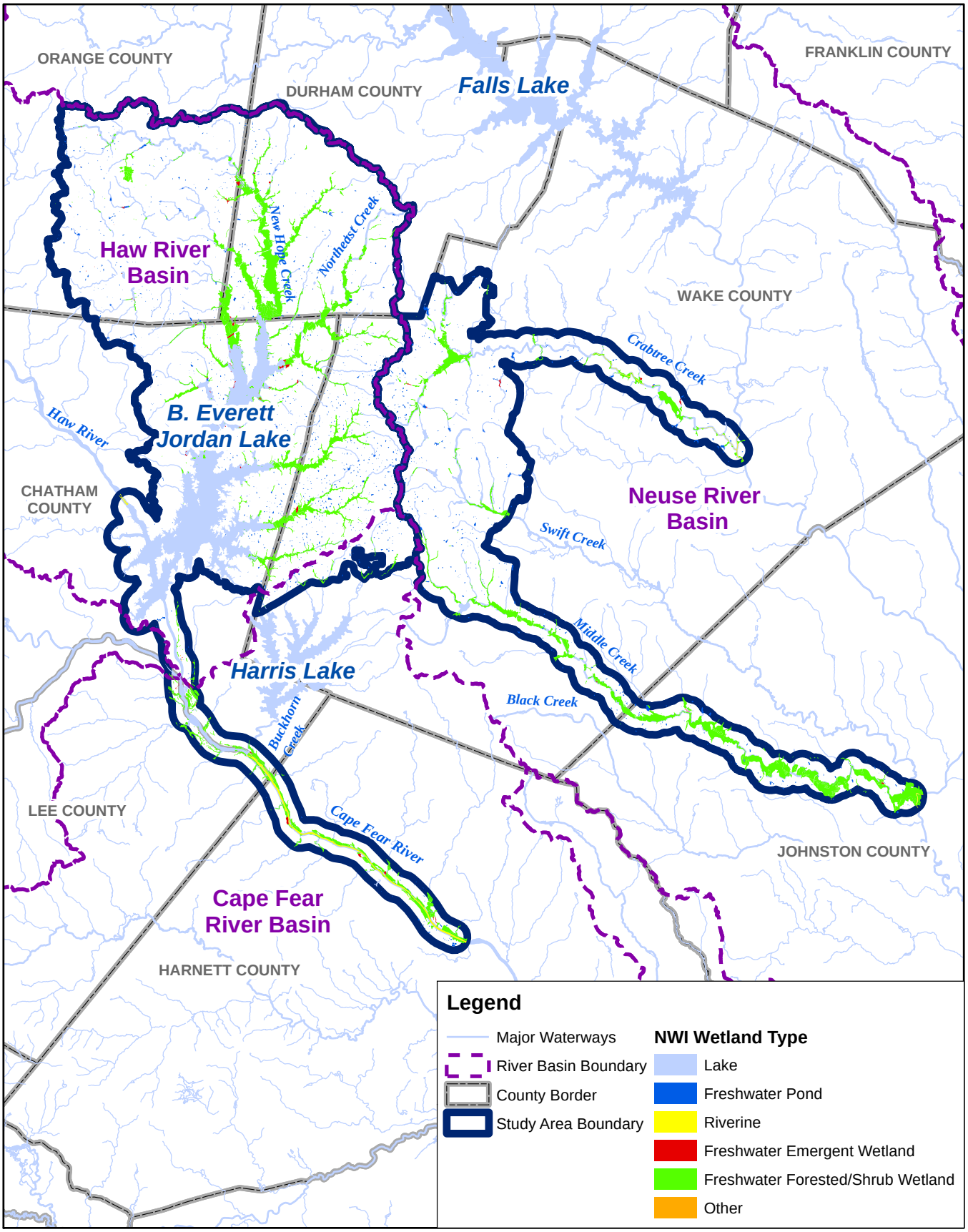


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EXHIBIT 4-8
Wetlands
Interbasin Transfer (IBT) Environmental Assessment

CH2MHILL

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4.2.4 Topography

The Study Area is primarily located in the North Carolina Piedmont, with gently sloping to moderately steep terrain. The terrain supported the formation of Jordan and Harris Lakes. The Cape Fear River within the Study Area transitions to the Coastal Plain before it reaches the USGS gage at Lillington. The topography transitions in this area, at the fall line, from sloping terrain and rolling hills to more of a flat topography.

Important topographical features in the Study Area include floodplains. Floodplains are low, relatively flat areas adjacent to streams and function as storage areas for surface water during large rainfall events. Within floodplains, micro topographical variations often create pockets of riverine wetlands, such as those within the Study Area. These riparian floodplain areas provide multiple functions, including flood water storage, sediment depositional areas, wildlife habitat, corridors for wildlife movement, and water quality functions such as infiltration zones and surface water filtering.

Flood Insurance Rate Maps (FIRMs) for the area indicate approximately 98.5 mi^2 of open water and Federal Emergency Management Agency (FEMA)-regulated floodplains inside the Study Area. The majority of the open water and floodplain area occurs in the Source Basin Study Area, with Jordan Lake comprising 21.7 mi^2 of the 75.7 mi^2. Approximately 22.8 mi^2 of floodplain and open water occur in the Receiving Basins Study Area (FEMA, 2013). Floodplains within watersheds greater than one square mile are regulated by FEMA. FIRMs for the area are dated May 2, 2006 (FEMA, 2006). FIRMs for the Neuse River basin and Cape Fear River basin in Wake County are being updated and are expected to be available for public review in 2014. This will include new limited detailed floodplain studies and future flood conditions in some areas of the Cape Fear River basin, which will likely increase the floodplain information available to the Towns. The floodplains may change in the future based on the revisions reflected in the updated FIRMs.

4.3 Soils

According to the Wake County Soil Survey (USDA, 1970), “a soil association is a landscape that has a distinctive proportional pattern of soils. It normally consists of one or more major soils and at least one minor soil, and it is named for the major soils.” Most of the soil types within the Study Area can be summarized by their broader soil association categories.

4.3.1 Source Basin

The major soil types in the Source Basin Study Area are Appling, Creedmoor, Georgeville, Nanford, Tarrus, and Wedowee. These soils are mostly silt loams. Soil types within floodplains and adjacent to streams include Wehadkee and Chewacla. Other soil types present in smaller areas include Georgeville, Nanford, and Tarrus. Many of these soils have been impacted by the formation of Jordan Lake; development, especially in the eastern portion of the Source Basin Study Area; and other soil disturbances.

4.3.2 Receiving Basins

The major soil types in the Receiving Basins Study Area are Appling, Cecil, Creedmoor, and White Store. These soils are mostly sandy loams. Soil types within floodplains and adjacent to streams include Wehadkee and Chewacla. Other soil types present in smaller areas include Appling, Mayodan, and White Store. Many of these soils have been impacted by development and other soil disturbances.

4.4 Wildlife Resources

Within the Study Area, natural vegetation is typical of Piedmont upland and bottomland communities. However, smaller unique ecosystems are also present. Exhibit 4-9 presents a listing of natural communities within the Study Area (North Carolina Natural Heritage Program [NCNHP], 2013).

EXHIBIT 4-9
Natural Communities

Source Basin Study Area	Receiving Basins Study Area
Piedmont Bottomland Forest (Typic Low Subtype)	Piedmont Alluvial Forest
Mesic Mixed Hardwood Forest (Piedmont Subtype)	Piedmont Monadnock Forest (Typic Subtype)
Dry-Mesic Oak–Hickory Forest (Piedmont Subtype)	Mesic Mixed Hardwood Forest (Piedmont Subtype)
Piedmont Bottomland Forest (High Subtype)	
Piedmont Alluvial Forest	
Piedmont Levee Forest (Typic Subtype)	

Source: NCNHP, 2013

Significant Natural Heritage Areas (SNHAs) also provide habitat for rare species and are listed in Exhibit 4-17.

Upland wildlife communities are home to Virginia opossum (*Didelphis virginiana*), raccoon (*Procyon lotor*), eastern cottontail (*Sylvilagus floridanus*), gray squirrel (*Sciurus carolinensis*), red fox (*Vulpes vulpes*), gray fox (*Urocyon cinereoargenteus*), white-tailed deer (*Odocoileus virginianus*), eastern mole (*Scalopus aquaticus*) and several species of shrews and mice. Amphibians and reptiles are abundant and diverse. Frogs, turtles, and water snakes inhabit wetlands and the perimeters of ponds and streams.

Bird life in the Study Area is typical of the Carolina Piedmont. The Northern cardinal (*Cardinalis cardinalis*), American robin (*Turdus migratorius*), Carolina chickadee (*Poecile carolinensis*), Eastern bluebird (*Sialia sialis*), Eastern towhee (*Pipilo erythrophthalmus*), various sparrow and warbler species, and other songbirds make their homes in the backyard habitats and forests of the area. Hawks, such as the red-tailed hawk (*Buteo jamaicensis*), owls, and vultures, are predator and scavenger species known to inhabit the area. The open waters of Jordan Lake and the many ponds in the Study Area attract a variety of waterfowl, including migratory species. Mallards, wood ducks, teal, and other ducks, as well as geese, may be seen during certain seasons. Wading birds including great blue heron (*Ardea herodias*) and green heron (*Butorides virescens*) may be encountered along water body shallows. The large open bodies of water also support predatory bird populations, including bald eagle (*Haliaeetus leucocephalus*) and osprey (*Pandion haliaetus*).

Section 4.4.1.1 discusses more rare wildlife and wildlife habitats within the Study Area. Forested areas and habitats are discussed in Section 4.8.

4.4.1 Threatened and Endangered Terrestrial Species

Specific regulations exist at the State and federal levels to protect endangered and threatened terrestrial species and their habitats from impacts due to public or private projects and land-disturbing activities. The primary law that protects sensitive wildlife species is the federal Endangered Species Act.

Information obtained from the USFWS list of Endangered and Threatened Species and Species of Concern within the counties encompassed by the Study Area, including Wake (updated January 2014), Harnett (updated September 2010), Johnston, Chatham, Orange, and Durham Counties in North Carolina (updated December 2012), was analyzed to identify protected species with the potential to be present within the Study Area. Exhibit 4-10 presents the list of federally protected terrestrial species with recent (not historical) records within the Study Area.

Thirty wildlife species are federally listed in the counties encountered by the Study Area (Exhibit 4-10); of these, five species are listed as endangered, one is listed as proposed, and one, the bald eagle (*Haliaeetus leucocephalus*), is protected by the Bald and Golden Eagle Protection Act (USFWS, 2014a). An additional 23 species are listed as federal species of concern (FSC). Federally listed aquatic species and Significant Aquatic Endangered Species Habitats (SAESHs) are discussed in Section 4.5.

EXHIBIT 4-10
Federally Listed Terrestrial Wildlife and Plant Species Potentially Occurring Within the Study Area

Common Name	Scientific Name	Federal Status	Record Status	County
Vertebrate:				
Bachman's sparrow	*Aimophila aestivalis*	FSC	Current	Harnett, Chatham
Bald eagle	*Haliaeetus leucocephalus*	BGPA	Current	Wake, Johnston, Harnett, Chatham, Orange, Durham
Cerulean warbler	*Dendroica cerulea*	FSC	Current	Johnston
Northern long-eared bat	*Myotis septentrionalis*	P	Current	Wake
Northern pine snake	*Pituophis melanoleucus*	FSC	Obscure	Harnett
Red-cockaded woodpecker	*Picoides borealis*	E	Current	Wake, Johnston, Harnett
Southern hognose snake	*Heterodon simus*	FSC	Obscure	Wake
Invertebrate:				
Diana fritillary (butterfly)	*Speyeria diana*	FSC	Current	Wake
Septima's clubtail	*Gomphus septima*	FSC	Current	Harnett, Chatham
Vascular Plant:				
Bog oatgrass	*Danthonia epilis*	FSC	Current	Harnett
Bog spicebush	*Lindera subcoriacea*	FSC	Current	Wake, Johnston
Buttercup phacelia	*Phacelia covillei*	FSC	Current	Harnett, Chatham
Carolina bogmint	*Macbridea caroliniana*	FSC	Current	Johnston, Harnett
Carolina grass-of-parnassus	*Parnassia caroliniana*	FSC	Current	Harnett
Georgia lead-plant	*Amorpha georgiana* var. *georgiana*	FSC	Current	Harnett
Harperella	*Ptilimnium nodosum*	E	Current	Chatham
Michaux's sumac	*Rhus michauxii*	E	Current	Wake, Durham
Pickering's dawnflower	*Stylisma pickeringii* var. *pickeringii*	FSC	Current	Harnett
Ravine sedge	*Carex impressinervia*	FSC	Current	Harnett
Rough-leaved loosestrife	*Lysimachia asperulaefolia*	E	Current	Harnett
Roughleaf yellow-eyed grass	*Xyris scabrifolia*	FSC	Current	Harnett
Sandhills bog lily	*Lilium pyrophilium*	FSC	Current	Harnett
Sandhills milk-vetch	*Astragalus michauxii*	FSC	Current	Harnett
Smooth coneflower	*Echinacea laevigata*	E	Current	Durham
Spring-flowering goldenrod	*Solidago verna*	FSC	Current	Johnston, Harnett
Sweet pinesap	*Monotropsis odorata*	FSC	Current	Chatham, Orange, Durham
Tall larkspur	*Delphinium exaltatum*	FSC	Current	Durham
Torrey's Mountain-mint	*Pycnanthemum torrei*	FSC	Current	Orange

EXHIBIT 4-10
Federally Listed Terrestrial Wildlife and Plant Species Potentially Occurring Within the Study Area

Common Name	Scientific Name	Federal Status	Record Status	County
Virginia least trillium	*Trillium pusillum* var. *virginianum*	FSC	Current	Wake
Well's sandhill pixie-moss	*Pyxidanthera barbulata* var. *brevifolia*	FSC	Current	Harnett

Notes:
BGPA = Bald and Golden Eagle Protection Act
E = Endangered
FSC = Federal Species of Concern
P = Proposed
Source: USFWS, 2014a (Harnett County was last updated in 2010, Wake County was updated January 2014, and the remaining counties were updated in 2012.)

4.5 Aquatic Resources

Water resources within the Study Area provide aquatic habitat for various species of fish, freshwater mussels, and other aquatic organisms. Streams provide free-flowing, warm-water habitats with moderate gradients, generally alternating pools and riffles, and substrates consisting mainly of rocks, gravel, sand, and mud. Many ponds and lakes, including Jordan Lake, also provide warm-water habitat where recreational fishing opportunities are available. Aquatic resources within the Study Area are varied and include important sport fish, commercial fish, and rare species. In general, many fish within the area contain high concentrations of mercury, similar to contamination observed throughout the country, due to atmospheric deposition of mercury and bioaccumulation up the food chain (NCDENR, 2005).

Sport fishing in the Study Area occurs in farm ponds, municipal water supply reservoirs, and sections of the rivers and their tributaries. Jordan Lake supports many different species of fish, including seven main species of game fish: largemouth bass, crappie, striper, hybrids, bream, catfish, and white perch (North Carolina Fish and Game, 2014). Popular sportfish species in the freshwater portion of the rivers and reservoirs include bass, sunfish, crappie, and pickerel, among others. The river basins are also home to a variety of other, non-game species of fish, including several species of catfish and carp (NCWRC, 2014). The majority of commercial fishing occurs a substantial distance downstream from the Study Area. Recreationally and commercially important anadromous species including striped bass, American and hickory shad, and shortnosed and Atlantic sturgeon migrate into freshwater portions of the Cape Fear River, Neuse River, and their tributaries to spawn (USFWS, 2014b).

Section 4.5.1.1 discusses the more rare aquatic species and habitats within the Study Area.

4.5.1 Threatened and Endangered Aquatic Species

Information obtained from the U.S. Fish & Wildlife Service (USFWS) list of Endangered and Threatened Species and Species of Concern within the counties encountered by the Study Area including for Wake (updated January 2014), Harnett (updated September 2010), Johnston, Chatham, Orange, and Durham Counties in North Carolina (updated December 2012), was analyzed to identify protected aquatic species with the potential to be present within the Study Area. Exhibit 4-11 presents the list of federally protected aquatic species with recent (not historical) records within the Study Area.

Eighteen species are federally listed in the counties encountered by the Study Area; of these, 3 species are listed as endangered and 15 are listed as FSC.

EXHIBIT 4-11
Federally Listed Aquatic Species Potentially Occurring Within the Study Area

Common Name	Scientific Name	Federal Status	Record Status	County
Vertebrate:				
American eel	*Anguilla rostrata*	FSC	Current	Wake, Johnston, Harnett, Chatham, Orange, Durham
Cape Fear shiner	*Notropis mekistocholas*	E	Current	Harnett, Chatham
Carolina darter	*Etheostoma collis lepidinion*	FSC	Wake: Probable/potential; Others: Current	Wake, Chatham, Orange, Durham
Carolina madtom	*Noturus furiosus*	FSC	Current	Wake, Johnston, Durham
Carolina redhorse	*Moxostoma* sp.2	FSC	Current	Harnett, Chatham
Pinewoods shiner	*Lythrurus matutinus*	FSC	Current	Wake, Johnston, Durham
Roanoke bass	*Ambloplites cavifrons*	FSC	Current	Wake, Johnston, Orange, Durham
Sandhills chub	*Semotilus lumbee*	FSC	Current	Harnett
Invertebrate:				
Atlantic pigtoe	*Fusconaia masoni*	FSC	Current	Wake, Johnston, Harnett, Chatham, Orange, Durham
Brook floater	*Alasmidonta varicosa*	FSC	Current	Chatham, Orange
Carolina creekshell	*Villosa vaughaniana*	FSC	Current	Chatham
Dwarf wedgemussel	*Alasmidonta heterodon*	E	Current	Wake, Johnston, Orange
Green floater	*Lasmigona subviridis*	FSC	Current	Wake, Johnston, Orange, Durham
Panhandle pebblesnail	*Somatogyrus virginicus*	FSC	Current	Durham
Savannah lilliput	*Toxolasma pullus*	FSC	Current	Orange
Tar River spinymussel	*Elliptio steinstansana*	E	Current	Johnston
Yellow lampmussel	*Lampsilis cariosa*	FSC	Current	Johnston, Harnett, Chatham, Orange, Durham
Yellow lance	*Elliptio lanceolata*	FSC	Current	Wake, Johnston

Status
E = Endangered
FSC = Federal Species of Concern
Source: USFWS, 2014a (Harnett County was last updated in 2010, Wake County was updated January 2014, and the remaining counties were updated in 2012.)

4.5.2 Significant Aquatic Endangered Species Habitat

Approximately 33 miles of SAESHs occur in the Source Basin Study Area, primarily as part of Phil's Creek, Morgan Creek, Pritchard Creek, and unnamed tributaries. Within the Receiving Basins Study Area, approximately 43 miles of endangered species habitat occur, primarily as part of Swift Creek, Macgregor Downs Lake, Williams Branch, Speight Branch, and unnamed tributaries. Exhibit 4-12 presents the aquatic SNHAs within the Study Area. Some of the species that these habitats support include the dwarf wedgemussel, cape fear shiner, yellow lance, Atlantic pigtoe, green floater, and yellow lampmussel, among others.

4.6 Land Cover

This section summarizes the existing land cover and land uses for the Source Basin Study Area and Receiving Basins Study Area. The primary source for land cover information is the 2006 National Land Cover Database (NLCD) (USGS, 2011). The satellite-based dataset was developed through efforts of a consortium of federal and state agencies to provide detailed land cover information. Data are provided as a 30-meter grid of land cover characterized into more than a dozen developed and undeveloped cover categories. Exhibit 4-13 illustrates the land cover categories within the Study Area and provides the acreage within each broad land use category.

4.6.1 Source Basin

As shown in the Exhibit 4-13, approximately 14 percent of the Source Basin Study Area is developed open space and approximately 10 percent other low-, medium-, or high-density developed areas. Approximately 55 percent of the Source Basin Study Area is currently forested, grassland, shrubland, or barren. Deciduous forest is the largest cover type at 29 percent; evergreen forest is 21 percent. Approximately 10 percent of the area is wetland or open water, mainly Jordan Lake.

4.6.2 Receiving Basins

As shown in Exhibit 4-13, approximately 26 percent of the Receiving Basins Study Area is developed open space and approximately 21 percent other low-, medium-, or high-density developed areas. Approximately 35 percent of the Receiving Basins Study Area is currently forested, grassland, shrubland, or barren. Deciduous forest is the largest cover type at 15 percent; evergreen forest is 10 percent. Approximately 9 percent of the area is wetland or open water.

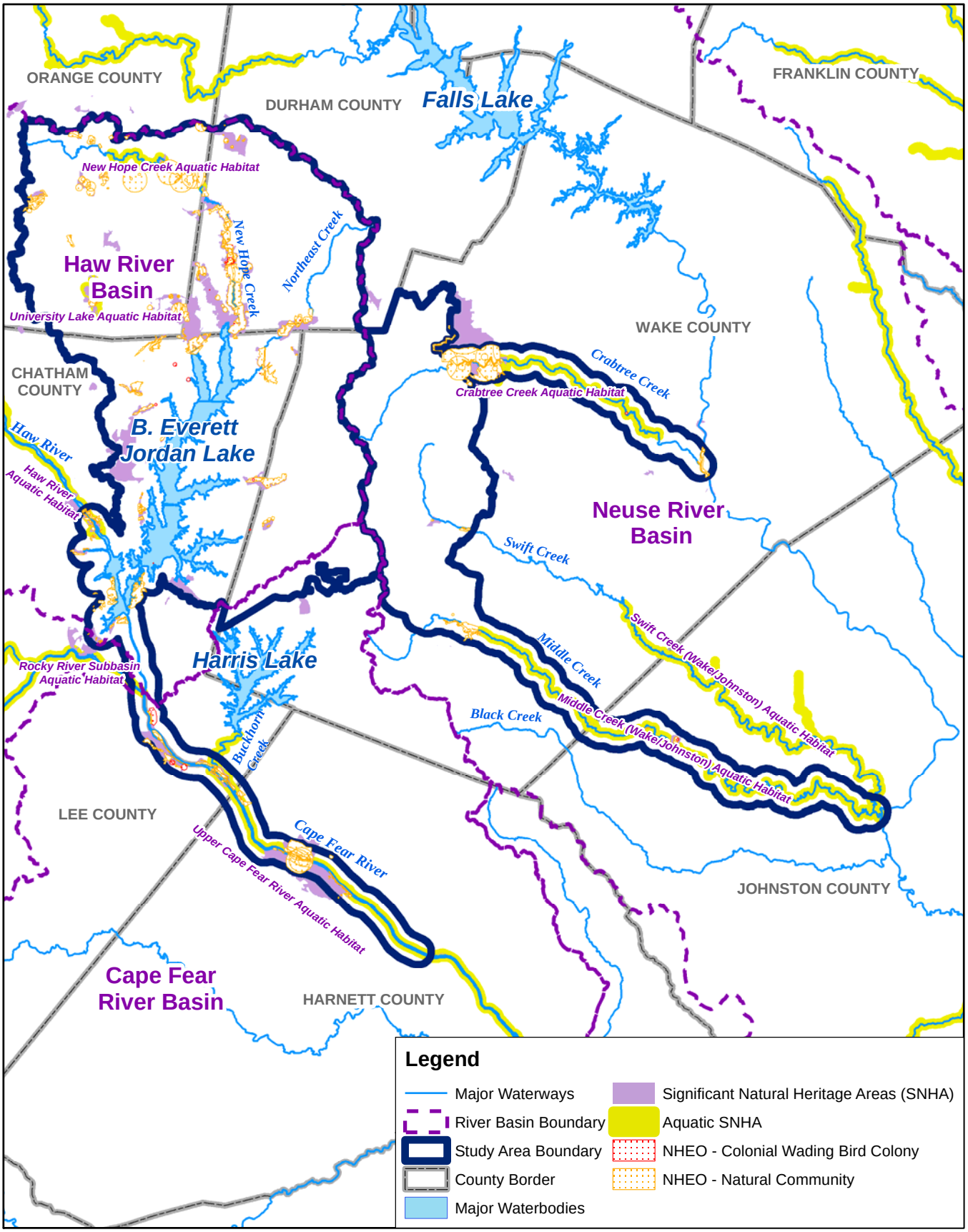

EXHIBIT 4-12

Wildlife and Natural Habitat

Interbasin Transfer (IBT) Environmental Assessment

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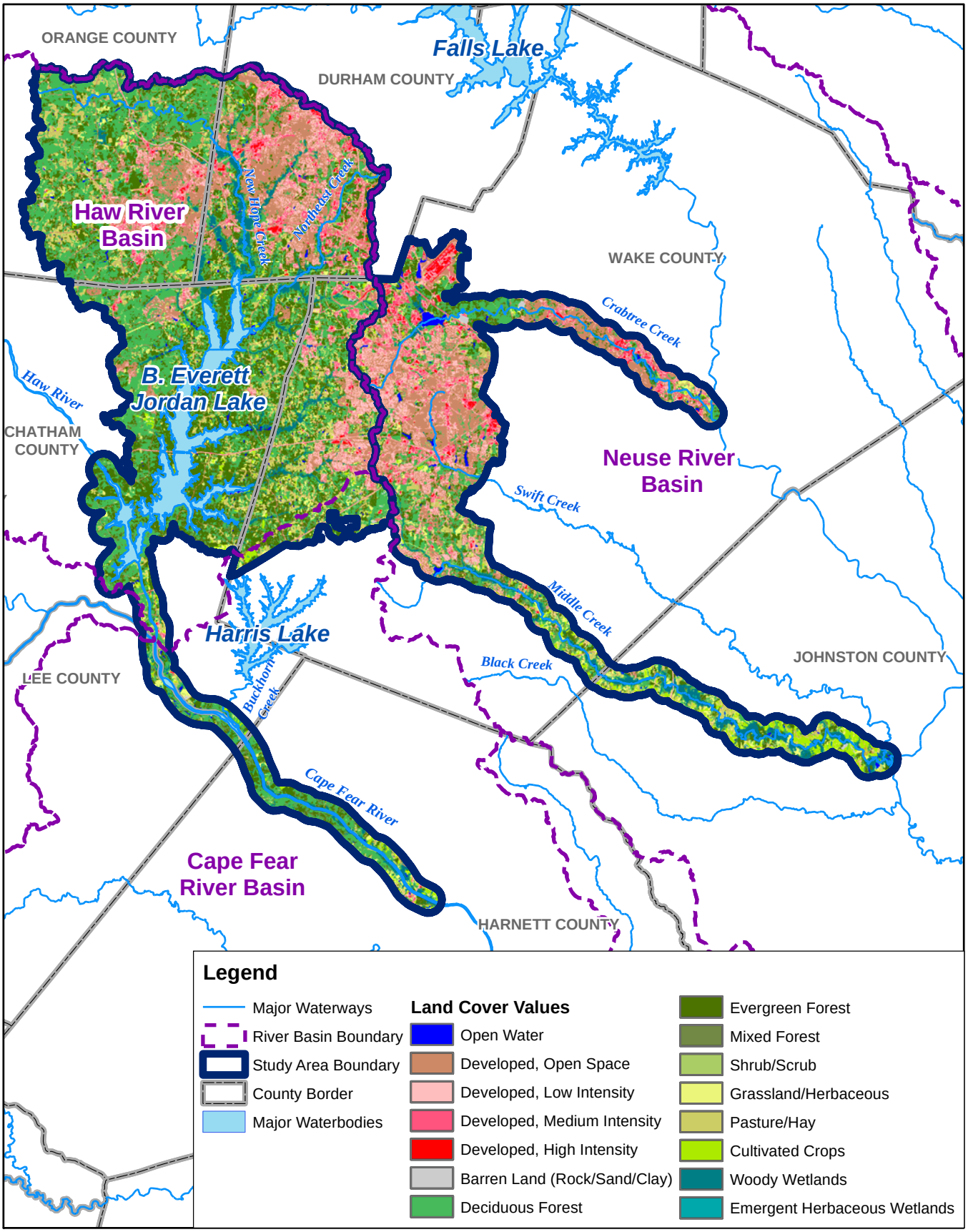

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EXHIBIT 4-13
Land Cover
Interbasin Transfer (IBT) Environmental Assessment

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4.7 Agricultural Land and Prime Farmland

The USDA Natural Resources Conservation Service has classified lands into three categories based on suitability for agricultural uses. *Prime farmland* is land that has the best combination of physical and chemical characteristics for producing food, feed, fiber, forage, oilseed, and other agricultural crops with minimum inputs of fuel, fertilizer, pesticides, and labor, and without intolerable soil erosion, as determined by the Secretary of Agriculture. Prime farmland is of major importance for meeting the nation's short and long range needs for food and fiber with minimal input of energy and economic resources and the least damage to other environmental resources. *Unique farmland* is land other than prime farmland that is used for production of specific high-value food and fiber crops, as determined by the Secretary of Agriculture. *Farmland*, other than prime of unique farmland, is land that is of statewide or local importance for the production of food feed, fiber, forage, or oilseed crops (USDA, 1981).

An analysis of cultivated area was conducted using the 2006 NLCD satellite imagery (USGS, 2011). Currently, agriculture comprises a small portion of land cover for the Study Area. Approximately 7 percent of the Source Basin Study Area and 10 percent of the Receiving Basins Study Area are in agricultural use. Agricultural lands are dispersed throughout the source basin, with higher concentrations in the northwest portion of the basin and directly east of Jordan Lake. Cultivated lands in the receiving basins are concentrated in the east part of the basin, primarily along Middle Creek. These agricultural areas include pockets of cultivated row crops and pasture areas. Major crops include tobacco, soybeans, wheat, barley, oats, corn, and pastures and forages.

4.7.1 Source Basin

Prime farmlands are present within the Study Area. The major soil types in the Source Basin Study Area are Appling, Creedmoor, Georgeville, Nanford, Tarrus, and Wedowee. These soils are mostly silt loams. Of the major soil types within the Source Basin Study Area, Appling, Creedmoor, Herndon, Enon, and Wedowee are listed as prime farmlands (USDA, 2014). Chewacla soils must be drained to be of use for agricultural purposes. Other soil types considered of statewide importance include Georgeville, Nanford, and Tarrus. Many of these soils, especially in the eastern portion of the Study Area, have been affected by development and other soil disturbances and are not currently being used for agriculture.

4.7.2 Receiving Basins

The major soil types in the Receiving Basins Study Area are Appling, Cecil, Creedmoor, and White Store. Of the major soil types within the Receiving Basins Study Area, Appling, and Creedmoor are listed as prime farmlands (USDA, 2014). Chewacla soils must be drained to be of use for agricultural purposes. Other soil types considered of statewide importance include Appling on steeper slopes, Mayodan thin silt loams, and White Store. Many of these soils, especially in the western portion of the Study Area, have been affected by development and other soil disturbances and are not currently being used for agriculture.

4.8 Forested Resources

Forests provide "quality of life" benefits for local communities and provide habitat for wildlife. Selected sites may serve the community as parks, greenways, and recreational areas. Forested buffers protect water quality in local streams by slowing stormwater runoff and removing nutrients, sediment, and other pollutants. These areas can also be used as a buffer or screen between incompatible land uses. Forested areas, if of significant enough size, can provide economic value through harvesting.

This section further describes those lands within the forested land use category. Although much of the original forest community in the Study Area has been progressively harvested for wood products and cleared for agricultural, residential, and industrial development, significant forested areas remain. Natural reseeding of abandoned tracts of land usually results in a mixture of pine and second growth hardwoods. Currently, approximately 48 percent (263 mi^2) of the Study Area is in forested land use. Forested land

covers 219 mi^2 within the Source Basin Study Area and 45 mi^2 within the Receiving Basins Study Area (USGS, 2011).

CH2M HILL analyzed a source, the North Carolina Gap Analysis Program (GAP), which describes forested resources within the Study Area (USGS, 2006). NC GAP is based on land cover data not land use data, which are limited by parcel boundaries. These data provide a better understanding of the types of forest resources present within the Study Area. The most dominant forest types within the Study Area are as follows:

- Piedmont/Mountains Dry-Mesic Oak and Hardwood Forests
  - Covers 78 mi^2 within the Study Area: 60 mi^2 within the Source Basin Study Area and 18 mi^2 within the Receiving Basins Study Area.
  - Dominant species include white oak (*Quercus alba*) and are also represented by sweetgum (*Liquidambar styraciflua*) and tulip poplar (*Liriodendron tulipifera*) dominated forests.
- Piedmont Dry-Mesic Pine Forests
  - Covers 68.4 mi^2 within the Study Area: 54.5 mi^2 within the Source Basin Study Area and 13.9 mi^2 within the Receiving Basins Study Area.
  - The dominant species is loblolly (*Pinus taeda*).
- Dry Mesic Oak Pine Forests
  - Covers 65.6 mi^2 within the Study Area: 51.7 mi^2 within the Source Basin Study Area and 15.9 mi^2 within the Receiving Basins Study Area.
  - Dominant species assemblages include loblolly with white, southern red (*Q. rubra*), and/or post oak (*Q. stella*) and loblolly with water oak (*Q. nigra*). Eastern red cedar (*Juniperus virginiana*) may co-occur with post, black (*Q. velutina*), and blackjack oaks (*Q. marilandica*).
- Coniferous Cultivated Plantation (natural/planted)
  - Covers 53 mi^2 within the Study Area: 43.5 mi^2 within the Source Basin Study Area and 9.5 mi^2 within the Receiving Basins Study Area.
  - The dominant species is loblolly, but slash (*P. elliottii*) and longleaf pine (*P. palustris*) also occur.

Because of the fragmented and patchwork nature of the forested parcels of land in the Study Area, smaller areas of forest are not suitable for continued silviculture use. However, forested areas being converted to other land uses provide a one-time source of wood products.

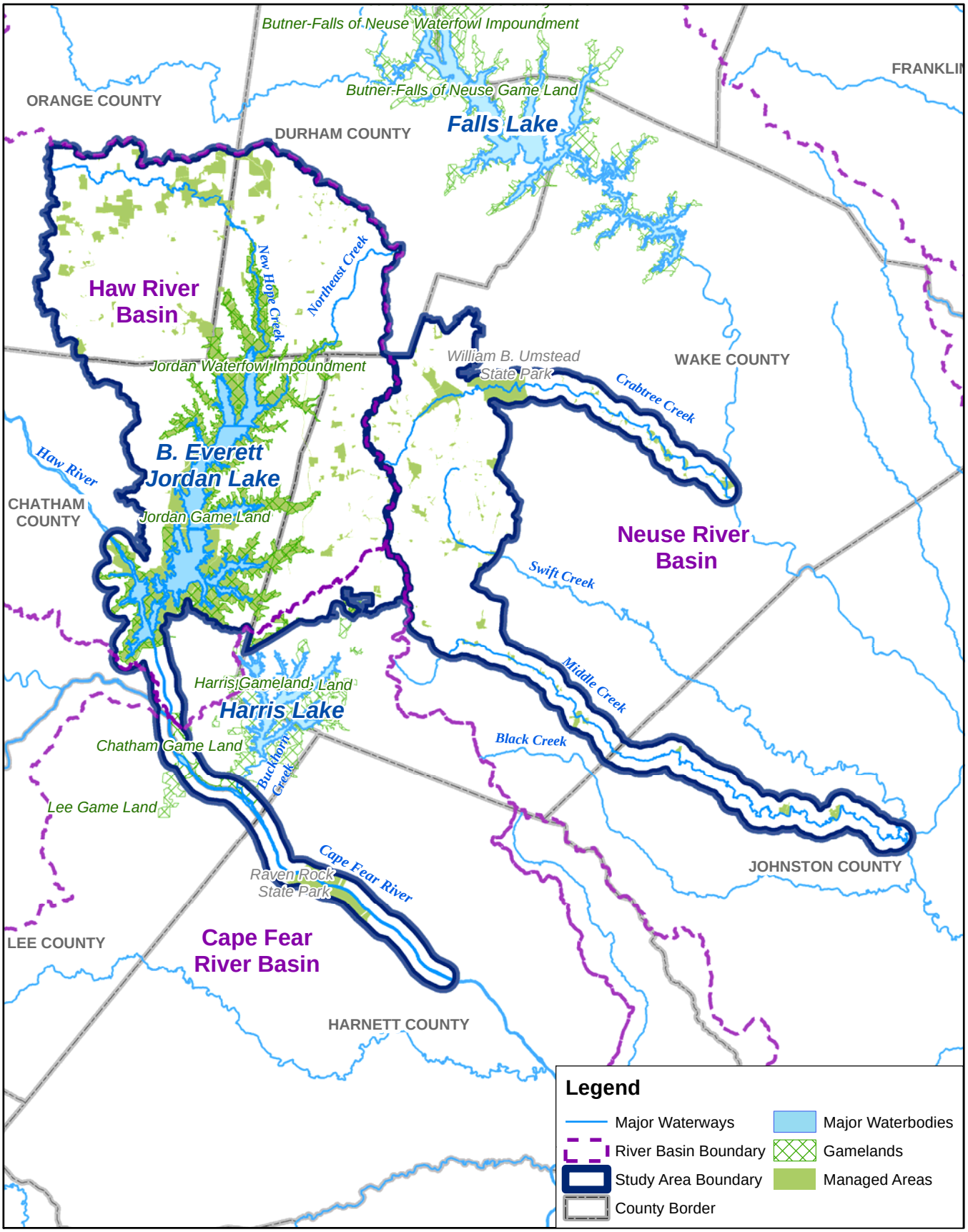

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EXHIBIT 4-14
Protected Lands
Interbasin Transfer (IBT) Environmental Assessment

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4.9 Public Lands and Scenic and Natural Areas

This section discusses public or conservation lands, federal, State and local parks, and other scenic and recreational areas including recreation areas, greenways, and gamelands. Open spaces provide scenic and recreational opportunities for residents. These public lands, generally held in perpetuity, cannot typically be redeveloped. The major parks, recreation areas, and public lands within the Study Area and within a 1-mile buffer along streams and rivers are displayed in Exhibit 4-14; the largest is the Jordan Lake Recreation Area. Gamelands within the Study Area were identified by using North Carolina Wildlife Resources Commission (NCWRC) GIS coverage (NCWRC, 2013). Gamelands provide the public with recreational opportunities including hunting. The gamelands within the Study Area are listed in Exhibit 4-15.

EXHIBIT 4-15
Gamelands

Gameland	Acres within Study Area	Gameland Total Acres
Chatham	2,723	1,667
Harris	12,299	931
Jordan	40,620	40,568
Lee	1,394	379

Source: NCWRC, 2013

SNHAs include those spaces within public lands or private conservation lands held by non-profit organizations such as the Triangle Land Conservancy. These areas are home to rare plant or animal species, high-quality natural communities, and geologic features and may provide scenic and recreational value to the community. The NCNHP compiles the NCDENR list of SNHAs, as required by the Nature Preserve Act (GS Chapter 113-A-164 of Article 9A). The sites included in the list are the best representatives of the natural diversity of North Carolina and, therefore, have priority for protection. Inclusion in the list does not imply that any protection or public access exists. The SNHAs within the Study Area are listed in Exhibit 4-16.

EXHIBIT 4-16
Significant Natural Heritage Areas

SNHA	Acres within Study Area	SNHA Total Acres	County	Portion within Towns' Service Areas
Source Basin Study Area				
Bald Mountain	140.5	140.5	Orange	No
Battle Park	80.8	80.8	Orange	No
Beaver Creek Floodplain	172.1	172.1	Wake	No
Bennett Mountain	84.2	84.2	Chatham	No
Berryhill Rhododendron Bluff	15.4	15.4	Orange	No
Big Oak Woods	56.6	56.6	Durham, Orange	No
Big Woods Road Upland Forests	2,116.0	2,116.0	Chatham	No
Blackwood Mountain	129.9	129.9	Orange	No
Bolin Creek Natural Area	281.5	281.5	Orange	No
Boothe Hill	117.2	117.3	Chatham	No
Bush Creek Marshes	216.5	216.5	Chatham	No

EXHIBIT 4-16
Significant Natural Heritage Areas

SNHA	Acres within Study Area	SNHA Total Acres	County	Portion within Towns' Service Areas
Calvander Laurel Bluff and Bottom	65.5	65.6	Orange	No
Camp Agape	127.8	127.8	Harnett	No
Cape Fear River/Buckhorn Levees	417.5	417.5	Chatham, Lee	No
Cape Fear River/McKay Island Floodplain	1,140.5	1,140.6	Chatham, Lee	No
Cub Creek Bottomlands and Beaver Ponds	103.3	103.3	Chatham, Orange	No
Dry Creek/Mount Moriah Bottomland	523.3	523.3	Orange, Durham	No
Eubanks Road Xeric Hardpan Forest	4.1	4.1	Orange	No
Gum Springs Church Road Slopes	285.1	285.1	Chatham	No
Haw River Aquatic Habitat	244.5	918.3	Chatham	No
Haw River Dicentra Slopes	15.9	15.9	Chatham	No
Haw River Levees and Bluffs	518.2	1,010.2	Chatham	No
Henry J. Oosting Natural Area	193.7	193.7	Orange	No
Herndon Creek Ravine	147.4	147.4	Chatham	No
Kit Creek Slopes and Floodplain	55.4	55.4	Chatham	No
Little Creek Bottomlands and Slopes	1,447.3	1,447.3	Durham, Orange	No
Lower Deep River Slopes	538.6	611.2	Chatham	No
Lower New Hope Creek Floodplain Forest and Slopes	1,830.8	1,830.8	Durham, Chatham	No
Lower Rocky River/Lower Deep River Aquatic Habitat	153.6	396.7	Chatham, Lee	No
Mason Farm/Laurel Hill Oak-Hickory Forest	447.4	447.4	Orange	No
Meadow Flats	233.4	233.4	Orange	No
Moncure Boggy Streamheads	269.1	269.1	Chatham	No
Morgan Creek Bluffs	214.9	214.9	Orange	No
Morgan Creek Floodplain Forest	1,589.0	1,589.0	Orange, Chatham, Durham	No
New Hope Creek Bottomland Forest	987.1	987.1	Durham	No
New Hope Overlook Bluff and Slopes	405.8	405.8	Chatham	No
North Edwards Ridge	119.7	119.8	Chatham	No
Northeast Creek Floodplain Forest	984.2	984.2	Chatham, Durham, Wake	Yes
Northeast Creek/Panther Creek Dikes and Bottomlands	498.7	498.7	Chatham	Yes
Parkers Creek Ridges	226.9	226.9	Chatham	No
Pickards Mountain	495.6	495.6	Orange	No
Pittsboro Wilderness	272.6	1,830.7	Chatham	No
Poes Ridge/Dam Road Upland Forests	177.6	177.6	Chatham	No
Raven Rock State Park	4,138.5	8,276.9	Harnett	No

EXHIBIT 4-16
Significant Natural Heritage Areas

SNHA	Acres within Study Area	SNHA Total Acres	County	Portion within Towns' Service Areas
Robeson Creek Depression and Hardpan	32.6	32.7	Chatham	No
Robeson Creek Slopes	140.2	140.2	Chatham	No
Shaddox Creek Swamp	22.6	22.6	Chatham	No
Shearon Harris Longleaf Pine Forest	259.5	356.9	Wake	No
Terrells Mountain	61.2	188.6	Chatham, Orange	No
Third Fork Creek Wetlands	165.4	165.4	Durham	No
University Lake Aquatic Habitat	163.2	163.2	Orange	No
University Lake/McCauley Mountain Slopes	466.6	466.6	Orange	No
Upper Cape Fear River Aquatic Habitat	852.7	3,769.2	Chatham, Harnett, Lee	No
Weaver Creek Pine Forest	581.9	581.9	Chatham	No
White Oak Creek Floodplain	613.8	613.8	Chatham, Wake	No
SUBTOTAL	**25,643.4**	**35,963.2**		
Receiving Basins Study Area				
Bennett Place Forest	83.5	83.5	Durham	No
Blue Pond Salamander Site	2.6	2.6	Wake	No
Camp Pipsissewa	26.4	26.4	Orange	No
Cates Creek Hardpan Forest	6.5	22.4	Orange	No
Cates Creek Hardwood Forest	160.5	160.5	Orange	No
Couch Mountain	263.9	263.9	Orange	No
Crabtree Creek Aquatic Habitat	110.4	331.2	Wake	No
Crabtree Creek Monadnock Ridge	396.4	3,298.1	Orange	No
Crabtree Creek/Ebenezer Church Road Slopes	79.1	158.1	Wake	No
Currie Hill	179.2	277.8	Orange	No
Duke Forest Oak-Hickory Upland	594.1	1,270.0	Durham	No
Gate 4 Mafic Forests	387.5	723.8	Durham	No
Gate 9 Pond	410.0	410.0	Durham	No
Hemlock Bluffs State Natural Area	122.0	122.0	Wake	Yes
Lake Johnson Nature Park	76.7	131.7	Wake	No
Middle Creek (Wake/Johnston) Aquatic Habitat	217.0	217.0	Johnston, Wake	No
Middle Creek Amphibolite Slope	36.8	36.8	Johnston	No
Middle Creek Bluffs and Floodplain	358.0	358.0	Wake	Yes
Middle Creek Floodplain Knolls	149.1	149.1	Johnston	No
Neuse River (Clayton) Forests	418.4	1,121.3	Wake	No
New Hope Chestnut Oak Forest	38.4	38.4	Orange	No
New Hope Church Road Basic Forest	35.5	35.5	Orange	No

EXHIBIT 4-16
Significant Natural Heritage Areas

SNHA	Acres within Study Area	SNHA Total Acres	County	Portion within Towns' Service Areas
New Hope Creek Aquatic Habitat	40.2	131.4	Orange	No
New Hope Creek Slopes	477.0	1,898.7	Orange	No
Richland Creek Hardwood Forest	73.6	73.6	Wake	No
Steep Bottom Branch Slopes	213.8	213.8	Orange	No
Stirrup Iron Creek Marsh and Sloughs	435.8	435.7	Durham	No
Stony Creek Spring	42.4	81.3	Orange	No
Swift Creek (Wake/Johnston) Aquatic Habitat	31.3	242.5	Johnston	No
Swift Creek Bluffs	48.5	48.5	Wake	Yes
Walnut Creek Bottomland Forests	47.3	300.6	Wake	No
Walnut Creek Sumac Site	5.1	5.1	Wake	No
William B. Umstead State Park	5,511.8	11,157.6	Wake	Yes
SUBTOTAL	**11,078.8**	**23826.9**		
GRAND TOTAL	**36,722.2**	**59,790.1**		

Source: NCNHP, 2014

4.10 Archaeological and Historic Resources

Archaeological sites are important because they contain the only material remains of Native American cultures dating back 12,000 years throughout North Carolina. The Cape Fear and Neuse River basins contain many archeological sites that have been surveyed. Several of these sites have significant archeological resources from many native groups that lived in the region up until 200 years ago. More than 7,000 recorded archaeological sites are located within the Cape Fear River basin, almost 1,500 of which are located in Wake County (North Carolina Department of Cultural Resources, 1999). Because of the size of the project's source and receiving basins and because no construction will occur with the project, preparation of an archeological survey was not completed for this project.

Europeans settled the Upper Piedmont area in the 1700s. Historic structures from those periods are significant because they preserve North Carolina history. The National Register of Historic Places (NRHP) is the formal repository of information pertaining to historic structures and districts. Places considered for listing include historic structures and districts, cemeteries, and archaeological sites. The Study Area contains many listings which can be found on the NRHP National Register Information System Database (National Park Service, 2012). Exhibit 4-17 lists the historic places within the Study Area. Fifty-eight sites are located in the Source Basin Study Area, and 31 sites are located in the Receiving Basins Study Area.

EXHIBIT 4-17

Historic Places

Source Basin Study Area	Receiving Basins Study Area
Alberta Mill Complex	American Tobacco Company Manufacturing Plant
American Tobacco Company Manufacturing Plant	Apex Historic District
Apex City Hall	Bloomsbury Historic District
Apex Historic District	Burch Avenue Historic District
Apex Union Depot	Carpenter Historic District
Beta Theta Pi Fraternity House	Cary Historic District
Blacknall, Richard D., House	Crabtree Creek Recreational Demonstration Area
Bull Durham Tobacco Factory	Downtown Durham Historic District
Burch Avenue Historic District	Erwin Cotton Mills Company Mill No. 1 Headquarters Building
Carolina Inn	Fadum House
Carpenter Historic District	Harris, Harwell Hamilton and Jean Bangs, House and Office
Carr, John C. and Binford, House	Hawkins-Hartness House
Carrboro Commercial Historic District	Heck-Andrews House
Chapel Hill Historic District	Hi-Mount Historic District
Chapel Hill Town Hall	Ivey–Ellington House
Chapel of the Cross	Jones, Crabtree, House
Downtown Durham Historic District	Jones, Nancy, House
Durham Cotton Mills Village Historic District	Kamphoefner, Henry L., House
Durham Hosiery Mills No. 2–Service Printing Company Building	Longview Gardens Historic District
Ebenezer Methodist Church	Madonna Acres Historic District
Emmanuel AME Church	Morehead Hill Historic District (Boundary Increase)
Erwin Cotton Mills Company Mill No. 1 Headquarters Building	Morrisville Historic District
Forest Hills Historic District	Oak View
Gimghoul Neighborhood Historic District	Page, Williamson, House
Goodwin Farm Complex	Page-Walker Hotel
Green Level Historic District	Paschal House
Greystone	Powe House
Hill, John Sprunt, House	Pugh House
Hogan, Thomas and Mary, House	Raleigh Bonded Warehouse
Lakewood Park Historic District	Utley–Council House
Lawrence, Calvin Wray, House	West Durham Historic District
Leigh Farm	-
Liberty Warehouse Nos. 1 and 2	-
Lloyd, Thomas F., Historic District	-
Mangum, Bartlett, House	-

EXHIBIT 4-17
Historic Places

Source Basin Study Area	Receiving Basins Study Area
Mangum, James, House	-
Mason, John A., House	-
McKinnon, Kenneth, House	-
Meadowmont	-
Morehead Hill Historic District	-
New Hill Historic District	-
North Carolina Central University	-
North Carolina Mutual Life Insurance Company Building	-
O'Brien, William Thomas, House	-
O'Kelly's Chapel	-
Old Chapel Hill Cemetery	-
Old East, University of North Carolina	-
Playmakers Theatre	-
Rocky Ridge Farm Historic District	-
Scarborough House	-
Smith Warehouse	-
St. Joseph's African Methodist Episcopal Church	-
Stokesdale Historic District	-
Stone, Joseph B., House	-
Thomas, James A., Farm	-
Venable Tobacco Company Prizery and Receiving Room	-
Venable Tobacco Company Warehouse	-
West Chapel Hill Historic District	-

Source: National Park Service, 2012

4.11 Air Quality

The USEPA uses the Air Quality Index (AQI) to report ambient air quality conditions. The AQI includes these classifications: good, moderate, unhealthy for sensitive groups, unhealthy, and hazardous. In 2012, the median AQI in Wake County was 42, or good. No days were considered unhealthful and 4 days were considered unhealthful for sensitive populations (USEPA, 2012).

A new, more stringent National Ambient Air Quality Standard for ozone was established by USEPA in 1997. As of June 2005, Wake County, which was identified as a maintenance area, is no longer subject to the 1-hour standard. In March 2008, USEPA further strengthened the national standards for 8-hour ozone levels. Since 2006, Wake County has been listed as a maintenance area for the 8-hour ozone standard. Ozone is not directly emitted but is formed when sunlight reacts with volatile organic compounds and nitrogen oxides. Ozone is a

component of smog. The largest source of the precursors to the formation of ozone is exhaust from motor vehicles. The Raleigh and Durham area is listed as a maintenance area for carbon monoxide, which is primarily emitted from transportation and industrial sources (USEPA, 2013a).

North Carolina had its lowest ozone levels on record in 2013 since air monitoring began in the early 1970s. The declining ozone levels coincided with lower emissions from the state's power plants. A report by the NCDENR Division of Air Quality shows that the state's coal-fired power plants have cut nitrogen oxide emissions, a primary industrial contributor to ozone pollution, by more than 80 percent since the General Assembly enacted the Clean Smokestacks Act in 2002 (NCDENR, 2013c).

4.12 Noise Levels

Within the Study Area, noise is created primarily by three sources: vehicular traffic, RDU Airport, and seasonal recreational use of lakes. Noise levels are highest along traffic corridors, with lower noise levels in residential areas. Typical flight patterns for the RDU airport cross a small part of the northeast portion of the Study Area. Seasonal use of Jordan Lake, in the Source Basin Study Area, for recreational purposes contributes to increased noise during the warm months. Lesser contributors to noise include industrial and agricultural activities. Undeveloped rural land is naturally devoid of significant human noises.

Sound is measured in decibels, a logarithmic scale; the measure of decibels on an A-weighted scale (dBA) is used to characterize sound levels sensed by the human ear. The auditory threshold is 0 dBA; a deafening sound is about 120 dBA. Typical daytime suburban noise levels, which would reasonably apply to the Study Area, is about 55 dBA. Noises associated with vehicular traffic and localized noise associated with flight patterns often exceed suburban noise levels. Noise in rural areas is typically less than 50 dBA unless the area is close to roads or railroads.

4.13 Toxic Substances and Hazardous Wastes

Prior to the 1970s, few controls were in place to control the discharge of hazardous materials into the environment. Toxic substances and their cleanup are enforced by USEPA regulations under the Resource Conservation and Recovery Act and the Comprehensive Environmental Response, Compensation, and Liability Act. The goals of these laws are to eliminate or reduce toxic waste; clean up waste that has been leaked, spilled, or has been improperly disposed of; and protect people from harmful waste.

There is one Superfund site on the border between the Source Basin and Receiving Basin, the Koppers Company, Inc. (Morrisville Plant) site, which includes an area where a wood treating facility operated from 1968 to 1975. USEPA placed the site on the National Priorities List (NPL) in 1989 because of contaminated groundwater, soil, and surface water resulting from facility operations. Site conditions have been investigated, steps have been taken to clean up the site, and site contamination does not currently threaten people living and working near the site. By treating groundwater, evaluating additional cleanup activities, and undertaking 5-year reviews, USEPA, NCDENR, and the site's potentially responsible party continue to protect people and the environment from site contamination (USEPA, 2013b).

A second Superfund site is located adjacent to the Study Area, the Ward Transformer site, which includes an area where Ward Transformer Company operated a facility that handled transformers, switchgear, and other types of electrical equipment from 1964 to 2006. USEPA placed the site on the NPL in 2003 because of nearby contaminated fish tissue, sediment, and soil resulting from facility operations. Site conditions are being investigated, steps are being taken to clean up the site, and site contamination does not currently threaten people living and working near the site. By investigating the site, conducting cleanup activities, and placing institutional controls on the site property, USEPA, NCDENR, and the site's potentially responsible parties continue to protect people and the environment from site contamination (USEPA, 2013c). This site is located in the Receiving Basins Study Area upstream from Crabtree Creek, Lake Crabtree, Brier Creek, Little Brier Creek, and Walnut Creek, all of which have been included on the State 303(d) list due to a fish consumption advisory related to PCB contamination.

Permit-requiring activities within the Study Area include treated water discharge permits, hazardous waste operations, dry cleaners, and industrial activities. Nearby permit-requiring activities include operation of the Shearon Harris Nuclear Power Plant (USEPA, 2013d) and a Wake County (Feltonsville) landfill near the Town of Apex. The landfill has a non-discharge permit from DWQ for use of land application as waste disposal (Buck Engineering, 2003).

Other potential sources for toxic substances present in the Study Area include agricultural-related substances such as fertilizers, weed control chemicals, pesticides, and fuels from vehicles including cars and boats. Other common toxic substances are employed in the construction of homes and commercial buildings, including glues, solvents, and paints. Typical household hazardous wastes include oils, cleaners, solvents, paints, herbicides, and fertilizers.

SECTION 5

Environmental Effects

For both the source and receiving basins, the direct environmental effects, if any, are described for the resources discussed in Section 4. The discussion in this section focuses on the evaluation of direct effects on water resources, aquatic resources and other resources in the Study Area as a result of the proposed increase in IBT.

This EA concludes that the direct effects of the proposed IBT certificate modification on both the source and receiving basins would be insignificant. As discussed in this section, the proposed IBT certificate modification will not significantly change Jordan Lake elevations, water quality or water supply pool storage volumes, downstream flows, downstream users' water supply availability, or downstream water quality in the source or receiving basins. Based on the hydrologic modeling, there are noticeable changes in a number of the reviewed hydrologic indicators, but only as a result of future water withdrawals within the Cape Fear River basin and full utilization of the Jordan Lake water supply pool. The Town's existing discharges or permits in the receiving basins will not be expanded as a result of the proposed IBT certificate modification. No significant direct effects to environmental resources are expected.

No construction is associated with the requested increase in IBT, so there is little potential for direct effects on land-based resources, and those effects would be addressed in environmental documents for construction of the specific facilities. The facilities and water resources management plans associated with this request are the same as those that were presented in the 2000 EIS (CH2M HILL, 2000), which is the basis of the 2001 IBT Certificate. The extension of the planning period from 2030 to 2045 is the only substantive change from the 2000 EIS. The ROD associated with the 2000 EIS stated that there were no direct impacts associated with the transfer, and the potential SCI were being mitigated to a level deemed reasonable by the EMC. In the time since the 2001 IBT Certificate was issued, no impacts from the IBT have been identified.

The potential for SCI resulting from the Towns' land use plans and implementation of associated infrastructure master plans is addressed in the Towns' SCIMMPs (CH2M HILL, 2014a, 2014b, and 2014c). The proposed increase in IBT is consistent with the plans addressed in the SCIMMPs. The Towns' service areas are predominantly the same as presented in the 2000 EIS (minor changes are inclusion of the Town of Apex's expanded service area in the Cape Fear subbasin and expansion of the Town of Cary's service area immediately north of the South Cary WRF and westward into Chatham County). Important SCI definitions include the following:

- *Cumulative effects* are defined as "resulting from the incremental impact of the proposed activity when added to other past, present, and reasonably foreseeable future activities regardless of what entities undertake such other activities" (15A NCAC 1C .0101(d)(2)).
- *Indirect effects*, or secondary effects, are "caused by and result from the proposed activity although they are later in time or further removed in distance, but they are still reasonably foreseeable" (15A NCAC 1C .0101(d)(4)).

The SCIMMPs include a comprehensive description of mitigation programs to avoid or minimize SCI to environmental resources that could occur with the Towns' land use plans and implementation of projects in the Towns' infrastructure master plans.

5.1 Water Resources

5.1.1 Surface Water

The primary potential impact associated with IBT is typically water quantity in the source basin resulting from the transfer of surface water. To evaluate the potential for water quantity effects within the Study

Area resulting from the increased IBT, the primary tool used was the combined Cape Fear–Neuse River Basin Hydrologic Model (CFNRBHM). DWR originally developed individual hydrologic models for the Cape Fear and Neuse River basins. In 2012, a combined model was created to facilitate analysis of the numerous interconnections between the two basins. The resulting model was developed using the OASIS water resources program which combines graphic representations of components such as river sections, demands, and withdrawals, with logical statements that describe the components' behavior. These statements, including operational rules, demands, and elevation–storage relationships are evaluated within a linear programming environment to determine the state of each component within the system (HydroLogics, 2006).

The revised base CFNRBHM was completed in January 2014 and includes all withdrawals and discharges in both river basins greater than 100,000 gallons per day (i.e., 0.1 mgd). DWR modified the base model by incorporating future demands to create several future scenarios. Estimates of existing demands and discharges as well as projections to the year 2045 were developed by DWR by using local water supply plans (LWSP), information provided directly from municipalities, and input from Triangle J Council of Governments. The 2010 and 2045 OASIS model scenarios were obtained from DWR to evaluate the hydrologic effects of the proposed increase in IBT on water resources. Additional model background, further details regarding the structure of the CFNRBHM, and the model scenarios are discussed further in the *Modeling Evaluation of the Effects of the Cary/Apex Water Supply Interbasin Transfer Technical Memorandum* (CH2M HILL, 2014d), included in **Appendix D**.

The following four CFNRBHM scenarios were developed to establish baseline scenarios for the years 2010 and 2045, and to allow evaluation of the potential relative effects of the proposed increase in IBT and alternatives:

- 2010 Baseline – represents current conditions as defined by DWR
- 2045 Baseline – represents Alternative 1 (no action) and Alternatives 3a through 3e (avoid an increase in IBT)
  - The 2045 Baseline scenario is intended to approximate 2045 conditions without the proposed increase in IBT, and is based on the withdrawal and discharge values used in the 2000 EIS - the basis of the Towns' 2001 IBT certificate. The objective of this scenario is to represent EA alternatives where the Towns do not increase their IBT above the Updated 2001 IBT Certificate limit. This objective could be simulated by either constraining the water supply withdrawn from Jordan Lake (the 2045 Baseline scenario) or by increasing the discharge/return to the Cape Fear River basin with an increased Jordan Lake withdrawal. EA Alternatives 3a and 3b represent future scenarios with an increased discharge to the Cape Fear River basin, but ultimately the results for scenarios explicitly representing these alternatives would be very similar to the 2045 Baseline scenario. There may be a small increased benefit to the lowest flow periods (downstream of Jordan Lake), but a significant portion of the low flow hydrograph for the river will be controlled by the operational targets at the Lillington USGS gage dictating the releases from the Jordan Lake water quality pool. Therefore, the EA Alternatives that do not increase the Towns' IBT (1 and 3a through 3e) are all represented by the 2045 Baseline scenario.
- 2045 Expanded IBT – represents Alternative 2a (proposed increase in IBT)
- 2045 Maximum IBT – represents Alternative 2b (increased discharge to the Neuse River basin)

To isolate the impact of the proposed increase in IBT from the effects of increased use of the Jordan Lake water supply pool, all of the 2045 scenarios assume full allocation and use of the Jordan Lake water supply pool (total average annual demand = 100 mgd). A summary of the model scenarios is provided in Exhibit 5-1; additional details on each scenario can be found in **Appendix D**.

EXHIBIT 5-1
Summary of Hydrologic Model Scenarios

	Model Scenario (EA Alternatives)			
	2010 Baseline [a]	**2045 Baseline (1, 3a -3e) [a]**	**2045 Requested IBT (2a) [a]**	**2045 Increased Neuse Discharge IBT (2b) [a]**
Updated 2001 IBT Certificate	Yes	Yes	Yes	Yes
Increased IBT	No	No	Yes	Yes
Jordan Lake Drought Contingency Plan – Turned on in CFNRBHM	Yes	Yes	Yes	Yes
Water Shortage Response Plans – Turned on in CFNRBHM	Yes	Yes	Yes	Yes
Cary/Apex Jordan Lake Average Day Withdrawal (mgd) [b]	20.7	32.8	45.9	45.9
Jordan Lake Average Day Withdrawal by Others (mgd) [c]	2.2	45.1	45.1	45.1
Additional Jordan Lake Average Day Withdrawal for Full Utilization (mgd)	N/A	22.1	9.0	9.0
Total Jordan Lake Average Day Demands (mgd)	22.9	100.0	100.0	100.0
CAWTF Process Water Average Day Discharges (mgd)	3.1	2.6[d]	6.6	6.6
Cary/Apex Cape Fear River Basin Average Day WRF Discharges (mgd)	2.1	12.7	12.8	5.0
Cary/Apex Neuse River Basin Average Day WRF Discharges (mgd)	14.1	8.4	22.3	30.1
Cary/Apex Average Day IBT (mgd) [e, f]	16	15	24	32
Cary/Apex Maximum Month Average Day IBT (mgd) [e, f]	19	22	33	44

N/A – Not applicable

[a] Numbers have been rounded.

[b] Includes the Town of Apex, Cary, Morrisville and RTP South

[c] Includes Chatham County, Hillsborough, Orange County, Orange Water and Sewer Authority, Pittsboro, Holly Springs, and the City of Durham as listed in Appendix D, Table 3.

[d] Based on 8 percent WTP process water loss (2000 EIS [CH2M HILL, 2000] analysis assumption).

[e] IBT values have been rounded to whole numbers.

[f] 2010 IBT value is based on input data to CFNRBHM; 2045 IBT values are projected based on forecasting data provided in the LRWRP (CH2M HILL and Brown and Caldwell, 2013).

Output variables related to Jordan Lake elevation, water quality and water supply pool levels, and flows at Lillington and Fayetteville - also used in the 2000 EIS - were selected in collaboration with DWR as key hydrologic indicators for use in evaluating the relative effects of the alternatives. Model results for each indicator were summarized using a variety of presentation formats including flow/level duration curves, time series plots, and statistics during for both the period of record (January 1930 through September 2011) and extreme drought conditions (1950s, 2002, and 2007 droughts). The *Modeling Evaluation of the Effects of the Cary/Apex Water Supply Interbasin Transfer Technical Memorandum* (CH2M HILL, 2014d), **Appendix D**, includes a detailed discussion of the modeling evaluation. The remainder of this section summarizes that evaluation.

Exhibit 5-2 presents results showing the frequency with which the following conditions occur, using the entire period of record, for each model scenario:

- Jordan Lake Levels less than 210 feet msl (lower limit for boat ramp use)
- Jordan Lake Levels < 210 ft. MSL (lower limit for boat ramp use); between Memorial Day and Labor Day
- Water Quality Pool less than 80 percent (Stage 1 Drought trigger, in accordance with the *Jordan Lake Drought Contingency Plan*)
- Water Quality Pool less than 60 percent (Stage 2 Drought trigger, in accordance with the *Jordan Lake Drought Contingency Plan*)
- Water Quality Pool less than 40 percent (Stage 3 Drought trigger, in accordance with the *Jordan Lake Drought Contingency Plan*)
- Water Quality Pool less than 20 percent (Stage 4 Drought trigger, in accordance with the *Jordan Lake Drought Contingency Plan*)
- Water Supply Pool less than 50 percent
- Cape Fear River Flow at Lillington less than 550 cfs (normal target flow is 600 ± 50 cfs)
- Cape Fear River Flow at Fayetteville less than 600 cfs

EXHIBIT 5-2
Comparison of the Percentage of the Period of Record Below the Key Hydrologic Indicators

Model Scenario (as presented in Appendix D)	2010 Baseline	2045 Baseline	2045 Requested IBT	2045 Increased Neuse Discharge IBT
EA Alternative		**1 (no action) and 3a through 3e**	**2a**	**2b**
Jordan Lake Level < 210 feet msl	0.0%	1.6%	2.0%	2.0%
Jordan Lake Level < 210 feet msl, Memorial Day to Labor Day	0.0%	0.2%	0.3%	0.4%
Water Quality Pool <80%	13.5%	15.8%	16.4%	16.9%
Water Quality Pool <60%	5.6%	5.9%	6.4%	6.5%
Water Quality Pool <40%	0.9%	0.5%	0.7%	0.8%
Water Quality Pool <20%	0.0%	0.0%	0.0%	0.0%
Water Supply Pool <50%	0.0%	1.6%	1.9%	1.9%
Flow at Lillington < 550 cfs	13.9%	15.6%	15.9%	16.4%
Flow at Fayetteville < 600 cfs	5.9%	6.1%	6.3%	6.7%

The following bullets provide a scenario comparison for the key hydrologic indicators:

- 2045 Baseline vs. 2010 Baseline
  - The modeling evaluation results indicate a potential for a small decrease in lake level and Cape Fear River flow from the 2010 to 2045 Baseline scenario. This is attributed to the full utilization of the Jordan Lake water supply pool and the increase in water withdrawals upstream of Jordan Lake – both of which are assumed to happen regardless of whether there is any increase in the Towns' IBT.
  - The 2045 Baseline results are indicative of the potential effects of Alternatives 1 (no action) and 3a through 3e – all of which represent no increase in IBT and the Towns' continued operation under a Updated 2001 IBT Certificate.
- 2045 Requested IBT and 2045 Increased Neuse River Discharge vs. 2045 Baseline
  - Under both the 2045 Requested IBT and 2045 Increased Neuse River Discharge scenarios, there is a very small increase in duration that the lake level, as compared to the 2045 baseline scenario, is below 210-ft MSL (0.4 percent increase in duration over the period of record), and both the water supply and water quality pools operate at lower levels for a very small percentage of the period of record (example: 0.6 percent increase in duration below 80 percent full for the water quality pool, as compared to the 2045 baseline scenario).
  - For all scenarios, the water quality pool never goes below 20 percent.

In addition to the key hydrologic indicators reviewed, Jordan Lake Drought Stages, as defined by the *Jordan Lake Drought Contingency Plan*, and downstream water supply availability were reviewed. The following bullets highlight the results:

- For all scenarios, there is no occurrence of a Stage 4 Drought, as defined in the *Jordan Lake Drought Contingency Plan,* during the entire period of record.
- The frequencies and durations of Stage 1 and Stage 2 Droughts for all 2045 scenarios were greater than the 2010 Baseline scenario, as would be expected based on the increased withdrawals within the Cape Fear River basin and the assumed full utilization of the water supply pool.
- A beneficial effect of the 2045 scenarios, attributed to the increase in wastewater discharge to the Cape Fear River from the WWRWRF resulting in a reduced need for releases from Jordan Lake during drought periods, is that there is a lower frequency of Stage 3 Droughts for the 2045 scenarios when compared to the 2010 Baseline scenario. The model results show that all downstream demands (City of Sanford, Harnett County, City of Dunn, Fayetteville PWC, Smithfield Foods, Lower Cape Fear Water and Sewer Authority, and Cape Fear Public Utility Authority) are met 100 percent of the time for all model scenarios; no shortages result from the increase in future demands or from either of the scenarios with an increase in IBT.

A comparison of in-stream flows under the 2045 Baseline and 2045 Requested IBT scenario was also performed at the Lillington gage and at Fayetteville. It was determined that on average there is only a 10 cfs (0.3 percent) difference between the scenarios for the period of record. During drought periods the 2045 Requested IBT scenario had a 0.2 to 1.9 percent increase in time below specific low flow targets (550 cfs and 250 cfs for Lillington; 600 cfs for Fayetteville). These results indicate that the proposed increase in IBT will not affect the water quality pool sufficiently to reduce upstream releases from Jordan Lake required to maintain in-stream flows, even during periods of drought. Downstream flow releases from Jordan Lake will remain subject to the USACE release regimes, and the target flows at the Lillington gage, which protect in-stream aquatic habitat and resources, will continue to be met.

A review of water shortage response plan (WSRP) implementation occurrences (frequency and duration) for public water supply systems downstream of Jordan Lake with river flow based WSRP stage triggers, indicates

a potential increase in WSRP implementation occurrences for the City of Dunn, Fayetteville PWC and Harnett County from the 2010 Baseline scenario to the 2045 scenarios. This increase is attributed to the increase in water supply withdrawals within the Cape Fear River basin, including the assumed full utilization of the Jordan Lake water supply pool. The 2045 Requested IBT model scenario results are not significantly different in frequency or duration of WSRP implementation occurrences when compared to the 2045 Baseline scenario, increasing frequency of occurrence by one event (10 events instead of 9 events) and duration for the longest drought event by approximately four days (25 days instead of 21 days).

The proposed increased IBT from Jordan Lake is not expected to significantly impact lake levels or downstream flows; therefore, no impacts on water quantity or water quality near Jordan Lake or downstream are expected. WWRWRF discharges into the Cape Fear River are expected to increase as growth occurs and as the withdrawals from Jordan Lake increase. Water quality will be protected because the WWRWRF has more stringent nutrient removal criteria in its NPDES permit than any other facility in the Middle Cape Fear River basin.

Wastewater discharges are expected to increase in the Neuse River basin portion of the Receiving Basins but are planned to be within the limits of the current NPDES permitted flows. No additional water quantity or water quality impacts beyond those already accounted for in the NPDES permits are expected.

Potential SCI on surface waters from other factors such as growth are further discussed in Section 5 of the SCIMMPs (CH2M HILL, 2014a, 2014b, and 2014c).

5.1.2 Groundwater

Shallow groundwater resources are connected to surface waters and wetlands and, therefore, have a potential to be indirectly impacted if surface water hydrology is altered. Results of the hydrologic modeling show that long-term changes to the Jordan Lake water surface elevation, pool volume, and in-stream flow were minimal for all scenarios. These short drawdown periods are not expected to affect groundwater levels. Increased withdrawal from Jordan Lake is not expected to impact lake levels; therefore, no impacts on groundwater levels near Jordan Lake are expected.

5.1.3 Wetlands

Wetland complexes are present along the fringe of the Jordan Lake reservoir and where tributary streams backwater as they flow into Jordan Lake. These wetlands would have the potential to be impacted by water withdrawal if the withdrawal pattern changes the surface water elevation of Jordan Lake. Results of the hydrologic modeling show that long-term changes to lake elevation and in-stream flow were minimal for all scenarios. The primary difference is a result of future demands. During extreme droughts, the lake level shows an additional but temporary drawdown of 1 to 2 feet. These short, 2 to 3 month, drawdown periods should not have long-term effects on wetland areas. Riparian wetlands should not be affected, because the lake is managed to maintain downstream flow levels. Even during extreme droughts, the water quality pool storage volume is sufficient to maintain the target flows at Lillington. Potential SCI to wetlands are further discussed in Section 5 of the SCIMMPs (CH2M HILL, 2014a, 2014b, and 2014c). Water needs for wetlands adjacent to Jordan Lake should still be met, and impacts on these wetlands are not expected.

5.1.4 Topography

Topography, including floodplains adjacent to Jordan Lake and downstream, will not be impacted by the additional water withdrawal. The impacts of topography on water surface elevation were minimal for all scenarios. Floodplain functions will be unaltered.

5.2 Aquatic Resources

Aquatic resources in Jordan Lake, its tributaries, and in the downstream reaches of the Haw River and Cape Fear River are not expected to be directly impacted by the proposed increase in water withdrawal from Jordan Lake. Lake levels are not expected to be significantly altered, and downstream flow releases from

Jordan Lake will remain subject to the USACE release regimes. The Cape Fear River is designated as a Primary Nursery Area below Buckhorn Dam and the maintenance of downstream flow release patterns is important to anadromous fish, especially with regard to spring flows. In-stream flow patterns will not be impacted, and the target flows at the Lillington gage, which protect in-stream aquatic habitat, aquatic resources and water quality, will continue to be met.

5.3 Other Resources

Within the Study Area, other resources, as categorized in Section 4, include:

- Soils
- Wildlife Resources
- Land Cover
- Agricultural Land and Prime Farmland
- Forested Resources
- Public Lands and Scenic and Natural Areas
- Archaeological and Historic Resources
- Air Quality
- Noise Levels
- Toxic Substances/Hazardous Wastes

These resources are not expected to be directly affected by the proposed increase in IBT. This conclusion is based on the following:

- There are no construction activities directly associated with the proposed increase in IBT.
- There have been no measurable impacts on the Jordan Lake water surface elevation or downstream flow patterns as a result of the Towns' current withdrawal and IBT, and the results of the hydrologic modeling indicate that no significant impacts are expected in the future.
- Any future facility construction needed to meet 2045 water demands will undergo a separate environmental permitting process and assessment of potential environmental impacts.

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SECTION 6

Mitigation

The Towns of Cary, Apex and Morrisville, as well as RTP South, are thriving communities in the heart of the Triangle region of North Carolina, between the City of Raleigh and the RTP. The Triangle region has repeatedly ranked among the top regions in the country in which to live or work, find a home or start a business, raise a family, or retire.

To provide a high quality of life for its residents and continue to be an attractive place to live and raise a family, the Towns are managing growth by using innovative planning approaches and techniques. The Towns are always working to address environmental concerns related to open space, water and wastewater infrastructure, transportation, and stormwater. The Towns have placed a high priority on preserving natural and historical features and have focused on maintaining their unique downtown areas. The Towns have put these priorities into action by developing individual SCIMMPs (CH2M HILL, 2014a, 2014b, and 2014c) and have implemented programs to direct denser developments to designated activity and employment centers, preserve open space, protect floodplain and riparian buffers, and maintain water quality through erosion and sediment control and stormwater programs.

The SCIMMPs discuss the federal, State, and local programs that mitigate the potential SCI related to growth facilitated to some extent by infrastructure and public utility projects, including this proposed increase in IBT. The SCIMMPs discuss the potential for SCI to occur and the programs designed to mitigate SCI to a level that is not expected to be significant. The SCIMMPs are included in this section by reference. Because no construction is proposed as part of this IBT certificate modification, the only potential for direct effects is related to water resources. As discussed in Section 5, the water withdrawal and wastewater discharges related to the proposed IBT certificate modification are not expected to generate significant effects on water resources in the Study Area. One way the Towns accomplish this is through management of their water demands through the water resources management programs summarized in this section. Additional information is provided in the SCIMMPs.

6.1 Water Conservation

Each Town uses education, regulations, and incentives to encourage water conservation by residents and businesses, including the following components:

- Water waste is prohibited. No person shall operate an irrigation system in a manner that allows water to fall on impervious surfaces (e.g., driveways, roads, and sidewalks).
- No person shall operate an irrigation system in a manner that allows water to accumulate and run off the property.
- An odd/even day irrigation schedule for all customers is in place year-round, allowing customers to irrigate 3 days per week. In Cary, hand-held hose watering and drip irrigation is allowed every day. Exceptions can be made for newly placed sod.
- Rain sensors are required on all automatic irrigation systems to measure rainfall and override the irrigation systems to shut them off. To meet the requirements of this ordinance, sensors should shut off irrigation systems when ¼ inch of rain has fallen.
- The Towns use direct mailings, utility bill insert messages, appearances at community events, brochures, flyers, messages in annual drinking water quality reports, and the Town Web sites to provide water conservation information to customers.

- The Town of Cary has a tiered rate system to incentivize water conservation. The highest rate tiers are based on a "water budget" of 15,000 gallons, based on the maximum amount of water that could be needed for landscape irrigation on a typical lot size. Non-residential domestic water meter and irrigation meter budgets are developed on a site-specific basis. The Town also charges the lowest rate for use of reclaimed water for non-potable uses, where applicable.

The Town of Cary's water conservation program is presented in the LRWRP (CH2M HILL and Brown and Caldwell, 2013), which evaluates the effectiveness of program measures and charts a course for future measure implementation. The LRWRP provides an overarching road map for water resources management for the future for each Town (CH2M HILL and Brown and Caldwell, 2013). A comprehensive summary of the Towns (Cary and Apex) existing water conservation programs can be found in each Towns' SCIMMP (CH2M HILL, 2014a; 2014c)

6.2 Water Shortage Response Plan

Each Town has a water shortage response plan that outlines policies to implement water use reductions during water shortage events. Each Town Manager is authorized by ordinance to invoke water use reduction or rationing measures and to develop and enforce those water use reduction measures when a water emergency exists. Voluntary, mandatory, and water-shortage-emergency measures may be imposed on all water customers for the duration of the water emergency, depending on severity. The Towns have developed a staged water use reduction system. Note that each stage imposes the requirements of all preceding stages.

The following factors are considered when implementing the water shortage response plans:

- Jordan Lake water supply storage volume
- Current level of Towns' potable water demand
- Jordan Lake water surface elevation
- USACE operation of Jordan Lake in drought contingency mode
- Water quality concerns regarding Jordan Lake or other sources
- Drought advisories issued by the North Carolina Drought Management Advisory Council
- Sudden loss of supplemental water supplies during periods of high demand

6.3 Water Reuse

The Towns recognize that having a reclaimed water system reduces the amount of drinking water that is used for non-potable water needs, such as irrigation and cooling towers. The use of reclaimed water reduces the water that needs to be withdrawn from Jordan Lake, the Town's water source. The Towns of Apex and Cary have permits allowing the use of reclaimed water, and the LRWRP (CH2M HILL and Brown and Caldwell, 2013) provides recommendations for the future use of reclaimed water by each Town.

The Town of Cary's program is currently being expanded. The program is intended to provide a safe, cost-effective, and beneficial alternative to using valuable drinking water for some non-potable water needs. The system allows the Town to reduce the amount of wastewater that is discharged into Neuse River basin from the Town's WRFs (CH2M HILL and Brown and Caldwell, 2013; CDM Smith, 2013). The Town of Apex is currently building demand for a reclaimed water system and plans to use its reclaimed water permit in the future. The planning efforts for the future of the Towns' reclaimed water systems demonstrate their commitment to continue strong water stewardship, which includes using reclaimed water as a beneficial resource.

6.4 Water Quality Protection

The Towns' ability to continue to meet their existing NPDES permit requirements as growth occurs is critical for the protection of in-stream water quality in their receiving waters. The WWRWRF discharges into the

Cape Fear River, and the discharges are expected to increase as growth occurs and as the withdrawals from Jordan Lake increase. Water quality will be protected because the WWRWRF has more stringent nutrient removal criteria in its NPDES permit than any other facility in the Middle Cape Fear River basin.

Wastewater discharges are also expected to increase in the Neuse River basin portion of the Receiving Basins, but they are expected to be within the limits of the current NPDES permitted discharge amounts. No additional water quantity or water quality impacts beyond those already accounted for in the NPDES permits are expected. The NPDES permitting process, including setting limits, monitoring and enforcement, will ensure water quality conditions in the receiving streams are maintained as growth occurs (CH2M HILL, 2014a, 2014b, and 2014c).

6.5 Regional Water Supply Collaboration

Efforts to balance the water supply needs of those utilities in the Jordan Lake watershed with needs of the environment and downstream utilities are ongoing. The *Triangle Regional Water Supply Plan* was developed by local governments and water agencies to enhance the long-term sustainability, security, and reliability of the region's water supply, including Jordan Lake (Triangle J Council of Governments, 2012). One group that was created in 2009 during the regional planning process was the Jordan Lake Regional Water Supply Partnership, or JLP. The ongoing Jordan Lake water supply pool allocation process is one collaborative planning effort currently in process.

In addition to the water supply planning efforts currently underway, the USACE has a drought contingency plan for Jordan Lake, which outlines water management measures and coordination actions in the event of a severe drought. The water level is used as the primary drought indicator. More prescriptive management plans are provided in the Jordan Lake Drought Management Plan (NCDENR, 2002c).

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SECTION 7

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Appendix A
2001 Interbasin Transfer Certificate

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ENVIRONMENTAL MANAGEMENT COMMISSION

Certificate Authorizing the Towns of Cary, Apex, and Morrisville and Wake County
to Increase Their Transfer of Water
from the Haw River basin to the Neuse River basin
under the Provisions of G.S. 143-215.22I

On September 13, 2000, the Towns of Cary, Apex, and Morrisville and Wake County (for RTP South) petitioned the Environmental Management Commission (EMC) for an increase in the existing Cary/Apex interbasin transfer certificate from 16.0 to 27.0 million gallons per day, incidental to their proposed increased withdrawals from Jordan Lake and discharge of treated wastewater to tributaries of the Neuse River. Public hearings on the proposed transfer increase were held in Raleigh on March 5, 2001 and in Fayetteville on March 6, 2001 pursuant to G.S. 143-215.22I. The original hearing officer's report was prepared in April of 2001 and mailed to members of the EMC on May 2, 2001. A revised hearing officer's report was prepared in June of 2001 and mailed to members of the EMC on July 3, 2001.

The EMC considered the petitioner's request at its regular meeting on July 12, 2001. According to G.S. 143-215.22I (g), the EMC shall issue a transfer certificate only if the benefits of the proposed transfer outweigh the detriments of the proposed transfer, and the detriments have been or will be mitigated to a reasonable degree.

The EMC may grant the petition in whole or in part, or deny it, and may require mitigation measures to minimize detrimental effects. In making this determination, the EMC shall specifically consider:

1. The necessity, reasonableness, and beneficial effects of the transfer
2. Detrimental effects on the source river basin
2a. The cumulative effect on the source major river basin of any water transfer or consumptive water use
3. Detrimental effects on the receiving basin
4. Reasonable alternatives to the proposed transfer
5. Use of impounded storage
6. Purposes and water storage allocations in a US Army Corps of Engineers multi-purpose reservoir
7. Any other facts or circumstances necessary to carry out the law

In addition, the certificate may require a drought management plan. The plan will describe the actions a certificate holder will take to protect the source basin during drought conditions.

The members of the EMC reviewed and considered the complete record which included the hearing officer's report, staff recommendations, the applicant's petition, the Final Environmental Impact Statement, the public comments relating to the proposed interbasin transfer, and all of the criteria specified above. Based on that record, the Commission makes the following findings of fact.

Finding of Fact

THE COMMISSION FINDS:

(1) **Necessity, Reasonableness, and Benefits of the Transfer**

North Carolina has been enjoying significant population and job growth over the last decade. Growth in the Triangle is centered on the Research Triangle Park and the surrounding communities of Durham, Raleigh, Cary, Apex, and Morrisville. The proposed transfer of water will provide water to three of these fast growing communities in the Triangle. Their current combined population is about 122,900 with a maximum day water use of 23.4 million gallons per day (mgd) and projected to grow to a population of 325,400 with maximum day water use of 53.6 mgd by 2030. This water will also support economic development and job creation in the portion of RTP located in Wake County as well as the workers who are attracted to the Triangle region to fill these jobs. Raleigh and Durham each have dedicated sources of water that are adequate to meet current needs but are inadequate in their current state of development to meet long term demands for these communities. Raleigh and Durham do not have enough water to supply Cary, Apex, and Morrisville to meet their long-term needs.

Cary and Apex are located on the eastern boundary of the Jordan Lake Project and have invested in development of the only water supply intake on the lake, with approval of the state, sized to allow the withdrawal of 50 mgd of water. The Cary-Apex water treatment plant provides water to Cary, Apex, Morrisville, RTP, and Raleigh-Durham International Airport. The Chatham County water system also receives raw water through this intake to supply water to the eastern part of the county.

The state permitted the development of a raw water intake on the eastern shore of Jordan Lake to supply surrounding communities from this regional water supply. Cary and Apex received permission to use Jordan Lake water to meet their community needs and support economic development in and around RTP. They received permission to transfer 16 mgd of water from the Haw River Basin to the Neuse River Basin. This amount is no longer adequate to meet the communities' water demands. Durham and Raleigh have assisted the communities receiving water from the Cary-Apex water system by providing water to the system but can not continue because they need the water to meet demands within their own service areas.

These petitioners have made a request to transfer enough water to meet their future needs. The petitioners' combined 2030 projected transfer amount is 24.1 mgd plus an additional 2.9 mgd contingency amount for a total requested amount of 27 mgd. The projected 2009 transfer amount is 27 mgd, which will drop to 17.9 mgd in 2010 when the regional water reclamation facility becomes operational. The 24.1 mgd transfer amount assumes that the Towns of Cary and Apex will construct a regional water reclamation facility that would discharge to the Cape Fear River Basin by 2010, therefore limiting the need for additional future transfers.

The transfer of water will benefit the Research Triangle Region by guaranteeing water to support the economic development and associated population growth that have been encouraged by the establishment of the Research Triangle Park.

Based on the record the Commission finds the transfer is necessary to supply water to the growing communities of this area. Water from the source basin is readily available and within a short distance from the service area. The applicants have reasonably mitigated this need by returning treated wastewater to the source basin by December 31, 2009, and therefore the transfer is a reasonable allocation to these communities. The transfer will greatly benefit these communities by providing raw water of high quality for residential and industrial purposes.

The Commission finds that the appropriate transfer amount should not include a contingency factor, therefore 24 mgd is the appropriate necessary and reasonable transfer amount.

(2) **Detrimental Effects on the Source Basin**

In order to assess the direct impacts of the proposed transfer on the source basin, the petitioners participated in the development of a Cape Fear River Basin Hydrologic Model that was developed for water supply planning, using Moffat & Nichol and the Danish Hydraulic Institute as contractors. The model considers all major water withdrawals (water supply and irrigation) and discharges within the Cape Fear River basin, including those into and out of Jordan Lake. As required under G.S. 143-215.22I(f)(2), local water supply plans were considered in developing the model. In addition, industrial and agricultural withdrawals were model inputs. Model runs for seven alternatives were evaluated for present and 2030 water demands. Impacts were assessed for the Jordan Lake watershed and downstream to Lock and Dam Number 1, including impacts at Fayetteville.

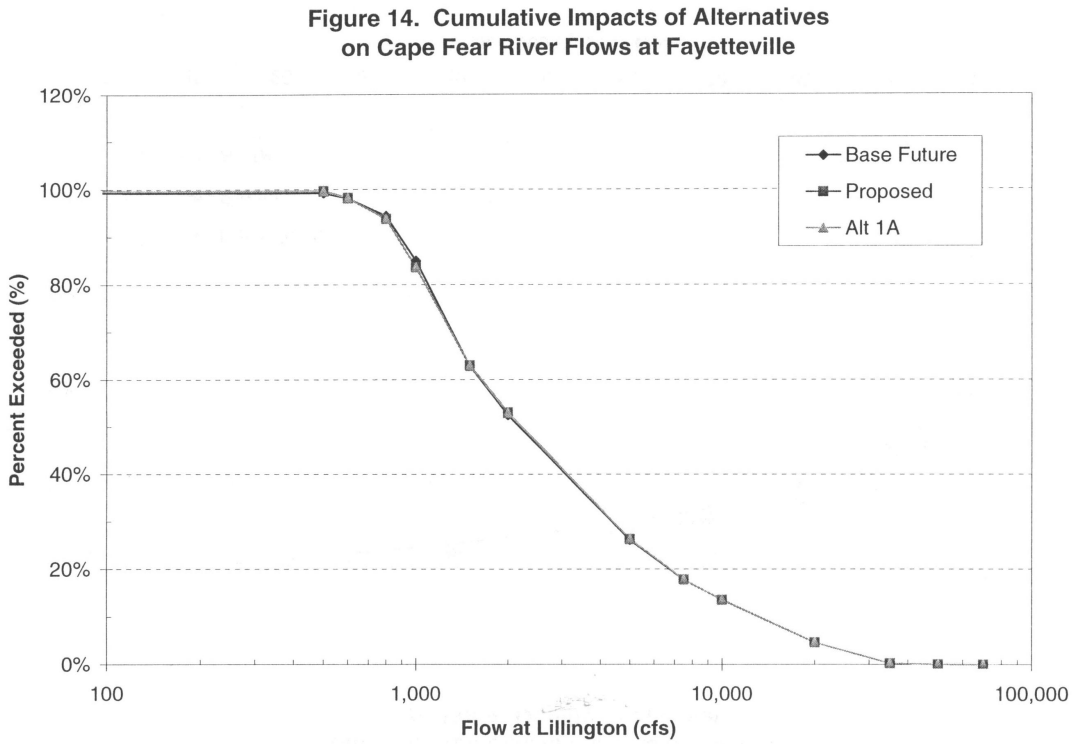
The source for all of the petitioners' water is the water supply pool of Jordan Lake. The water supply pool is operated entirely separate from the low flow augmentation pool. The low flow augmentation pool, not the water supply pool, is dedicated to maintaining flows in the Cape Fear River downstream of Jordan Lake dam. Therefore, the petitioners' water supply withdrawals will have no significant impact on the downstream flows as demonstrated with the model. A comparison of the alternatives showed that the proposed transfer will not have any significant impact on Jordan Lake surface water elevation, minimum releases from the dam, water quality pool levels, the target flows at Lillington, flows at Fayetteville, and water quality pool levels compared to the other alternatives and to present conditions (see Appendix B in the EIS). As shown in the following figure (Figure 14 from the EIS) there are no significant differences in flows at Fayetteville.

Approximately two-thirds of Jordan Lake's conservation storage is dedicated to maintaining minimum flows in the Cape Fear River, compared with the one-third dedicated to water supply. Downstream users benefit from this low-flow augmentation pool without requiring a Jordan Lake allocation and at no cost. Upstream users do not benefit from the low flow augmentation pool. The historic low flow of the Cape Fear River at Lillington was 75 cfs prior to regulation by Jordan Dam. The target flow at Lillington is now 600 cfs, supported by the low flow augmentation pool of Jordan Lake. This target flow is 8 times as great as the historic low flow, and equivalent to 388 mgd. Even allowing for instream flow requirements for habitat, an enormous amount of water is available to downstream users. Based on the 1997 Local Water Supply Plans the projected water supply demand for the middle Cape Fear River (Jordan Lake to Fayetteville) is 93.5 mgd. The target flow of 388 mgd is over 4 times as great as the projected municipal water supply demand.

Because wastewater assimilation is directly related to flows, no significant changes in wastewater assimilation are expected from the proposed action. Similarly, no impacts were identified for hydropower generation, navigation or recreation.

Secondary effects from growth such as increased runoff, erosion, and loss of open space are expected to have negative impacts on water quality and fish and wildlife habitat. These impacts will be mitigated to a reasonable degree through existing regulations and programs, as well as new initiatives. The most notable of these initiatives are Cary's Stream Buffer Ordinance and Open Space and Historic Resources Plan

The Commission finds that it is reasonable to minimize the impacts of secondary effects caused by growth in the Towns of Cary, Apex and Morrisville and Wake County through the implementation of ordinances similar to the Neuse River Buffer rules for the parts of their jurisdictions that are within the Jordan Lake watershed for protection of the lake.



(2a) **<u>Cumulative effect on Source Basin of any transfers or consumptive water use projected in local water supply plans</u>**

Local water supply plan data, including current and projected water use and water transfers, were used to develop the input data sets for the Cape Fear River Basin Model. The model was used to evaluate current and future scenarios of basin water use.

In a statement to the Commission, a representative of the Public Works Commission of Fayetteville asserted that the Department of Environmental and Natural Resources had established a limit on the amount of water PWC could withdraw from the Cape Fear River. He was asked to provide the Commission a copy of that document. The document was a memo from the North Carolina Division of Environmental Management (now the Division of Water Quality), dated December 9, 1996 from Jason Doll transmitted through Ruth Swanek to Tom Fransen, Division of Water Resources.

The sentence in that memo that caused concern to representatives of Fayetteville states: "...our analysis indicates the City of Fayetteville could withdraw up to 60 MGD from the Cape Fear River without causing substantial declines in predicted instream DO (dissolved oxygen) levels."

That sentence does not limit how much water Fayetteville can withdraw from the Cape Fear River. In fact, there is no existing regulation that explicitly limits the amount of water Fayetteville can withdraw from the river. North Carolina does not have a statewide permit system for water withdrawals. The only procedure for issuing such permits is the Capacity Use Act of 1967. Under that authority, the Environmental Management Commission must first declare a specific geographical area to be a "capacity use area" based on findings that "aggregate uses of groundwater or surface water, or both, in or affecting said area (i) have developed or threatened to develop to a degree which requires coordination and regulation, or (ii) exceed or threaten to exceed, or otherwise threaten or impair, the renewal or replenishment of such waters or any part of them". Only one area of the state has ever been so designated, that being the area around the phosphate mining operation near Aurora. Another area currently under consideration for designation is a portion of the central coastal plain. No such designation has ever been considered for surface water withdrawals from the Lower Cape Fear River, and given the abundance of water in that area relative to current and foreseeable use, it is highly unlikely that such an action would be contemplated for decades to come. Given projected water use in the Lower Cape Fear River relative to available supply, there is no foreseeable limit on withdrawals from the river.

The memo in question goes on to say that: "***The Division (of Water Quality) does not believe that our water quality predictions constitute a basis to impede increases in withdrawal from the Cape Fear River by the City of Fayetteville.***" It does say that DWQ reserves the right to assign even more stringent effluent limits in the future if the need arises. That statement would be true for all dischargers in North Carolina. Details of the earlier analysis have been challenged and are now under review. A consulting engineering firm, CH2MHill, has been retained by the cities of Cary and Fayetteville to review and evaluate the QUAL2E models used in that analysis. That review is expected to be completed in August 2001 at the earliest.

Under no foreseeable circumstances, however, would Fayetteville's withdrawal be limited by water quality considerations. Durham and the Orange Water and Sewer Authority (Chapel Hill/Carrboro) are permitted to discharge effluents from their wastewater treatment plants into streams with low flows of less than 1.0 MGD. They are upstream of an arm of Jordan Lake that has a very long detention time. When comparing those dischargers with Fayetteville, two factors are important. First, effluent limits assigned to the Durham and Chapel Hill plants for substances related to dissolved oxygen are very comparable to those for Fayetteville plants. Current limits are given in the table below. Second, the Cape Fear River at Fayetteville has critical low flows several hundred times those for streams into which Chapel Hill and South Durham are discharging.

Facility	Effluent Limits BOD mg/l summer/winter	Ammonia mg/l summer/winter
OWASA	4/8	2/4
South Durham	5/7	1/2
Fayetteville Cross Creek	6.8/8	1/2
Fayetteville Rockfish Crk	5/10	1/2

Furthermore, any effect on water quality due to Fayetteville's withdrawals would be limited primarily to that section of the river between the point of withdrawal and the points of discharge.

Based on the modeling discussed in Finding No. 2, the Commission finds the cumulative effects of this and other future water transfers or consumptive uses as described in G.S. §143-215.22I(f)(2a) will be insignificant. Also, the EMC concludes that, despite the language in the December 9, 1996 memorandum, the proposed transfer will not adversely affect or limit water supply availability in the Fayetteville area.

(3) **Detrimental Effects on the Receiving Basin**

The proposed transfer will utilize existing permitted wastewater discharges to the Neuse River basin; therefore no plant expansions will be required. Previous studies for the existing plants indicated no significant direct impacts to water quality or wastewater assimilation on the receiving streams. Because stream flows in the Neuse River basin are not expected to change significantly due to the proposal, no impacts are likely to occur to navigation, recreation, or flooding. According to 1998 Neuse River Basinwide Water Quality Plan: "Over 80% of the freshwater streams in the basin that have been monitored are either impaired or rated as fully supporting but threatened. …. A major cause of this impairment, especially in the upper basin, is population growth and urbanization, and every indication is that this strong growth will continue for decades to come. In addition to the tremendous challenges ahead in balancing the growth in the basin with the restoration of its waters, it is also clear that if we are to prevent more waters from becoming impaired in the future, and if the nutrient-related problems in the lower basin and lakes are to be solved, it can no longer be business as usual in the Neuse."

Based on the record the Commission finds the transfer will support continued population growth and the attendant impacts of that growth. These impacts include effects on wastewater assimilation, fish and wildlife habitat, and water quality similar to the secondary growth effects described in Finding No. 2, above. However, these impacts will be minimal. Reasonable mitigation is prohibiting additional wastewater treatment facilities in the Neuse River basin as a result of this transfer and to limit the applicants' existing Neuse River wastewater treatment facilities to their current permitted levels.

(4) **Alternatives to Proposed Transfer**

The petitioners evaluated six alternatives to the proposed transfer. The alternatives considered include:

Alternative 1A: No IBT Increase and No Additional Jordan Lake Allocations

- No increase in the existing 16-mgd (average day basis) Jordan Lake allocation
- No increase in the existing IBT certificate (16 mgd on a maximum day basis)
- No construction of a regional treatment and water reclamation facility
- No other additional discharges to the source basin, in western Wake County

Alternative 1B: No IBT Increase with Additional Jordan Lake Allocations

- Increases in Jordan Lake water supply allocations
- No increase in existing IBT certificate (16 mgd on maximum day basis)

Alternative 2: Obtain Water From the Neuse River Basin

- No increase in existing IBT certificate (16 mgd)
- Regional Cape Fear WWTP
- Purchase of finished water from the Neuse River basin

Alternative 3: Increase Wastewater Discharges to Cape Fear River Basin

- No increase in existing IBT certificate (16 mgd)
- Additional Jordan Lake water supply allocations
- Relocation of existing Apex and Cary WWTP discharges to Cape Fear basin
- Regional Cape Fear WWTP

Alternative 4: Merger of Water and Sewer Utility Operations of Town of Cary and City of Durham

- Institutional arrangement offsets existing Durham transfer (Neuse to Haw)
- No increase in existing IBT certificate (16 mgd)
- Additional Jordan Lake water supply allocations
- Regional Cape Fear WWTP

Alternative 5: No Regional Treatment and Water Reclamation Facility

- Discharge through existing WWTPs in Neuse River basin
- Additional Jordan Lake water supply allocations
- 45 mgd IBT

The table on the following page compares the proposed transfer with the six alternatives. Factors used in the comparison of alternatives include:

- required increase in interbasin transfer
- direct and indirect impacts
- ability to meet future water needs
- capital cost
- construction of a regional water reclamation facility
- outside water purchases
- expansion of Cary/Apex water treatment plant

Except for Alternative 1A, which does not serve the projected water supply needs of the petitioners, the alternatives will not substantially reduce the expected impacts of the proposed transfer increase. The only significant impacts associated with the proposed transfer are secondary impacts associated with growth. All of the alternatives will have essentially the same growth related impacts due to high rates of regional growth.

Based on these comparisons, the Commission finds that the proposed alternative is the most feasible means of meeting the petitioners' long-term water supply needs while minimizing overall impacts and cost.

Summary of Alternatives

Item	Alternatives						
	Proposed Action	**1A No Action**	**1B No Action**	**2 Water From Neuse**	**3 Move WWTP Discharges**	**4 Merger with Durham**	**5 No Regional WWTP**
Increase in IBT (mgd)	11	0	0	0	0	0	29
Significant Direct Impacts	No	No	No	Yes	Yes	No	Yes
Significant Secondary Impacts	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Additional Jordan Lake Allocations	Yes	No	Yes	Yes	Yes	Yes	Yes
2030 MDD Water Demands (mgd)	53.6	19	43.8	53.6	53.6	53.6	53.6
Maximum IBT (mgd)	25[1]	16	16	16	16	19 (Neuse to Haw)	45
Total Capital Cost (million)	$225.7	$11.1	$206.6	$206.9	$279	$248	$84.0
Water Reuse	3.8 mgd	3.8 mgd	3.8 mgd	3.8 mgd	3.8 mgd	3.8 mgd	3.8 mgd
Construct Regional WWTP (2030 max month capacity)	18.0 mgd	No	18.0 mgd	18.0 mgd	18.0 mgd	18.0 mgd	No
Finished Water Purchases (2030 max day demand)	No	No	No	9.2 mgd	No	No	No
Expand Cary/Apex WTP (capacity beyond 40 mgd, max day basis)	20.0 mgd	No	9.0 mgd	9.0 mgd	20.0 mgd	20.0 mgd	20.0 mgd

Note: [1]Projected IBT in 2030 is approximately 25 mgd. The requested amount of 27 mgd includes some contingency

(5) **Impoundment Storage**

This criterion is not applicable, as the petitioners do not have an impoundment.

(6) **Jordan Lake Purposes/Water Supply**

The source of the water for this transfer is Jordan Lake, which is a multipurpose reservoir constructed by the United States Army Corps of Engineers. One of the federally authorized purposes of this reservoir is water supply. Water is allocated from this reservoir intermittently. The applicants for this transfer plan to secure an allocation prior to initiating this transfer.

The Commission finds that the transfer and allocations are consistent with the federally authorized project purposes of Jordan Lake. Also, the Commission finds that to be consistent with the use of Jordan Lake as a regional water supply Cary/Apex are required to provide access through their intake with other Jordan Lake Water Allocation Holders that need access to their allocation. The cost associated with getting any necessary permits, engineering design, and associated construction costs are not the responsibility of Cary/Apex.

(7) **Other Considerations**

The Commission finds that to protect the source basin during drought conditions, to mitigate the future need for allocations of the limited resources of this basin, and as authorized by G.S. § 143-215.22I(h), a drought management plan is appropriate. The plan should describe the actions that the Towns of Cary, Apex, Morrisville and Wake County (for RTP South) will take to protect the Cape Fear River Basin during drought conditions.

The Commission notes that future developments may prove the projections and predictions in the EIS to be incorrect and new information may become available that shows that there are substantial environmental impacts associated with this transfer. Therefore, to protect water quality and availability and associated benefits, modification of the terms and conditions of the certificate may be necessary at a later date.

Decision

Based on the hearing record and the recommendation of the hearing officers, the Commission, on July 12, 2001, by duly made motions concludes that by a preponderance of the evidence based upon the Findings of Fact stated above that (1) the benefits of the proposed transfer outweigh the detriments of the proposed transfer, and (2) the detriments of the proposed transfer will be mitigated to a reasonable degree. Therefore, and by duly made motions, the Commission grants the petition of the Towns of Cary, Apex, Morrisville, and Wake County (with modification) to increase their transfer of water from the Haw River basin to the Neuse River basin. The permitted transfer amount shall be 24 million gallons per day (mgd) on a maximum day basis from the effective date. This certificate supercedes any other transfer certificates held by the Towns of Cary and Apex under G.S. § 143-215.22I and any other laws. This certificate is effective immediately. The certificate is subject to the following conditions, imposed under the authority of G.S. § 143-215.22I:

1. The holders of this certificate, after 2010, shall return water supplied from the Haw River basin used in the Neuse River Basin to either the Haw or Cape Fear River basins as described below:

    (a) Any water used in the Neuse Basin in excess of 16 million gallons per day adjusted on an average daily basis shall be returned.
    (b) Water used for consumptive purposes in the Neuse Basin will not be subject to this condition.

    Nothing in this certificate shall decrease the amount of any transfer that existed prior to July 1, 1993 or that was approved pursuant to G.S. § 162A-7 (repealed by 1993 Laws, ch. 348, § 6), as provided in G.S. § 143-215.22I(i), including such approved transfer of 16 million gallons per day.

    For purposes of this condition the average annual daily return to the Haw River and Cape Fear River basin will be calculated as follows:

    All amounts are a calendar year average annual daily amount in million of gallons per day (mgd).

    Peaking Factor (P_F) = Maximum Daily Demand (MDD) / Average Daily Demand (ADD)

    For the first year $P_F = 1.64$. Thereafter, the certificate holders annual compliance and monitor report will include the information needed by the Division of Water Resources to determine if an adjustment is needed for P_F. The Division of Water Resources shall have the authority to make modifications to P_F as necessary to accurately reflect local water use practices.

    Consumptive use = C% of Finished Water (X) (average annual basis)
    Neuse Consumptive use (C_N) = C% of Finished Water (X) times Neuse Finished Water (X_N)

For the first year C% = 20%. Thereafter, the certificate holders annual compliance and monitor report will include the information needed by the Division of Water Resources to determine if an adjustment is needed for C%. The Division of Water Resources shall have the authority to make modifications to C% as necessary to accurately reflect local water use practices.

Required Return (R_R) = (Neuse Finished Water (X_N) - 16 mgd adjusted to an average annual basis (16 / Peaking Factor (P_F)) – Neuse Consumptive use (C_N)

$$R_R = (X_N - 16/ P_F) - C\% X_N$$

If R_R is less than Zero then $R_R = 0$

2. The holders of this certificate shall manage the authorized transfer amount in such a way that none of the individual petitioners (Towns of Cary, Apex, Morrisville, and Wake County (for RTP South)) are prevented from fully using their respective Jordan Lake water supply allocations.

3. If the holders of this certificate discontinue their cooperative service agreement with each other, the maximum day permitted transfer will be adjusted by the Division of Water Resources based on the 2030 projected transfer of each applicant at that time.

4. Prior to transferring water under this certificate, the holders of this certificate shall work with the Division of Water Resources to develop compliance and monitoring plan subject to approval by the Division. The plan shall include methodologies and reporting schedules for reporting the following information: maximum daily transfer amounts, compliance with permit conditions, progress on mitigation measures, drought management, and reporting. A copy of the approved plan shall be kept on file with the Division for public inspection. The Division of Water Resources shall have the authority to make modifications to the compliance and monitoring plan as necessary to assess compliance with the certificate.

5. If either the EIS is found at a later date to be incorrect or new information becomes available such that the environmental impacts associated with this transfer are substantially different from those projected impacts that formed the basis for the above Findings of Fact and this certificate, the Commission may reopen the certificate to adjust the existing conditions or require new conditions to ensure that the detriments continue to be mitigated to a reasonable degree.

6. The Towns of Cary and Apex shall be required to provide access at their existing intake site to other Jordan Lake water allocation holders that need access to utilize their allocation to the extent that this additional use is determined to be feasible by the Division of Water Resources. The cost associated with getting any necessary permits, engineering design, and associated construction costs are the responsibility of the allocation holder(s) requesting the access and not Cary and Apex.

7. Prior to transferring water under this certificate, the Towns of Cary, Apex, and Morrisville, and Wake County (for RTP South) shall develop individual water shortage response plans subject to approval by the Division. The holders of this certificate shall develop a drought management plan for the interbasin transfer, incorporating the individual water shortage response plans and subject to approval by the Division. The plans shall tie specific water conservation actions to the percent storage remaining in each of the petitioners' Jordan Lake water supply accounts. A copy of the approved plans shall be kept on file with the Division for public inspection. The Division of Water Resources shall have the authority to approve modifications to the drought management plan as necessary.

8. Within six months from the effective date of this certificate, the Towns of Cary, Apex and Morrisville and Wake County (for RTP South) shall enact ordinances similar to or more protective than the Neuse River buffer rules (15 A NCAC 2B.0233) for the parts of their jurisdictions that are within the Jordan Lake watershed. These buffer requirements shall be subject to approval by the Division of Water Resources after consultation with the Division of Water Quality and shall be adopted as local ordinances.

NOTICE: The holders of this certificate are jointly and severally responsible for compliance with the terms, conditions and requirements stated herein, and are therefore jointly and severally liable for all penalties assessed to enforce such terms, conditions and requirements as provided in G.S. §143-215.6A.

This is the 12th day of July, 2001.

David H. Moreau, Chairman

Appendix B
2013 Annual Report on Interbasin Transfers

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2013 ANNUAL REPORT on INTERBASIN TRANSFERS
for
RTP South and the Towns of Cary, Apex, and Morrisville

Prepared for:

Town of Apex

Town of Cary

Town of Morrisville

RTP South/Wake County

Submitted to:

North Carolina Division of Water Resources

April 2014

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Executive Summary

The 2013 Annual Report on Interbasin Transfers for RTP South and the Towns of Cary, Apex, and Morrisville includes monitoring data for daily tracking of IBT amounts and combined Jordan Lake allocations held by the certificate holders.

The Town of Cary and Morrisville merged their utility systems on April 3, 2006. Cary is responsible for providing billing and system maintenance for water and sewer services to Morrisville and RTP South customers. Morrisville and Wake County RTP South, continue to hold independent Jordan Lake water supply allocations.

In 2013, the certificate holders complied with all conditions of the IBT certificate. The maximum daily IBT amount for Cary, Apex, Morrisville, and RTP South was 19.2 million gallons per day (mgd). Maximum day IBT amounts and a summary of Jordan Lake withdrawals are provided in Table ES-1. The daily IBT amounts in 2013 for Cary, Apex, Morrisville, and RTP South are shown in Figure ES-1. The required average annual return of reclaimed water to the Cape Fear or Haw basin was 0.0 mgd and the actual average reclaimed water return was 1.9 mgd (see Table ES-2). The annual average IBT amount was 13.8 mgd.

Table ES-1

Summary of Interbasin Transfers for Cary, Apex, Morrisville and RTP South

	Withdrawal from Haw Subbasin (mgd)[1]		**Total Return to Haw Subbasin (mgd) [4]**		**Interbasin Transfer (mgd)**		**IBT as % of Certificate**
Calendar Year	Average Annual	Max. Day	Average Annual	Max. Day	Average Annual	Max. Day	Max.
1998	10.8	15.7	1.7	3.5	9.0	14.3	90%
1999	9.2	15.6	1.6	4.2	7.6	12.9	81%
2000	7.3	14.2	1.1	4.4	6.2	11.8	74%
2001[2]	9.7	18.8	2.8	9.4	6.8	15.0	63%[3]
2002	16.9	29.2	3.5	10.3	13.5	22.5	94%
2003	15.9	22.7	2.5	5.5	13.4	17.8	74%
2004	17.0	25.5	2.8	6.1	14.2	22.6	94%
2005	18.4	26.1	3.8	8.1	14.5	19.6	82%
2006	17.6	25.9	3.3	6.6	14.3	20.8	87%
2007	19.8	30.8	3.8	7.7	15.9	23.5	98%
2008	18.9	28.3	4.6	9.1	14.1	20.9	87%
2009	19.5	28.0	5.5	11.3	14.0	20.4	85%
2010	20.9	33.1	6.5	12.1	14.4	22.3	93%
2011	20.0	33.6	5.9	14.3	14.1	21.7	90%
2012	19.3	31.1	5.4	9.1	13.9	22.7	94%
2013	18.5	25.1	4.7	7.5	13.8	19.2	80%

1. Includes water use by Cary, Apex, Morrisville, and RTP South.
2. Withdrawals in 2001 were unusually high due to construction activities at the Cary/Apex WTP and do not reflect actual potable water demands.
3. Permitted IBT amount increased from 16 mgd to 24 mgd in July 2001. The maximum day IBT of 15.0 mgd occurred after the permitted amount increased to 24 mgd.
4. Includes consumptive use.

Figure ES-1: Daily Interbasin Transfer for Cary, Apex, Morrisville and RTP South [Haw Sub-Basin to Neuse Sub-Basin]

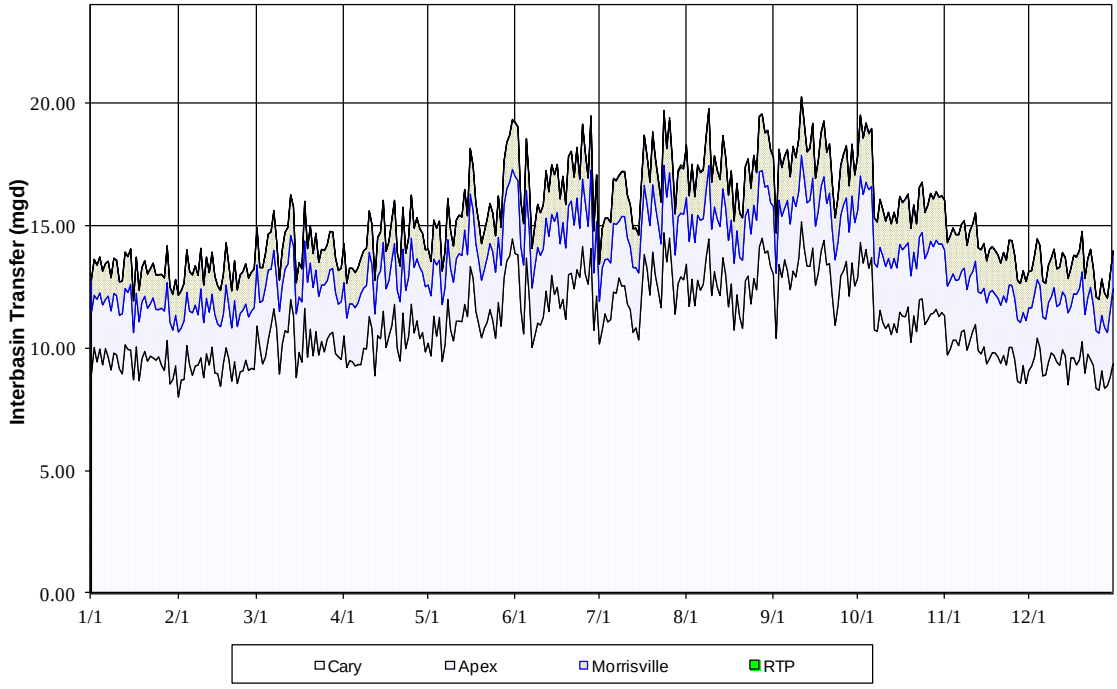


Table ES-2

Summary of Compliance with IBT Certificate Condition No. 1

Year	Neuse Finished Water from the Haw (mgd)	Peaking Factor	16 mgd MDD adjusted to ADD	Consumptive Use Factor (%)	Neuse Consumptive Use (from the Haw) (mgd)	Required Return (mgd)	Amount Returned (mgd)
	(a)	(b)	(c)=16/(b)	(d)	(e)=(a)*(d)	(f)=(a)-(c)-(e)	(g)
2011	12.0	1.64	9.76	20%	2.4	0.0	2.0
2012	11.6	1.64	9.76	20%	2.3	0.0	2.0
2013	11.4	1.64	9.76	20%	2.3	0.0	1.9

a = Average annual transfer from Haw to Neuse (see Table B-1)

b = Peaking factor specified in Certificate for first year, and to be approved by DWR thereafter

d = Percent consumptive use specified in Certificate for first year and to be approved by DWR thereafter

g = Average annual wastewater discharges and water reuse in Haw and Cape Fear Basins (see Table B-1)

1.0 Jordan Lake Allocation Monitoring

The combined Jordan Lake water supply allocation for Cary, Apex, Morrisville, and RTP South can be tracked on a daily basis. Daily tracking of the combined Jordan Lake allocation for the period January 1, 2013 through December 31, 2013 is included in Appendix A. The water supply pool for each allocation holder was full on January 1, 2013.

The Town of Cary and the Town of Morrisville merged their utility systems on April 3, 2006, and subsequently the Town of Cary began providing billing, facilities, and system maintenance for water and sewer services to Morrisville customers. Morrisville continues to hold its own Jordan Lake water supply allocation. For purposes of reporting on Jordan Lake allocations and IBT, Cary and Morrisville measurements will continue to be reported separately.

For 2013, the maximum day withdrawal for all certificate holders was 25.1 mgd, which occurred on July 26th. The average daily withdrawal for all certificate holders was 18.5 mgd during 2013 (Table 1-1).

Table 1-1

Summary of Jordan Lake Withdrawals[1]

Year	Average Annual Withdrawal (mgd)	Maximum Daily Withdrawal (mgd)
1998[2]	10.8	15.7
1999[2]	9.2	15.6
2000	7.3	14.2
2001	9.7	18.8
2002	16.9	29.2
2003	15.9	22.7
2004	17.0	25.5
2005	18.4	26.1
2006	17.6	25.9
2007	19.8	30.8
2008	18.7	28.3
2009	19.5	28.0
2010	20.9	33.1
2011	20.0	33.6
2012	19.3	31.1
2013	18.5	25.1

1. Withdrawals from Jordan Lake at the Cary/Apex raw water intake. Includes water use by Apex, Cary, Morrisville and RTP South. Does not include water use by Durham.
2. Includes water use by Holly Springs from 1/1/98 to 6/30/99

Table 1-2 presents historical water use for the certificate holders (Cary, Apex, Morrisville, and RTP South) based on finished water produced at the Cary/Apex WTP plus purchases. In 2013, finished water demands averaged 16.3 mgd and the maximum day demand was 22.8 mgd. The maximum day peaking factor was 1.40 in 2013.

Table 1-2

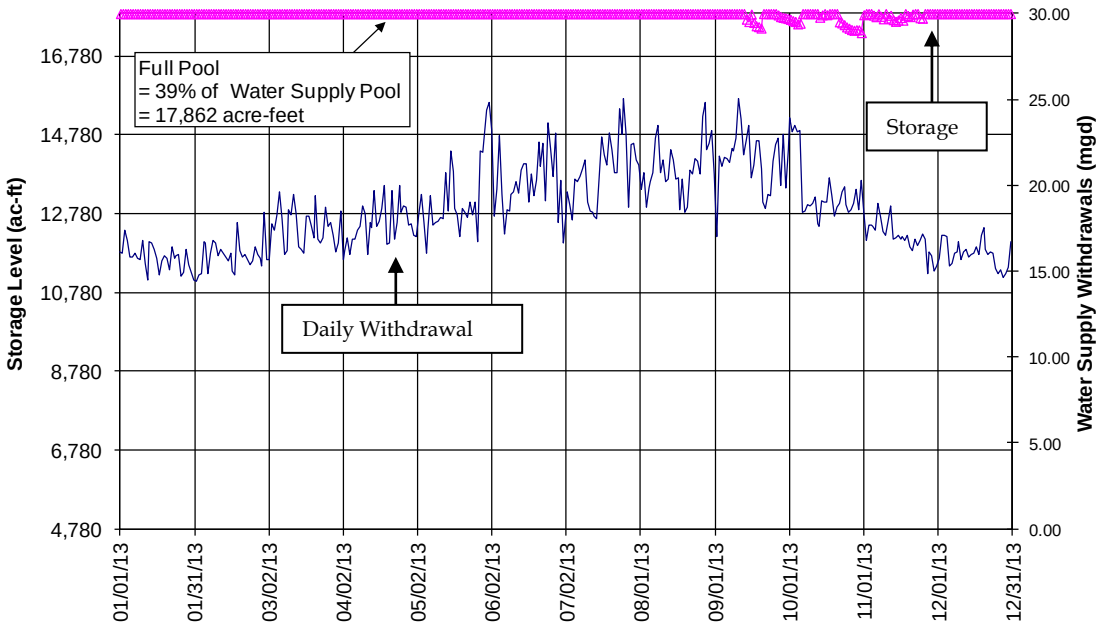
Summary of Finished Water Demands

Year	Average Annual Demand (mgd)	Maximum Daily Demand (mgd)	Maximum Day/Average Day Peaking Factor
1998[2]	12.2	20.1	1.65
1999[2]	12.6	21.5	1.71
2000	13.0	21.6	1.66
2001	14.2	22.0	1.55
2002	14.9	25.6	1.72
2003	13.9	19.9	1.43
2004	14.8	25.8	1.74
2005	15.6	22.6	1.45
2006	15.7	24.0	1.53
2007	17.9	28.1	1.57
2008	16.1	25.9	1.61
2009	16.1	24.6	1.53
2010	17.1	27.8	1.63
2011	17.2	27.6	1.61
2012	16.5	29.0	1.75
2013	16.3	22.8	1.40

1. Includes finished water delivered to the distribution system by the Cary/Apex WTP.
2. Includes water use by Holly Springs from 1/1/98 to 6/30/99.

Water distributed to Morrisville and RTP South is not measured on a daily basis. Therefore, accurate daily tracking of Jordan Lake water supply allocations can only be performed for the combined Jordan Lake water supply allocation for Cary, Apex, Morrisville, and RTP South. Figure 1 shows the partners' combined water supply withdrawals and allocation storage level for 2013. The minimum storage level for the combined allocation was 97.3% occurring on October 31, 2013. The average percent storage was 99.9% for 2013.

Figure 1. Cary/Apex/Morrisville/RTP South Water Supply Allocation and Withdrawals for 2013



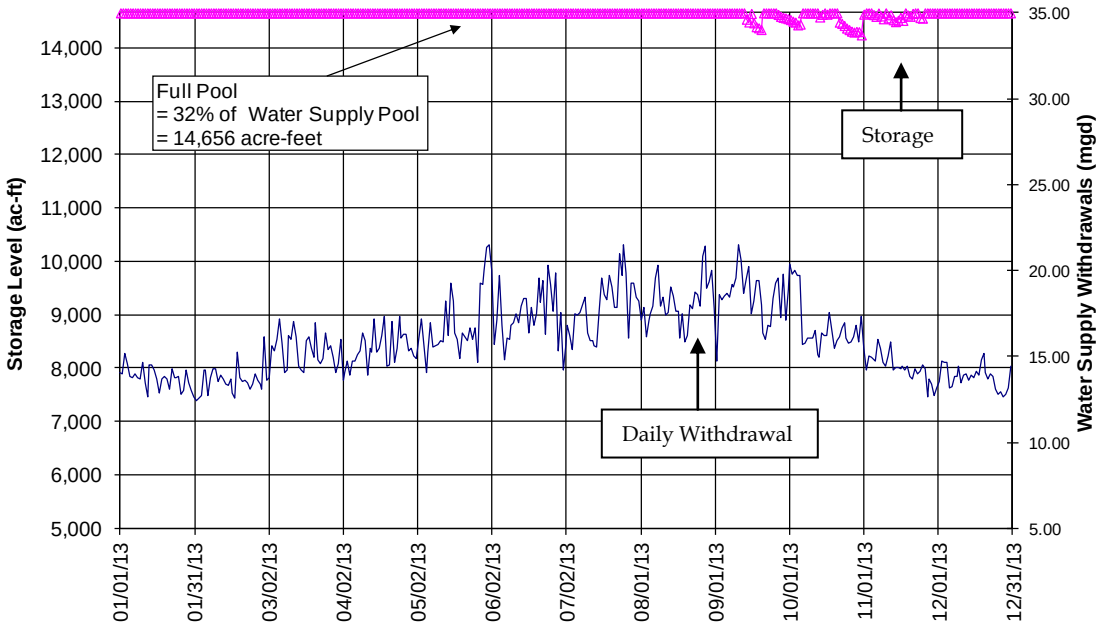
Individual Jordan Lake water allocation withdrawals are estimated on a daily basis using monthly Morrisville and RTP South water usage records. Daily water use for Morrisville is estimated from monthly retail billing data by assuming that water usage variations between billing periods follow the same patterns as the total combined water use ("Net Cary" use). Daily water use for RTP South is estimated similarly using monthly retail billing data, assuming that water usage trends throughout the month follow similar patterns as Net Cary. For a given day, the ratio of daily Net Cary water use to average Net Cary water use for the period between monthly retail bills is applied to Morrisville and RTP South monthly retail billed use.

Levels in individual water supply pools are calculated on a daily basis using daily water use estimates and daily lake inflows. Lake inflow data is obtained from the US Army Corps of Engineers and allocated to each water supply pool according to the percentage allocation held. Any inflow amount that would fill the allocated storage above 100 percent is not stored. Any time the elevation in Jordan Lake is at or above 216 feet mean sea level, the water supply pools are reset to 100 percent full. If any allocation holder or larger pool has excess inflow, it is first distributed within that pool to another user, if needed, before being "spilled."

The daily Cary/Apex withdrawal amounts are estimated by subtracting the estimated daily Morrisville and RTP flows from the metered total daily flow; Cary amounts are then estimated by subtracting the daily recorded Apex flow from the remainder.

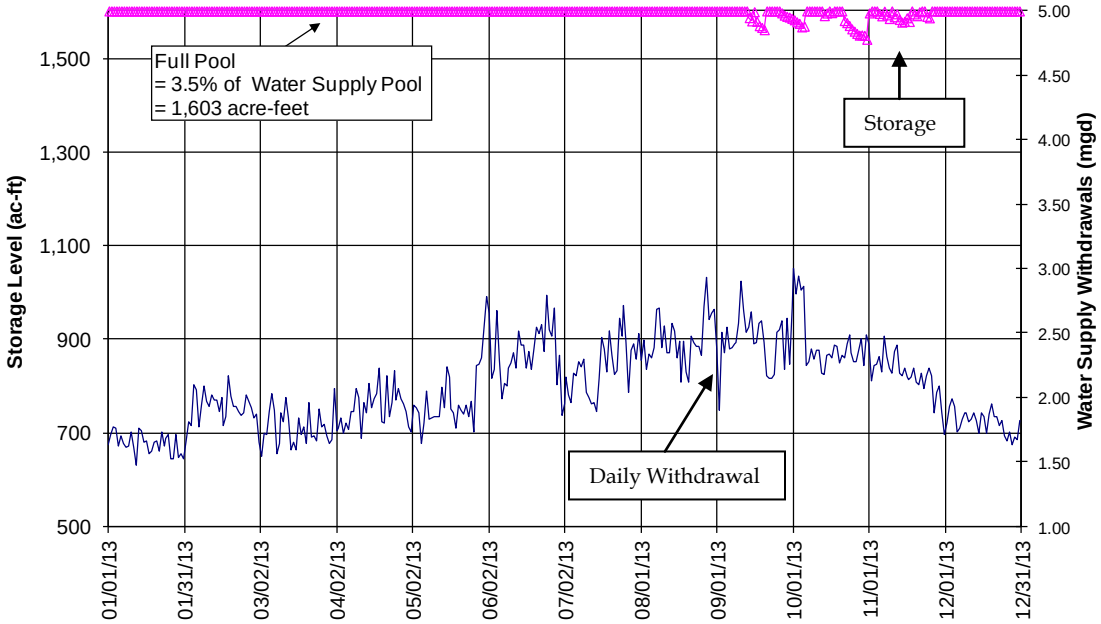
Cary/Apex holds a water supply storage allocation equal to 32 percent of the water supply pool or 14,656 acre-feet. Figure 2 shows the Cary/Apex water supply withdrawals and the allocation storage level for 2013. The minimum storage level for the Cary/Apex allocation was 97.2% occurring on October 31, 2013. The average percent storage was 99.9% for 2013.

Figure 2. Cary/Apex Water Supply Allocation and Withdrawals for 2013



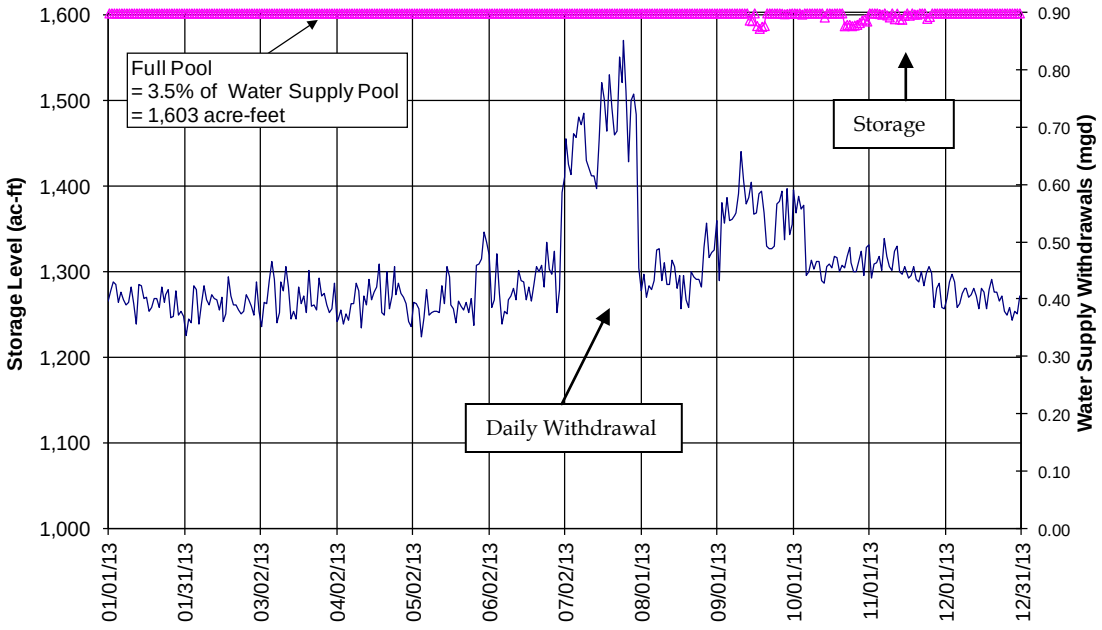
Morrisville holds a water supply storage allocation equal to 3.5 percent of the water supply pool or 1,603 acre-feet. Figure 3 shows the Morrisville water supply withdrawals and allocation storage level for 2013. The minimum storage level for the Morrisville allocation was 96.2% occurring on October 31, 2013. The average percent storage was 99.8% for 2013.

Figure 3. MorrisvilleWater Supply Allocation and Withdrawals for 2013



RTP South holds a water supply storage allocation equal to 3.5 percent of the water supply pool or 1,603 acre-feet. Figure 4 shows the RTP South supply withdrawals and allocation storage level for 2013. The minimum storage level for the RTP South allocation was 98.8% occurring on September 18, 2013. The average percent storage was 100.0% for 2013.

Figure 4. RTP South Water Supply Allocation and Withdrawals for 2013



2.0 IBT Monitoring

Daily IBT estimates for the certificate holders are included in Appendix B. Estimates are provided for the period January 1, 2013 through December 31, 2013. ***The maximum day IBT transfer during the calendar year 2013 was 19.2 mgd, which occurred on July 24, 2013***. This represents 80 percent of the permitted IBT transfer, 24 mgd, under the certificate approved by the EMC on July 12, 2001. The annual average IBT transfer was 13.8 mgd during calendar year 2013. The average daily consumptive use was 11.3% for the period January 1, 2013 through December 31, 2013. Historical consumptive use is shown in Table 2-1.

TABLE 2-1

Historical Consumptive Use for Cary, Apex, Morrisville, and RTP South

Year	Average Daily Finished Water Demand (mgd)	Average Daily Consumptive Use (mgd)	% Consumptive Use
1998[1]	12.2	2.4	19.7%
1999[1]	12.6	2.1	16.7%
2000	13.0	1.8	13.8%
2001	14.1	2.0	14.7%
2002	14.9	3.0	20.1%
2003	13.9	1.4	10.0%
2004	14.8	2.2	14.9%
2005	15.6	2.7	17.3%
2006	15.7	2.3	14.6%
2007	17.9	4.2	23.5%
2008	16.1	2.5	15.5%
2009	16.1	2.3	14.4%
2010	17.1	3.1	17.9%
2011	17.2	3.1	17.9%
2012	16.5	2.0	12.3%
2013	16.3	1.8	11.3%

1. Includes some water use by Holly Springs. Holly Springs purchased water from Apex in 1998 and 1999.

The distribution of consumptive uses between the Haw, Cape Fear, and Neuse River subbasins for 2013 was estimated based on historical water use in each basin as determined by billing records for each certificate holder. During 2013, based on the 2012 annual report, it was assumed that 29.0% of water use occurred in the Haw subbasin, 0.9% of water use occurred in the Cape Fear subbasin, and 70.1% of water use occurred in the Neuse River subbasin. The certificate holders track historical use by assigning a subbasin to each customer. Data on the distribution of water use between subbasins for each entity from 2000 through 2013, based on billing records, is shown in Table 2-2. For purposes of calculating daily IBT amounts in 2014, the certificate holders estimate that 29.0% of their water use will occur in the Haw subbasin and that 0.9% of their water use will occur in the Cape Fear subbasin.

TABLE 2-2
Distribution of Water Billed to Retail Customers by River Subbasin

Year	Cary			Apex					Morrsiville[1]			RTP South		
	Total Water Use (mgd)	Water Use in Haw (mgd)	% Use in Haw	Total Water Use (mgd)	Water Use in Haw (mgd)	% Use in Haw	Water Use in Cape Fear (mgd)	% Use in Cape Fear	Total Water Use (mgd)	Water Use in Haw (mgd)	% Use in Haw	Total Water Use (mgd)	Water Use in Haw (mgd)	% Use in Haw
2000[(1)]	9.29	0.82	8.8%	1.65	0.82	49.9%	0.07	4.3%	0.86	0.05	6.20%	0.27	0.27	100%
2001	10.73	1.07	10.0%	1.88	1.03	54.8%	0.08	4.3%	1.05	0.06	6.20%	0.31	0.31	100%
2002	10.23	1.23	12.0%	2.15	1.29	60.0%	0.08	3.7%	1.18	0.14	11.2%	0.39	0.39	100%
2003	9.02	0.75	8.3%	1.94	1.15	59.3%	0.073	3.8%	1.10	0.15	14.0%	0.36	0.36	100%
2004	9.69	1.21	12.5%	2.12	1.28	60.2%	0.080	3.8%	1.26	0.19	14.9%	0.35	0.35	100%
2005	10.38	1.47	14.2%	2.25	1.40	62.2%	0.092	4.1%	1.32	0.21	16.1%	0.44	0.44	100%
2006	9.79	1.15	11.8%	2.20	1.35	61.5%	0.085	3.9%	1.36	0.22	16.1%	0.41	0.41	100%
2007	10.90	1.52	13.9%	2.75	1.74	63.3%	0.110	4.0%	1.39	0.24	17.3%	0.48	0.48	100%
2008	9.83	1.43	14.5%	2.36	1.46	62.0%	0.09	4.0%	1.33	0.26	19.5%	0.41	0.41	100%
2009	10.23	1.68	16.4%	2.65	1.68	63.3%	0.13	5.1%	1.40	0.29	20.4%	0.39	0.39	100%
2010	11.34	2.09	18.4%	2.97	1.89	63.6%	0.14	4.6%	1.64	0.34	20.8%	0.40	0.40	100%
2011	11.29	1.98	17.5%	2.73	1.72	62.9%	0.13	4.6%	1.71	0.35	20.6%	0.43	0.43	100%
2012	10.56	1.83	17.3%	2.63	1.62	61.6%	0.13	5.1%	1.62	0.32	19.9%	0.42	0.42	100%
2013	9.89	1.91	19.3%	2.60	1.56	60.2%	0.18	6.9%	1.46	0.33	22.6%	0.39	0.39	100%

1. Water use by basin for the Town of Morrisville is unavailable for 2000, and so the percentage was assumed to be the same as in 2001.

Table 2-3 shows the combined water use for the certificate holders and the percentage water use in the Haw and Cape Fear River Subbasins.

TABLE 2-3

Historical Water Use in the Haw and Cape Fear River Subbasins for Cary, Apex, Morrisville, and RTP South

Year	Total Billed Water Use (mgd)	Water Use in Haw Subbasin (mgd)	Percent Use in Haw Subbasin	Water Use in Cape Fear Subbasin (mgd)	Percent Use in Cape Fear River Subbasin
2000[1]	12.07	1.97	16.3%	0.07	0.6%
2001	13.97	2.47	17.7%	0.08	0.6%
2002	13.95	3.05	21.8%	0.08	0.6%
2003	12.42	2.41	19.4%	0.07	0.6%
2004	13.42	3.03	22.5%	0.08	0.6%
2005	14.39	3.53	24.5%	0.09	0.6%
2006	13.75	3.13	22.7%	0.09	0.6%
2007	15.52	3.98	25.6%	0.11	0.7%
2008	13.93	3.96	25.6%	0.09	0.7%
2009	14.67	4.04	27.5%	0.13	0.9%
2010	16.34	4.71	28.8%	0.14	0.8%
2011	16.16	4.48	27.7%	0.13	0.8%
2012	15.23	4.19	27.5%	0.13	0.9%
2013	14.33	4.19	29.3%	0.18	1.3%

1. Water use by basin for the Town of Morrisville is unavailable for 2000, and so the percentage was assumed to be the same as in 2001.

In 1998, 1999, 2000 and 2007, Apex along with Cary implemented mandatory irrigation restrictions due to water supply limitations as well as IBT permit restrictions. The Town of Morrisville asked residents to voluntarily conserve water beginning in 1998, further implementing mandatory water use restrictions in July 1999. The restrictions reduced consumptive water use from what would normally be expected during those years. In 2000, Cary implemented a year round conservation program which includes: alternate day watering, prohibition of water waste, a rain sensor requirement on all irrigation systems, and an increasing block rate structure. In 2002, all of the Towns under this IBT certificate instituted mandatory restrictions because of regional drought conditions, but they were implemented after June which was when the highest water use occurred that year. Apex continued stage II water restrictions through December 29, 2005 when they returned to stage I, or voluntary water conservation measures. Starting April 3, 2006 the Cary and Morrisville utility systems merged. As part of this merger Morrisville adopted Cary's water conservation ordinances and Cary staff began education and enforcement in both Cary and Morrisville. On October 1, 2007, Apex adopted a year round alternate day watering

ordinance. Also in 2007, Apex, Cary, Morrisville and RTP South implemented mandatory irrigation restrictions. The changes in watering rules were made in response to Governor Easley's call for tougher water restrictions. The Apex Town Council adopted a ban on use of outdoor fountains and automated and sprinkler irrigation effective October 19, 2007. On November 1st 2007, the Town of Cary issued a Water Shortage Declaration, and citizens in Cary, Morrisville and RTP South connected to the Town of Cary's water system were no longer able to water outdoors using irrigation systems, sprinklers, or other automated watering devices; the Town also discontinued issuing three-week exemptions to its year-round watering rules for establishing new grass or reseeding. These mandatory irrigation restrictions for all the partners remained in effect until April 1, 2008.

3.0 Compliance with Certificate Conditions

A summary of the conditions of the IBT certificate dated July 12, 2001, along with the current status of compliance for each is provided below.

Condition 1 (2010 Required Return)

The holders of the certificate, after 2010, shall return water supplied from the Haw River Basin used in the Neuse River Basin to either the Haw or Cape Fear River Basins as described below.

a) *Any water use in the Neuse Basin in excess of 16 million gallons per day adjusted on an average daily basis shall be returned.*

b) *Water used for consumptive purposes in the Neuse Basin will not be subject to this condition.*

Compliance with this condition was not required until after 2010. However, the calculations for determining compliance with Condition 1, shown in Table 3-1, began in 2001. The amounts in column (a) are based on the percentage of billed water use in the Neuse Basin applied to the total amount of water used. As reported in the 2010 annual report, the calculation method was changed so Table 3-1 values shown reports for 2009 and earlier will differ from what is shown in later years.

Figures 5 and 6 depict both the short and long-term plans for complying with Condition 1. For IBT purposes, it would be best to return reclaimed water to the source (Haw) basin and, more specifically, directly to the water supply source – Jordan Lake. Cary began returning reclaimed water to Jordan Lake on April 19, 2005, by way of a wastewater treatment interlocal agreement (ILA) between Cary and Durham County. Per the ILA, Durham County treats wastewater for Cary from a service area that includes portions of Cary and Morrisville and all of RTP South. The reclaimed water is returned to Jordan Lake after being treated at the Durham County Triangle WWTP. Unfortunately, this arrangement to return reclaimed water to Jordan Lake is not feasible as a long-term management approach. Durham County will need the capacity of its Triangle WWTP for its own service area after 2015. A new discharge to Jordan Lake was investigated but deemed infeasible because of TMDL requirements and the nutrient management strategy that has been developed for Jordan Lake.

Since return of reclaimed water to the water supply source in the Haw basin is not feasible for the long-term, Apex, Cary, and Morrisville, which are the Western Wake Partners (Partners), investigated other alternatives and are implementing the Western Wake Regional Wastewater Management Facilities which will include reclaimed water discharge to the Cape Fear River below Buckhorn Dam. Apex, Cary and Morrisville wastewater will be treated at the new Western Wake Water Reclamation Facility.

The Western Wake Regional Wastewater Management Facilities project includes multiple components, which are being constructed through eight major construction contracts. More information about the status of the project can be found at the Western Wake Partners' website at http://www.westernwakepartners.org. The new facilities are expected to be on-line in 2014.

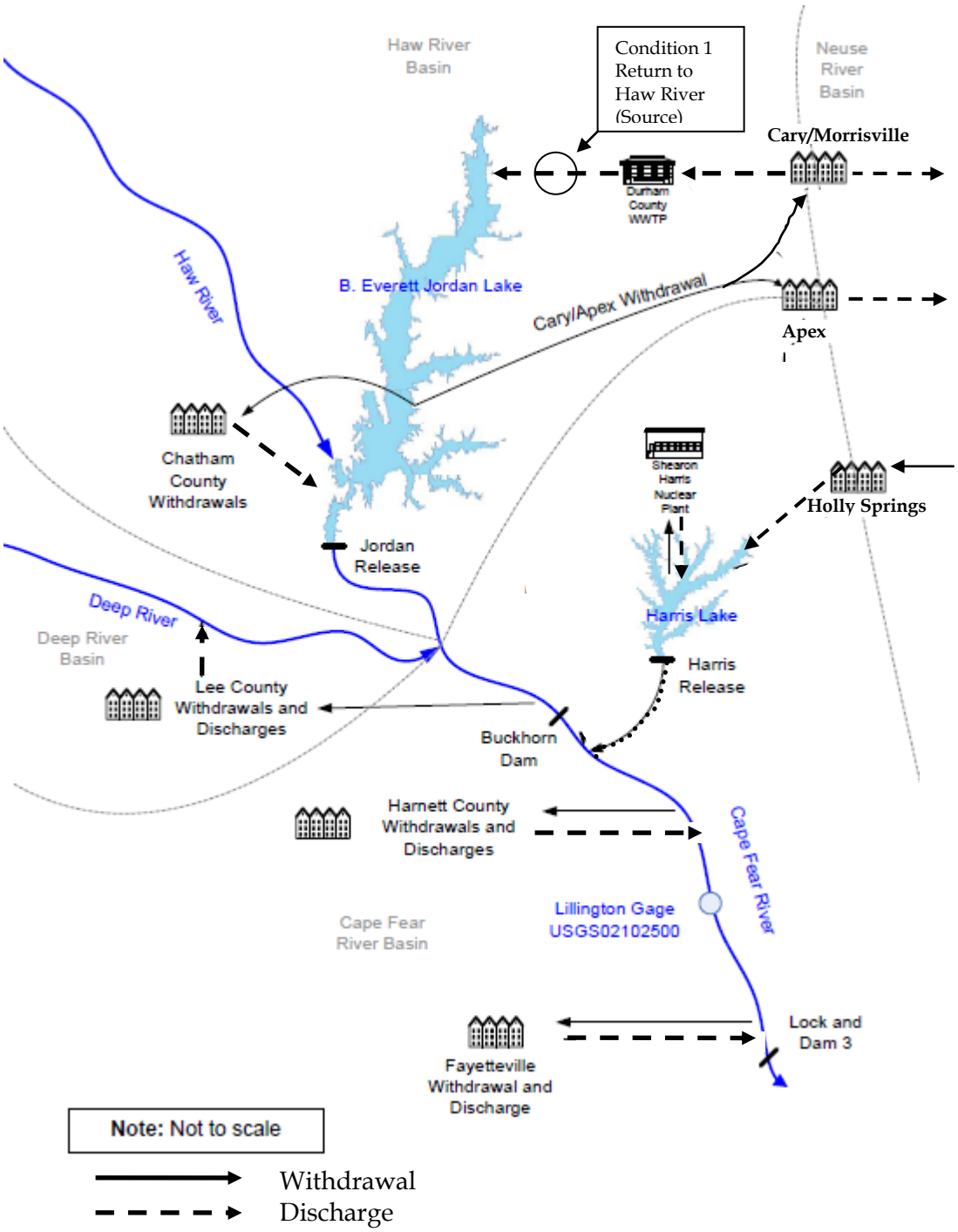


Figure 5. Return to Haw River Basin, Before Western Wake WRF Startup (during 2014)

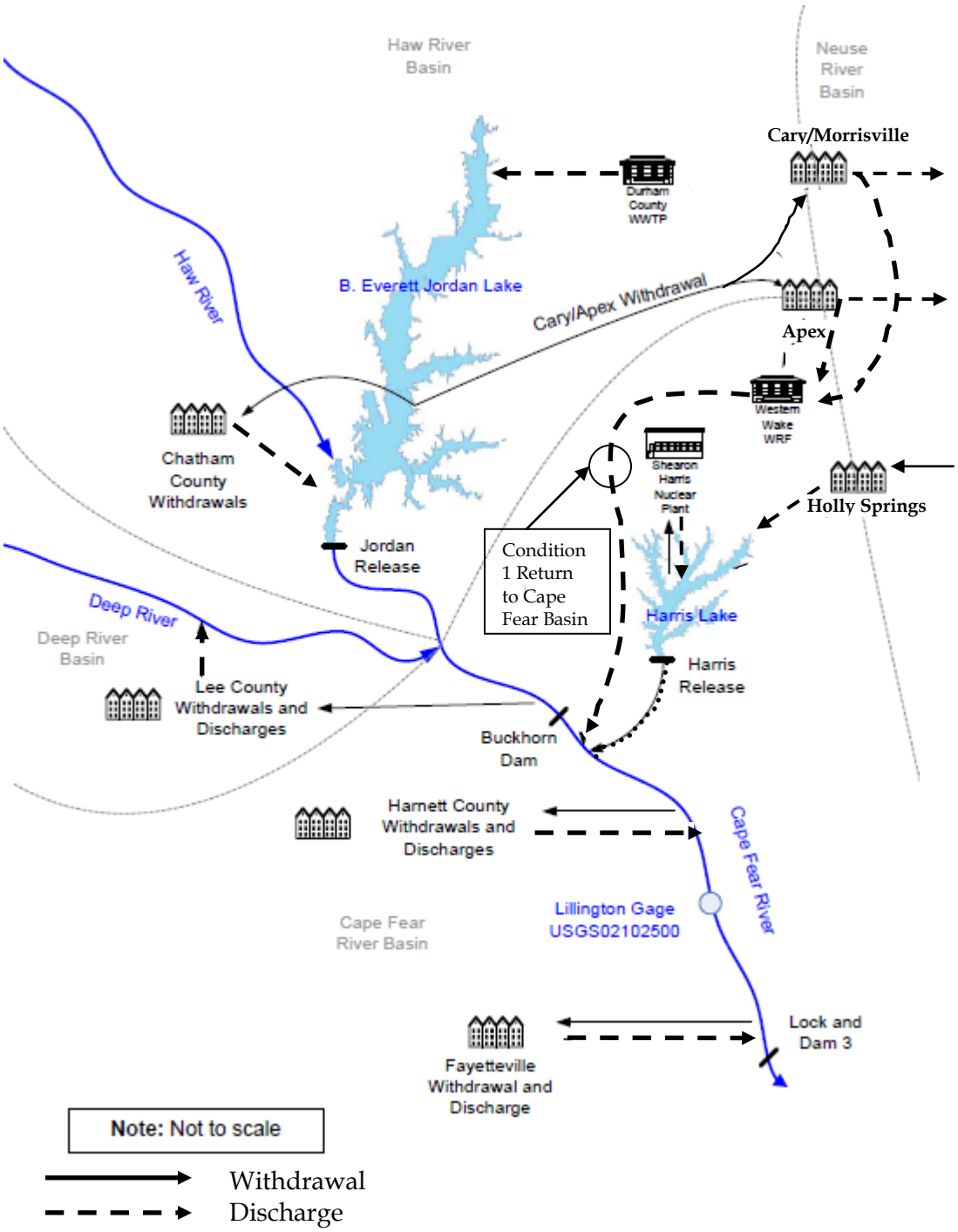


Figure 6. Proposed Return to Cape Fear River Basin, After Western Wake WRF Startup (during 2014)

Table 3-1

Summary of Compliance with Certificate Condition No. 1

Year	Neuse Finished Water from the Haw (mgd)	Peaking Factor	16 mgd MDD adjusted to ADD	Consumptive Use Factor (%)	Neuse Consumptive Use (from the Haw) (mgd)	Required Return if After 2010 (mgd)	Amount Returned (mgd)
	(a)	(b)	(c)=16/(b)	(d)	(e)=(a)*(d)	(f)=(a)-(c)-(e)	(g)
2001	5.1	1.64	9.76	20%	1.0	0.0	0.0
2002	11.3	1.64	9.76	20%	2.3	0.0	0.0
2003	10.6	1.64	9.76	20%	2.1	0.0	0.0
2004	11.6	1.64	9.76	20%	2.3	0.0	0.0
2005	11.9	1.64	9.76	20%	2.4	0.0	0.3
2006	11.5	1.64	9.76	20%	2.3	0.0	0.5
2007	13.3	1.64	9.76	20%	2.7	0.9	0.8
2008	11.5	1.64	9.76	20%	2.3	0.0	1.2
2009	11.5	1.64	9.76	20%	2.3	0.0	1.3
2010	12.2	1.64	9.76	20%	2.4	0.0	1.7
2011	12.0	1.64	9.76	20%	2.4	0.0	2.0
2012	11.6	1.64	9.76	20%	2.3	0.0	2.0
2013	11.4	1.64	9.76	20%	2.3	0.0	1.9

a = Average annual transfer from Haw to Neuse (see Table B-1)

b = Peaking factor specified in Certificate for first year, and to be approved by DWR thereafter

d = Percent consumptive use specified in Certificate for first year and to be approved by DWR thereafter

g = Average annual wastewater discharges and water reuse in Haw and Cape Fear Basins (see Table B-1)

Condition 2 (Facilitate Allocation Use)

The holders of this certificate shall manage the authorized transfer amount in such a way that none of the individual petitioners (Towns of Cary, Apex, Morrisville, and Wake County [for RTP South]) are prevented from fully using their respective Jordan Lake water supply allocations.

The IBT certificate requirements were not a limitation on Jordan Lake withdrawals for any of the allocation holders in 2013.

Condition 3 (Disaggregation of IBT Amount)

If the certificate holders discontinue their cooperative service agreement with each other, the maximum day permitted transfer will be adjusted by the Division of Water Resources based on the 2030 projections of each applicant at that time.

The cooperative service agreements between the certificate holders have remained in effect during 2013.

Condition 4 (Compliance and Monitoring Plan)

Prior to transferring water under this certificate, the holders of this certificate shall work with the Division of Water Resources to develop compliance and monitoring plan subject to approval by the Division. The plan shall include methodologies and reporting schedules for reporting the following information: maximum day transfer amounts, compliance with permit conditions, progress on mitigation measures, drought management, and reporting. A copy of the approved plan will be kept on file with the Division for public inspection. The Division of Water Resources shall have the authority to make modifications to the compliance and monitoring plan as necessary to assess compliance with the certificate.

Cary, Apex, Morrisville, and RTP South submitted a Compliance and Monitoring Plan concurrent with the submittal of the 2001 report. In 2003, the Division of Water Resources agreed to modify the submittal date of each annual report to be May 1 of the following year.

Condition 5 (EMC Consideration of Impacts)

If either the EIS is found at a later date to be incorrect or new information becomes available such that the environmental impacts associated with this transfer are substantially different from those projected impacts that formed the basis for the above Findings of Fact and this certificate, the Commission may reopen the certificate to adjust the existing conditions or require new conditions to ensure that the detriments continue to be mitigated to a reasonable degree.

This condition requires no action by the certificate holders.

Condition 6 (Intake Access)

The Towns of Cary and Apex shall be required to provide access at their existing intake site to other Jordan Lake water allocation holders that need access to utilize their allocation to the extent that this additional use is determined to be feasible by the Division of Water Resources. The cost associated with getting the necessary permits, engineering design, and associated construction costs are the responsibility of the allocation holder(s) requesting the access and not Cary and Apex.

The Town of Cary has continued to provide retail water service to RTP South and starting April 3rd, 2006, has merged utility services with the Town of Morrisville. Chatham County has continued to access their allocation through the Cary/Apex raw water intake on Jordan Lake.

Condition 7 (Drought Management Plan)

Prior to transferring water under this certificate, the Towns of Cary, Apex, and Morrisville, and Wake County (for RTP South) shall develop individual water shortage response plans subject to approval by the Division. The holders of this certificate shall develop a drought management plan for the interbasin transfer, incorporating the individual water shortage response plans and subject to approval by the Division. The plans shall tie specific water conservation actions to the percent storage remaining in each of the petitioners' Jordan Lake water supply accounts. A copy of the approved plans shall be kept on file with the Division for public inspection. The Division of Water Resources shall have the authority to approve modifications to the drought management plan as necessary.

Water Shortage Response Plans for each certificate holder were submitted as attachments to the 2001 Annual Report and have been updated in later years. The current Water Shortage Response Plans, which remained unchanged during 2013, are attached in Appendix C.

Condition 8 (Stream Buffer Rules)

Within six months from the effective date of this certificate, the Towns of Cary, Apex, and Morrisville, and Wake County (for RTP South) shall enact ordinances similar to or more protective than the Neuse River buffer rules (15A NCAC 2B.0233) for the parts of their jurisdictions that are within the Jordan Lake watershed. These buffer requirements shall be subject to approval by the Division of Water Resources after consultation with the Division of Water Quality and shall be adopted as local ordinances.

Each Town's buffer ordinance was submitted with the 2001 Annual Report.

In 2004, there was one change:

1. The Town of Morrisville put 370,312 feet of 50-foot wide stream buffers under a conservation easement.

In 2006, there were three changes:

1. The Town of Apex approved amendments to UDO Section 6.1.11 Riparian Buffers which clarified the zones for riparian buffers associated with perennial streams Zone 1 of the perennial buffer was defined as the inner 60 feet and zone 2 as the outer 40 feet.
2. The Town of Apex clarified the uses permitted within riparian buffers to allow new stormwater ponds (excluding dry ponds) that control nitrogen and associated stormwater outfalls in zone 2 of the riparian buffer provided that diffuse flow is met through zone 1 of the buffer. This is the outer 20 feet for an intermittent stream buffer (50 feet) and the outer 40 feet for a perennial stream buffer (100 feet).
3. Wake County (for RTP South) adopted a Unified Development Ordinance (UDO) on April 17th, 2006, which repealed and replaced the existing Zoning and Subdivision Ordinances. The UDO consolidates development regulations into a single document.

In 2008, there was 1 change:

1. The Town of Morrisville adopted new engineering standards (*Design and Construction Ordinance*), effective February 2008, which adopted revised stormwater quantity and quality standards for the Town, including application of Neuse River Basin performance standards throughout the jurisdiction.

In 2009, there was 1 change:

1. The Town of Morrisville approved amendments to its zoning ordinance (Zoning Ordinance), effective July 23, 2009, which included provisions for riparian buffers in the Cape Fear River Basin in response to the Jordan Lake Nutrient Management Strategy Rules.

In 2010, there were 2 changes:

1. The Town of Apex approved changes to its riparian buffer rules (Watershed Protection Overlay Districts), effective November 16, 2010, which incorporated the requirements of the Jordan Lake Nutrient Management Strategy Rules.

2. The Town of Cary approved minor changes to its riparian buffer rules (Land Use Development Ordinance) to remove allowable uses in its table of uses that conflicted with the Town's 100 ft. buffer rule and the state's 50 ft. buffer rule.

In 2011, there were 2 changes:

1. The Town of Cary approved modifications to the Jordan Lake Buffer to comply with the Jordan Lake Rules passed in 2009, effective July 14, 2011.
2. The Town of Morrisville adopted a Riparian Buffer Ordinance (for lands within both the Neuse River Basin and the Jordan Lake Watershed) to comply with the Jordan Lake Rules.

In 2012, there was 1 change:

1. The Town of Morrisville made minor changes to its Riparian Buffer Ordinance that it had adopted in 2011 to comply with the Jordan Lake Rules, as requested by NC DWQ.

In 2013, there were no changes.

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Appendix A:

Daily Tracking of Combined Jordan Lake Water Supply Allocations for 2013

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TABLE A-1
Jordan Lake Water Supply Storage Allocation Tracking
Cary/Apex, Morrisville, and Wake County/RTP South COMBINED

Date	Reservoir Level (ft)	Cary/Apex/ Morrisville/RTP Water Supply (mgd)	Cary/Apex/ Morrisville/RTP Water Supply (cfs)	Inflow to Cary/Apex/ Morrisville/RTP (cfs) [1]	Cary/Apex/ Morrisville/RTP Storage Level (ac-ft)	Cary/Apex/ Morrisville/RTP Storage Level (%)
1/1/2013	215.12	16.12	24.94	24.94	17,862.00	100.00%
1/2/2013	215.18	16.07	24.86	24.86	17,862.00	100.00%
1/3/2013	215.28	17.39	26.90	26.90	17,862.00	100.00%
1/4/2013	215.36	16.76	25.93	25.93	17,862.00	100.00%
1/5/2013	215.42	15.82	24.47	24.47	17,862.00	100.00%
1/6/2013	215.48	15.85	24.52	24.52	17,862.00	100.00%
1/7/2013	215.51	16.02	24.78	24.78	17,862.00	100.00%
1/8/2013	215.53	15.72	24.32	24.32	17,862.00	100.00%
1/9/2013	215.54	15.69	24.27	24.27	17,862.00	100.00%
1/10/2013	215.55	16.77	25.94	25.94	17,862.00	100.00%
1/11/2013	215.58	15.48	23.95	23.95	17,862.00	100.00%
1/12/2013	215.60	14.46	22.37	22.37	17,862.00	100.00%
1/13/2013	215.62	16.71	25.85	25.85	17,862.00	100.00%
1/14/2013	215.64	16.64	25.74	25.74	17,862.00	100.00%
1/15/2013	215.71	16.24	25.12	25.12	17,862.00	100.00%
1/16/2013	215.96	15.74	24.35	24.35	17,862.00	100.00%
1/17/2013	216.62	14.78	22.86	22.86	17,862.00	100.00%
1/18/2013	218.91	15.63	24.18	24.18	17,862.00	100.00%
1/19/2013	219.86	15.88	24.57	24.57	17,862.00	100.00%
1/20/2013	219.75	15.77	24.40	24.40	17,862.00	100.00%
1/21/2013	219.31	15.09	23.34	23.34	17,862.00	100.00%
1/22/2013	218.73	16.43	25.42	25.42	17,862.00	100.00%
1/23/2013	218.19	15.78	24.41	24.41	17,862.00	100.00%
1/24/2013	217.53	15.87	24.55	24.55	17,862.00	100.00%
1/25/2013	217.00	15.98	24.72	24.72	17,862.00	100.00%
1/26/2013	216.80	14.70	22.74	22.74	17,862.00	100.00%
1/27/2013	216.64	14.91	23.07	23.07	17,862.00	100.00%
1/28/2013	216.58	16.30	25.22	25.22	17,862.00	100.00%
1/29/2013	216.55	15.37	23.78	23.78	17,862.00	100.00%
1/30/2013	216.35	14.92	23.08	23.08	17,862.00	100.00%
1/31/2013	216.53	14.50	22.43	22.43	17,862.00	100.00%
2/1/2013	216.74	14.40	22.28	22.28	17,862.00	100.00%
2/2/2013	216.74	14.78	22.86	22.86	17,862.00	100.00%
2/3/2013	216.74	14.82	22.93	22.93	17,862.00	100.00%
2/4/2013	216.67	16.74	25.90	25.90	17,862.00	100.00%
2/5/2013	216.61	16.66	25.77	25.77	17,862.00	100.00%
2/6/2013	216.52	14.83	22.94	22.94	17,862.00	100.00%
2/7/2013	216.52	16.05	24.83	24.83	17,862.00	100.00%
2/8/2013	216.80	16.77	25.94	25.94	17,862.00	100.00%
2/9/2013	217.03	16.63	25.73	25.73	17,862.00	100.00%
2/10/2013	216.75	15.89	24.58	24.58	17,862.00	100.00%
2/11/2013	216.60	16.30	25.22	25.22	17,862.00	100.00%
2/12/2013	216.63	16.03	24.80	24.80	17,862.00	100.00%

TABLE A-1
Jordan Lake Water Supply Storage Allocation Tracking
Cary/Apex, Morrisville, and Wake County/RTP South COMBINED

Date	Reservoir Level (ft)	Cary/Apex/ Morrisville/RTP Water Supply (mgd)	Cary/Apex/ Morrisville/RTP Water Supply (cfs)	Inflow to Cary/Apex/ Morrisville/RTP (cfs) [1]	Cary/Apex/ Morrisville/RTP Storage Level (ac-ft)	Cary/Apex/ Morrisville/RTP Storage Level (%)
2/13/2013	216.57	15.79	24.43	24.43	17,862.00	100.00%
2/14/2013	216.45	15.59	24.12	24.12	17,862.00	100.00%
2/15/2013	216.37	16.07	24.86	24.86	17,862.00	100.00%
2/16/2013	216.26	14.97	23.16	23.16	17,862.00	100.00%
2/17/2013	216.12	14.79	22.88	22.88	17,862.00	100.00%
2/18/2013	216.16	17.82	27.57	27.57	17,862.00	100.00%
2/19/2013	216.25	16.19	25.05	25.05	17,862.00	100.00%
2/20/2013	216.30	15.83	24.49	24.49	17,862.00	100.00%
2/21/2013	216.34	15.96	24.69	24.69	17,862.00	100.00%
2/22/2013	216.44	15.70	24.29	24.29	17,862.00	100.00%
2/23/2013	216.82	15.35	23.75	23.75	17,862.00	100.00%
2/24/2013	217.23	15.61	24.15	24.15	17,862.00	100.00%
2/25/2013	217.25	16.39	25.36	25.36	17,862.00	100.00%
2/26/2013	217.49	16.00	24.75	24.75	17,862.00	100.00%
2/27/2013	218.56	15.72	24.32	24.32	17,862.00	100.00%
2/28/2013	218.67	15.30	23.67	23.67	17,862.00	100.00%
3/1/2013	218.30	18.41	28.48	28.48	17,862.00	100.00%
3/2/2013	217.78	15.66	24.23	24.23	17,862.00	100.00%
3/3/2013	217.16	15.64	24.20	24.20	17,862.00	100.00%
3/4/2013	216.77	17.73	27.43	27.43	17,862.00	100.00%
3/5/2013	216.74	17.41	26.93	26.93	17,862.00	100.00%
3/6/2013	216.67	18.31	28.33	28.33	17,862.00	100.00%
3/7/2013	216.62	19.64	30.38	30.38	17,862.00	100.00%
3/8/2013	216.51	18.07	27.95	27.95	17,862.00	100.00%
3/9/2013	216.36	15.99	24.74	24.74	17,862.00	100.00%
3/10/2013	216.27	16.19	25.05	25.05	17,862.00	100.00%
3/11/2013	216.25	18.55	28.70	28.70	17,862.00	100.00%
3/12/2013	216.43	18.24	28.22	28.22	17,862.00	100.00%
3/13/2013	216.98	19.46	30.10	30.10	17,862.00	100.00%
3/14/2013	216.83	18.38	28.43	28.43	17,862.00	100.00%
3/15/2013	216.62	16.39	25.36	25.36	17,862.00	100.00%
3/16/2013	216.54	16.25	25.14	25.14	17,862.00	100.00%
3/17/2013	216.44	16.04	24.81	24.81	17,862.00	100.00%
3/18/2013	216.36	18.21	28.17	28.17	17,862.00	100.00%
3/19/2013	216.42	18.21	28.17	28.17	17,862.00	100.00%
3/20/2013	216.43	17.63	27.27	27.27	17,862.00	100.00%
3/21/2013	216.44	16.97	26.25	26.25	17,862.00	100.00%
3/22/2013	216.39	19.36	29.95	29.95	17,862.00	100.00%
3/23/2013	216.34	16.88	26.11	26.11	17,862.00	100.00%
3/24/2013	216.40	16.64	25.74	25.74	17,862.00	100.00%
3/25/2013	216.68	16.93	26.19	26.19	17,862.00	100.00%
3/26/2013	216.79	18.73	28.98	28.98	17,862.00	100.00%
3/27/2013	216.48	17.59	27.21	27.21	17,862.00	100.00%

TABLE A-1
Jordan Lake Water Supply Storage Allocation Tracking
Cary/Apex, Morrisville, and Wake County/RTP South COMBINED

Date	Reservoir Level (ft)	Cary/Apex/ Morrisville/RTP Water Supply (mgd)	Cary/Apex/ Morrisville/RTP Water Supply (cfs)	Inflow to Cary/Apex/ Morrisville/RTP (cfs) [1]	Cary/Apex/ Morrisville/RTP Storage Level (ac-ft)	Cary/Apex/ Morrisville/RTP Storage Level (%)
3/28/2013	216.48	17.81	27.55	27.55	17,862.00	100.00%
3/29/2013	216.36	17.07	26.41	26.41	17,862.00	100.00%
3/30/2013	216.32	16.09	24.89	24.89	17,862.00	100.00%
3/31/2013	216.41	16.63	25.73	25.73	17,862.00	100.00%
4/1/2013	216.56	18.52	28.65	28.65	17,862.00	100.00%
4/2/2013	216.59	15.69	24.27	24.27	17,862.00	100.00%
4/3/2013	216.43	16.18	25.03	25.03	17,862.00	100.00%
4/4/2013	216.53	16.97	26.25	26.25	17,862.00	100.00%
4/5/2013	216.94	15.97	24.71	24.71	17,862.00	100.00%
4/6/2013	217.03	16.87	26.10	26.10	17,862.00	100.00%
4/7/2013	216.73	16.87	26.10	26.10	17,862.00	100.00%
4/8/2013	216.48	17.40	26.92	26.92	17,862.00	100.00%
4/9/2013	216.35	17.60	27.23	27.23	17,862.00	100.00%
4/10/2013	216.28	18.83	29.13	29.13	17,862.00	100.00%
4/11/2013	216.28	18.35	28.39	28.39	17,862.00	100.00%
4/12/2013	216.43	15.94	24.66	24.66	17,862.00	100.00%
4/13/2013	216.42	17.81	27.55	27.55	17,862.00	100.00%
4/14/2013	216.32	17.53	27.12	27.12	17,862.00	100.00%
4/15/2013	216.21	19.69	30.46	30.46	17,862.00	100.00%
4/16/2013	216.17	17.59	27.21	27.21	17,862.00	100.00%
4/17/2013	216.17	17.90	27.69	27.69	17,862.00	100.00%
4/18/2013	216.19	18.66	28.87	28.87	17,862.00	100.00%
4/19/2013	216.27	20.01	30.96	30.96	17,862.00	100.00%
4/20/2013	216.39	16.59	25.66	25.66	17,862.00	100.00%
4/21/2013	216.45	16.65	25.76	25.76	17,862.00	100.00%
4/22/2013	216.35	19.66	30.41	30.41	17,862.00	100.00%
4/23/2013	216.21	16.90	26.14	26.14	17,862.00	100.00%
4/24/2013	216.21	17.81	27.55	27.55	17,862.00	100.00%
4/25/2013	216.20	20.01	30.96	30.96	17,862.00	100.00%
4/26/2013	216.17	18.43	28.51	28.51	17,862.00	100.00%
4/27/2013	216.14	18.76	29.02	29.02	17,862.00	100.00%
4/28/2013	216.21	18.70	28.93	28.93	17,862.00	100.00%
4/29/2013	216.70	17.69	27.37	27.37	17,862.00	100.00%
4/30/2013	217.23	17.73	27.43	27.43	17,862.00	100.00%
5/1/2013	217.27	17.12	26.48	26.48	17,862.00	100.00%
5/2/2013	217.22	16.98	26.27	26.27	17,862.00	100.00%
5/3/2013	217.05	18.37	28.42	28.42	17,862.00	100.00%
5/4/2013	216.83	19.47	30.12	30.12	17,862.00	100.00%
5/5/2013	216.57	17.85	27.61	27.61	17,862.00	100.00%
5/6/2013	216.60	16.05	24.83	24.83	17,862.00	100.00%
5/7/2013	217.00	17.41	26.93	26.93	17,862.00	100.00%
5/8/2013	217.21	19.39	30.00	30.00	17,862.00	100.00%
5/9/2013	217.10	17.71	27.40	27.40	17,862.00	100.00%

TABLE A-1
Jordan Lake Water Supply Storage Allocation Tracking
Cary/Apex, Morrisville, and Wake County/RTP South COMBINED

Date	Reservoir Level (ft)	Cary/Apex/ Morrisville/RTP Water Supply (mgd)	Cary/Apex/ Morrisville/RTP Water Supply (cfs)	Inflow to Cary/Apex/ Morrisville/RTP (cfs) [1]	Cary/Apex/ Morrisville/RTP Storage Level (ac-ft)	Cary/Apex/ Morrisville/RTP Storage Level (%)
5/10/2013	216.84	17.83	27.58	27.58	17,862.00	100.00%
5/11/2013	216.62	17.91	27.71	27.71	17,862.00	100.00%
5/12/2013	216.50	18.15	28.08	28.08	17,862.00	100.00%
5/13/2013	216.34	18.07	27.95	27.95	17,862.00	100.00%
5/14/2013	216.23	20.71	32.04	32.04	17,862.00	100.00%
5/15/2013	216.23	18.49	28.60	28.60	17,862.00	100.00%
5/16/2013	216.21	21.96	33.97	33.97	17,862.00	100.00%
5/17/2013	216.17	20.80	32.18	32.18	17,862.00	100.00%
5/18/2013	216.20	18.63	28.82	28.82	17,862.00	100.00%
5/19/2013	216.40	18.24	28.22	28.22	17,862.00	100.00%
5/20/2013	216.91	16.99	26.28	26.28	17,862.00	100.00%
5/21/2013	217.53	18.67	28.88	28.88	17,862.00	100.00%
5/22/2013	217.62	18.45	28.54	28.54	17,862.00	100.00%
5/23/2013	217.48	18.14	28.06	28.06	17,862.00	100.00%
5/24/2013	217.33	19.01	29.41	29.41	17,862.00	100.00%
5/25/2013	216.93	18.25	28.23	28.23	17,862.00	100.00%
5/26/2013	216.52	19.03	29.44	29.44	17,862.00	100.00%
5/27/2013	216.22	16.72	25.87	25.87	17,862.00	100.00%
5/28/2013	216.10	22.00	34.03	34.03	17,862.00	100.00%
5/29/2013	216.12	21.94	33.94	33.94	17,862.00	100.00%
5/30/2013	216.14	22.76	35.21	35.21	17,862.00	100.00%
5/31/2013	216.12	24.38	37.72	37.72	17,862.00	100.00%
6/1/2013	216.10	24.81	38.38	38.38	17,862.00	100.00%
6/2/2013	216.07	23.16	35.83	35.83	17,862.00	100.00%
6/3/2013	216.17	18.23	28.20	28.20	17,862.00	100.00%
6/4/2013	216.29	19.73	30.52	30.52	17,862.00	100.00%
6/5/2013	216.37	22.89	35.41	35.41	17,862.00	100.00%
6/6/2013	216.42	19.50	30.17	30.17	17,862.00	100.00%
6/7/2013	217.61	17.14	26.52	26.52	17,862.00	100.00%
6/8/2013	219.28	18.56	28.71	28.71	17,862.00	100.00%
6/9/2013	219.92	18.48	28.59	28.59	17,862.00	100.00%
6/10/2013	220.42	19.44	30.07	30.07	17,862.00	100.00%
6/11/2013	221.06	19.64	30.38	30.38	17,862.00	100.00%
6/12/2013	220.75	20.20	31.25	31.25	17,862.00	100.00%
6/13/2013	220.03	19.57	30.27	30.27	17,862.00	100.00%
6/14/2013	219.24	20.90	32.33	32.33	17,862.00	100.00%
6/15/2013	218.39	21.22	32.83	32.83	17,862.00	100.00%
6/16/2013	217.47	21.23	32.84	32.84	17,862.00	100.00%
6/17/2013	216.83	19.02	29.42	29.42	17,862.00	100.00%
6/18/2013	216.59	20.62	31.90	31.90	17,862.00	100.00%
6/19/2013	216.48	19.40	30.01	30.01	17,862.00	100.00%
6/20/2013	216.37	20.30	31.40	31.40	17,862.00	100.00%
6/21/2013	216.30	22.54	34.87	34.87	17,862.00	100.00%

TABLE A-1
Jordan Lake Water Supply Storage Allocation Tracking
Cary/Apex, Morrisville, and Wake County/RTP South COMBINED

Date	Reservoir Level (ft)	Cary/Apex/ Morrisville/RTP Water Supply (mgd)	Cary/Apex/ Morrisville/RTP Water Supply (cfs)	Inflow to Cary/Apex/ Morrisville/RTP (cfs) [1]	Cary/Apex/ Morrisville/RTP Storage Level (ac-ft)	Cary/Apex/ Morrisville/RTP Storage Level (%)
6/22/2013	216.28	21.07	32.60	32.60	17,862.00	100.00%
6/23/2013	216.24	22.45	34.73	34.73	17,862.00	100.00%
6/24/2013	216.20	19.08	29.52	29.52	17,862.00	100.00%
6/25/2013	216.19	23.61	36.52	36.52	17,862.00	100.00%
6/26/2013	216.25	22.17	34.30	34.30	17,862.00	100.00%
6/27/2013	216.32	20.52	31.74	31.74	17,862.00	100.00%
6/28/2013	216.48	23.06	35.67	35.67	17,862.00	100.00%
6/29/2013	216.96	17.82	27.57	27.57	17,862.00	100.00%
6/30/2013	218.36	20.31	31.42	31.42	17,862.00	100.00%
7/1/2013	220.34	16.64	25.74	25.74	17,862.00	100.00%
7/2/2013	221.01	18.24	28.22	28.22	17,862.00	100.00%
7/3/2013	221.65	19.64	30.38	30.38	17,862.00	100.00%
7/4/2013	222.57	18.84	29.15	29.15	17,862.00	100.00%
7/5/2013	222.48	17.98	27.82	27.82	17,862.00	100.00%
7/6/2013	221.91	20.36	31.50	31.50	17,862.00	100.00%
7/7/2013	221.20	20.22	31.28	31.28	17,862.00	100.00%
7/8/2013	220.81	20.52	31.74	31.74	17,862.00	100.00%
7/9/2013	220.57	20.96	32.43	32.43	17,862.00	100.00%
7/10/2013	219.95	21.44	33.17	33.17	17,862.00	100.00%
7/11/2013	220.15	19.03	29.44	29.44	17,862.00	100.00%
7/12/2013	220.49	18.51	28.63	28.63	17,862.00	100.00%
7/13/2013	220.11	18.46	28.56	28.56	17,862.00	100.00%
7/14/2013	219.36	18.20	28.16	28.16	17,862.00	100.00%
7/15/2013	218.71	18.04	27.91	27.91	17,862.00	100.00%
7/16/2013	217.85	20.45	31.64	31.64	17,862.00	100.00%
7/17/2013	216.94	22.84	35.33	35.33	17,862.00	100.00%
7/18/2013	216.28	21.74	33.63	33.63	17,862.00	100.00%
7/19/2013	215.96	21.21	32.81	32.81	17,862.00	100.00%
7/20/2013	215.95	23.04	35.64	35.64	17,862.00	100.00%
7/21/2013	215.95	22.10	34.19	34.19	17,862.00	100.00%
7/22/2013	215.96	20.74	32.08	32.08	17,862.00	100.00%
7/23/2013	216.08	20.72	32.05	32.05	17,862.00	100.00%
7/24/2013	216.06	24.43	37.79	37.79	17,862.00	100.00%
7/25/2013	216.11	22.95	35.50	35.50	17,862.00	100.00%
7/26/2013	216.15	25.06	38.77	38.77	17,862.00	100.00%
7/27/2013	216.15	23.05	35.66	35.66	17,862.00	100.00%
7/28/2013	216.19	18.74	28.99	28.99	17,862.00	100.00%
7/29/2013	216.29	22.39	34.64	34.64	17,862.00	100.00%
7/30/2013	216.25	22.43	34.70	34.70	17,862.00	100.00%
7/31/2013	216.08	21.46	33.20	33.20	17,862.00	100.00%
8/1/2013	216.32	21.17	32.75	32.75	17,862.00	100.00%
8/2/2013	216.42	19.79	30.62	30.62	17,862.00	100.00%
8/3/2013	216.24	20.74	32.08	32.08	17,862.00	100.00%

TABLE A-1
Jordan Lake Water Supply Storage Allocation Tracking
Cary/Apex, Morrisville, and Wake County/RTP South COMBINED

Date	Reservoir Level (ft)	Cary/Apex/ Morrisville/RTP Water Supply (mgd)	Cary/Apex/ Morrisville/RTP Water Supply (cfs)	Inflow to Cary/Apex/ Morrisville/RTP (cfs) [1]	Cary/Apex/ Morrisville/RTP Storage Level (ac-ft)	Cary/Apex/ Morrisville/RTP Storage Level (%)
8/4/2013	215.98	18.74	28.99	28.99	17,862.00	100.00%
8/5/2013	215.88	19.85	30.71	30.71	17,862.00	100.00%
8/6/2013	215.92	20.20	31.25	31.25	17,862.00	100.00%
8/7/2013	215.98	20.74	32.08	32.08	17,862.00	100.00%
8/8/2013	216.03	22.74	35.18	35.18	17,862.00	100.00%
8/9/2013	216.03	23.50	36.35	36.35	17,862.00	100.00%
8/10/2013	216.02	20.76	32.12	32.12	17,862.00	100.00%
8/11/2013	216.06	21.48	33.23	33.23	17,862.00	100.00%
8/12/2013	216.11	20.19	31.23	31.23	17,862.00	100.00%
8/13/2013	216.22	20.35	31.48	31.48	17,862.00	100.00%
8/14/2013	216.27	22.08	34.16	34.16	17,862.00	100.00%
8/15/2013	216.18	21.50	33.26	33.26	17,862.00	100.00%
8/16/2013	216.11	20.35	31.48	31.48	17,862.00	100.00%
8/17/2013	216.10	20.47	31.67	31.67	17,862.00	100.00%
8/18/2013	216.27	18.54	28.68	28.68	17,862.00	100.00%
8/19/2013	216.71	20.38	31.53	31.53	17,862.00	100.00%
8/20/2013	216.88	18.43	28.51	28.51	17,862.00	100.00%
8/21/2013	216.89	18.69	28.91	28.91	17,862.00	100.00%
8/22/2013	217.19	20.90	32.33	32.33	17,862.00	100.00%
8/23/2013	216.89	20.66	31.96	31.96	17,862.00	100.00%
8/24/2013	216.39	21.53	33.31	33.31	17,862.00	100.00%
8/25/2013	216.03	21.43	33.15	33.15	17,862.00	100.00%
8/26/2013	216.02	20.65	31.95	31.95	17,862.00	100.00%
8/27/2013	216.00	24.01	37.14	37.14	17,862.00	100.00%
8/28/2013	215.96	24.85	38.44	38.44	17,862.00	100.00%
8/29/2013	215.99	22.07	34.14	34.14	17,862.00	100.00%
8/30/2013	215.96	22.43	34.70	34.70	17,862.00	100.00%
8/31/2013	215.93	23.15	35.81	35.81	17,862.00	100.00%
9/1/2013	215.94	20.67	31.98	31.98	17,862.00	100.00%
9/2/2013	216.19	17.02	26.33	26.33	17,862.00	100.00%
9/3/2013	216.41	21.70	33.57	33.57	17,862.00	100.00%
9/4/2013	216.42	21.14	32.70	32.70	17,862.00	100.00%
9/5/2013	216.39	21.63	33.46	33.46	17,862.00	100.00%
9/6/2013	216.35	21.56	33.35	33.35	17,862.00	100.00%
9/7/2013	216.28	21.36	33.04	33.04	17,862.00	100.00%
9/8/2013	216.24	22.17	34.30	34.30	17,862.00	100.00%
9/9/2013	216.17	22.03	34.08	34.08	17,862.00	100.00%
9/10/2013	216.12	22.73	35.16	35.16	17,862.00	100.00%
9/11/2013	216.09	25.05	38.75	38.75	17,862.00	100.00%
9/12/2013	216.04	23.89	36.96	29.83	17,862.00	100.00%
9/13/2013	216.00	21.77	33.68	33.68	17,862.00	100.00%
9/14/2013	215.88	22.61	34.98	(37.02)	17,719.19	99.20%
9/15/2013	215.81	23.51	36.37	6.62	17,660.17	98.87%

TABLE A-1
Jordan Lake Water Supply Storage Allocation Tracking
Cary/Apex, Morrisville, and Wake County/RTP South COMBINED

Date	Reservoir Level (ft)	Cary/Apex/ Morrisville/RTP Water Supply (mgd)	Cary/Apex/ Morrisville/RTP Water Supply (cfs)	Inflow to Cary/Apex/ Morrisville/RTP (cfs) [1]	Cary/Apex/ Morrisville/RTP Storage Level (ac-ft)	Cary/Apex/ Morrisville/RTP Storage Level (%)
9/16/2013	215.82	20.46	31.65	126.61	17,848.53	99.92%
9/17/2013	215.67	21.17	32.75	(73.66)	17,637.47	98.74%
9/18/2013	215.59	22.58	34.93	(8.14)	17,552.03	98.26%
9/19/2013	215.54	22.58	34.93	23.66	17,529.68	98.14%
9/20/2013	215.48	20.94	32.39	14.63	17,494.45	97.94%
9/21/2013	215.58	18.99	29.38	214.68	17,862.00	100.00%
9/22/2013	215.56	18.62	28.81	28.81	17,862.00	100.00%
9/23/2013	215.59	19.43	30.06	30.06	17,862.00	100.00%
9/24/2013	215.61	19.37	29.97	29.97	17,862.00	100.00%
9/25/2013	215.61	21.41	33.12	33.12	17,862.00	100.00%
9/26/2013	215.59	22.38	34.62	34.62	17,862.00	100.00%
9/27/2013	215.55	22.72	35.15	17.46	17,826.91	99.80%
9/28/2013	215.50	19.98	30.91	9.68	17,784.81	99.57%
9/29/2013	215.45	22.97	35.53	25.94	17,765.78	99.46%
9/30/2013	215.40	19.86	30.72	24.69	17,753.81	99.39%
10/1/2013	215.35	22.09	34.17	25.86	17,737.32	99.30%
10/2/2013	215.30	23.96	37.07	26.47	17,716.31	99.18%
10/3/2013	215.24	23.14	35.80	18.80	17,682.61	99.00%
10/4/2013	215.18	23.52	36.39	25.58	17,661.17	98.88%
10/5/2013	215.11	23.08	35.70	4.98	17,600.24	98.53%
10/6/2013	215.06	23.15	35.81	44.97	17,618.41	98.64%
10/7/2013	215.17	18.39	28.45	151.26	17,862.00	100.00%
10/8/2013	215.18	18.50	28.62	28.62	17,862.00	100.00%
10/9/2013	215.27	18.88	29.21	29.21	17,862.00	100.00%
10/10/2013	215.26	18.77	29.04	29.04	17,862.00	100.00%
10/11/2013	215.27	18.91	29.25	29.25	17,862.00	100.00%
10/12/2013	215.30	19.32	29.89	29.89	17,862.00	100.00%
10/13/2013	215.33	17.72	27.41	27.41	17,862.00	100.00%
10/14/2013	215.26	17.58	27.20	(19.72)	17,768.94	99.48%
10/15/2013	215.25	19.11	29.56	59.81	17,828.94	99.81%
10/16/2013	215.22	19.02	29.42	46.09	17,862.00	100.00%
10/17/2013	215.17	18.99	29.38	14.56	17,832.60	99.84%
10/18/2013	215.15	20.43	31.61	46.43	17,862.00	100.00%
10/19/2013	215.11	19.40	30.01	30.01	17,862.00	100.00%
10/20/2013	215.08	18.18	28.12	28.12	17,862.00	100.00%
10/21/2013	215.04	18.72	28.96	28.96	17,862.00	100.00%
10/22/2013	214.89	18.92	29.27	(76.46)	17,652.29	98.83%
10/23/2013	214.85	19.58	30.29	16.54	17,625.01	98.67%
10/24/2013	214.80	19.90	30.79	8.14	17,580.10	98.42%
10/25/2013	214.74	18.86	29.18	0.51	17,523.24	98.10%
10/26/2013	214.69	18.45	28.54	11.83	17,490.09	97.92%
10/27/2013	214.64	18.56	28.71	11.83	17,456.61	97.73%
10/28/2013	214.60	18.94	29.30	20.35	17,438.87	97.63%

TABLE A-1
Jordan Lake Water Supply Storage Allocation Tracking
Cary/Apex, Morrisville, and Wake County/RTP South COMBINED

Date	Reservoir Level (ft)	Cary/Apex/ Morrisville/RTP Water Supply (mgd)	Cary/Apex/ Morrisville/RTP Water Supply (cfs)	Inflow to Cary/Apex/ Morrisville/RTP (cfs) [1]	Cary/Apex/ Morrisville/RTP Storage Level (ac-ft)	Cary/Apex/ Morrisville/RTP Storage Level (%)
10/29/2013	214.56	19.75	30.55	37.72	17,453.09	97.71%
10/30/2013	214.51	18.54	28.68	27.00	17,449.75	97.69%
10/31/2013	214.44	20.31	31.42	(4.58)	17,378.34	97.29%
11/1/2013	214.51	18.41	28.48	257.46	17,832.53	99.84%
11/2/2013	214.48	16.80	25.99	40.85	17,862.00	100.00%
11/3/2013	214.47	17.70	27.38	27.38	17,862.00	100.00%
11/4/2013	214.44	17.67	27.34	27.34	17,862.00	100.00%
11/5/2013	214.39	17.63	27.27	7.32	17,822.43	99.78%
11/6/2013	214.34	17.38	26.89	7.04	17,783.06	99.56%
11/7/2013	214.32	18.95	29.32	67.39	17,858.58	99.98%
11/8/2013	214.26	18.23	28.20	(5.09)	17,792.55	99.61%
11/9/2013	214.20	17.31	26.78	(5.22)	17,729.09	99.26%
11/10/2013	214.21	17.07	26.41	93.42	17,862.00	100.00%
11/11/2013	214.12	17.90	27.69	(30.02)	17,747.52	99.36%
11/12/2013	214.12	18.77	29.04	64.99	17,818.84	99.76%
11/13/2013	214.03	16.83	26.04	(30.41)	17,706.89	99.13%
11/14/2013	213.98	16.97	26.25	5.22	17,665.17	98.90%
11/15/2013	213.96	17.06	26.39	42.88	17,697.87	99.08%
11/16/2013	213.93	16.88	26.11	58.11	17,761.34	99.44%
11/17/2013	213.86	17.01	26.31	(7.25)	17,694.76	99.06%
11/18/2013	213.89	16.80	25.99	110.30	17,862.00	100.00%
11/19/2013	213.83	17.11	26.47	1.76	17,812.99	99.73%
11/20/2013	213.78	16.39	25.36	11.49	17,785.48	99.57%
11/21/2013	213.76	16.19	25.05	57.36	17,849.58	99.93%
11/22/2013	213.75	16.88	26.11	32.37	17,862.00	100.00%
11/23/2013	213.74	16.48	25.49	25.49	17,862.00	100.00%
11/24/2013	213.65	16.77	25.94	(27.86)	17,755.28	99.40%
11/25/2013	213.62	17.18	26.58	20.23	17,742.69	99.33%
11/26/2013	213.75	16.86	26.08	86.24	17,862.00	100.00%
11/27/2013	214.00	14.88	23.02	23.02	17,862.00	100.00%
11/28/2013	214.38	16.12	24.94	24.94	17,862.00	100.00%
11/29/2013	214.55	15.90	24.60	24.60	17,862.00	100.00%
11/30/2013	214.61	14.98	23.17	23.17	17,862.00	100.00%
12/1/2013	214.65	15.29	23.65	23.65	17,862.00	100.00%
12/2/2013	214.68	15.77	24.40	24.40	17,862.00	100.00%
12/3/2013	214.70	17.06	26.39	26.39	17,862.00	100.00%
12/4/2013	214.70	17.09	26.44	26.44	17,862.00	100.00%
12/5/2013	214.70	17.01	26.31	26.31	17,862.00	100.00%
12/6/2013	214.72	15.30	23.67	23.67	17,862.00	100.00%
12/7/2013	214.78	15.42	23.85	23.85	17,862.00	100.00%
12/8/2013	214.82	16.07	24.86	24.86	17,862.00	100.00%
12/9/2013	214.89	16.15	24.98	24.98	17,862.00	100.00%
12/10/2013	215.04	16.75	25.91	25.91	17,862.00	100.00%

TABLE A-1
Jordan Lake Water Supply Storage Allocation Tracking
Cary/Apex, Morrisville, and Wake County/RTP South COMBINED

Date	Reservoir Level (ft)	Cary/Apex/ Morrisville/RTP Water Supply (mgd)	Cary/Apex/ Morrisville/RTP Water Supply (cfs)	Inflow to Cary/Apex/ Morrisville/RTP (cfs) [1]	Cary/Apex/ Morrisville/RTP Storage Level (ac-ft)	Cary/Apex/ Morrisville/RTP Storage Level (%)
12/11/2013	215.38	15.65	24.21	24.21	17,862.00	100.00%
12/12/2013	215.56	16.14	24.97	24.97	17,862.00	100.00%
12/13/2013	215.67	16.25	25.14	25.14	17,862.00	100.00%
12/14/2013	215.87	15.85	24.52	24.52	17,862.00	100.00%
12/15/2013	216.33	15.98	24.72	24.72	17,862.00	100.00%
12/16/2013	216.76	16.04	24.81	24.81	17,862.00	100.00%
12/17/2013	216.80	16.40	25.37	25.37	17,862.00	100.00%
12/18/2013	216.82	15.98	24.72	24.72	17,862.00	100.00%
12/19/2013	216.80	17.10	26.45	26.45	17,862.00	100.00%
12/20/2013	216.73	17.54	27.13	27.13	17,862.00	100.00%
12/21/2013	216.60	16.29	25.20	25.20	17,862.00	100.00%
12/22/2013	216.47	15.94	24.66	24.66	17,862.00	100.00%
12/23/2013	217.12	16.14	24.97	24.97	17,862.00	100.00%
12/24/2013	218.35	16.04	24.81	24.81	17,862.00	100.00%
12/25/2013	218.69	15.15	23.44	23.44	17,862.00	100.00%
12/26/2013	218.69	14.84	22.96	22.96	17,862.00	100.00%
12/27/2013	218.29	15.05	23.28	23.28	17,862.00	100.00%
12/28/2013	218.04	14.66	22.68	22.68	17,862.00	100.00%
12/29/2013	219.20	14.84	22.96	22.96	17,862.00	100.00%
12/30/2013	220.52	15.21	23.53	23.53	17,862.00	100.00%
12/31/2013	220.31	16.68	25.80	25.80	17,862.00	100.00%

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Appendix B

Daily Interbasin Transfer Estimates for 2013

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	(3)	(4)	(5)	(7)=3+4+5	(8)	(9)	(10)	(11)	(12)	(13)	L=8+9+10 +11+12+13	(14)	(15)	(17)	(16)	(18)=8+9+ 14+15	R=10+11+ 17	19=12+13 +16	T=18+R+ 19	(21)=18-3	(22)=R	(23)=19-4- 5	(24)=22	(25)=23
	Water Withdrawal/Purchase (mgd)				Consumptive Use (mgd)							Water Use Discharged as Wastewater (mgd)				Total Returned/Used in Each Basin (mgd)				Net Basin Gain(+)/Loss(-) (mgd)			Interbasin Transfer (mgd)	
	Jordan Lake Withdrawal	Neuse Basin Purchase		Total System Use	Haw		Cape Fear		Neuse		Total	Haw		Cape Fear	Neuse	Haw	Cape Fear	Neuse	Total- All Basins	Haw	Cape Fear	Neuse	Haw to Cape Fear	Haw to Neuse
DATE	Haw	Raleigh	Durham		Potable	WRF Reuse	Potable	WRF Reuse	Potable	WRF Reuse		WTP Process Water	WRF	WRF	Total WRFs									
1/1/2013	16.12	0.00	0.00	16.12	0.20	0.00	0.01	0.00	0.47	0.69	1.36	2.78	1.72	0.00	10.26	4.70	0.01	11.41	16.12	-11.42	0.01	11.41	0.01	11.41
1/2/2013	16.07	0.00	0.00	16.07	0.25	0.00	0.01	0.00	0.62	0.77	1.65	1.82	1.65	0.00	10.96	3.72	0.01	12.34	16.07	-12.35	0.01	12.34	0.01	12.34
1/3/2013	17.39	0.00	0.00	17.39	0.23	0.00	0.01	0.00	0.55	0.67	1.45	3.42	1.77	0.00	10.76	5.41	0.01	11.97	17.39	-11.98	0.01	11.97	0.01	11.97
1/4/2013	16.76	0.00	0.00	16.76	0.25	0.00	0.01	0.00	0.61	0.69	1.56	2.42	1.58	0.00	11.19	4.26	0.01	12.50	16.76	-12.50	0.01	12.50	0.01	12.50
1/5/2013	15.82	0.00	0.00	15.82	0.22	0.00	0.01	0.00	0.52	0.67	1.42	2.11	1.60	0.00	10.70	3.92	0.01	11.89	15.82	-11.90	0.01	11.89	0.01	11.89
1/6/2013	15.85	0.00	0.00	15.85	0.25	0.00	0.00	0.00	0.61	0.68	1.54	1.78	1.53	0.00	11.00	3.56	0.00	12.29	15.85	-12.29	0.00	12.29	0.00	12.29
1/7/2013	16.02	0.00	0.00	16.02	0.24	0.00	0.01	0.00	0.57	0.71	1.52	1.88	1.54	0.00	11.08	3.66	0.01	12.35	16.02	-12.36	0.01	12.35	0.01	12.35
1/8/2013	15.72	0.00	0.00	15.72	0.20	0.00	0.01	0.00	0.49	0.72	1.42	2.30	1.42	0.00	10.58	3.93	0.01	11.79	15.72	-11.79	0.01	11.79	0.01	11.79
1/9/2013	15.69	0.00	0.00	15.69	0.25	0.00	0.01	0.00	0.59	0.80	1.64	1.41	1.64	0.00	11.00	3.29	0.01	12.39	15.69	-12.40	0.01	12.39	0.01	12.39
1/10/2013	16.77	0.00	0.00	16.77	0.24	0.00	0.01	0.00	0.58	0.74	1.57	2.59	1.77	0.00	10.84	4.60	0.01	12.16	16.77	-12.17	0.01	12.16	0.01	12.16
1/11/2013	15.48	0.00	0.00	15.48	0.20	0.00	0.01	0.00	0.49	0.72	1.42	2.23	1.62	0.00	10.21	4.05	0.01	11.42	15.48	-11.43	0.01	11.42	0.01	11.42
1/12/2013	14.46	0.00	0.00	14.46	0.20	0.00	0.01	0.00	0.47	0.81	1.48	1.19	1.74	0.00	10.04	3.13	0.01	11.33	14.46	-11.33	0.01	11.33	0.01	11.33
1/13/2013	16.71	0.00	0.00	16.71	0.26	0.00	0.01	0.00	0.64	0.71	1.62	2.15	1.91	0.00	11.03	4.33	0.01	12.38	16.71	-12.38	0.01	12.38	0.01	12.38
1/14/2013	16.64	0.00	0.00	16.64	0.25	0.00	0.01	0.00	0.61	0.73	1.61	2.28	1.82	0.00	10.93	4.35	0.01	12.28	16.64	-12.29	0.01	12.28	0.01	12.28
1/15/2013	16.24	0.00	0.00	16.24	0.28	0.00	0.01	0.00	0.64	0.82	1.74	1.54	1.60	0.00	11.35	3.42	0.01	12.81	16.24	-12.82	0.01	12.81	0.01	12.81
1/16/2013	15.74	0.00	0.00	15.74	0.18	0.00	0.00	0.00	0.44	0.69	1.31	3.30	1.40	0.00	9.73	4.88	0.00	10.85	15.74	-10.86	0.00	10.85	0.00	10.85
1/17/2013	14.78	0.00	0.00	14.78	0.26	0.00	0.01	0.00	0.62	0.68	1.57	0.44	1.65	0.00	11.13	2.35	0.01	12.43	14.78	-12.43	0.01	12.43	0.01	12.43
1/18/2013	15.63	0.00	0.00	15.63	0.19	0.00	0.01	0.00	0.45	0.81	1.46	2.74	1.41	0.00	10.02	4.34	0.01	11.28	15.63	-11.29	0.01	11.28	0.01	11.28
1/19/2013	15.88	0.00	0.00	15.88	0.23	0.00	0.01	0.00	0.56	0.69	1.48	2.00	1.57	0.00	10.83	3.80	0.01	12.08	15.88	-12.08	0.01	12.08	0.01	12.08
1/20/2013	15.77	0.00	0.00	15.77	0.25	0.00	0.01	0.00	0.60	0.70	1.55	1.59	1.74	0.00	10.88	3.58	0.01	12.18	15.77	-12.19	0.01	12.18	0.01	12.18
1/21/2013	15.09	0.00	0.00	15.09	0.22	0.00	0.01	0.00	0.54	0.71	1.47	1.49	1.50	0.00	10.63	3.21	0.01	11.88	15.09	-11.88	0.01	11.88	0.01	11.88
1/22/2013	16.43	0.00	0.00	16.43	0.23	0.00	0.01	0.00	0.57	0.78	1.59	2.60	1.60	0.00	10.65	4.43	0.01	11.99	16.43	-12.00	0.01	11.99	0.01	11.99
1/23/2013	15.78	0.00	0.00	15.78	0.23	0.00	0.01	0.00	0.57	0.69	1.49	1.72	1.69	0.00	10.87	3.64	0.01	12.13	15.78	-12.14	0.01	12.13	0.01	12.13
1/24/2013	15.87	0.00	0.00	15.87	0.22	0.00	0.01	0.00	0.54	0.66	1.43	2.31	1.65	0.00	10.47	4.19	0.01	11.68	15.87	-11.68	0.01	11.68	0.01	11.68
1/25/2013	15.98	0.00	0.00	15.98	0.23	0.00	0.00	0.00	0.56	0.60	1.39	2.40	1.46	0.00	10.73	4.09	0.00	11.89	15.98	-11.89	0.00	11.89	0.00	11.89
1/26/2013	14.70	0.00	0.00	14.70	0.21	0.00	0.01	0.00	0.52	0.65	1.39	1.13	1.45	0.00	10.73	2.79	0.01	11.90	14.70	-11.91	0.01	11.90	0.01	11.90
1/27/2013	14.91	0.00	0.00	14.91	0.20	0.00	0.01	0.00	0.49	0.65	1.35	1.50	1.54	0.00	10.52	3.25	0.01	11.66	14.91	-11.66	0.01	11.66	0.01	11.66
1/28/2013	16.30	0.00	0.00	16.30	0.27	0.00	0.01	0.00	0.67	0.68	1.63	1.47	1.88	0.00	11.32	3.63	0.01	12.66	16.30	-12.67	0.01	12.66	0.01	12.66
1/29/2013	15.37	0.00	1.71	17.08	0.25	0.00	0.01	0.00	0.61	0.75	1.61	2.64	1.78	0.00	11.06	4.67	0.01	12.41	17.08	-10.70	0.01	10.70	0.01	10.70
1/30/2013	14.92	0.00	2.26	17.18	0.27	0.00	0.01	0.00	0.66	0.79	1.73	2.62	1.57	0.00	11.26	4.46	0.01	12.71	17.18	-10.46	0.01	10.45	0.01	10.45
1/31/2013	14.50	0.00	1.79	16.29	0.27	0.00	0.01	0.00	0.64	0.76	1.68	1.49	1.62	0.00	11.50	3.37	0.01	12.91	16.29	-11.13	0.01	11.12	0.01	11.12
2/1/2013	14.40	0.00	0.75	15.15	0.25	0.00	0.01	0.00	0.62	0.77	1.65	1.83	1.49	0.00	10.18	3.57	0.01	11.56	15.15	-10.83	0.01	10.82	0.01	10.82
2/2/2013	14.78	0.00	0.00	14.78	0.26	0.00	0.01	0.00	0.62	0.80	1.68	1.85	1.61	0.00	9.63	3.72	0.01	11.06	14.78	-11.06	0.01	11.06	0.01	11.06
2/3/2013	14.82	0.00	0.00	14.82	0.26	0.00	0.01	0.00	0.63	0.81	1.70	1.59	1.68	0.00	9.85	3.53	0.01	11.29	14.82	-11.29	0.01	11.29	0.01	11.29
2/4/2013	16.74	0.00	0.00	16.74	0.35	0.00	0.01	0.00	0.86	0.62	1.84	2.00	1.73	0.00	11.17	4.08	0.01	12.66	16.74	-12.66	0.01	12.66	0.01	12.66
2/5/2013	16.66	0.00	0.00	16.66	0.30	0.00	0.01	0.00	0.73	0.55	1.58	2.89	1.50	0.00	10.69	4.69	0.01	11.97	16.66	-11.97	0.01	11.97	0.01	11.97
2/6/2013	14.83	0.00	0.00	14.83	0.27	0.00	0.01	0.00	0.66	0.54	1.48	1.23	1.45	0.00	10.66	2.96	0.01	11.87	14.83	-11.87	0.01	11.87	0.01	11.87
2/7/2013	16.05	0.00	0.00	16.05	0.30	0.00	0.01	0.00	0.73	0.54	1.57	2.04	1.43	0.00	11.01	3.77	0.01	12.27	16.05	-12.28	0.01	12.27	0.01	12.27
2/8/2013	16.77	0.00	0.00	16.77	0.30	0.00	0.01	0.00	0.72	0.55	1.57	3.15	1.31	0.00	10.74	4.76	0.01	12.01	16.77	-12.01	0.01	12.01	0.01	12.01
2/9/2013	16.63	0.00	0.00	16.63	0.33	0.00	0.01	0.00	0.79	0.54	1.67	1.87	1.58	0.00	11.51	3.77	0.01	12.85	16.63	-12.86	0.01	12.85	0.01	12.85
2/10/2013	15.89	0.00	0.00	15.89	0.26	0.00	0.01	0.00	0.64	0.55	1.46	2.72	1.68	0.00	10.04	4.66	0.01	11.23	15.89	-11.23	0.01	11.23	0.01	11.23
2/11/2013	16.30	0.00	0.00	16.30	0.33	0.00	0.01	0.00	0.80	0.93	2.07	1.89	1.65	0.00	10.68	3.87	0.01	12.42	16.30	-12.43	0.01	12.42	0.01	12.42

	(3)	(4)	(5)	(7)=3+4+5	(8)	(9)	(10)	(11)	(12)	(13)	L=8+9+10 +11+12+13	(14)	(15)	(17)	(16)	(18)=8+9+ 14+15	R=10+11+ 17	19=12+13 +16	T=18+R+ 19	(21)=18-3	(22)=R	(23)=19-4-5	(24)=22	(25)=23
	Water Withdrawal/Purchase (mgd)				Consumptive Use (mgd)							Water Use Discharged as Wastewater (mgd)				Total Returned/Used in Each Basin (mgd)				Net Basin Gain(+)/Loss(-) (mgd)			Interbasin Transfer (mgd)	
	Jordan Lake Withdrawal	Neuse Basin Purchase		Total System Use	Haw		Cape Fear		Neuse		Total	Haw		Cape Fear	Neuse	Haw	Cape Fear	Neuse	Total- All Basins	Haw	Cape Fear	Neuse	Haw to Cape Fear	Haw to Neuse
DATE	Haw	Raleigh	Durham		Potable	WRF Reuse	Potable	WRF Reuse	Potable	WRF Reuse		WTP Process Water	WRF	WRF	Total WRFs									
2/12/2013	16.03	0.00	0.00	16.03	0.30	0.00	0.01	0.00	0.72	0.42	1.44	2.30	1.57	0.00	10.71	4.17	0.01	11.85	16.03	-11.86	0.01	11.85	0.01	11.85
2/13/2013	15.79	0.00	0.00	15.79	0.35	0.00	0.01	0.00	0.85	0.36	1.56	1.15	1.84	0.00	11.24	3.33	0.01	12.45	15.79	-12.46	0.01	12.45	0.01	12.45
2/14/2013	15.59	0.00	0.00	15.59	0.28	0.00	0.01	0.00	0.68	0.35	1.31	2.04	1.55	0.00	10.68	3.87	0.01	11.71	15.59	-11.72	0.01	11.71	0.01	11.71
2/15/2013	16.07	0.00	0.00	16.07	0.27	0.00	0.01	0.00	0.66	0.34	1.27	2.92	1.69	0.00	10.19	4.88	0.01	11.19	16.07	-11.19	0.01	11.19	0.01	11.19
2/16/2013	14.97	0.00	0.00	14.97	0.24	0.00	0.01	0.00	0.59	0.33	1.17	2.05	1.55	0.00	10.21	3.84	0.01	11.12	14.97	-11.13	0.01	11.12	0.01	11.12
2/17/2013	14.79	0.00	0.00	14.79	0.30	0.00	0.00	0.00	0.73	0.32	1.35	1.14	1.71	0.00	10.59	3.15	0.00	11.64	14.79	-11.64	0.00	11.64	0.00	11.64
2/18/2013	17.82	0.00	0.00	17.82	0.35	0.00	0.01	0.00	0.86	0.83	2.05	2.80	1.64	0.00	11.33	4.79	0.01	13.02	17.82	-13.03	0.01	13.02	0.01	13.02
2/19/2013	16.19	0.00	0.00	16.19	0.31	0.00	0.01	0.00	0.76	0.80	1.88	2.15	1.69	0.00	10.47	4.15	0.01	12.03	16.19	-12.04	0.01	12.03	0.01	12.03
2/20/2013	15.83	0.00	0.00	15.83	0.25	0.00	0.01	0.00	0.61	0.73	1.60	2.91	1.57	0.00	9.75	4.74	0.01	11.09	15.83	-11.09	0.01	11.09	0.01	11.09
2/21/2013	15.96	0.00	0.00	15.96	0.31	0.00	0.01	0.00	0.76	0.64	1.71	1.73	1.61	0.00	10.91	3.65	0.01	12.30	15.96	-12.31	0.01	12.30	0.01	12.30
2/22/2013	15.70	0.00	0.00	15.70	0.25	0.00	0.01	0.00	0.60	0.61	1.46	2.75	1.31	0.00	10.17	4.31	0.01	11.38	15.70	-11.39	0.01	11.38	0.01	11.38
2/23/2013	15.35	0.00	0.00	15.35	0.28	0.00	0.01	0.00	0.68	0.62	1.60	1.74	1.34	0.00	10.68	3.36	0.01	11.98	15.35	-11.99	0.01	11.98	0.01	11.98
2/24/2013	15.61	0.00	0.00	15.61	0.29	0.00	0.01	0.00	0.69	0.64	1.62	1.86	1.57	0.00	10.56	3.72	0.01	11.89	15.61	-11.89	0.01	11.89	0.01	11.89
2/25/2013	16.39	0.00	0.00	16.39	0.31	0.00	0.01	0.00	0.76	0.64	1.72	2.28	1.61	0.00	10.78	4.20	0.01	12.18	16.39	-12.19	0.01	12.18	0.01	12.18
2/26/2013	16.00	0.00	0.00	16.00	0.28	0.00	0.01	0.00	0.69	0.66	1.63	2.52	1.30	0.00	10.55	4.10	0.01	11.89	16.00	-11.90	0.01	11.89	0.01	11.89
2/27/2013	15.72	0.00	0.00	15.72	0.29	0.00	0.01	0.00	0.71	0.67	1.67	1.99	1.41	0.00	10.65	3.69	0.01	12.03	15.72	-12.03	0.01	12.03	0.01	12.03
2/28/2013	15.30	0.00	0.00	15.30	0.29	0.00	0.01	0.00	0.70	0.68	1.69	1.43	1.62	0.00	10.57	3.34	0.01	11.95	15.30	-11.96	0.01	11.95	0.01	11.95
3/1/2013	18.41	0.00	0.00	18.41	0.29	0.00	0.01	0.00	0.71	0.69	1.71	2.82	1.88	0.00	12.01	4.99	0.01	13.41	18.41	-13.42	0.01	13.41	0.01	13.41
3/2/2013	15.66	0.00	0.00	15.66	0.24	0.00	0.00	0.00	0.57	0.67	1.48	1.79	1.63	0.00	10.76	3.65	0.00	12.01	15.66	-12.01	0.00	12.01	0.00	12.01
3/3/2013	15.64	0.00	0.00	15.64	0.21	0.00	0.01	0.00	0.49	0.71	1.42	1.83	1.67	0.00	10.72	3.71	0.01	11.93	15.64	-11.93	0.01	11.93	0.01	11.93
3/4/2013	17.73	0.00	0.00	17.73	0.23	0.00	0.01	0.00	0.54	0.72	1.49	3.31	1.75	0.00	11.18	5.29	0.01	12.44	17.73	-12.44	0.01	12.44	0.01	12.44
3/5/2013	17.41	0.00	0.00	17.41	0.27	0.00	0.01	0.00	0.64	0.67	1.59	2.14	1.69	0.00	12.00	4.09	0.01	13.31	17.41	-13.32	0.01	13.31	0.01	13.31
3/6/2013	18.31	0.00	0.00	18.31	0.29	0.00	0.01	0.00	0.71	0.72	1.73	2.90	1.87	0.00	11.81	5.06	0.01	13.24	18.31	-13.25	0.01	13.24	0.01	13.24
3/7/2013	19.64	0.00	0.00	19.64	0.33	0.00	0.01	0.00	0.81	0.72	1.86	3.31	1.91	0.00	12.55	5.56	0.01	14.08	19.64	-14.08	0.01	14.08	0.01	14.08
3/8/2013	18.07	0.00	0.00	18.07	0.28	0.00	0.01	0.00	0.69	0.72	1.69	3.05	1.75	0.00	11.58	5.08	0.01	12.98	18.07	-12.99	0.01	12.98	0.01	12.98
3/9/2013	15.99	0.00	0.00	15.99	0.20	0.00	0.01	0.00	0.46	0.72	1.38	2.70	1.58	0.00	10.33	4.47	0.01	11.51	15.99	-11.52	0.01	11.51	0.01	11.51
3/10/2013	16.19	0.00	0.00	16.19	0.25	0.00	0.01	0.00	0.60	0.69	1.55	1.59	1.78	0.00	11.27	3.62	0.01	12.57	16.19	-12.57	0.01	12.57	0.01	12.57
3/11/2013	18.55	0.00	0.00	18.55	0.28	0.00	0.01	0.00	0.69	0.72	1.70	3.17	1.85	0.00	11.83	5.30	0.01	13.24	18.55	-13.25	0.01	13.24	0.01	13.24
3/12/2013	18.24	0.00	0.00	18.24	0.28	0.00	0.01	0.00	0.68	0.69	1.67	2.67	1.77	0.00	12.13	4.73	0.01	13.51	18.24	-13.51	0.01	13.51	0.01	13.51
3/13/2013	19.46	0.00	0.00	19.46	0.36	0.00	0.01	0.00	0.87	0.72	1.95	2.44	2.08	0.00	12.98	4.88	0.01	14.57	19.46	-14.58	0.01	14.57	0.01	14.57
3/14/2013	18.38	0.00	0.00	18.38	0.32	0.00	0.01	0.00	0.79	0.68	1.80	1.90	2.14	0.00	12.54	4.36	0.01	14.01	18.38	-14.02	0.01	14.01	0.01	14.01
3/15/2013	16.39	0.00	0.00	16.39	0.20	0.00	0.01	0.00	0.45	0.66	1.32	3.22	1.61	0.00	10.23	5.03	0.01	11.35	16.39	-11.36	0.01	11.35	0.01	11.35
3/16/2013	16.25	0.00	0.00	16.25	0.23	0.00	0.01	0.00	0.55	0.68	1.46	2.20	1.74	0.00	10.85	4.16	0.01	12.08	16.25	-12.09	0.01	12.08	0.01	12.08
3/17/2013	16.04	0.00	0.00	16.04	0.21	0.00	0.01	0.00	0.50	0.71	1.43	2.27	1.65	0.00	10.69	4.13	0.01	11.90	16.04	-11.91	0.01	11.90	0.01	11.90
3/18/2013	18.21	0.00	0.00	18.21	0.34	0.00	0.01	0.00	0.82	0.77	1.94	1.49	1.94	0.00	12.84	3.77	0.01	14.43	18.21	-14.44	0.01	14.43	0.01	14.43
3/19/2013	18.21	0.00	0.00	18.21	0.47	0.00	0.03	0.00	0.66	0.75	1.91	3.32	1.66	0.00	11.32	5.45	0.03	12.73	18.21	-12.76	0.03	12.73	0.03	12.73
3/20/2013	17.63	0.00	0.00	17.63	0.29	0.00	0.01	0.00	0.70	0.76	1.76	1.99	1.75	0.00	12.13	4.03	0.01	13.60	17.63	-13.60	0.01	13.60	0.01	13.60
3/21/2013	16.97	0.00	0.00	16.97	0.34	0.00	0.01	0.00	0.60	0.71	1.67	2.43	1.72	0.00	11.16	4.48	0.01	12.47	16.97	-12.49	0.01	12.47	0.01	12.47
3/22/2013	19.36	0.00	0.00	19.36	0.28	0.00	0.01	0.00	0.68	0.71	1.68	4.03	1.81	0.00	11.84	6.12	0.01	13.24	19.36	-13.24	0.01	13.24	0.01	13.24
3/23/2013	16.88	0.00	0.00	16.88	0.22	0.00	0.01	0.00	0.54	0.69	1.46	2.82	1.67	0.00	10.93	4.71	0.01	12.16	16.88	-12.17	0.01	12.16	0.01	12.16
3/24/2013	16.64	0.00	0.00	16.64	0.25	0.00	0.01	0.00	0.62	0.68	1.56	2.01	1.65	0.00	11.41	3.92	0.01	12.72	16.64	-12.72	0.01	12.72	0.01	12.72
3/25/2013	16.93	0.00	0.00	16.93	0.24	0.00	0.01	0.00	0.57	0.68	1.50	2.37	1.88	0.00	11.18	4.49	0.01	12.43	16.93	-12.44	0.01	12.43	0.01	12.43

	(3)	(4)	(5)	(7)=3+4+5	(8)	(9)	(10)	(11)	(12)	(13)	L=8+9+10 +11+12+13	(14)	(15)	(17)	(16)	(18)=8+9+ 14+15	R=10+11+ 17	19=12+13 +16	T=18+R+ 19	(21)=18-3	(22)=R	(23)=19-4- 5	(24)=22	(25)=23
	Water Withdrawal/Purchase (mgd)				Consumptive Use (mgd)							Water Use Discharged as Wastewater (mgd)				Total Returned/Used in Each Basin (mgd)				Net Basin Gain(+)/Loss(-) (mgd)			Interbasin Transfer (mgd)	
	Jordan Lake Withdrawal	Neuse Basin Purchase		Total System Use	Haw		Cape Fear		Neuse		Total	Haw		Cape Fear	Neuse	Haw	Cape Fear	Neuse	Total- All Basins	Haw	Cape Fear	Neuse	Haw to Cape Fear	Haw to Neuse
DATE	Haw	Raleigh	Durham		Potable	WRF Reuse	Potable	WRF Reuse	Potable	WRF Reuse		WTP Process Water	WRF	WRF	Total WRFs									
3/26/2013	18.73	0.00	0.00	18.73	0.26	0.00	0.01	0.00	0.63	0.68	1.58	3.91	1.86	0.00	11.38	6.03	0.01	12.70	18.73	-12.70	0.01	12.70	0.01	12.70
3/27/2013	17.59	0.72	0.00	18.31	0.32	0.00	0.01	0.00	0.77	0.69	1.79	2.14	1.98	0.00	12.40	4.44	0.01	13.86	18.31	-13.15	0.01	13.15	0.01	13.15
3/28/2013	17.81	0.00	0.00	17.81	0.28	0.00	0.01	0.00	0.68	0.69	1.66	2.42	1.85	0.00	11.88	4.55	0.01	13.25	17.81	-13.26	0.01	13.25	0.01	13.25
3/29/2013	17.07	0.00	0.00	17.07	0.23	0.00	0.01	0.00	0.55	0.68	1.46	2.84	1.74	0.00	11.03	4.81	0.01	12.26	17.07	-12.26	0.01	12.26	0.01	12.26
3/30/2013	16.09	0.00	0.00	16.09	0.22	0.00	0.01	0.00	0.52	0.68	1.43	2.37	1.77	0.00	10.52	4.36	0.01	11.73	16.09	-11.73	0.01	11.73	0.01	11.73
3/31/2013	16.63	0.00	0.00	16.63	0.21	0.00	0.01	0.00	0.51	0.69	1.43	2.83	1.75	0.00	10.62	4.79	0.01	11.83	16.63	-11.84	0.01	11.83	0.01	11.83
4/1/2013	18.52	0.00	0.00	18.52	0.31	0.00	0.01	0.00	0.74	0.70	1.76	3.60	1.90	0.00	11.27	5.81	0.01	12.71	18.52	-12.71	0.01	12.71	0.01	12.71
4/2/2013	15.69	0.00	0.00	15.69	0.22	0.00	0.01	0.00	0.54	0.71	1.48	2.50	1.49	0.00	10.22	4.21	0.01	11.47	15.69	-11.48	0.01	11.47	0.01	11.47
4/3/2013	16.18	0.00	0.00	16.18	0.25	0.00	0.01	0.00	0.60	0.73	1.58	2.35	1.63	0.00	10.62	4.23	0.01	11.95	16.18	-11.95	0.01	11.95	0.01	11.95
4/4/2013	16.97	0.00	0.00	16.97	0.24	0.00	0.01	0.00	0.59	0.68	1.52	3.15	1.46	0.00	10.85	4.85	0.01	12.12	16.97	-12.12	0.01	12.12	0.01	12.12
4/5/2013	15.97	0.00	0.00	15.97	0.23	0.00	0.01	0.00	0.57	0.61	1.42	2.34	1.59	0.00	10.62	4.16	0.01	11.80	15.97	-11.81	0.01	11.80	0.01	11.80
4/6/2013	16.87	0.00	0.00	16.87	0.24	0.00	0.01	0.00	0.58	0.68	1.50	3.03	1.65	0.00	10.69	4.92	0.01	11.95	16.87	-11.95	0.01	11.95	0.01	11.95
4/7/2013	16.87	0.00	0.00	16.87	0.24	0.00	0.01	0.00	0.59	0.73	1.57	2.65	1.78	0.00	10.88	4.67	0.01	12.19	16.87	-12.20	0.01	12.19	0.01	12.19
4/8/2013	17.40	0.00	0.00	17.40	0.28	0.00	0.01	0.00	0.68	0.75	1.71	2.81	1.75	0.00	11.13	4.84	0.01	12.56	17.40	-12.56	0.01	12.56	0.01	12.56
4/9/2013	17.60	0.00	0.00	17.60	0.28	0.00	0.01	0.00	0.68	0.76	1.72	2.91	1.81	0.00	11.16	5.00	0.01	12.59	17.60	-12.60	0.01	12.59	0.01	12.59
4/10/2013	18.83	0.00	0.00	18.83	0.36	0.00	0.01	0.00	0.88	0.86	2.11	2.49	1.96	0.00	12.28	4.81	0.01	14.02	18.83	-14.02	0.01	14.02	0.01	14.02
4/11/2013	18.35	0.00	0.00	18.35	0.33	0.00	0.01	0.00	0.80	0.79	1.93	2.63	1.82	0.00	11.98	4.78	0.01	13.57	18.35	-13.57	0.01	13.57	0.01	13.57
4/12/2013	15.94	0.00	0.00	15.94	0.21	0.00	0.01	0.00	0.51	0.73	1.45	2.65	1.58	0.00	10.26	4.44	0.01	11.49	15.94	-11.50	0.01	11.49	0.01	11.49
4/13/2013	17.81	0.00	0.00	17.81	0.31	0.00	0.01	0.00	0.75	0.76	1.83	2.63	1.79	0.00	11.56	4.73	0.01	13.07	17.81	-13.08	0.01	13.07	0.01	13.07
4/14/2013	17.53	0.00	0.00	17.53	0.31	0.00	0.01	0.00	0.75	0.77	1.83	2.14	1.90	0.00	11.66	4.35	0.01	13.17	17.53	-13.18	0.01	13.17	0.01	13.17
4/15/2013	19.69	0.00	0.00	19.69	0.62	0.00	0.03	0.00	1.09	0.75	2.49	2.63	2.03	0.00	12.54	5.28	0.03	14.38	19.69	-14.41	0.03	14.38	0.03	14.38
4/16/2013	17.59	0.00	0.00	17.59	0.28	0.00	0.01	0.00	0.68	0.74	1.71	3.02	1.69	0.00	11.17	4.99	0.01	12.59	17.59	-12.60	0.01	12.59	0.01	12.59
4/17/2013	17.90	0.00	0.00	17.90	0.31	0.00	0.01	0.00	0.75	0.81	1.87	2.90	1.90	0.00	11.23	5.11	0.01	12.79	17.90	-12.79	0.01	12.79	0.01	12.79
4/18/2013	18.66	0.00	0.00	18.66	0.34	0.00	0.01	0.00	0.82	0.76	1.93	2.74	2.16	0.00	11.83	5.24	0.01	13.42	18.66	-13.42	0.01	13.42	0.01	13.42
4/19/2013	20.01	0.00	0.00	20.01	0.39	0.00	0.01	0.00	0.95	0.72	2.07	3.20	2.07	0.00	12.68	5.66	0.01	14.35	20.01	-14.35	0.01	14.35	0.01	14.35
4/20/2013	16.59	0.00	0.00	16.59	0.28	0.00	0.01	0.00	0.67	0.63	1.58	2.09	1.69	0.00	11.23	4.05	0.01	12.53	16.59	-12.54	0.01	12.53	0.01	12.53
4/21/2013	16.65	0.00	0.00	16.65	0.25	0.00	0.01	0.00	0.60	0.64	1.49	2.73	1.72	0.00	10.71	4.69	0.01	11.95	16.65	-11.96	0.01	11.95	0.01	11.95
4/22/2013	19.66	0.00	0.00	19.66	0.37	0.00	0.01	0.00	0.90	0.69	1.97	3.16	2.06	0.00	12.48	5.59	0.01	14.07	19.66	-14.07	0.01	14.07	0.01	14.07
4/23/2013	16.90	0.00	0.00	16.90	0.28	0.00	0.01	0.00	0.67	0.72	1.68	2.41	1.85	0.00	10.97	4.53	0.01	12.36	16.90	-12.37	0.01	12.36	0.01	12.36
4/24/2013	17.81	0.00	0.00	17.81	0.31	0.00	0.01	0.00	0.75	0.94	2.00	2.67	1.87	0.00	11.27	4.84	0.01	12.96	17.81	-12.97	0.01	12.96	0.01	12.96
4/25/2013	20.01	0.00	0.00	20.01	0.39	0.00	0.01	0.00	0.96	0.72	2.08	2.98	2.18	0.00	12.77	5.55	0.01	14.45	20.01	-14.46	0.01	14.45	0.01	14.45
4/26/2013	18.43	0.00	0.00	18.43	0.44	0.00	0.02	0.00	0.87	0.75	2.08	2.72	2.01	0.00	11.62	5.17	0.02	13.24	18.43	-13.26	0.02	13.24	0.02	13.24
4/27/2013	18.76	0.00	0.00	18.76	0.35	0.00	0.01	0.00	0.85	0.72	1.93	2.72	2.03	0.00	12.08	5.10	0.01	13.66	18.76	-13.66	0.01	13.66	0.01	13.66
4/28/2013	18.70	0.00	0.00	18.70	0.31	0.00	0.01	0.00	0.75	0.72	1.79	3.16	1.92	0.00	11.83	5.39	0.01	13.30	18.70	-13.31	0.01	13.30	0.01	13.30
4/29/2013	17.69	0.00	0.00	17.69	0.32	0.00	0.01	0.00	0.77	0.74	1.84	2.33	1.77	0.00	11.75	4.42	0.01	13.26	17.69	-13.27	0.01	13.26	0.01	13.26
4/30/2013	17.73	0.00	0.00	17.73	0.27	0.00	0.01	0.00	0.66	0.68	1.62	3.11	1.75	0.00	11.25	5.13	0.01	12.59	17.73	-12.60	0.01	12.59	0.01	12.59
5/1/2013	17.12	0.00	0.00	17.12	0.26	0.00	0.01	0.00	0.63	0.71	1.60	2.50	1.85	0.00	11.16	4.61	0.01	12.50	17.12	-12.51	0.01	12.50	0.01	12.50
5/2/2013	16.98	0.00	0.00	16.98	0.23	0.00	0.01	0.00	0.55	0.67	1.46	2.91	1.82	0.00	10.78	4.96	0.01	12.01	16.98	-12.02	0.01	12.01	0.01	12.01
5/3/2013	18.37	0.00	0.00	18.37	0.32	0.00	0.01	0.00	0.78	0.69	1.80	2.47	2.08	0.00	12.02	4.87	0.01	13.50	18.37	-13.50	0.01	13.50	0.01	13.50
5/4/2013	19.47	0.00	0.00	19.47	0.45	0.00	0.02	0.00	0.78	0.71	1.96	3.78	1.95	0.00	11.78	6.18	0.02	13.27	19.47	-13.29	0.02	13.27	0.02	13.27
5/5/2013	17.85	0.00	0.00	17.85	0.32	0.00	0.01	0.00	0.78	0.69	1.80	2.00	2.00	0.00	12.05	4.32	0.01	13.52	17.85	-13.53	0.01	13.52	0.01	13.52
5/6/2013	16.05	0.00	0.00	16.05	0.21	0.00	0.01	0.00	0.52	0.73	1.47	2.39	1.55	0.00	10.64	4.15	0.01	11.89	16.05	-11.90	0.01	11.89	0.01	11.89

	(3)	(4)	(5)	(7)=3+4+5	(8)	(9)	(10)	(11)	(12)	(13)	L=8+9+10 +11+12+13	(14)	(15)	(17)	(16)	(18)=8+9+ 14+15	R=10+11+ 17	19=12+13 +16	T=18+R+ 19	(21)=18-3	(22)=R	(23)=19-4- 5	(24)=22	(25)=23
	Water Withdrawal/Purchase (mgd)				Consumptive Use (mgd)							Water Use Discharged as Wastewater (mgd)				Total Returned/Used in Each Basin (mgd)				Net Basin Gain(+)/Loss(-) (mgd)			Interbasin Transfer (mgd)	
	Jordan Lake Withdrawal	Neuse Basin Purchase		Total System Use	Haw		Cape Fear		Neuse		Total	Haw		Cape Fear	Neuse	Haw	Cape Fear	Neuse	Total- All Basins	Haw	Cape Fear	Neuse	Haw to Cape Fear	Haw to Neuse
DATE	Haw	Raleigh	Durham		Potable	WRF Reuse	Potable	WRF Reuse	Potable	WRF Reuse		WTP Process Water	WRF	WRF	Total WRFs									
5/7/2013	17.41	0.00	0.00	17.41	0.25	0.00	0.01	0.00	0.62	0.70	1.58	2.88	1.64	0.00	11.31	4.77	0.01	12.63	17.41	-12.64	0.01	12.63	0.01	12.63
5/8/2013	19.39	0.00	0.00	19.39	0.36	0.00	0.01	0.00	0.89	0.73	1.99	2.55	1.83	0.00	13.02	4.74	0.01	14.64	19.39	-14.65	0.01	14.64	0.01	14.64
5/9/2013	17.71	0.00	0.00	17.71	0.29	0.00	0.01	0.00	0.71	0.69	1.70	2.31	1.78	0.00	11.92	4.38	0.01	13.32	17.71	-13.33	0.01	13.32	0.01	13.32
5/10/2013	17.83	0.00	0.00	17.83	0.26	0.00	0.01	0.00	0.64	0.76	1.67	3.08	1.86	0.00	11.23	5.20	0.01	12.62	17.83	-12.63	0.01	12.62	0.01	12.62
5/11/2013	17.91	0.00	0.00	17.91	0.31	0.00	0.01	0.00	0.76	0.72	1.80	2.03	2.00	0.00	12.07	4.35	0.01	13.56	17.91	-13.56	0.01	13.56	0.01	13.56
5/12/2013	18.15	0.00	0.00	18.15	0.32	0.00	0.01	0.00	0.77	0.68	1.78	2.06	2.08	0.00	12.24	4.45	0.01	13.69	18.15	-13.70	0.01	13.69	0.01	13.69
5/13/2013	18.07	0.00	0.00	18.07	0.31	0.00	0.01	0.00	0.76	0.76	1.84	2.06	2.10	0.00	12.07	4.47	0.01	13.59	18.07	-13.60	0.01	13.59	0.01	13.59
5/14/2013	20.71	0.00	0.00	20.71	0.52	0.00	0.02	0.00	0.99	0.75	2.29	3.34	2.14	0.00	12.94	6.01	0.02	14.68	20.71	-14.70	0.02	14.68	0.02	14.68
5/15/2013	18.49	0.00	0.00	18.49	0.32	0.00	0.01	0.00	0.79	0.85	1.96	2.41	2.01	0.00	12.10	4.75	0.01	13.74	18.49	-13.74	0.01	13.74	0.01	13.74
5/16/2013	21.96	0.00	0.00	21.96	0.95	0.00	0.04	0.00	1.89	0.83	3.71	2.42	2.20	0.00	13.63	5.57	0.04	16.35	21.96	-16.39	0.04	16.35	0.04	16.35
5/17/2013	20.80	0.00	0.00	20.80	0.70	0.00	0.02	0.00	1.69	0.87	3.27	2.25	2.25	0.00	13.03	5.20	0.02	15.58	20.80	-15.60	0.02	15.58	0.02	15.58
5/18/2013	18.63	0.00	0.00	18.63	0.34	0.00	0.01	0.00	0.83	0.80	1.97	2.04	2.13	0.00	12.48	4.51	0.01	14.11	18.63	-14.12	0.01	14.11	0.01	14.11
5/19/2013	18.24	0.00	0.00	18.24	0.31	0.00	0.01	0.00	0.75	0.71	1.77	2.43	1.82	0.00	12.21	4.56	0.01	13.67	18.24	-13.68	0.01	13.67	0.01	13.67
5/20/2013	16.99	0.00	0.00	16.99	0.27	0.00	0.01	0.00	0.66	0.70	1.64	2.13	1.76	0.00	11.46	4.16	0.01	12.82	16.99	-12.83	0.01	12.82	0.01	12.82
5/21/2013	18.67	0.00	0.00	18.67	0.29	0.00	0.01	0.00	0.72	0.71	1.72	3.29	1.85	0.00	11.80	5.44	0.01	13.22	18.67	-13.23	0.01	13.22	0.01	13.22
5/22/2013	18.45	0.00	0.00	18.45	0.31	0.00	0.01	0.00	0.76	0.82	1.90	2.54	1.87	0.00	12.14	4.72	0.01	13.72	18.45	-13.73	0.01	13.72	0.01	13.72
5/23/2013	18.14	0.00	0.00	18.14	0.34	0.00	0.01	0.00	0.83	0.74	1.92	1.54	1.97	0.00	12.71	3.85	0.01	14.28	18.14	-14.29	0.01	14.28	0.01	14.28
5/24/2013	19.01	0.00	0.00	19.01	0.32	0.00	0.01	0.00	0.78	0.77	1.87	2.82	1.97	0.00	12.34	5.11	0.01	13.89	19.01	-13.90	0.01	13.89	0.01	13.89
5/25/2013	18.25	0.00	0.00	18.25	0.28	0.00	0.01	0.00	0.67	0.80	1.76	3.06	1.76	0.00	11.67	5.10	0.01	13.14	18.25	-13.15	0.01	13.14	0.01	13.14
5/26/2013	19.03	0.00	0.00	19.03	0.66	0.00	0.02	0.00	1.59	0.74	3.00	1.79	2.01	0.00	12.23	4.45	0.02	14.56	19.03	-14.58	0.02	14.56	0.02	14.56
5/27/2013	16.72	0.00	0.00	16.72	0.30	0.00	0.01	0.00	0.73	0.82	1.86	1.15	2.11	0.00	11.60	3.56	0.01	13.15	16.72	-13.16	0.01	13.15	0.01	13.15
5/28/2013	22.00	0.00	0.00	22.00	0.53	0.00	0.02	0.00	1.14	0.95	2.63	3.45	2.41	0.00	13.51	6.39	0.02	15.59	22.00	-15.61	0.02	15.59	0.02	15.59
5/29/2013	21.94	0.00	0.00	21.94	0.88	0.00	0.03	0.00	2.02	1.08	4.02	2.23	2.24	0.00	13.46	5.35	0.03	16.56	21.94	-16.59	0.03	16.56	0.03	16.56
5/30/2013	22.76	0.00	0.00	22.76	1.13	0.00	0.05	0.00	2.10	1.07	4.35	2.48	2.40	0.00	13.52	6.01	0.05	16.70	22.76	-16.75	0.05	16.70	0.05	16.70
5/31/2013	24.38	0.00	0.00	24.38	1.32	0.00	0.04	0.00	3.20	0.84	5.40	3.25	2.44	0.00	13.29	7.01	0.04	17.33	24.38	-17.37	0.04	17.33	0.04	17.33
6/1/2013	24.81	0.00	0.00	24.81	1.92	0.00	0.08	0.00	3.82	1.00	6.81	3.17	2.39	0.00	12.44	7.48	0.08	17.25	24.81	-17.33	0.08	17.25	0.08	17.25
6/2/2013	23.16	0.00	0.00	23.16	1.44	0.00	0.05	0.00	3.17	0.86	5.53	2.22	2.49	0.00	12.93	6.15	0.05	16.96	23.16	-17.01	0.05	16.96	0.05	16.96
6/3/2013	18.23	0.00	0.00	18.23	0.42	0.00	0.01	0.00	1.02	0.76	2.21	1.44	2.25	0.00	12.33	4.11	0.01	14.12	18.23	-14.12	0.01	14.12	0.01	14.12
6/4/2013	19.73	0.00	0.00	19.73	0.50	0.00	0.02	0.00	0.98	0.79	2.29	3.80	2.30	0.00	11.34	6.60	0.02	13.11	19.73	-13.13	0.02	13.11	0.02	13.11
6/5/2013	22.89	0.00	0.00	22.89	0.90	0.00	0.04	0.00	1.71	0.80	3.45	3.00	2.15	0.00	14.29	6.05	0.04	16.80	22.89	-16.84	0.04	16.80	0.04	16.80
6/6/2013	19.50	0.00	0.00	19.50	0.45	0.00	0.01	0.00	1.11	0.89	2.46	1.88	2.21	0.00	12.95	4.54	0.01	14.95	19.50	-14.96	0.01	14.95	0.01	14.95
6/7/2013	17.14	0.00	0.00	17.14	0.31	0.00	0.01	0.00	0.76	0.60	1.68	2.44	1.63	0.00	11.39	4.38	0.01	12.76	17.14	-12.76	0.01	12.76	0.01	12.76
6/8/2013	18.56	0.00	0.00	18.56	0.35	0.00	0.01	0.00	0.85	0.81	2.02	2.88	1.66	0.00	12.00	4.89	0.01	13.67	18.56	-13.67	0.01	13.67	0.01	13.67
6/9/2013	18.48	0.00	0.00	18.48	0.39	0.00	0.01	0.00	0.94	0.67	2.00	1.88	2.03	0.00	12.56	4.30	0.01	14.17	18.48	-14.18	0.01	14.17	0.01	14.17
6/10/2013	19.44	0.00	0.00	19.44	0.38	0.00	0.01	0.00	0.92	0.70	2.01	3.19	2.04	0.00	12.20	5.61	0.01	13.83	19.44	-13.83	0.01	13.83	0.01	13.83
6/11/2013	19.64	0.00	0.00	19.64	0.40	0.00	0.01	0.00	0.97	0.76	2.14	3.05	2.15	0.00	12.30	5.60	0.01	14.04	19.64	-14.04	0.01	14.04	0.01	14.04
6/12/2013	20.20	0.00	0.00	20.20	0.47	0.00	0.01	0.00	1.15	0.92	2.54	2.11	2.33	0.00	13.22	4.91	0.01	15.28	20.20	-15.29	0.01	15.28	0.01	15.28
6/13/2013	19.57	0.00	0.00	19.57	0.43	0.00	0.01	0.00	1.03	0.93	2.40	2.40	2.36	0.00	12.42	5.18	0.01	14.38	19.57	-14.39	0.01	14.38	0.01	14.38
6/14/2013	20.90	0.00	0.00	20.90	0.51	0.00	0.01	0.00	1.23	0.74	2.48	2.51	2.38	0.00	13.53	5.40	0.01	15.50	20.90	-15.50	0.01	15.50	0.01	15.50
6/15/2013	21.22	0.00	0.00	21.22	0.72	0.00	0.03	0.00	1.32	0.92	2.99	3.02	2.42	0.00	12.79	6.15	0.03	15.03	21.22	-15.07	0.03	15.03	0.03	15.03
6/16/2013	21.23	0.00	0.00	21.23	0.84	0.00	0.03	0.00	1.59	0.76	3.21	2.49	2.47	0.00	13.06	5.79	0.03	15.40	21.23	-15.44	0.03	15.40	0.03	15.40
6/17/2013	19.02	0.00	0.00	19.02	0.42	0.00	0.01	0.00	1.02	0.81	2.26	2.14	2.31	0.00	12.31	4.87	0.01	14.14	19.02	-14.15	0.01	14.14	0.01	14.14

	(3)	(4)	(5)	(7)=3+4+5	(8)	(9)	(10)	(11)	(12)	(13)	L=8+9+10 +11+12+13	(14)	(15)	(17)	(16)	(18)=8+9+ 14+15	R=10+11+ 17	19=12+13 +16	T=18+R+ 19	(21)=18-3	(22)=R	(23)=19-4-5	(24)=22	(25)=23
	Water Withdrawal/Purchase (mgd)				Consumptive Use (mgd)							Water Use Discharged as Wastewater (mgd)				Total Returned/Used in Each Basin (mgd)				Net Basin Gain(+)/Loss(-) (mgd)			Interbasin Transfer (mgd)	
	Jordan Lake Withdrawal	Neuse Basin Purchase		Total System Use	Haw		Cape Fear		Neuse		Total	Haw		Cape Fear	Neuse	Haw	Cape Fear	Neuse	Total- All Basins	Haw	Cape Fear	Neuse	Haw to Cape Fear	Haw to Neuse
DATE	Haw	Raleigh	Durham		Potable	WRF Reuse	Potable	WRF Reuse	Potable	WRF Reuse		WTP Process Water	WRF	WRF	Total WRFs									
6/18/2013	20.62	0.00	0.00	20.62	0.46	0.00	0.01	0.00	1.13	0.87	2.47	2.77	2.07	0.00	13.31	5.30	0.01	15.31	20.62	-15.32	0.01	15.31	0.01	15.31
6/19/2013	19.40	0.00	0.00	19.40	0.39	0.00	0.01	0.00	0.96	0.78	2.14	2.79	2.15	0.00	12.31	5.34	0.01	14.06	19.40	-14.06	0.01	14.06	0.01	14.06
6/20/2013	20.30	0.00	0.00	20.30	0.60	0.00	0.02	0.00	1.39	0.91	2.92	1.46	2.43	0.00	13.49	4.49	0.02	15.79	20.30	-15.81	0.02	15.79	0.02	15.79
6/21/2013	22.54	0.00	0.00	22.54	1.08	0.00	0.05	0.00	1.63	0.94	3.70	2.98	2.32	0.00	13.54	6.38	0.05	16.11	22.54	-16.16	0.05	16.11	0.05	16.11
6/22/2013	21.07	0.00	0.00	21.07	0.55	0.00	0.01	0.00	1.34	1.02	2.92	3.15	2.37	0.00	12.63	6.07	0.01	14.99	21.07	-15.00	0.01	14.99	0.01	14.99
6/23/2013	22.45	0.00	0.00	22.45	1.06	0.00	0.05	0.00	1.93	0.89	3.93	2.75	2.44	0.00	13.33	6.26	0.05	16.15	22.45	-16.19	0.05	16.15	0.05	16.15
6/24/2013	19.08	0.00	0.00	19.08	0.49	0.00	0.00	0.00	1.20	0.84	2.54	1.28	2.30	0.00	12.96	4.07	0.00	15.00	19.08	-15.01	0.00	15.00	0.00	15.00
6/25/2013	23.61	0.00	0.00	23.61	1.27	0.00	0.03	0.00	3.09	1.05	5.45	2.73	2.32	0.00	13.12	6.32	0.03	17.25	23.61	-17.29	0.03	17.25	0.03	17.25
6/26/2013	22.17	0.00	0.00	22.17	0.98	0.00	0.05	0.00	1.60	0.91	3.54	2.78	2.40	0.00	13.45	6.16	0.05	15.96	22.17	-16.01	0.05	15.96	0.05	15.96
6/27/2013	20.52	0.00	0.00	20.52	0.48	0.00	0.01	0.00	1.17	0.79	2.45	2.70	2.39	0.00	12.98	5.57	0.01	14.94	20.52	-14.95	0.01	14.94	0.01	14.94
6/28/2013	23.06	0.00	0.00	23.06	0.83	0.00	0.01	0.00	2.01	0.77	3.62	2.32	2.51	0.00	14.61	5.66	0.01	17.39	23.06	-17.40	0.01	17.39	0.01	17.39
6/29/2013	17.82	0.00	0.00	17.82	0.36	0.00	0.01	0.00	0.87	0.70	1.93	2.34	2.01	0.00	11.54	4.71	0.01	13.11	17.82	-13.11	0.01	13.11	0.01	13.11
6/30/2013	20.31	0.00	0.00	20.31	0.51	0.00	0.02	0.00	1.21	0.63	2.36	2.35	2.47	0.00	13.14	5.32	0.02	14.97	20.31	-14.99	0.02	14.97	0.02	14.97
7/1/2013	16.64	0.00	0.00	16.64	0.27	0.00	0.00	0.00	0.67	0.70	1.65	2.43	1.89	0.00	10.67	4.59	0.00	12.04	16.64	-12.05	0.00	12.04	0.00	12.04
7/2/2013	18.24	0.00	0.00	18.24	0.32	0.00	0.01	0.00	0.78	0.74	1.84	2.52	1.88	0.00	12.00	4.72	0.01	13.52	18.24	-13.52	0.01	13.52	0.01	13.52
7/3/2013	19.64	0.00	0.00	19.64	0.36	0.00	0.01	0.00	0.87	0.66	1.89	3.43	2.10	0.00	12.22	5.89	0.01	13.75	19.64	-13.75	0.01	13.75	0.01	13.75
7/4/2013	18.84	0.00	0.00	18.84	0.55	0.00	0.01	0.00	1.35	0.60	2.51	2.43	2.42	0.00	11.48	5.40	0.01	13.43	18.84	-13.44	0.01	13.43	0.01	13.43
7/5/2013	17.98	0.00	0.00	17.98	0.34	0.00	0.01	0.00	0.84	0.62	1.80	1.96	2.20	0.00	12.02	4.50	0.01	13.47	17.98	-13.48	0.01	13.47	0.01	13.47
7/6/2013	20.36	0.00	0.00	20.36	0.52	0.00	0.01	0.00	1.27	0.70	2.49	2.33	2.37	0.00	13.17	5.22	0.01	15.13	20.36	-15.14	0.01	15.13	0.01	15.13
7/7/2013	20.22	0.00	0.00	20.22	0.42	0.00	0.01	0.00	1.01	0.61	2.04	2.37	2.45	0.00	13.36	5.24	0.01	14.98	20.22	-14.98	0.01	14.98	0.01	14.98
7/8/2013	20.52	0.00	0.00	20.52	0.45	0.00	0.01	0.00	1.09	0.58	2.12	2.40	2.42	0.00	13.58	5.27	0.01	15.25	20.52	-15.25	0.01	15.25	0.01	15.25
7/9/2013	20.96	0.00	0.00	20.96	0.48	0.00	0.01	0.00	1.15	0.94	2.58	2.67	2.31	0.00	13.41	5.45	0.01	15.49	20.96	-15.51	0.01	15.49	0.01	15.49
7/10/2013	21.44	0.00	0.00	21.44	0.45	0.00	0.01	0.00	1.09	1.03	2.58	3.18	2.31	0.00	13.38	5.94	0.01	15.49	21.44	-15.50	0.01	15.49	0.01	15.49
7/11/2013	19.03	0.00	0.00	19.03	0.39	0.00	0.01	0.00	0.94	0.98	2.32	1.84	2.15	0.00	12.72	4.38	0.01	14.64	19.03	-14.65	0.01	14.64	0.01	14.64
7/12/2013	18.51	0.00	0.00	18.51	0.37	0.00	0.01	0.00	0.91	0.79	2.08	1.71	2.15	0.00	12.58	4.23	0.01	14.27	18.51	-14.28	0.01	14.27	0.01	14.27
7/13/2013	18.46	0.00	0.00	18.46	0.32	0.00	0.01	0.00	0.77	0.86	1.95	2.75	1.96	0.00	11.80	5.03	0.01	13.42	18.46	-13.43	0.01	13.42	0.01	13.42
7/14/2013	18.20	0.00	0.00	18.20	0.32	0.00	0.01	0.00	0.79	0.75	1.87	2.45	2.08	0.00	11.79	4.86	0.01	13.34	18.20	-13.34	0.01	13.34	0.01	13.34
7/15/2013	18.04	0.00	0.00	18.04	0.30	0.00	0.01	0.00	0.72	0.86	1.89	2.62	2.02	0.00	11.51	4.94	0.01	13.09	18.04	-13.10	0.01	13.09	0.01	13.09
7/16/2013	20.45	0.00	0.00	20.45	0.58	0.00	0.02	0.00	1.14	1.10	2.84	2.47	2.22	0.00	12.92	5.27	0.02	15.16	20.45	-15.18	0.02	15.16	0.02	15.16
7/17/2013	22.84	0.00	0.00	22.84	1.03	0.00	0.02	0.00	2.51	1.09	4.66	2.43	2.31	0.00	13.44	5.78	0.02	17.04	22.84	-17.06	0.02	17.04	0.02	17.04
7/18/2013	21.74	0.00	0.00	21.74	0.76	0.00	0.01	0.00	1.85	1.12	3.74	2.50	1.87	0.00	13.63	5.13	0.01	16.60	21.74	-16.61	0.01	16.60	0.01	16.60
7/19/2013	21.21	0.00	0.00	21.21	0.86	0.00	0.04	0.00	1.28	1.00	3.18	2.95	0.92	0.00	14.15	4.73	0.04	16.44	21.21	-16.48	0.04	16.44	0.04	16.44
7/20/2013	23.04	0.00	0.00	23.04	1.40	0.00	0.02	0.00	3.40	1.12	5.95	2.17	0.90	0.00	14.02	4.47	0.02	18.55	23.04	-18.57	0.02	18.55	0.02	18.55
7/21/2013	22.10	0.00	0.00	22.10	1.00	0.00	0.04	0.00	1.98	0.89	3.91	2.76	0.92	0.00	14.50	4.68	0.04	17.38	22.10	-17.42	0.04	17.38	0.04	17.38
7/22/2013	20.74	0.00	0.00	20.74	0.80	0.00	0.04	0.00	1.28	0.90	3.01	2.47	0.93	0.00	14.33	4.19	0.04	16.51	20.74	-16.55	0.04	16.51	0.04	16.51
7/23/2013	20.72	0.00	0.00	20.72	0.51	0.00	0.02	0.00	1.04	1.20	2.77	3.66	0.86	0.00	13.43	5.03	0.02	15.67	20.72	-15.69	0.02	15.67	0.02	15.67
7/24/2013	24.43	0.00	0.00	24.43	1.71	0.00	0.06	0.00	3.66	1.10	6.53	2.31	1.14	0.00	14.45	5.16	0.06	19.21	24.43	-19.27	0.06	19.21	0.06	19.21
7/25/2013	22.95	0.00	0.00	22.95	1.15	0.00	0.04	0.00	2.65	1.01	4.85	2.95	0.93	0.00	14.22	5.03	0.04	17.88	22.95	-17.92	0.04	17.88	0.04	17.88
7/26/2013	25.06	0.00	0.00	25.06	1.86	0.00	0.05	0.00	4.49	0.91	7.31	3.11	0.90	0.00	13.74	5.87	0.05	19.14	25.06	-19.19	0.05	19.14	0.05	19.14
7/27/2013	23.05	0.00	0.00	23.05	1.25	0.00	0.05	0.00	2.37	1.10	4.77	3.46	0.87	0.00	13.96	5.58	0.05	17.42	23.05	-17.47	0.05	17.42	0.05	17.42
7/28/2013	18.74	0.00	0.00	18.74	0.36	0.00	0.01	0.00	0.87	0.89	2.13	2.34	0.86	0.00	13.40	3.56	0.01	15.17	18.74	-15.18	0.01	15.17	0.01	15.17
7/29/2013	22.39	0.00	0.00	22.39	0.75	0.00	0.03	0.00	1.32	0.86	2.96	3.81	1.02	0.00	14.60	5.58	0.03	16.77	22.39	-16.81	0.03	16.77	0.03	16.77

	(3)	(4)	(5)	(7)=3+4+5	(8)	(9)	(10)	(11)	(12)	(13)	L=8+9+10 +11+12+13	(14)	(15)	(17)	(16)	(18)=8+9+ 14+15	R=10+11+ 17	19=12+13 +16	T=18+R+ 19	(21)=18-3	(22)=R	(23)=19-4-5	(24)=22	(25)=23
	Water Withdrawal/Purchase (mgd)				Consumptive Use (mgd)							Water Use Discharged as Wastewater (mgd)				Total Returned/Used in Each Basin (mgd)				Net Basin Gain(+)/Loss(-) (mgd)			Interbasin Transfer (mgd)	
	Jordan Lake Withdrawal	Neuse Basin Purchase		Total System Use	Haw		Cape Fear		Neuse		Total	Haw		Cape Fear	Neuse	Haw	Cape Fear	Neuse	Total- All Basins	Haw	Cape Fear	Neuse	Haw to Cape Fear	Haw to Neuse
DATE	Haw	Raleigh	Durham		Potable	WRF Reuse	Potable	WRF Reuse	Potable	WRF Reuse		WTP Process Water	WRF	WRF	Total WRFs									
7/30/2013	22.43	0.00	0.00	22.43	0.93	0.00	0.03	0.00	2.07	1.13	4.16	3.44	0.93	0.00	13.89	5.30	0.03	17.10	22.43	-17.13	0.03	17.10	0.03	17.10
7/31/2013	21.46	0.00	0.00	21.46	0.74	0.00	0.03	0.00	1.45	1.04	3.26	2.75	0.96	0.00	14.49	4.45	0.03	16.98	21.46	-17.01	0.03	16.98	0.03	16.98
8/1/2013	21.17	0.00	0.00	21.17	0.95	0.00	0.03	0.00	2.08	0.93	3.99	1.51	0.97	0.00	14.70	3.43	0.03	17.70	21.17	-17.74	0.03	17.70	0.03	17.70
8/2/2013	19.79	0.00	0.00	19.79	0.75	0.00	0.03	0.00	1.28	0.83	2.90	2.42	0.94	0.00	13.53	4.11	0.03	15.64	19.79	-15.68	0.03	15.64	0.03	15.64
8/3/2013	20.74	0.00	0.00	20.74	0.70	0.00	0.03	0.00	1.42	0.95	3.10	2.15	0.92	0.00	14.57	3.77	0.03	16.94	20.74	-16.97	0.03	16.94	0.03	16.94
8/4/2013	18.74	0.00	0.00	18.74	0.45	0.00	0.01	0.00	1.10	0.74	2.30	1.73	0.88	0.00	13.83	3.06	0.01	15.67	18.74	-15.68	0.01	15.67	0.01	15.67
8/5/2013	19.85	0.00	0.00	19.85	0.81	0.00	0.03	0.00	1.64	0.82	3.30	1.17	0.98	0.00	14.39	2.97	0.03	16.85	19.85	-16.88	0.03	16.85	0.03	16.85
8/6/2013	20.20	0.00	0.00	20.20	0.98	0.00	0.05	0.00	1.49	1.12	3.63	1.62	0.97	0.00	13.97	3.57	0.05	16.58	20.20	-16.63	0.05	16.58	0.05	16.58
8/7/2013	20.74	0.00	0.00	20.74	1.08	0.00	0.06	0.00	1.58	0.99	3.70	1.95	1.33	0.00	13.75	4.36	0.06	16.32	20.74	-16.38	0.06	16.32	0.06	16.32
8/8/2013	22.74	0.00	0.00	22.74	1.13	0.00	0.04	0.00	2.56	1.09	4.83	2.55	2.38	0.00	12.98	6.06	0.04	16.64	22.74	-16.68	0.04	16.64	0.04	16.64
8/9/2013	23.50	0.00	0.00	23.50	2.11	0.00	0.09	0.00	4.13	0.96	7.29	1.08	2.37	0.00	12.76	5.56	0.09	17.85	23.50	-17.94	0.09	17.85	0.09	17.85
8/10/2013	20.76	0.00	0.00	20.76	0.93	0.00	0.05	0.00	1.43	1.13	3.54	2.63	2.25	0.00	12.34	5.81	0.05	14.90	20.76	-14.95	0.05	14.90	0.05	14.90
8/11/2013	21.48	0.00	0.00	21.48	0.87	0.00	0.02	0.00	2.10	0.93	3.93	2.33	2.38	0.00	12.85	5.58	0.02	15.88	21.48	-15.90	0.02	15.88	0.02	15.88
8/12/2013	20.19	0.00	0.00	20.19	0.85	0.00	0.03	0.00	1.75	0.96	3.59	1.66	2.43	0.00	12.50	4.95	0.03	15.21	20.19	-15.24	0.03	15.21	0.03	15.21
8/13/2013	20.35	0.00	0.00	20.35	0.75	0.00	0.03	0.00	1.35	0.91	3.04	2.30	2.25	0.00	12.76	5.31	0.03	15.01	20.35	-15.04	0.03	15.01	0.03	15.01
8/14/2013	22.08	0.00	0.00	22.08	1.23	0.00	0.05	0.00	2.47	0.88	4.63	1.71	2.36	0.00	13.38	5.30	0.05	16.73	22.08	-16.78	0.05	16.73	0.05	16.73
8/15/2013	21.50	0.00	0.00	21.50	1.12	0.00	0.04	0.00	2.38	1.03	4.57	2.13	2.26	0.00	12.54	5.51	0.04	15.95	21.50	-15.99	0.04	15.95	0.04	15.95
8/16/2013	20.35	0.00	0.00	20.35	1.01	0.00	0.05	0.00	1.40	0.91	3.37	2.67	2.21	0.00	12.10	5.88	0.05	14.41	20.35	-14.47	0.05	14.41	0.05	14.41
8/17/2013	20.47	0.00	0.00	20.47	0.76	0.00	0.02	0.00	1.85	1.02	3.65	2.06	2.29	0.00	12.47	5.11	0.02	15.34	20.47	-15.36	0.02	15.34	0.02	15.34
8/18/2013	18.54	0.00	0.00	18.54	0.57	0.00	0.03	0.00	1.05	0.74	2.38	2.41	2.12	0.00	11.63	5.10	0.03	13.41	18.54	-13.44	0.03	13.41	0.03	13.41
8/19/2013	20.38	0.00	0.00	20.38	0.46	0.00	0.01	0.00	1.13	0.78	2.38	2.81	2.34	0.00	12.86	5.61	0.01	14.76	20.38	-14.77	0.01	14.76	0.01	14.76
8/20/2013	18.43	0.00	0.00	18.43	0.40	0.00	0.01	0.00	0.97	0.89	2.27	2.16	2.13	0.00	11.87	4.69	0.01	13.73	18.43	-13.74	0.01	13.73	0.01	13.73
8/21/2013	18.69	0.00	0.00	18.69	0.61	0.00	0.03	0.00	1.08	0.80	2.51	2.39	2.11	0.00	11.68	5.11	0.03	13.55	18.69	-13.58	0.03	13.55	0.03	13.55
8/22/2013	20.90	0.00	0.00	20.90	0.71	0.00	0.02	0.00	1.63	0.92	3.28	2.36	2.36	0.00	12.90	5.43	0.02	15.45	20.90	-15.47	0.02	15.45	0.02	15.45
8/23/2013	20.66	0.00	0.00	20.66	1.01	0.00	0.04	0.00	2.17	0.94	4.16	1.49	2.42	0.00	12.59	4.92	0.04	15.70	20.66	-15.74	0.04	15.70	0.04	15.70
8/24/2013	21.53	0.00	0.00	21.53	1.23	0.00	0.07	0.00	1.53	1.07	3.90	3.33	2.26	0.00	12.04	6.82	0.07	14.64	21.53	-14.71	0.07	14.64	0.07	14.64
8/25/2013	21.43	0.00	0.00	21.43	1.53	0.00	0.08	0.00	2.28	0.82	4.72	1.55	2.43	0.00	12.74	5.51	0.08	15.84	21.43	-15.92	0.08	15.84	0.08	15.84
8/26/2013	20.65	0.00	0.00	20.65	1.20	0.00	0.07	0.00	1.60	0.96	3.82	1.83	2.45	0.00	12.55	5.47	0.07	15.11	20.65	-15.18	0.07	15.11	0.07	15.11
8/27/2013	24.01	0.00	0.00	24.01	2.27	0.00	0.10	0.00	4.03	1.19	7.60	1.72	2.37	0.00	12.32	6.36	0.10	17.55	24.01	-17.65	0.10	17.55	0.10	17.55
8/28/2013	24.85	0.00	0.00	24.85	1.55	0.00	0.05	0.00	3.45	1.06	6.11	3.24	2.36	0.00	13.14	7.15	0.05	17.65	24.85	-17.70	0.05	17.65	0.05	17.65
8/29/2013	22.07	0.00	0.00	22.07	1.50	0.00	0.05	0.00	3.42	1.11	6.08	1.29	2.36	0.00	12.34	5.15	0.05	16.87	22.07	-16.92	0.05	16.87	0.05	16.87
8/30/2013	22.43	0.00	0.00	22.43	1.61	0.00	0.05	0.00	3.78	1.08	6.52	1.44	2.38	0.00	12.09	5.43	0.05	16.95	22.43	-17.00	0.05	16.95	0.05	16.95
8/31/2013	23.15	0.00	0.00	23.15	1.88	0.00	0.07	0.00	3.78	1.15	6.88	2.68	2.21	0.00	11.38	6.76	0.07	16.31	23.15	-16.39	0.07	16.31	0.07	16.31
9/1/2013	20.67	0.00	0.00	20.67	0.73	0.00	0.02	0.00	1.72	0.91	3.38	1.63	2.19	0.00	13.47	4.55	0.02	16.10	20.67	-16.12	0.02	16.10	0.02	16.10
9/2/2013	17.02	0.00	0.00	17.02	0.41	0.00	0.01	0.00	0.89	0.77	2.08	1.50	2.08	0.00	11.36	3.99	0.01	13.02	17.02	-13.03	0.01	13.02	0.01	13.02
9/3/2013	21.70	0.00	0.00	21.70	0.91	0.00	0.03	0.00	2.07	0.99	4.00	2.14	2.50	0.00	13.06	5.55	0.03	16.12	21.70	-16.15	0.03	16.12	0.03	16.12
9/4/2013	21.14	0.00	0.00	21.14	1.60	0.00	0.09	0.00	2.21	0.93	4.83	1.59	2.41	0.00	12.31	5.60	0.09	15.45	21.14	-15.54	0.09	15.45	0.09	15.45
9/5/2013	21.63	0.00	0.00	21.63	1.35	0.00	0.05	0.00	2.99	1.11	5.49	1.88	2.31	0.00	11.95	5.54	0.05	16.05	21.63	-16.09	0.05	16.05	0.05	16.05
9/6/2013	21.56	0.00	0.00	21.56	1.84	0.00	0.08	0.00	3.28	0.98	6.17	1.04	2.30	0.00	12.05	5.17	0.08	16.30	21.56	-16.39	0.08	16.30	0.08	16.30
9/7/2013	21.36	0.00	0.00	21.36	1.23	0.00	0.06	0.00	2.12	1.13	4.53	2.61	2.29	0.00	11.94	6.12	0.06	15.18	21.36	-15.24	0.06	15.18	0.06	15.18
9/8/2013	22.17	0.00	0.00	22.17	1.77	0.00	0.09	0.00	2.88	0.93	5.66	1.59	2.39	0.00	12.52	5.75	0.09	16.33	22.17	-16.42	0.09	16.33	0.09	16.33
9/9/2013	22.03	0.00	0.00	22.03	1.44	0.00	0.07	0.00	2.37	1.06	4.94	2.25	2.41	0.00	12.43	6.10	0.07	15.86	22.03	-15.93	0.07	15.86	0.07	15.86

	(3)	(4)	(5)	(7)=3+4+5	(8)	(9)	(10)	(11)	(12)	(13)	L=8+9+10 +11+12+13	(14)	(15)	(17)	(16)	(18)=8+9+ 14+15	R=10+11+ 17	19=12+13 +16	T=18+R+ 19	(21)=18-3	(22)=R	(23)=19-4-5	(24)=22	(25)=23
	Water Withdrawal/Purchase (mgd)				Consumptive Use (mgd)							Water Use Discharged as Wastewater (mgd)				Total Returned/Used in Each Basin (mgd)				Net Basin Gain(+)/Loss(-) (mgd)			Interbasin Transfer (mgd)	
	Jordan Lake Withdrawal	Neuse Basin Purchase		Total System Use	Haw		Cape Fear		Neuse		Total	Haw		Cape Fear	Neuse	Haw	Cape Fear	Neuse	Total- All Basins	Haw	Cape Fear	Neuse	Haw to Cape Fear	Haw to Neuse
DATE	Haw	Raleigh	Durham		Potable	WRF Reuse	Potable	WRF Reuse	Potable	WRF Reuse		WTP Process Water	WRF	WRF	Total WRFs									
9/10/2013	22.73	0.00	0.00	22.73	1.60	0.00	0.06	0.00	3.36	1.21	6.23	2.03	2.34	0.00	12.13	5.97	0.06	16.70	22.73	-16.76	0.06	16.70	0.06	16.70
9/11/2013	25.05	0.00	0.00	25.05	1.92	0.00	0.06	0.00	4.65	1.15	7.78	2.24	2.32	0.00	12.71	6.48	0.06	18.51	25.05	-18.57	0.06	18.51	0.06	18.51
9/12/2013	23.89	0.00	0.00	23.89	1.99	0.00	0.08	0.00	4.01	1.27	7.34	2.12	2.28	0.00	12.15	6.39	0.08	17.43	23.89	-17.50	0.08	17.43	0.08	17.43
9/13/2013	21.77	0.00	0.00	21.77	1.31	0.00	0.04	0.00	2.94	1.16	5.46	1.89	2.28	0.00	12.14	5.48	0.04	16.25	21.77	-16.29	0.04	16.25	0.04	16.25
9/14/2013	22.61	0.00	0.00	22.61	1.83	0.00	0.07	0.00	3.94	1.16	6.99	2.04	2.21	0.00	11.38	6.08	0.07	16.47	22.61	-16.53	0.07	16.47	0.07	16.47
9/15/2013	23.51	0.00	0.00	23.51	1.89	0.00	0.06	0.00	4.25	0.92	7.12	1.85	2.29	0.00	12.25	6.02	0.06	17.42	23.51	-17.49	0.06	17.42	0.06	17.42
9/16/2013	20.46	0.00	0.00	20.46	0.59	0.00	0.01	0.00	1.44	0.98	3.02	2.45	2.37	0.00	12.62	5.41	0.01	15.04	20.46	-15.05	0.01	15.04	0.01	15.04
9/17/2013	21.17	0.00	0.00	21.17	1.31	0.00	0.04	0.00	2.94	1.18	5.48	1.64	2.21	0.00	11.84	5.16	0.04	15.96	21.17	-16.01	0.04	15.96	0.04	15.96
9/18/2013	22.58	0.00	0.00	22.58	1.82	0.00	0.06	0.00	3.92	1.13	6.93	1.36	2.24	0.00	12.05	5.42	0.06	17.10	22.58	-17.16	0.06	17.10	0.06	17.10
9/19/2013	22.58	0.00	0.00	22.58	1.95	0.00	0.06	0.00	4.47	1.28	7.77	0.74	2.21	0.00	11.86	4.91	0.06	17.61	22.58	-17.67	0.06	17.61	0.06	17.61
9/20/2013	20.94	0.00	0.00	20.94	1.26	0.00	0.04	0.00	2.94	0.93	5.17	1.13	2.32	0.00	12.32	4.71	0.04	16.19	20.94	-16.23	0.04	16.19	0.04	16.19
9/21/2013	18.99	0.00	0.00	18.99	0.97	0.00	0.03	0.00	2.34	0.86	4.20	-0.84	2.41	0.00	13.22	2.54	0.03	16.42	18.99	-16.45	0.03	16.42	0.03	16.42
9/22/2013	18.62	0.00	0.00	18.62	0.44	0.00	0.01	0.00	1.08	0.75	2.28	1.03	2.33	0.00	12.98	3.80	0.01	14.81	18.62	-14.82	0.01	14.81	0.01	14.81
9/23/2013	19.43	0.00	0.00	19.43	0.69	0.00	0.03	0.00	1.10	0.80	2.63	2.97	2.23	0.00	11.60	5.89	0.03	13.50	19.43	-13.54	0.03	13.50	0.03	13.50
9/24/2013	19.37	0.00	0.00	19.37	0.81	0.00	0.04	0.00	1.28	1.05	3.17	1.93	2.28	0.00	11.99	5.02	0.04	14.31	19.37	-14.35	0.04	14.31	0.04	14.31
9/25/2013	21.41	0.00	0.00	21.41	1.04	0.00	0.02	0.00	2.52	0.86	4.44	2.39	2.28	0.00	12.30	5.71	0.02	15.68	21.41	-15.70	0.02	15.68	0.02	15.68
9/26/2013	22.38	0.00	0.00	22.38	1.54	0.00	0.06	0.00	3.05	1.01	5.65	2.36	2.32	0.00	12.04	6.22	0.06	16.10	22.38	-16.16	0.06	16.10	0.06	16.10
9/27/2013	22.72	0.00	0.00	22.72	1.52	0.00	0.06	0.00	3.18	0.98	5.74	2.37	2.33	0.00	12.29	6.22	0.06	16.44	22.72	-16.50	0.06	16.44	0.06	16.44
9/28/2013	19.98	0.00	0.00	19.98	1.25	0.00	0.06	0.00	2.05	1.09	4.45	1.58	2.25	0.00	11.70	5.09	0.06	14.84	19.98	-14.89	0.06	14.84	0.06	14.84
9/29/2013	22.97	0.00	0.00	22.97	1.45	0.00	0.05	0.00	3.11	0.95	5.56	2.64	2.35	0.00	12.41	6.44	0.05	16.48	22.97	-16.53	0.05	16.48	0.05	16.48
9/30/2013	19.86	0.00	0.00	19.86	0.97	0.00	0.04	0.00	1.94	0.94	3.90	1.30	2.40	0.00	12.26	4.68	0.04	15.14	19.86	-15.18	0.04	15.14	0.04	15.14
10/1/2013	22.09	0.00	0.00	22.09	1.58	0.00	0.07	0.00	2.92	1.13	5.70	2.15	2.34	0.00	11.91	6.07	0.07	15.95	22.09	-16.02	0.07	15.95	0.07	15.95
10/2/2013	23.96	0.00	0.00	23.96	2.02	0.00	0.07	0.00	4.59	1.07	7.74	1.84	2.35	0.00	12.03	6.21	0.07	17.69	23.96	-17.75	0.07	17.69	0.07	17.69
10/3/2013	23.14	0.00	0.00	23.14	2.01	0.00	0.09	0.00	3.52	1.02	6.64	1.96	2.39	0.00	12.15	6.36	0.09	16.69	23.14	-16.78	0.09	16.69	0.09	16.69
10/4/2013	23.52	0.00	0.00	23.52	1.79	0.00	0.06	0.00	4.10	0.98	6.93	1.97	2.51	0.00	12.11	6.27	0.06	17.20	23.52	-17.25	0.06	17.20	0.06	17.20
10/5/2013	23.08	0.00	0.00	23.08	1.45	0.00	0.04	0.00	3.51	1.10	6.10	2.33	2.35	0.00	12.29	6.13	0.04	16.91	23.08	-16.95	0.04	16.91	0.04	16.91
10/6/2013	23.15	0.00	0.00	23.15	1.63	0.00	0.06	0.00	3.60	0.98	6.27	2.00	2.40	0.00	12.48	6.03	0.06	17.06	23.15	-17.12	0.06	17.06	0.06	17.06
10/7/2013	18.39	0.00	0.00	18.39	0.57	0.00	0.02	0.00	1.15	0.84	2.59	2.09	2.19	0.00	11.52	4.85	0.02	13.52	18.39	-13.54	0.02	13.52	0.02	13.52
10/8/2013	18.50	0.00	0.00	18.50	0.54	0.00	0.02	0.00	1.13	0.83	2.53	2.40	2.16	0.00	11.41	5.11	0.02	13.37	18.50	-13.39	0.02	13.37	0.02	13.37
10/9/2013	18.88	0.00	0.00	18.88	0.52	0.00	0.01	0.00	1.25	0.79	2.56	1.86	2.35	0.00	12.11	4.72	0.01	14.14	18.88	-14.16	0.01	14.14	0.01	14.14
10/10/2013	18.77	0.00	0.00	18.77	0.67	0.00	0.03	0.00	1.25	0.82	2.76	2.02	2.30	0.00	11.68	4.99	0.03	13.75	18.77	-13.78	0.03	13.75	0.03	13.75
10/11/2013	18.91	0.00	0.00	18.91	0.45	0.00	0.01	0.00	1.08	0.73	2.27	2.87	2.29	0.00	11.47	5.61	0.01	13.29	18.91	-13.30	0.01	13.29	0.01	13.29
10/12/2013	19.32	0.00	0.00	19.32	0.64	0.00	0.03	0.00	1.22	0.81	2.70	2.71	2.25	0.00	11.66	5.60	0.03	13.69	19.32	-13.72	0.03	13.69	0.03	13.69
10/13/2013	17.72	0.00	0.00	17.72	0.40	0.00	0.01	0.00	0.98	0.75	2.14	1.85	2.20	0.00	11.53	4.46	0.01	13.26	17.72	-13.26	0.01	13.26	0.01	13.26
10/14/2013	17.58	0.00	0.00	17.58	0.50	0.00	0.02	0.00	1.16	0.77	2.44	1.12	2.22	0.00	11.79	3.84	0.02	13.72	17.58	-13.74	0.02	13.72	0.02	13.72
10/15/2013	19.11	0.00	0.00	19.11	0.69	0.00	0.03	0.00	1.19	0.84	2.76	2.89	2.15	0.00	11.31	5.73	0.03	13.35	19.11	-13.38	0.03	13.35	0.03	13.35
10/16/2013	19.02	0.00	0.00	19.02	0.65	0.00	0.03	0.00	1.30	0.81	2.79	1.74	2.25	0.00	12.24	4.64	0.03	14.36	19.02	-14.38	0.03	14.36	0.03	14.36
10/17/2013	18.99	0.00	0.00	18.99	0.81	0.00	0.04	0.00	1.36	0.86	3.06	1.79	2.28	0.00	11.86	4.88	0.04	14.07	18.99	-14.11	0.04	14.07	0.04	14.07
10/18/2013	20.43	0.00	0.00	20.43	1.16	0.00	0.06	0.00	1.53	0.76	3.51	2.71	2.29	0.00	11.92	6.17	0.06	14.20	20.43	-14.26	0.06	14.20	0.06	14.20
10/19/2013	19.40	0.00	0.00	19.40	0.78	0.00	0.03	0.00	1.40	0.88	3.10	1.88	2.31	0.00	12.11	4.97	0.03	14.40	19.40	-14.43	0.03	14.40	0.03	14.40
10/20/2013	18.18	0.00	0.00	18.18	1.59	0.00	0.01	0.00	3.88	0.77	6.25	1.28	2.37	0.00	8.28	5.24	0.01	12.93	18.18	-12.94	0.01	12.93	0.01	12.93
10/21/2013	18.72	0.00	0.00	18.72	0.59	0.00	0.02	0.00	1.25	0.75	2.61	1.86	2.34	0.00	11.92	4.78	0.02	13.92	18.72	-13.94	0.02	13.92	0.02	13.92

	(3)	(4)	(5)	(7)=3+4+5	(8)	(9)	(10)	(11)	(12)	(13)	L=8+9+10 +11+12+13	(14)	(15)	(17)	(16)	(18)=8+9+ 14+15	R=10+11+ 17	19=12+13 +16	T=18+R+ 19	(21)=18-3	(22)=R	(23)=19-4- 5	(24)=22	(25)=23
	Water Withdrawal/Purchase (mgd)				Consumptive Use (mgd)							Water Use Discharged as Wastewater (mgd)				Total Returned/Used in Each Basin (mgd)				Net Basin Gain(+)/Loss(-) (mgd)			Interbasin Transfer (mgd)	
	Jordan Lake Withdrawal	Neuse Basin Purchase		Total System Use	Haw		Cape Fear		Neuse		Total	Haw		Cape Fear	Neuse	Haw	Cape Fear	Neuse	Total- All Basins	Haw	Cape Fear	Neuse	Haw to Cape Fear	Haw to Neuse
DATE	Haw	Raleigh	Durham		Potable	WRF Reuse	Potable	WRF Reuse	Potable	WRF Reuse		WTP Process Water	WRF	WRF	Total WRFs									
10/22/2013	18.92	0.00	0.00	18.92	0.71	0.00	0.03	0.00	1.21	0.93	2.89	2.71	2.15	0.00	11.17	5.58	0.03	13.31	18.92	-13.34	0.03	13.31	0.03	13.31
10/23/2013	19.58	0.00	0.00	19.58	0.94	0.00	0.05	0.00	1.53	0.90	3.42	1.60	2.28	0.00	12.28	4.82	0.05	14.71	19.58	-14.76	0.05	14.71	0.05	14.71
10/24/2013	19.90	0.00	0.00	19.90	0.77	0.00	0.02	0.00	1.84	0.91	3.54	1.90	2.31	0.00	12.15	4.97	0.02	14.90	19.90	-14.93	0.02	14.90	0.02	14.90
10/25/2013	18.86	0.00	0.00	18.86	0.43	0.00	0.01	0.00	1.05	0.78	2.27	2.48	2.24	0.00	11.87	5.15	0.01	13.70	18.86	-13.71	0.01	13.70	0.01	13.70
10/26/2013	18.45	0.00	0.00	18.45	0.52	0.00	0.02	0.00	1.19	0.87	2.59	1.68	2.19	0.00	11.99	4.39	0.02	14.05	18.45	-14.06	0.02	14.05	0.02	14.05
10/27/2013	18.56	0.00	0.00	18.56	0.48	0.00	0.01	0.00	1.17	0.77	2.42	1.34	2.29	0.00	12.51	4.11	0.01	14.44	18.56	-14.45	0.01	14.44	0.01	14.44
10/28/2013	18.94	0.00	0.00	18.94	0.49	0.00	0.01	0.00	1.19	0.84	2.53	1.93	2.26	0.00	12.22	4.68	0.01	14.25	18.94	-14.26	0.01	14.25	0.01	14.25
10/29/2013	19.75	0.00	0.00	19.75	0.50	0.00	0.01	0.00	1.20	1.02	2.73	2.44	2.23	0.00	12.35	5.16	0.01	14.58	19.75	-14.59	0.01	14.58	0.01	14.58
10/30/2013	18.54	0.00	0.00	18.54	0.67	0.00	0.03	0.00	1.28	0.89	2.87	1.27	2.20	0.00	12.20	4.13	0.03	14.38	18.54	-14.41	0.03	14.38	0.03	14.38
10/31/2013	20.31	0.00	0.00	20.31	0.71	0.00	0.03	0.00	1.38	0.95	3.07	2.94	2.30	0.00	12.00	5.95	0.03	14.33	20.31	-14.36	0.03	14.33	0.03	14.33
11/1/2013	18.41	0.00	0.00	18.41	0.49	0.00	0.01	0.00	1.19	0.85	2.54	1.43	2.05	0.00	12.39	3.97	0.01	14.44	18.41	-14.44	0.01	14.44	0.01	14.44
11/2/2013	16.80	0.00	0.00	16.80	0.37	0.00	0.01	0.00	0.91	0.73	2.02	1.72	2.11	0.00	10.95	4.20	0.01	12.59	16.80	-12.60	0.01	12.59	0.01	12.59
11/3/2013	17.70	0.00	0.00	17.70	0.39	0.00	0.01	0.00	0.95	0.75	2.10	2.32	1.96	0.00	11.32	4.68	0.01	13.02	17.70	-13.02	0.01	13.02	0.01	13.02
11/4/2013	17.67	0.00	0.00	17.67	0.45	0.00	0.01	0.00	1.09	0.75	2.31	1.89	2.14	0.00	11.33	4.48	0.01	13.18	17.67	-13.19	0.01	13.18	0.01	13.18
11/5/2013	17.63	0.00	0.00	17.63	0.41	0.00	0.01	0.00	1.01	0.84	2.26	2.16	1.97	0.00	11.23	4.55	0.01	13.08	17.63	-13.08	0.01	13.08	0.01	13.08
11/6/2013	17.38	0.00	0.00	17.38	0.57	0.00	0.02	0.00	1.12	0.84	2.54	1.76	2.02	0.00	11.06	4.35	0.02	13.01	17.38	-13.03	0.02	13.01	0.02	13.01
11/7/2013	18.95	0.00	0.00	18.95	0.49	0.00	0.01	0.00	1.17	0.76	2.43	2.97	2.15	0.00	11.40	5.61	0.01	13.33	18.95	-13.34	0.01	13.33	0.01	13.33
11/8/2013	18.23	0.00	0.00	18.23	0.83	0.00	0.04	0.00	1.35	0.71	2.93	1.74	2.20	0.00	11.35	4.77	0.04	13.42	18.23	-13.46	0.04	13.42	0.04	13.42
11/9/2013	17.31	0.00	0.00	17.31	0.48	0.00	0.02	0.00	1.04	0.81	2.35	2.22	2.19	0.00	10.54	4.89	0.02	12.40	17.31	-12.42	0.02	12.40	0.02	12.40
11/10/2013	17.07	0.00	0.00	17.07	0.48	0.00	0.02	0.00	1.10	0.78	2.38	1.38	1.91	0.00	11.40	3.76	0.02	13.29	17.07	-13.31	0.02	13.29	0.02	13.29
11/11/2013	17.90	0.00	0.00	17.90	0.44	0.00	0.01	0.00	1.07	0.78	2.30	1.97	1.96	0.00	11.67	4.37	0.01	13.52	17.90	-13.53	0.01	13.52	0.01	13.52
11/12/2013	18.77	0.00	0.00	18.77	0.74	0.00	0.03	0.00	1.35	0.80	2.92	2.04	2.12	0.00	11.68	4.91	0.03	13.83	18.77	-13.86	0.03	13.83	0.03	13.83
11/13/2013	16.83	0.00	0.00	16.83	0.41	0.00	0.01	0.00	0.99	0.72	2.13	1.92	1.96	0.00	10.82	4.29	0.01	12.53	16.83	-12.54	0.01	12.53	0.01	12.53
11/14/2013	16.97	0.00	0.00	16.97	0.52	0.00	0.02	0.00	1.04	0.72	2.30	2.02	1.95	0.00	10.70	4.49	0.02	12.46	16.97	-12.48	0.02	12.46	0.02	12.46
11/15/2013	17.06	0.00	0.00	17.06	0.42	0.00	0.01	0.00	1.01	0.69	2.13	1.96	2.04	0.00	10.93	4.41	0.01	12.64	17.06	-12.65	0.01	12.64	0.01	12.64
11/16/2013	16.88	0.00	0.00	16.88	0.36	0.00	0.01	0.00	0.87	0.71	1.95	2.57	1.80	0.00	10.55	4.73	0.01	12.14	16.88	-12.15	0.01	12.14	0.01	12.14
11/17/2013	17.01	0.00	0.00	17.01	0.49	0.00	0.02	0.00	0.99	0.69	2.19	2.09	1.99	0.00	10.74	4.57	0.02	12.42	17.01	-12.44	0.02	12.42	0.02	12.42
11/18/2013	16.80	0.00	0.00	16.80	0.41	0.00	0.01	0.00	0.98	0.67	2.07	1.85	2.18	0.00	10.71	4.43	0.01	12.36	16.80	-12.37	0.01	12.36	0.01	12.36
11/19/2013	17.11	0.00	0.00	17.11	0.37	0.00	0.01	0.00	0.91	0.69	1.98	2.35	2.05	0.00	10.73	4.78	0.01	12.33	17.11	-12.33	0.01	12.33	0.01	12.33
11/20/2013	16.39	0.00	0.00	16.39	0.40	0.00	0.01	0.00	0.96	0.68	2.05	1.79	1.98	0.00	10.57	4.17	0.01	12.21	16.39	-12.22	0.01	12.21	0.01	12.21
11/21/2013	16.19	0.00	0.00	16.19	0.34	0.00	0.01	0.00	0.84	0.71	1.89	1.99	1.97	0.00	10.34	4.30	0.01	11.88	16.19	-11.89	0.01	11.88	0.01	11.88
11/22/2013	16.88	0.00	0.00	16.88	0.39	0.00	0.01	0.00	0.94	0.70	2.03	2.19	1.97	0.00	10.68	4.55	0.01	12.32	16.88	-12.33	0.01	12.32	0.01	12.32
11/23/2013	16.48	0.00	0.00	16.48	0.53	0.00	0.02	0.00	0.96	0.65	2.17	1.97	1.92	0.00	10.42	4.42	0.02	12.04	16.48	-12.06	0.02	12.04	0.02	12.04
11/24/2013	16.77	0.00	0.00	16.77	0.39	0.00	0.01	0.00	0.96	0.70	2.05	1.56	2.12	0.00	11.03	4.08	0.01	12.69	16.77	-12.69	0.01	12.69	0.01	12.69
11/25/2013	17.18	0.00	0.00	17.18	0.40	0.00	0.01	0.00	0.96	0.64	2.00	1.99	2.18	0.00	11.01	4.56	0.01	12.61	17.18	-12.62	0.01	12.61	0.01	12.61
11/26/2013	16.86	0.00	0.00	16.86	0.36	0.00	0.01	0.00	0.87	0.59	1.82	2.34	1.78	0.00	10.92	4.47	0.01	12.38	16.86	-12.39	0.01	12.38	0.01	12.38
11/27/2013	14.88	0.00	0.00	14.88	0.29	0.00	0.01	0.00	0.71	0.52	1.53	1.47	1.68	0.00	10.21	3.44	0.01	11.44	14.88	-11.44	0.01	11.44	0.01	11.44
11/28/2013	16.12	0.00	0.00	16.12	0.29	0.00	0.01	0.00	0.69	0.54	1.53	2.84	1.99	0.00	9.76	5.12	0.01	10.99	16.12	-11.00	0.01	10.99	0.01	10.99
11/29/2013	15.90	0.00	0.00	15.90	0.33	0.00	0.01	0.00	0.81	0.57	1.72	2.03	1.88	0.00	10.27	4.24	0.01	11.65	15.90	-11.66	0.01	11.65	0.01	11.65
11/30/2013	14.98	0.00	0.00	14.98	0.29	0.00	0.01	0.00	0.69	0.58	1.56	1.62	1.80	0.00	10.00	3.71	0.01	11.27	14.98	-11.27	0.01	11.27	0.01	11.27
12/1/2013	15.29	0.00	0.00	15.29	0.25	0.00	0.01	0.00	0.62	0.60	1.47	1.55	1.89	0.00	10.38	3.69	0.01	11.59	15.29	-11.60	0.01	11.59	0.01	11.59
12/2/2013	15.77	0.00	0.00	15.77	0.26	0.00	0.01	0.00	0.64	0.65	1.56	1.99	1.93	0.00	10.29	4.19	0.01	11.58	15.77	-11.58	0.01	11.58	0.01	11.58

	(3)	(4)	(5)	(7)=3+4+5	(8)	(9)	(10)	(11)	(12)	(13)	L=8+9+10 +11+12+13	(14)	(15)	(17)	(16)	(18)=8+9+ 14+15	R=10+11+ 17	19=12+13 +16	T=18+R+ 19	(21)=18-3	(22)=R	(23)=19-4- 5	(24)=22	(25)=23
	Water Withdrawal/Purchase (mgd)				Consumptive Use (mgd)							Water Use Discharged as Wastewater (mgd)				Total Returned/Used in Each Basin (mgd)				Net Basin Gain(+)/Loss(-) (mgd)			Interbasin Transfer (mgd)	
	Jordan Lake Withdrawal	Neuse Basin Purchase		Total System Use	Haw		Cape Fear		Neuse		Total	Haw		Cape Fear	Neuse	Haw	Cape Fear	Neuse	Total- All Basins	Haw	Cape Fear	Neuse	Haw to Cape Fear	Haw to Neuse
DATE	Haw	Raleigh	Durham		Potable	WRF Reuse	Potable	WRF Reuse	Potable	WRF Reuse		WTP Process Water	WRF	WRF	Total WRFs									
12/3/2013	17.06	0.00	0.00	17.06	0.31	0.00	0.01	0.00	0.74	0.73	1.80	2.62	1.85	0.00	10.79	4.78	0.01	12.27	17.06	-12.28	0.01	12.27	0.01	12.27
12/4/2013	17.09	0.00	0.00	17.09	0.34	0.00	0.01	0.00	0.82	0.75	1.92	1.89	1.76	0.00	11.52	3.99	0.01	13.10	17.09	-13.10	0.01	13.10	0.01	13.10
12/5/2013	17.01	0.00	0.00	17.01	0.37	0.00	0.01	0.00	0.82	0.70	1.91	2.08	1.27	0.00	11.75	3.72	0.01	13.27	17.01	-13.29	0.01	13.27	0.01	13.27
12/6/2013	15.30	0.00	0.00	15.30	0.24	0.00	0.01	0.00	0.58	0.78	1.61	1.99	1.77	0.00	9.93	4.00	0.01	11.30	15.30	-11.30	0.01	11.30	0.01	11.30
12/7/2013	15.42	0.00	0.00	15.42	0.24	0.00	0.01	0.00	0.58	0.76	1.58	2.19	1.69	0.00	9.95	4.12	0.01	11.29	15.42	-11.30	0.01	11.29	0.01	11.29
12/8/2013	16.07	0.00	0.00	16.07	0.28	0.00	0.01	0.00	0.67	0.70	1.65	2.04	1.75	0.00	10.63	4.07	0.01	12.00	16.07	-12.00	0.01	12.00	0.01	12.00
12/9/2013	16.15	0.00	0.00	16.15	0.30	0.00	0.01	0.00	0.72	0.69	1.72	1.80	1.84	0.00	10.80	3.93	0.01	12.21	16.15	-12.22	0.01	12.21	0.01	12.21
12/10/2013	16.75	0.00	0.00	16.75	0.30	0.00	0.01	0.00	0.72	0.74	1.77	2.04	1.71	0.00	11.23	4.05	0.01	12.70	16.75	-12.70	0.01	12.70	0.01	12.70
12/11/2013	15.65	0.00	0.00	15.65	0.27	0.00	0.01	0.00	0.66	0.73	1.68	1.78	1.61	0.00	10.58	3.67	0.01	11.98	15.65	-11.98	0.01	11.98	0.01	11.98
12/12/2013	16.14	0.00	0.00	16.14	0.27	0.00	0.01	0.00	0.65	0.73	1.65	2.21	1.29	0.00	10.99	3.76	0.01	12.37	16.14	-12.38	0.01	12.37	0.01	12.37
12/13/2013	16.25	0.00	0.00	16.25	0.31	0.00	0.01	0.00	0.75	0.70	1.76	1.66	1.92	0.00	10.90	3.89	0.01	12.35	16.25	-12.36	0.01	12.35	0.01	12.35
12/14/2013	15.85	0.00	0.00	15.85	0.29	0.00	0.01	0.00	0.71	0.72	1.73	1.49	1.67	0.00	10.96	3.46	0.01	12.39	15.85	-12.39	0.01	12.39	0.01	12.39
12/15/2013	15.98	0.00	0.00	15.98	0.23	0.00	0.01	0.00	0.53	0.72	1.49	2.57	1.80	0.00	10.12	4.60	0.01	11.38	15.98	-11.38	0.01	11.38	0.01	11.38
12/16/2013	16.04	0.00	0.00	16.04	0.28	0.00	0.01	0.00	0.69	0.73	1.70	2.13	1.87	0.00	10.33	4.29	0.01	11.75	16.04	-11.75	0.01	11.75	0.01	11.75
12/17/2013	16.40	0.00	0.00	16.40	0.29	0.00	0.01	0.00	0.70	0.77	1.77	1.96	1.41	0.00	11.27	3.66	0.01	12.74	16.40	-12.74	0.01	12.74	0.01	12.74
12/18/2013	15.98	0.00	0.00	15.98	0.59	0.00	0.03	0.00	0.83	0.76	2.21	1.29	0.71	0.00	11.77	2.59	0.03	13.36	15.98	-13.39	0.03	13.36	0.03	13.36
12/19/2013	17.10	0.00	0.00	17.10	0.41	0.00	0.02	0.00	0.77	0.74	1.94	2.34	1.20	0.00	11.62	3.95	0.02	13.13	17.10	-13.15	0.02	13.13	0.02	13.13
12/20/2013	17.54	0.00	0.00	17.54	0.52	0.00	0.02	0.00	0.94	0.75	2.24	1.85	2.06	0.00	11.40	4.43	0.02	13.09	17.54	-13.11	0.02	13.09	0.02	13.09
12/21/2013	16.29	0.00	0.00	16.29	0.25	0.00	0.01	0.00	0.60	0.74	1.59	2.85	1.77	0.00	10.08	4.87	0.01	11.41	16.29	-11.42	0.01	11.41	0.01	11.41
12/22/2013	15.94	0.00	0.00	15.94	0.29	0.00	0.01	0.00	0.72	0.76	1.78	1.63	1.84	0.00	10.70	3.76	0.01	12.17	15.94	-12.18	0.01	12.17	0.01	12.17
12/23/2013	16.14	0.00	0.00	16.14	0.29	0.00	0.01	0.00	0.70	0.76	1.76	1.45	1.62	0.00	11.31	3.36	0.01	12.78	16.14	-12.78	0.01	12.78	0.01	12.78
12/24/2013	16.04	0.00	0.00	16.04	0.27	0.00	0.01	0.00	0.65	0.76	1.68	2.15	1.77	0.00	10.44	4.19	0.01	11.85	16.04	-11.85	0.01	11.85	0.01	11.85
12/25/2013	15.15	0.00	0.00	15.15	0.20	0.00	0.01	0.00	0.49	0.72	1.43	2.53	1.74	0.00	9.46	4.47	0.01	10.67	15.15	-10.68	0.01	10.67	0.01	10.67
12/26/2013	14.84	0.00	0.00	14.84	0.20	0.00	0.01	0.00	0.48	0.73	1.42	2.33	1.54	0.00	9.55	4.07	0.01	10.77	14.84	-10.77	0.01	10.77	0.01	10.77
12/27/2013	15.05	0.00	0.00	15.05	0.25	0.00	0.01	0.00	0.61	0.76	1.62	1.63	1.50	0.00	10.30	3.38	0.01	11.66	15.05	-11.67	0.01	11.66	0.01	11.66
12/28/2013	14.66	0.00	0.00	14.66	0.21	0.00	0.01	0.00	0.50	0.76	1.47	1.89	1.37	0.00	9.93	3.46	0.01	11.19	14.66	-11.20	0.01	11.19	0.01	11.19
12/29/2013	14.84	0.00	0.00	14.84	0.21	0.00	0.01	0.00	0.51	0.81	1.53	2.26	1.17	0.00	9.88	3.63	0.01	11.20	14.84	-11.21	0.01	11.20	0.01	11.20
12/30/2013	15.21	0.00	0.00	15.21	0.24	0.00	0.01	0.00	0.58	0.80	1.63	1.63	1.53	0.00	10.42	3.40	0.01	11.81	15.21	-11.81	0.01	11.81	0.01	11.81
12/31/2013	16.68	0.00	0.00	16.68	0.28	0.00	0.01	0.00	0.68	0.76	1.72	2.07	1.85	0.00	11.04	4.20	0.01	12.47	16.68	-12.48	0.01	12.47	0.01	12.47

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Appendix C:

Towns of Cary and Apex Water Shortage Response Plans Updated for 2013

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Town of Cary
Water Shortage Response Plan

Prepared by: Leila Goodwin, P.E., Water Resources Manager and Marie Cefalo, Water Conservation Coordinator
Supersedes: 5/10/2007
Approved by Council: 6/10/2009
Effective: July 1, 2009
Modified January 21, 2010

Purpose: To establish measures and procedures for reducing potable water use during times of water shortage.

In 1996 the Town established a comprehensive water conservation program designed to effectively manage Cary's long term water resources. The established goals for the program are to support the high quality of life in Cary by providing safe, reliable water service, while reducing per capita use of potable water, conserve a limited natural resource, and reduce the costs of infrastructure expansion. To achieve these goals the comprehensive water conservation program includes regulatory, educational, and financial incentive components. The regulatory component primarily consists of three year-round water conservation ordinances: Section 36-80, Water Service Provided by Town Includes only Alternate Day Outdoor Irrigation; Section 36-83, Waste While Watering Ordinance, 36-84 Rain Sensor Ordinance. There are also irrigation system design requirements included in the Land Development Ordinance. The fundamental educational initiatives are school lessons; the annual Beat the Peak Campaign, The Block Leader Program, and the Town's Web pages. The primary financial incentive is the Town's tiered rate structure.

In contrast to Cary's long-term water conservation program, the purpose of this Water Shortage Response Plan (WSRP) is to deal with short-term or immediate water shortage, which may be caused by things such as drought, water quality problems, or disruptions in facility operations. The Town of Cary has been required by the state to have a WSRP since 2001 by both our Jordan Lake Allocation water supply contract and our interbasin transfer certificate. More recently, as of July 1, 2009 all public and privately owned water systems subject to GS 143-355 (l) are required to have an approved WSRP as part of their Local Water Supply Plan (LWSP). Rules governing water use during droughts and water emergencies (15A NCAC 02E. 0607) stipulate specific items that must be included in those plans. This WSRP was developed in accordance with the *Water Shortage Response Plan Guidelines* provided by the Division of Water Resources (January 2009).

I. Authorization

The Cary Town Manager, and in his or her absence the Assistant Town Manager, is authorized by Section 36-81 of the Town Code of Ordinances to declare a Water Shortage and to enact water shortage response provisions. References in this

document to the Town Manager apply to the Assistant Town Manager in the Town Manager's absence.

II. Notification

Once a Water Shortage has been declared, and whenever the Water Shortage Response Stage (defined in Section IV below) changes, the following notifications will be made:

1. A notice of the effective date of the declaration and the current water use reduction state will be posted at Town Hall.
2. The Town Manager (or designee) notifies the Mayor, Town Council, neighboring municipal contract water recipients, and town government departments.
3. The Public Information Officer (or designee) will contact the media. The media, including television, print, internet, and radio, will inform the public. Contact information for the Public Works & Utilities Department will be provided for additional information needed by the public.
4. The Public Information Officer (or designee) will update the Town's Web site with the Water Shortage status.
5. The Public Works & Utilities Director (or designee) will contact Finance Customer Service and the Water Distribution System Operator, and distribute a general e-mail so Town employees can help provide accurate information to the public.
6. Finance Customer Service will contact major water customers (both irrigation and water accounts) and inform them of the implemented measures.
7. The Water Distribution System Operator will contact the police communications center, and coordinate with bulk users.
8. The Town will directly notify both residential and non-residential customers of water restrictions via mail and/or e-mail when a water shortage is declared and when a new more restrictive stage is implemented. In addition, Town staff will email the information to irrigation contractors listed on a notification list maintained by water conservation program staff.
9. Water conservation staff will provide PWUT field employees with handouts to give customers who ask them questions as they work throughout the community.

During drought periods when declaration of a water shortage appears likely, the Town will keep customers informed of the potential for declaring a water shortage, and will provide information to customers via public service announcements and the Web site about measures they can take to reduce water use and, potentially, avoid a water shortage situation.

III. Drought Contingency Plans for Non-residential Customers

Non-residential customers are encouraged to prepare for a water shortage by determining the measures they would implement to meet the requirements of the Water

Shortage Response stages described in Section IV. This can be accomplished by developing a Drought Contingency Plan during normal water supply conditions before there is a water shortage situation. Customers who use relatively large amounts of potable water and/or use potable water for public health purposes (e.g. hospitals or assisted living facilities) are especially encouraged to develop a Drought Contingency Plan well in advance of a potential water shortage situation. Resources available for assistance with developing a plan include the NCDENR Division of Pollution Prevention, which published the "Water Efficiency Manual for Commercial, Industrial and Institutional Facilities" in May 2009, and Waste Reduction Partners. The manual and more information are available at www.p2pays.org, or call (919) 715-6500 or (800) 763-0136.

If, after developing a Drought Contingency Plan, a customer believes that meeting the default water use reduction requirements will compromise public health and safety or cause extreme hardship, the customer can submit a Drought Contingency Plan as described below to the Town's Water Conservation Program Coordinator (or designee) for approval. An approved Drought Contingency Plan can then be used – and must be followed - in lieu of meeting the default requirements included in Section IV for non-residential customers.

To be considered for approval a Drought Contingency Plan must include:

1. Estimated amount of potable water use per day, during both an average winter month and an average summer month, for different purposes including drinking water, basic sanitation, process water, irrigation, and other major uses specific to the customer

2. Description of any alternate water sources available

3. Description of existing high-efficiency fixtures, technologies, hardware, management practices, or other measures in use to reduce water use.

4. Measures that would be taken during each Water Shortage Response stage in order to meet the requirements in Section IV.

5. Description of the impact to the customer or to the public (e.g. reduced production, reduction of business hours, employee impacts, structural damage, etc.) of meeting the water use reduction requirements.

6. Proposed alternative measures to be taken during each Water Shortage Response stage, and the resulting expected reduction in water use for the categories listed in item 1, under both average winter and average summer conditions.

Non-residential customers with an approved Drought Contingency Plan must resubmit their plan for approval every five years, or sooner if there is a significant change in water use or other conditions which would alter the plan's effectiveness.

IV. Water Shortage Response Stages

Four water shortage response stages, intended to achieve system-wide water use reduction, are described below and summarized in Table 1. Before Stage 1 is implemented, the Town will communicate to each customer a summary of the

customer's historical water use, their normal Tier 1 indoor water use, and information on how much water can be saved with different water use reduction measures.

Non-residential customers who have an approved Drought Contingency Plan must reduce water use during each stage as specified in their plan.

Stage 1

Spray irrigation using potable water is limited to one (1) day per week for all purposes except the maintenance of athletic fields. No new turf watering exemption permits will be issued and any existing permits for watering periods that begin later than 14 days after the effective date of Stage 1 will be rescinded. Hand watering, drip irrigation, and subsurface irrigation are still allowed. Other outdoor water uses such as pressure washing, car washing, and keeping swimming pools filled are allowed, although customers are strongly encouraged to minimize such uses.

Stage 2

Spray irrigation using potable water is not allowed for any purpose except the maintenance of athletic fields. No new turf watering exemption permits will be issued, and any previously issued exemption permits for watering periods that have not expired will be rescinded. Hand watering, drip irrigation, and subsurface irrigation are still allowed. Other outdoor water uses such as pressure washing, car washing, and keeping swimming pools filled are allowed, although customers are strongly encouraged to minimize such uses.

Stage 3

No outdoor water use with potable water is allowed, including but not limited to: spray irrigation, hand watering, drip irrigation, and subsurface irrigation, ornamental fountains, car washing, pressure washing, and keeping swimming pools filled. No new turf watering exemption permits will be issued and any previously issued permits for watering periods that have not expired will be rescinded. Firefighting and utility system maintenance are the only allowable outdoor water uses.

All customers are required to limit their monthly water use to the amount they normally use during the winter within Tier 1. This amount will be provided to each customer by the Public Works and Utilities Department, based on the water use history for their account, well in advance of Stage 3 implementation. For example, if during the winter a residential customer uses 4,000 gallons per month, then 4,000 gallons per month will be their normal Tier 1 indoor water use; if a customer normally uses 6,000 gallons per month in the winter - 5,000 Tier 1 and 1,000 Tier 2 – then their normal Tier 1 indoor water use will be 5,000 gallons per month. The approach will be the same for non-residential customers even though the maximum number of gallons based on the threshold between Tier 1 and Tier 2 varies for individual customers.

Rationing

In this stage, the goal is to ensure there is drinking water available to protect public health (e.g., health care, drinking water, basic sanitation). Customers are encouraged to use the minimum amount of water needed for public health protection. No outdoor

water use with potable water is allowed, including but not limited to: spray irrigation, hand watering, drip irrigation, and subsurface irrigation, ornamental fountains, car washing, pressure washing, and keeping swimming pools filled. As in Stage 3, no new turf watering exemption permits will be issued and any previously issued permits for watering periods that have not expired will be rescinded. Firefighting and utility system maintenance are the only allowable outdoor water uses.

All customers are required to reduce their normal Tier 1 indoor water use, calculated as defined above in Stage 3, by 15%.

Table 1: Water Shortage Response Stage Summary

	Year-round Water Conservation Program	Water Shortage Response Stages			
		Stage 1	Stage 2	Stage 3	Rationing
Outdoor Spray Irrigation	Three days per week	One day per week	None	None	None
Hand watering, drip irrigation, subsurface irrigation, athletic field maintenance	Allowed	Allowed	Allowed	None	None
Other outdoor water use such as pressure washing, car washing, filling/topping off swimming pools	Allowed	Allowed	Allowed	None	None
New Turf Watering Exception Permits	Allowed	No new permits issued, permits beginning more than 14 days after stage 1 date rescinded	None	None	None
Indoor Water Use Restrictions [1]	None	None	None	Limited to normal Tier 1 indoor use	Reduce normal Tier 1 indoor use by 15%

[1] Non-residential customers with an approved Drought Contingency Plan will follow the steps in their Plan.

V. Water Shortage Response Triggers for Chronic Conditions

Triggers are conditions which, when reached, cause a water shortage response stage to be implemented. Triggers are based on the ability to meet water demands and are influenced by several components of the Town's water supply system: the water source (Jordan Lake and/or purchase from others), raw water intake and pipeline, treatment plant, storage tanks, and distribution system. Town staff and the Town Manager continually evaluate the status of all these components to determine if a water shortage condition exists or is approaching.

Cary and Apex have a joint allocation of water supply storage volume in the Jordan Lake Water Supply Pool equal to 32 percent of the water supply pool or 14,656 acre-feet (4,778 million gallons). Morrisville holds a water supply storage allocation equal to 3.5 percent of the water supply pool or 1,603 acre-feet (523 million gallons). Wake County (on behalf of RTP South) holds a water supply storage allocation equal to 3.5 percent of the water supply pool or 1,603 acre-feet (523 million gallons). Cary staff track the amount of water in storage in each of these water supply allocation pools on a daily basis, using daily and monthly water use records along with daily lake inflow and outflow estimates obtained from the US Army Corps of Engineers.

The triggers that would initiate a water shortage declaration from the Town Manager, and cause changes in the Water Shortage Response Stages as conditions worsen or improve, are based on the number of days of water supply available to meet potable water demands. The days of water supply remaining is calculated by dividing the working supply volume by the moving 30-day average daily demand. The working supply volume is defined as the amount currently stored, and accessible without permitting or capital improvements, in the combined Cary/Apex, Morrisville, and Wake County (for RTP South) Jordan Lake water supply storage allocations. The moving 30-day average daily demand is the total demand from customers in the Towns of Apex, Cary, and Morrisville, and RTP South.

$$\text{Days of Supply Remaining} = \frac{\text{Working Supply Volume}}{\text{Moving 30-Day Average of Daily Demand}}$$

Table 2 describes the triggers for entering the increasing stages of Water Shortage Response as conditions worsen and the Days of Supply Remaining is declining. The Director of Public Works and Utilities (or designee) will advise the Town Manager, in writing, when a trigger has been reached for issuance of a water shortage declaration or increasing the water shortage response stage. The Manager (or designee) shall then implement the appropriate water shortage response stage by issuing a declaration to take effect within 10 days of the date when the trigger was reached. The Town Manager may, based on other factors (described below), declare a Water Shortage or implement stages before a trigger is reached (sooner than Table 2 would indicate) if Days of Supply are declining or other conditions are worsening.

Table 2: Water Shortage Response Triggers for Declining Days of Supply Remaining

Stage	Triggers When Days of Supply Remaining is Declining
(Water Shortage declared) Stage 1	Days of Supply Remaining is 120 days or less
Stage 1 to Stage 2	Stage 1 has been in place for 28 continuous days AND Days of Supply Remaining is 90 days or less
Stage 2 to Stage 3	Days of Supply Remaining is 60 days or less
Stage 3 to Rationing	Days of Supply Remaining is 30 days or less

Table 3 describes the triggers for moving out of Water Shortage Response stages as conditions improve and the Days of Supply Remaining increases. The Director shall advise the Manager, in writing, when a trigger has been reached for decreasing a water shortage response stage or ending a water shortage declaration. Based on the written notification that a trigger has been reached, the Manager, in his discretion, may issue a declaration decreasing the water shortage response stage or ending a water shortage declaration. Based on other factors (described below), the Manager may elect to move out of a stage after a trigger is reached (slower than Table 3 would indicate).

Table 3: Water Shortage Response Triggers for Increasing Days of Supply Remaining

Stage	Triggers When Days of Supply Remaining is Increasing
Rationing to Stage 3	Days of Supply Remaining has been at least 60 days for at least 14 continuous days
Stage 3 to Stage 2	Days of Supply Remaining has been at least 90 days for at least 14 continuous days
Stage 2 to Stage 1	Days of Supply Remaining has been at least 120 days for at least 14 continuous days
Water Shortage ended	Jordan Lake Water Supply allocation has been 100% full for at least 14 continuous days

Other factors considered may include but not be limited to:

- Jordan Lake elevation
- US Army Corps of Engineers' operation of Jordan Lake in drought contingency mode
- Indications of short or long-term water quality concerns regarding Jordan Lake or other sources.
- Level of interbasin transfers relative to the Cary/Apex, Morrisville/Wake County interbasin transfer certificate amount.
- Drought Advisory issued by the NC Drought Management Advisory Council.
- Sudden loss of supplemental water supplies during periods of high demand.

VI. Water Shortage Triggers and Response for Acute Conditions

Events such as contamination, equipment or facility failure, or line breaks require a swift and immediate response. Examples of conditions that may result in an immediate water shortage include:

- The occurrence of a major water transmission main break, fire, or any other emergency that would require high volumes of water, such that demand could exceed supply.
- Accidental or intentional contamination of the water system.
- Mechanical failure in the water treatment plant or distribution system.

- Inability to distribute water through part of the system.

The following Standard Operating Procedures identify protocols Town staff follow when these circumstances arise:

OPS #007, De-chlorination Procedure for Water Distribution System Flushing and Main Break or Reclaimed Water System Main Break

OPS #008, Water Main and Service Line Breaks

OPS # 010, Water Transmission Main Shut Down

OPS #015 Water Main Break by Contractor

OPS #017 Fecal Coliform-E.coli/Contamination Response

In addition, an Emergency Response Plan, kept confidential for security purposes, identifies detailed procedures to follow should an emergency of that magnitude happen. Upon recommendation of the Director, the Town Manager may declare a water shortage and implement any water shortage response stages or other measures as he or she deems appropriate for any such immediate water shortage situation.

VI. Enforcement

Compliance with the requirements of the Water Shortage Response Plan is required by the Water Shortage Ordinance (Section 36-81). Penalties are specified annually in the Budget Ordinance (Operating Budget Fee Schedule, Public Works and Utility Fees).

The Town has Water Conservation Technicians who regularly enforce our year-round water conservation ordinances, which address outdoor water use and water waste. During a water shortage, these staff members will continue their enforcement of outdoor water use restrictions, and other staff members may also be used as needed to achieve the desired system-wide water use reductions. During a water shortage, in contrast to during normal times, there will be no warnings before fines are issued for non-compliance with outdoor water use restrictions, and, the fines are higher than during normal times. However, the fine for a first-time violation will be deferred and either 1) waived at the end of the water shortage if there is not a second violation or 2) added to the fine for a second violation if that occurs.

Reductions in indoor water use are not required in Stages 1 and 2, but the amount of reductions that may be occurring voluntarily will be evaluated using monthly water billing usage data. Compliance with the required indoor water use reductions in Stage 3 and Rationing will be monitored during monthly meter reads at a minimum, and Town staff will audit water use more often as conditions warrant and/or if expected overall system water use is not decreasing as needed.

VII. Variance Protocols

The Town recognizes that the requirements for water use reduction in Table 1 may have significantly more impact on some customers than on others and in some cases could affect public health and safety. To be considered for a variance, customers may submit a letter requesting the variance to the Public Works and Utilities Director. The letter must include an explanation of why the requirements in Table 1 are not appropriate, cause extreme hardship, or affect health and safety. The letter should include proposed water use reductions for each stage and an explanation of why they are more appropriate.

A decision to approve or deny variance requests will be based upon consideration of criteria including but not limited to: impact on water demand, expected duration of water shortage, alternative source options, social and economic importance of water use, purpose of water use (i.e., necessary use of drinking water) and the prevention of structural damage.

VIII. Expected Effectiveness

The effectiveness of the Town of Cary Water Shortage Response Plan will be determined by measuring system-wide water use reduction. Variables other than water use restrictions that may impact reduction goals will be considered. Some of these include frequency of plan activation, any problem periods without activation, total number of violation citations, desired reductions attained and evaluation of demand reductions compared to historical data. Table 4 indicates the potential expected

reduction from normal use for each stage, depending on the time of year, developed using 2007 customer billing records.

Table 4: Expected Water Use Reductions

Water Shortage Response Stage	Expected Approximate Reductions Relative to Normal Water Use	
	May through October	November through April
Stage 1	13%	6%
Stage 2	32%	10%
Stage 3	38%	17%
Rationing	46%	29%

IX. Revision

The WSRP will be reviewed if there are new circumstances affecting water supply and demand, and following any Water Shortage declaration. The WSRP will be updated If indicated after a review, or at a minimum every five years as required by the provisions of GS 143-355 (l) and when our Local Water Supply Plan is updated. The Town of Cary Public Works and Utilities Director (or designee) is responsible for initiating all WSRP updates.

X. Public Comment

This WSRP was prepared based on public input received via an on-line survey (available for one month; 91 participants), emailed comments, and at an Open House held April 29, 2009. Subsequent revisions of the Water Shortage Response Plan will go through the normal processes for approval at regular meetings of the Town Operations Committee and then of the Town Council. The proposed WSRP revisions will be publicized as part of the meeting agendas.

Town of Apex
Water Shortage Response Plan

June 2009

Prepared by:

Jessica Bolin, PE

John Cratch

and

CH2MHILL

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Attachments

Attachment 1 Town of Apex 2007 Water Usage
Attachment 2 Town of Apex 2008 Water Usage

Appendix

A Water Conservation Ordinance, Effective February 2, 1999, Amended February 2010

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SECTION 1

Introduction

The purpose of this Water Shortage Response Plan (WSRP) is to provide a framework for making water supply and conservation decisions during times when water supplies in the region may be low either due to drought conditions, water quality problems, or disruptions in facility operations. This Plan supplements the Town of Apex's *Water Conservation Ordinance* (Appendix A), which became effective February 2, 1999 and was amended in February 2010.

The Town of Apex has been required by the State to have a WSRP since 2001 by both our Jordan Lake Allocation water supply contract and our interbasin transfer certificate. More recently, as of July 1, 2009 all public and privately owned water systems subject to GS 143-355 (I) are required to have an approved WSRP as part of their Local Water Supply Plan (LWSP). Rules governing water use during droughts and water emergencies (15A NCAC 02E.0607) require specific items that must be included in those plans. This WSRP was developed in accordance with the *Water Shortage Response Plan Guidelines* provided by the Division of Water Resources (DWR) (January 2009).

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SECTION 2

Water Supply Assessment

The Town of Apex and the Town of Cary have a joint allocation of the water supply storage volume in the Jordan Lake water supply pool. Only 61 percent of the Jordan Lake estimated 100 million gallons per day (MGD) safe yield has been allocated. The rest of the water supply pool is currently unallocated. Of the allocated 61 MGD, 32 MGD of the water supply pool (on an average annual basis), is allocated to the Towns of Apex and Cary. The Town of Apex portion of this allocation is 8.5 MGD.

Two graphs shown as Attachments 1 and 2 at the end of this document illustrate historical water usage for the Town of Apex by month for the calendar years 2007 and 2008.

The Towns of Apex and Cary currently share a raw water intake at Jordan Lake. The water is treated at the Cary/Apex Water Treatment Plant (WTP). The Town of Apex also has letter agreements with the Town of Holly Springs and Harnett County from which it could receive emergency water supplies of approximately 1 MGD of finished water.

Interconnections exist with the water distribution systems of Raleigh, Holly Springs, Harnett County, and Cary, which is also connected to Durham. These interconnections provide the Town with access to several back-up supplies in the event of a failure that may require the repair of pipelines. Although formal emergency agreements are not in place with all of these communities, the interconnections do provide the Town with the flexibility to respond to drought periods and other water supply emergencies.

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SECTION 3

Water Shortage Response Plan

The purpose of this Water Shortage Response Plan (WSRP) is to deal with short-term water shortage, which may be caused by drought, water quality problems, or disruptions in facility operations. The North Carolina Division of Water Resources (DWR) *Water Shortage Response Handbook for North Carolina Water Supply Systems* (2003) requires that municipalities develop a Water Shortage Response Plan/Program that includes the following components:

1. Adopt an ordinance to provide authority to enact system measures to reduce demand in the case of an emergency;
2. Develop a method to evaluate ability to meet demand;
3. Develop procedures for implementing appropriate water use restriction stages;
4. Identify person(s) responsible for implementing the water shortage response protocols;
5. Develop a method to notify system employees and the customers of the shortage;
6. Develop a method to measure the supply and demand and identify the conditions that trigger more or less restrictive measures;
7. Identify the levels of required response and actions to be taken;
8. Identify the enforcement and variances of the water shortage plan;
9. Develop a method for the Town to review and comment on the water shortage response protocols, revision of the protocols, and the evaluation of the effectiveness of the protocols.

Each of these components has been implemented by the Town of Apex and is described in the following sections.

3.1 Authority of Plan

DWR recommends that every municipality adopt an ordinance to "provide for the declaration of a water shortage and specify voluntary and mandatory conservation measures to be imposed at each level of water shortage severity."

The Town Manager has the authority to implement measures outlined in the water conservation ordinance to address potential water shortages, including Section 12-101, *Continuing Water Conservation Measures* which includes the odd/even outdoor irrigation schedule; and Section 12-102, *Stages of Conservation Measures in Response to Water Shortage*. In the Town Manager's absence, the Assistant Town Manager has vested authority to implement such measures. The Town Manager and/or the Assistant Town Manager will initiate water shortage response Stages 1, 2, 3, and Emergency/Rationing according to various factors affecting water supply and demand. Bruce Radford, Town Manager, can be contacted at 249-3301 and Mike Wilson, Assistant Town Manager, can be contacted at 249-3302.

3.2 Plan Activation and Notification Protocol

Once the potential for a water shortage has been declared, the following plan implementation and communication steps are taken. Mandatory measures will remain in effect until declared otherwise by the Town Manager, and updates to the plan over the duration of the water shortage will be provided in the sequence outlined below.

1. The Town Manager (or designee) notifies the Mayor, Town Council, neighboring municipal contract water recipients (if any), and Town employees.
2. The Public Information Officer (PIO) will contact the media (if the PIO is unavailable, media contacts will be made by the Town Manager's designee). The media, including television, newspaper, and radio, will inform the public. The phone number of the Public Works & Utilities Department (919-249-3427) will be provided for additional information if needed by the public. Informational mailings will be distributed to residents via monthly utility bills. In addition, the Town's website, www.apexnc.org, will be updated with the latest information.
3. Public Works & Utilities staff will coordinate with Finance Department Customer Service so Town employees can help provide accurate information to the public and to get a list of major water customers.
4. Staff will call major water customers (both irrigation and water accounts) and inform them of the implemented measures.
5. Staff will contact the Fire Department and coordinate with bulk users.
6. Staff will supply fliers for distribution by field employees to place on customers' doors or provide to customers that need more information.

3.3 Water Shortage Stages

Apex's water shortage response consists of four stages as summarized in Table 3-1. The stages have been designed and are defined to represent an increasing level of severity of water shortage, subsequently triggering an increasing level of response to reduce the Town of Apex water demands. The Stages are triggered when the water supply and/or the demand changes. The Town's ability to meet demand is dependent on several components of the water supply system: the water source (Jordan Lake and/or purchase from others), raw water intake and pipeline, treatment plant, storage tanks, and distribution system. The Town continually monitors its water demand and supply, especially during times of drought conditions.

Stage 1
Spray irrigation using potable water is limited to one (1) day per week for all purposes except the maintenance of athletic fields. No new turf watering exemption permits will be issued and any existing permits for watering periods that begin later than 14 days after the effective date of Stage 1 will be rescinded. Hand watering, drip irrigation, and subsurface irrigation are still allowed. Other outdoor water uses such as pressure washing, car washing, and keeping swimming pools filled are allowed, although customers are strongly encouraged to minimize such uses.

Stage 2
Spray irrigation using potable water is not allowed for any purpose except the maintenance of athletic fields. No new turf watering exemption permits will be issued, and any previously issued exemption permits for watering periods that have not expired will be rescinded. Hand watering, drip irrigation, and subsurface irrigation are still allowed. Other outdoor water uses such as pressure washing, car washing, and keeping swimming pools filled are allowed, although customers are strongly encouraged to minimize such uses.

Stage 3
No outdoor water use with potable water is allowed, including but not limited to: spray irrigation, hand watering, drip irrigation, and subsurface irrigation, ornamental fountains, car washing, pressure washing, and keeping swimming pools filled. No new turf watering exemption permits will be issued and any previously issued permits for watering periods that have not expired will be rescinded. Firefighting and utility system maintenance are the only allowable outdoor water uses.

Emergency/Rationing
In this stage, the goal is to ensure there is drinking water available to protect public health (e.g., health care, drinking water, basic sanitation). Customers are encouraged to use the minimum amount of water needed for public health protection. No outdoor water use with potable water is allowed, including but not limited to: spray irrigation, hand watering, drip irrigation, and subsurface irrigation, ornamental fountains, car washing, pressure washing, and keeping swimming pools filled. As in Stage 3, no new turf watering exemption permits will be issued and any previously issued permits for watering periods that have not expired will be rescinded. Firefighting and utility system maintenance are the only allowable outdoor water uses.

Table 3-1: Water Shortage Response Stage Summary

	Year-round Water Conservation Program	Water Shortage Response Stages			
		Stage 1	**Stage 2**	**Stage 3**	**Emergency/ Rationing**
Outdoor Spray Irrigation	Three days per week	One day per week	None	None	None
Hand watering, drip irrigation, subsurface irrigation, athletic field maintenance	Allowed	Allowed	Allowed	None	None
Other outdoor water use such as pressure washing, car washing, filling swimming pools	Allowed	Allowed	Allowed	None	None
New Turf Watering Exception Permits	Allowed	No new permits issued, permits beginning more than 14 days after Stage 1 date rescinded	None	None	None

3.4 Water Shortage Triggers

The goal of having staged trigger points is to provide the Town the ability to reduce their demands during times of water shortages and thereby extend the timeframe between reaching successive trigger points. Triggers are based on the ability to meet water demands and are influenced by several components of the Town's water supply system: the water source, raw water intake and pipeline, treatment plant, storage tanks, and the distribution system. Town staff continually evaluates the status of these components to determine if a water shortage condition exists or is approaching. The primary trigger is the water supply storage in Jordan.

3.4.1 Jordan Lake Water Supply Storage Allocation

Apex and Cary have a joint allocation of the water supply storage volume in the Jordan Lake water supply pool. Apex Public Works & Utilities staff communicates regularly with the Cary Public Works & Utilities staff regarding available water supply, especially during drought conditions.

The Town of Cary is responsible for tracking the amount of water in storage for the Apex/Cary allocation on a daily basis using daily and monthly water demand estimates,

and daily lake inflows obtained from the U.S. Army Corps of Engineers (USACE). Cary staff uses these storage estimates to predict a worst case scenario of the number of days of water supply that remains. This worst case scenario does not take into account any inflow to Jordan Lake; in other words, it is assumed that there is zero inflow to the lake. The number of days of remaining water supply is calculated by dividing the storage volume in the jointly allocated water supply pool by the average water demand for the previous 30 days. From these values, Apex staff determines the number of days of storage available to the Town based on the Town's percentage of the allocation and the recent demand profile.

DWR has recommended guidelines for monitoring the available water supply and when necessary, implementing a minimum of three stages of water shortage response: voluntary, mandatory, and emergency. As described previously, the Town of Apex has four water shortage stages: Stage 1, Stage 2, Stage 3, and Emergency/Rationing. Table 3-2 shows Apex's four water shortage stages and the associated number of days of remaining storage which act as the triggers to implement each stage. Table 3-3 shows the water supply response triggers for increasing days of supply remaining; this table would be used when coming out of a drought situation.

Table 3-2: Water Shortage Response Triggers for Declining Days of Supply Remaining

Stage	Triggers When Days of Supply Remaining is Declining
(Water Shortage declared) Stage 1	Days of Supply Remaining 120 days or less
Stage 1 to Stage 2	Stage 1 has been in place for 28 continuous days AND Days of Supply Remaining 90 days or less
Stage 2 to Stage 3	Days of Supply Remaining 60 days or less
Stage 3 to Emergency/ Rationing	Days of Supply Remaining 30 days or less

Table 3-3: Water Shortage Response Triggers for Increasing Days of Supply Remaining

Stage	Triggers When Days of Supply Remaining is Increasing
Emergency/ Rationing to Stage 3	Days of Supply Remaining has been at least 60 days for at least 14 continuous days
Stage 3 to Stage 2	Days of Supply Remaining has been at least 90 days for at least 14 continuous days
Stage 2 to Stage 1	Days of Supply Remaining has been at least 120 days for at least 14 continuous days
Water Shortage ended	Jordan Lake Water Supply allocation is 100% full for at least 14 continuous days

The triggers shown in Tables 3-2 and 3-3 serve as guidelines and are used by the Town of Apex in combination with an assessment of the other factors that influence water supply and demand as described in this section to determine the timing of implementation of the appropriate water shortage stages during periods of water shortage.

3.4.2 Other Factors

The Town recognizes that there are several other factors to be considered when evaluating the potential for water shortage conditions. These factors include:

1. Jordan Lake Elevation. The lake elevation is influenced most by the amount of inflow to the lake from upstream and the amount of water released from the dam to the Cape Fear River downstream. Apex Public Works & Utilities staff communicates regularly with the Cary Public Works & Utilities staff regarding lake elevation, especially during drought conditions. The Town of Cary is responsible for monitoring the lake levels and how the elevation compares to the elevations of the raw water intakes in Jordan Lake. The elevation of the top pipe of the primary raw water intake is at 208.3 feet mean sea level, while the elevation of the top pipe of the lower intake is 204.25 feet mean sea level. Extension devices have been fabricated to allow adjustments to the elevation of either intake.
2. A sudden loss of supplemental water supplies during periods of high demand;
3. The occurrence of a major water transmission main break, fire, or any other emergency that would require high volumes of water, such that demand could exceed supply;
4. An indication of short or long-term water quality concerns regarding Jordan Lake or other sources;
5. An accidental or intentional contamination of the water system;
6. The level of interbasin transfers relative to Apex and Cary's interbasin transfer (IBT) certificate amount;
7. A drought advisory issued by the NC Drought Management Advisory Council;
8. A mechanical failure at the WTP or within the distribution system.

3.5 Enforcement

If there is a violation of any provision of the water conservation ordinance including the mandatory water conservation measures, the violator is subject to a penalty of up to $1,000.00 per violation per day. A warning is issued for a first offense. Subsequent violations will be subject to the penalty fee. The Town may also choose to discontinue water service if necessary due to continuing violations. Citizens are encouraged to report violators to the Town Public Works & Utilities Department.

3.6 Variances

The Town recognizes that the requirements for water use reduction in Table 3-1 may have significantly more impact on some customers than on others and in some cases could affect public health and safety. To be considered for a variance, customers may submit a letter requesting the variance to the Public Works & Utilities Director at PO Box 250, Apex, NC

27502. The letter must include an explanation of why the requirements in Table 3-1 are not appropriate, cause extreme hardship, or affect health and safety. If a variance from either the Stage 3 or Emergency/Rationing requirements is requested, the letter should include proposed water use reductions and an explanation of why they are more appropriate.

A decision by the Public Works & Utilities director or designee to approve or deny variance requests can be expected within two weeks and will be based upon consideration of criteria including but not limited to: impact on water demand, expected duration of water shortage, alternative source options, social and economic importance, purpose of water use (i.e., necessary use of drinking water) and the prevention of structural damage.

3.7 Plan Evaluation

The Town of Apex is committed to providing a safe and reliable water supply to its citizens. The Town understands that an effective WSRP is necessary to reduce system demands during a water shortage situation. After a plan implementation, the Town will evaluate the effectiveness of the trigger thresholds to prolong the Town's water supply and the efficiency of conservation to reduce water demands. The effectiveness of the protocols will be measured by the frequency of their activation, the number of violation citations, and if desired reductions were attained. Table 3-4 indicates the potential expected reduction from normal use for each stages, depending on the time of year.

Table 3-4: Expected Water Use Reductions*

Water Shortage Response Stage	Expected Approximate Reductions Relative to Normal Water Use	
	May through October	November through April
Stage 1	13%	6%
Stage 2	32%	10%
Stage 3	38%	17%
Emergency/Rationing	46%	29%

**Town of Cary staff developed these numbers based on 2007 customer billing records.*

3.8 Plan Revisions

Water Shortage Response Plans should be updated regularly in response to changing conditions within the community. Circumstances warranting an updated plan may include new development, water supply demands, or changes in the number or types of available water supplies. A work group of Town staff will review procedures after each emergency reduction stage and will recommend necessary improvements to the Town Manager.

This plan will also be subject for review following any water shortage declaration. If indicated by these reviews or at a minimum of every five years as required by the provisions of GS 143-355 (1) the WSRP will be updated and submitted to DWR for review. An opportunity for public comment will be provided for any update of the WSRP before presentation to the Town Council for approval. The Town of Apex Public Works & Utilities Director (or designee) is responsible for initiating all WSRP updates.

3.9 Conservation Measures

The Town of Apex has multiple conservation measures that apply year-round even when there is no water shortage. The measures are in place in an effort to responsibly manage the valuable resource and to extend the Town's water supply during times of approaching drought conditions. The measures are listed below and explained in detail in Apex's *Water Conservation Ordinance* (Appendix A):

1. Mandatory year-round odd/even outdoor watering,
2. Prohibited operating conduct for irrigations systems;
3. Requiring rain sensors;
4. Operation of the rain sensors;
5. Irrigation surcharge;
6. Avoiding improper connections;
7. Improper connections;
8. Prohibiting unauthorized use.

In addition to the year-round measures outlined in the water conservation ordinance, the Town also has water conservation education and incentive based measures that assist the Town's goal of responsible resource management. These education and incentive based year-round conservation components are as follows:

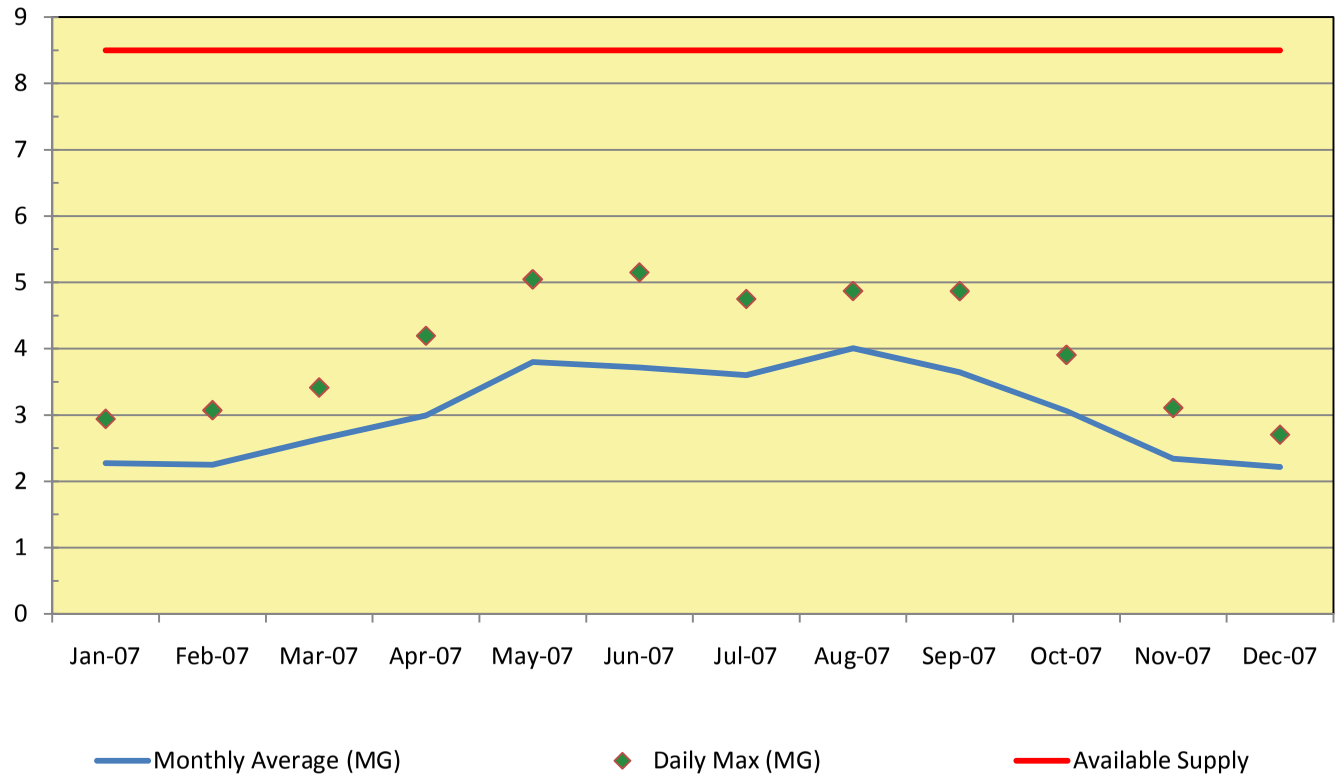
1. Water Conservation webpage – The Town's website contains information on household water conservation tips, an educational outline on the year-round irrigation restrictions, and frequently asked questions related to the water conservation ordinance.
2. Water Conservation pamphlet – The pamphlet is provided to all citizens on an as needed basis and details water conservation information including the schedule for the odd/even irrigation schedule requirements, ways to save water, current water restrictions, as well as contact information to call for questions on water conservation or on concerns in reference to significant water losses at a residence or from public water infrastructure.
3. Rain barrels – The Town provides citizens the ability to purchase rain barrels at cost at the Public Work & Utilities Department. The ability to conveniently purchase rain barrels provides citizens with an incentive for water conservation by using the rain barrels for landscape watering and is an educational opportunity for the community.

3.10 Public Comment

The public will be given several opportunities for plan review and comment. A draft plan will be posted on the Town's website at www.apexnc.org at least 30 days prior to the adoption vote by Town Council. A public meeting will be held at Apex Town Hall prior to this adoption vote in order to document verbal comments on the plan. Notices for these opportunities will be sent out in customer utility bill mailings.

ATTACHMENT 1

Town of Apex
2007 Water Usage



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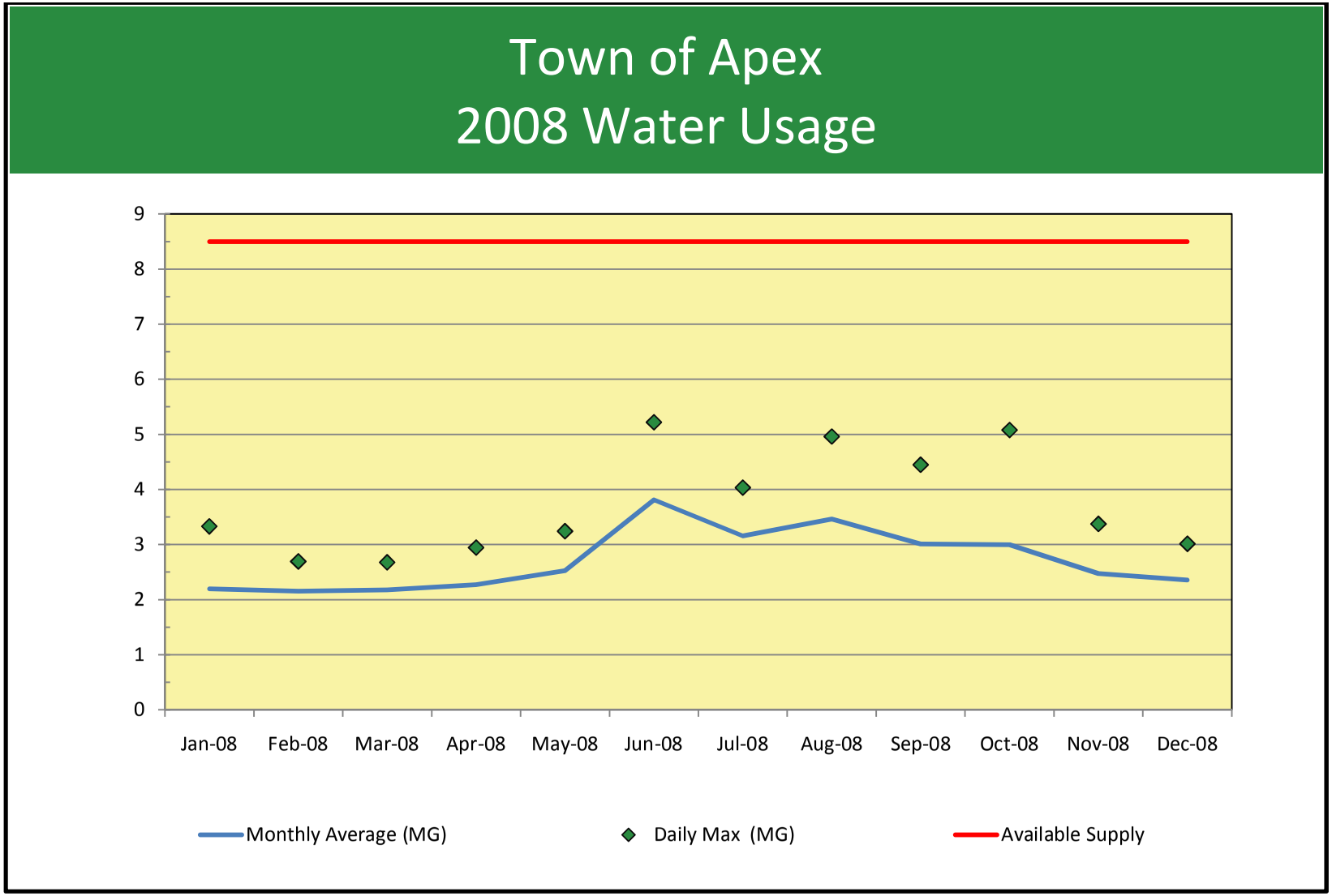
ATTACHMENT 2



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APPENDIX A

Water Conservation Ordinance, Effective February 2, 1999, Amended (Draft) April 2009

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TOWN OF APEX CODE OF ORDINANCES
Chapter 12 MUNICIPAL UTILITIES AND SERVICES*
ARTICLE III. WATER AND SEWERS
DIVISION 5. WATER CONSERVATION*

***Editor's note:** An Ordinance adopted Feb. 2, 1999, deleted §§ 12-100--12-104 in their entirety and replaced them with similar provisions to read as herein set out. Former §§ 12-100--12-104 derived from the 1973 Code and an Ord. of July 24, 1986.

Sec. 12-100. Definitions.

Customer means any person in whose name the Town maintains an account for water use, or who is responsible for payment of water passing through a particular meter. All customers are responsible for any use of water that passes through the meter for which they have an account or are otherwise responsible and are deemed to be users hereunder.

Hand watering means any form of irrigation that is connected to the Town's public water supply system and held in hand during irrigation use.

Impervious surface means any surface which cannot be penetrated by water or which causes water to run off the surface, including streets, driveways, and sidewalks.

Irrigation means the act of applying water to the outdoor landscape through means such as moveable sprinklers, installed watering systems, hoses, or other devices.

Irrigation system means a device or combination of devices that transmit or apply Town water or any mixture containing Town water to residential or commercial lawns, landscapes or green space.

Person means any individual, corporation, company, association, partnership, or other entity.

Public Works and Utilities Director means the Town department head in charge of the Public Works &Utilities department.

Rain sensor means a device that measures rainfall and overrides the irrigation cycle of an irrigation system, thus turning it off, when a predetermined amount of rain has fallen. To meet the requirements of this division, a rain sensor shall be adjusted to shut off irrigation systems when one-fourth inch (1/4") of rain has fallen.

Town Manager means the Town Manager or his designee.

Town water means all water available to the Town for treatment and any treated water introduced by the Town into its potable water distribution system. Not included in this definition is any treated wastewater effluent reclaimed for reuse in irrigation or other approved uses.

Trigger means conditions defined in the Water Shortage Response Plan (WSRP) which will cause a water shortage to be declared or ended, or cause water shortage response stages to be increased or decreased in severity.

Water shortage exists when the Town cannot satisfy the ordinary demands and requirements of water consumers served by the Town without depleting the water supply to a level that jeopardizes the continued availability of water for human consumption, sanitation, and fire protection.

Water system means the system of pipes, valves, meters, tanks, pumps, and treatment facilities owned and operated by the Town of Apex for the purpose of collecting, treating, and distributing Town water.

(Ord. of 2-2-99, § 1; Ord. No. 07-0807-09, § 1, 8-7-07)

Cross references: Definitions and rules of construction generally, § 1-3.

Sec. 12-101. Continuing water conservation measures.

The water conservation measures enumerated in this section shall apply to all Town water customers, Town water users, and other persons at all times whether or not a water shortage exists.

(1) *Mandatory year-round odd/even watering schedule*. Properties with odd-numbered addresses may water lawns and/or landscapes only on Tuesday, Thursday, and Saturday. Properties with even numbered addresses may water lawns and/or landscapes only on Wednesday, Friday, and Sunday. No lawns and/or landscapes shall be watered on Monday. Watering with a hand-held hose is permitted every day.

Exemption: Property owners may obtain a 45 day New Landscape Permit from the Public Works Department for the purpose of establishing new plantings. New plantings for the purpose of this permit are defined as large commercial plantings or the installation of new sod or seed to a bare area of more than 50% of the grassed or proposed grassed area of a residential yard. Such a permit may not be granted for over-seeding of established grass. The permit will become effective at the requested start date and expire 45 days later.

(2) *Prohibited conduct in operating irrigation systems*. No person shall operate or maintain an irrigation system in a manner that:

a. Allows water from emitting devices to fall on impervious surfaces to the extent that water runs off the property being irrigated onto public streets or property; or

b. Allows water from emitting devices to fall on any surface such that water accumulates to the extent that it runs off the property being irrigated onto public streets or property.

(3) *Rain sensors required*. Rain sensors are required on all automatic irrigation systems. The sensors shall be installed in appropriate locations in order to prevent irrigation during periods of rainfall.

(4) *Operation of rain sensors*. Rain sensors shall be adjusted and set so that for each rainfall event, the sensors shut off the irrigation system after one-fourth inch (1/4") of rainfall has occurred. Rain sensors shall be installed according to the manufacturer's instructions and in a location that provides full exposure to rainfall. Rain sensors shall be maintained in proper working condition.

(5) *Irrigation surcharge*. The charges for water used for irrigation shall be computed by multiplying the customer's otherwise applicable water rate by a multiplier established by the Town Council and revised from time to time.

(6) *Damage to system*. No person shall damage, cut, break, obstruct, alter, interfere with, or tamper with any water pipe, water main, hydrant sewer pipe, water tank, water meter, water meter box, or any other part of the water system without the express written permission of the Town.

(7) *Improper connections*. No person shall make a connection to any portion of the water system in a manner that violates the North Carolina State Building Code or the Rules Governing Public Water Systems promulgated by the State of North Carolina or any agency thereof.

(8) *Unauthorized use*. No person shall consume, use, or otherwise take water from the water system without first obtaining permission from the Town and making arrangements to pay the applicable fees for the water.

(Ord. of 2-2-99, § 1; Ord. No. 07-0807-09, § 2, 8-7-07)

Sec. 12-102. Stages of conservation measures in response to water shortage.

The mandatory odd/even watering schedule shall be enforced year-round. To avoid or lessen the impact of a water shortage, the Town Manager will institute Stages 1, 2, 3 and Emergency/Rationing by written declaration, which shall be effective upon being signed and posted on the Town bulletin board and a copy placed with the Town clerk.

The Town Manager shall base his action upon a review of all factors that affect the Town's water supply including, but not limited to, current water supply, stream flow, lake level, seasonal effect on water supply, and current consumption rates. The water shortage response triggers for declining days of supply as well as increasing days of supply will be followed as outlined in the Town's Water Shortage Response Plan (WSRP). The following table illustrates the irrigation restrictions associated with each stage of mandatory water conservation.

	STAGE 1	STAGE 2	STAGE 3	EMERGENCY/ RATIONING
SPRAY IRRIGATION	**1 DAY/WEEK**	**NOT ALLOWED**	**NOT ALLOWED**	**NOT ALLOWED**
HAND WATERING	**ALLOWED**	**ALLOWED**	**NOT ALLOWED**	**NOT ALLOWED**
DRIP IRRIGATION[1]	**ALLOWED**	**ALLOWED**	**NOT ALLOWED**	**NOT ALLOWED**
SUBSURFACE IRRIGATION[2]	**ALLOWED**	**ALLOWED**	**NOT ALLOWED**	**NOT ALLOWED**
ATHLETIC FIELD IRRIGATION	**ALLOWED**	**ALLOWED**	**NOT ALLOWED**	**NOT ALLOWED**
NEW TURF WATERING EXEMPTION[3]	**NO NEW PERMITS**	**NO NEW PERMITS**	**NO NEW PERMITS**	**NO NEW PERMITS**

1. Drip irrigation is the slow, even application of low-pressure water to soil and plants using plastic tubing placed directly at the root zone.
2. Subsurface irrigation is irrigation that occurs underground, down as far as 9-12" to effectively irrigate the root zone with much less potential for evaporation than traditional spray irrigation systems.
3. Exemptions granted prior to the declaration of a water shortage would continue to be honored until the 45-day period has expired.

(1) *Stage 1*. In Stage 1, the Town shall publicize and request the public to comply with the following conservation measures:
a. Spray irrigation is limited to once per week. Hand watering is permitted every day. Athletic field irrigation is permitted.

b. No new 45-day landscape permits shall be issued. Permits already issued during a Stage 1 declaration would continue to be honored until the 45-day period has expired.
c. Reuse household water when possible, (within State gray water laws).
d. Limit vehicle washing to the minimum.
e. Refrain from washing down outside areas such as sidewalks, patios, etc.
f. Use shower for bathing rather than bathtub, and limit shower to no more than four minutes.
g. Limit flushing of toilets by multiple usages.
h. Refrain from leaving faucets running while shaving or while rinsing dishes.
i. Limit the use of clothes washers and dishwashers and when used, to operate fully loaded.
j. Install water-flow restrictive devices in showerheads.
k. Use disposable and biodegradable dishes.
l. Install water-saving devices such as bricks, plastics, bottles or commercial units in toilet tanks.
m. Limit hours of operation of water-cooled air conditioners.

(2) *Stage2*. In Stage 2, the Town shall continue all recommendations of Stage 1 and the following measures shall be mandatory:
a. Spray irrigation is not allowed. Hand watering is permitted.
b. Filling of newly constructed or drained swimming or wading pools shall require the approval of the Public Works &Utilities director. Makeup water is allowed for maintaining the operation of swimming or wading pools.
c. No introducing water into any ornamental fountain, pool or pond or other structure making similar use of water.
d. No using water from public or private fire hydrants for any purposes other than fire suppression or other public emergency.
e. Watering for dust control or compaction shall require the approval of the Public Works & Utilities director.
f. No using water for any unnecessary purpose or intentionally wasting water.

(3) *Stage 3*. In Stage 3, all the provisions of Stages 1 and 2 apply and, in addition, the following measures shall be mandatory:
a. Spray irrigation is not allowed. Hand watering is not allowed. The irrigation of athletic fields is not allowed.
b. No nonessential use of water for commercial or public use, and the use of single service plates and utensils is encouraged and recommended in restaurants.
c. No washing down outside areas such as streets, driveways, service station aprons, parking lots, office buildings, exterior of existing or newly constructed homes or apartments, sidewalks, or patios, or use of water for other similar purposes.
d. Washing of vehicles is not permitted.

(4) *Emergency/Rationing Stage*. In this stage, all the provisions of Stages 1 through 3 apply and, in addition, the following measures are mandatory:
a. No using water outside of structures for any use other than emergencies involving fire. Fire protection will be maintained, but where possible, tank trucks shall use raw water.
b. All industrial uses of water are prohibited.

c. All other uses of water will be limited to those uses necessary to meet essential health and safety needs of customers.
d. No introducing water into swimming pools.
(Ord. of 2-2-99, § 1; Ord. of 3-20-00, § 1; Ord. No. 07-0807-09, § 3, 8-7-07)

Sec. 12-103. Violation, enforcement, and penalties.

(a) *Violations*. It shall be unlawful for any person to violate any provision of this division including any mandatory water conservation measure.
(b) *Criminal penalties*. Violations of this section shall not be a crime under G.S. 14-4, or other law.
(c) *Civil penalties*. Any person who violates this division is subject to a civil penalty of up to $1,000.00 per violation per day for so long as the violation exits. Violations and penalties shall be determined by the Public Works & Utilities director. In determining the amount of a civil penalty, the Public Works & Utilities director shall take into account all relevant circumstances, including, but not limited to, the extent of harm caused by the violation, the magnitude and duration of the violation, efforts to correct the violation, the compliance history of the parties against whom the violation is assessed, the cost of enforcement to the Town, whether the violation was willful or intentional and any other factor as justice requires. The Town shall serve a written citation on the violator, and the customer if different, by personal delivery or by certified or registered mail, return receipt requested. The citation shall describe the violation and shall specify the amount of the civil penalty levied. If a person fails to pay a civil penalty within ten days after receiving written notice of violation, then the Town may recover the penalty through a civil action in the nature of debt, including all further accruing penalties for continuing violations.
(d) *Continuing violation*. Each day that a violation continues shall constitute an additional and separate violation.
(e) *Discontinuance of service*. The Town may discontinue service to a customer upon a determination by the Public Works & Utilities director that the customer violated a provision of this division. Prior to discontinuance, the Public Works & Utilities director shall give the customer written notice of the violation and an opportunity to contest the discontinuance within 48 hours.
(f) *Multiple remedies*. The Town may seek to enforce this division through any appropriate equitable or legal action or through any combination of these or the foregoing remedies.
(g) *Appeal*. A person who is assessed civil penalties or whose service is discontinued may appeal to the board of adjustment by serving written notice to the Town clerk within ten days of the service of citation or notice of discontinuance. An order of discontinuance is not stayed pending appeal to the board of adjustment.
(Ord. of 2-2-99, § 1; Ord. No. 07-0807-09, § 4, 8-7-07)

Sec. 12-104. Reserved.

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Appendix C
Notice of Intent to Modify the Interbasin Transfer Certificate

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September 30, 2013

Mr. Benne Hutson, Chair
North Carolina Environmental Management Commission
c/o EMC Recording Clerk
Directors Office – Division of Water Resources
1617 Mail Service Center
Raleigh, NC 27699-1617

Subject: Notice of Intent to Modify the Interbasin Transfer Certificate for the Towns of Cary, Apex, and Morrisville, and Wake County

Dear Mr. Hutson:

The Towns of Cary, Apex and Morrisville, and Wake County (on behalf of the Wake County portion of Research Triangle Park), cooperate under various organizational arrangements for raw water supply, water treatment, water distribution, wastewater collection, and wastewater treatment. The four parties jointly hold an interbasin transfer (IBT) certificate issued by the Environmental Management Commission (EMC) on July 12, 2001. Together, we have developed long-range plans for secure water supply and responsible water resource management, including IBT. Based on those plans and by way of this letter, we are respectfully notifying the EMC of our intent to request a modification to our IBT certificate.

The current IBT certificate allows transfers from the Haw River subbasin (Jordan Lake is the water supply source) to the Neuse River subbasin up to 24 million gallons per day (mgd) on a maximum day basis. The attached map (Exhibit 1) shows the service areas for each of the communities relative to river basin boundaries, and also illustrates the Towns' water supply/wastewater management strategies and facilities, which are the same as those presented when the current IBT certificate was issued.

The requested modification will address:

- Recently adopted changes to G.S. 143-215.22L;
- As requested by DWR, inclusion of transfers to the Cape Fear River subbasin (consumptive uses in the southwestern portion of the Town of Apex service area), so that the modified certificate addresses transfers from the Haw River subbasin to both the Neuse River and Cape Fear River subbasins; and
- Extension of the certificate term to cover a 30-year planning period, ensuring the modified certificate addresses IBT through 2045 (previous certificate was based on 2030 planning).

The Towns expect to request that the modified certificate allow transfers of up to about 35 mgd from the Haw River subbasin, calculated as a daily average of a calendar month. The exact amount will be refined during the course of further analysis and hydrologic modeling, as part of the required environmental assessment.

The Towns have maintained compliance with the IBT Certificate issued in 2001– including the maximum day limit and eight additional conditions – and no significant environmental impacts have occurred as a result of the

ongoing transfer. This is consistent with both the Environmental Impact Statement (EIS) and the Record of Decision for the IBT certificate, which predicted no significant direct impacts. One condition specifically requires the return of reclaimed water to either the Haw or Cape Fear subbasins after 2010. This is currently met by transferring wastewater to the Durham County Triangle WWTP (which discharges to Jordan Lake) for treatment and starting in mid-2014 will be met by discharging reclaimed water from the Western Wake Regional Water Reclamation Facility to the Cape Fear River below Jordan Lake.

We will continue to work closely with DWR as we work through the next steps in the new IBT certificate modification process.

Please direct any correspondence regarding this Letter of Intent and the subsequent process to:

Leila Goodwin, P.E.
Water Resources Manager, Town of Cary
P.O. Box 8005
Cary, NC 27512-8005
919-462-3846
leila.goodwin@townofcary.org

Sincerely,

Benjamin T. Shiver
Manager, Town of Cary

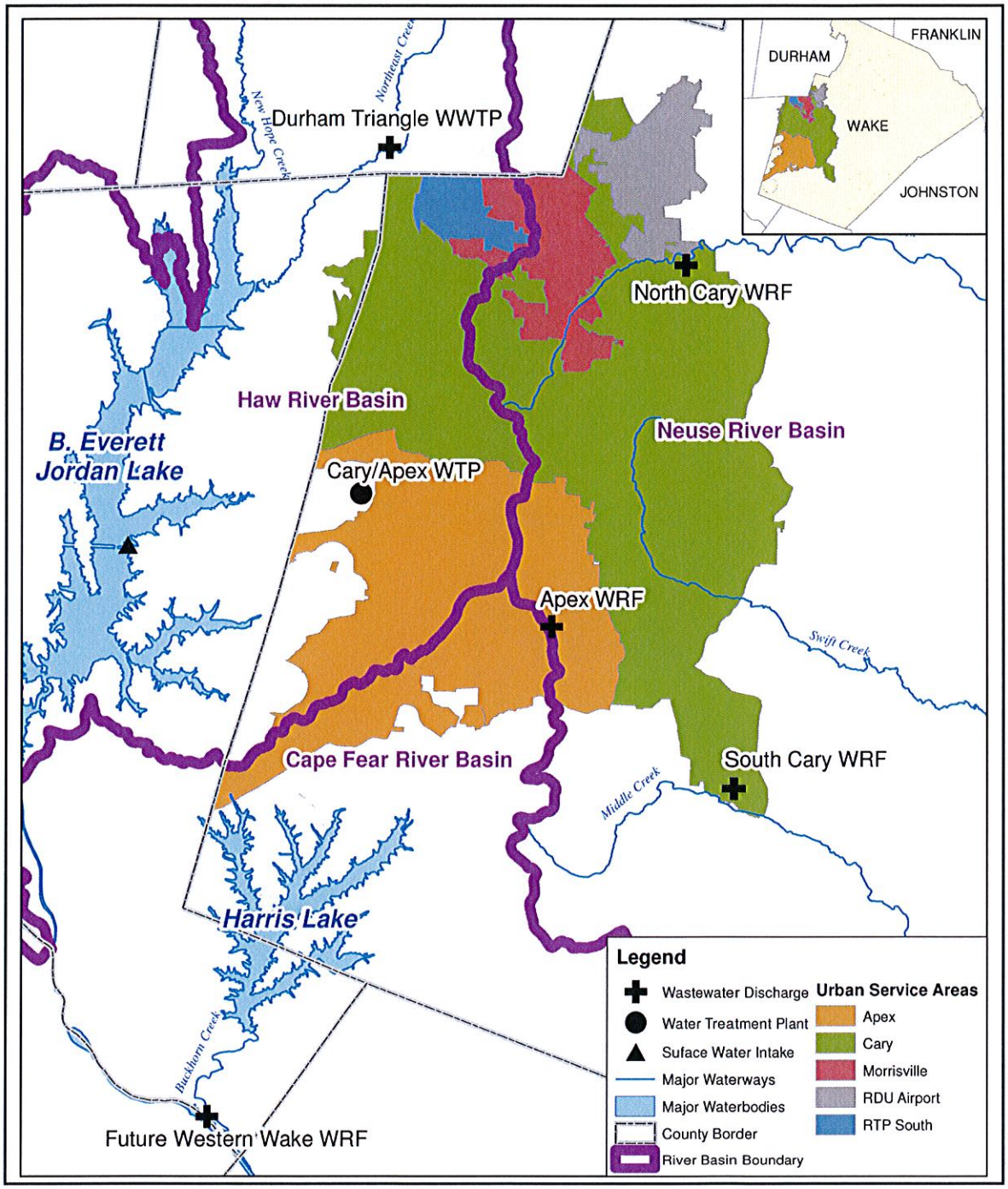
Bruce Radford
Manager, Town of Apex

Martha Wheelock
Manager, Town of Morrisville

David Cooke
Manager, Wake County

c: Tom Reeder, Director, NC DENR Division of Water Resources
Tom Fransen, NC DENR Division of Water Resources
Ian McMillan, NC DENR Division of Water Resources
Harold Brady, NC DENR Division of Water Resources
Leila Goodwin, Town of Cary
Adam Sharpe, CH2M HILL

EXHIBIT 1
TOWNS OF CARY, APEX, AND MORRISVILLE, AND RTP SOUTH PLANNING AREA OVERVIEW



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Appendix D
Modeling Evaluation of the Effects of the Cary/Apex Water Supply Interbasin Transfer Technical Memorandum

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Modeling Evaluation of the Effects of the Cary/Apex Water Supply Interbasin Transfer

PREPARED FOR: Town of Cary and Town of Apex

PREPARED BY: CH2M HILL

DATE: July 31, 2014

Introduction

Since the mid-1990s the Towns of Apex, Cary and Morrisville and Wake County (on behalf of the Wake County portion of Research Triangle Park (RTP), referred to as RTP South henceforth) have been cooperatively working to develop and manage their water resources. The Towns, Wake County, and RTP cooperate under various organizational arrangements for raw water supply, water treatment, water distribution, wastewater collection, wastewater treatment, and reclaimed water distribution. Together, the Towns and Wake County have been planning for a secure, long-range water supply for their customers and responsible water management.

The water and wastewater utility system serving customers throughout the Towns and RTP South is managed by the Towns of Apex and Cary. Apex is responsible for service provision within its own jurisdiction. Cary is responsible for service provision within its own jurisdiction, as well as Morrisville's jurisdiction (merged its utility with the Town of Cary in 2006), RTP South and Raleigh-Durham (RDU) airport.

The Towns and Wake County (for RTP South) are subject to an interbasin transfer (IBT) certificate issued by the EMC in 2001. This certificate is required by North Carolina law because wastewater discharges and consumptive uses occur in receiving basins that differ from the Towns' water supply source basin, the Haw River subbasin. The current IBT certificate limits transfers from the Towns' water supply source basin, the Haw River subbasin (Jordan Lake), to the Neuse River basin to 24 mgd on a maximum day basis. Figure 1 illustrates water movement within the Towns' service areas and how these movements relate to the basin boundaries defined in NCGS 143-215.22G.

The Towns have maintained compliance with their IBT certificate since 2001 – including the maximum day limit and eight additional conditions. Compliance with the transfer limit and certificate conditions is detailed in the 2013 Annual Report on Interbasin Transfers for RTP South and the Towns of Apex, Cary, and Morrisville, annual compliance reports are submitted to the NC Division of Water Resources (DWR). No impacts have been identified as a result of the ongoing transfers; this is consistent with both the 2000 Environmental Impact Statement (EIS) and the Record of Decision (ROD), which is the basis for the Towns' current IBT certificate and predicted no significant direct impacts.

In 2013, the NC General Assembly amended the IBT statute, making changes to the basis of IBT calculation and allowing for an existing certificate modification process option. To ensure their IBT certificate is aligned with the latest IBT statute and the needs of the communities are met through 2045, the Towns and Wake County are proceeding with a request for a modification of their current IBT certificate to accomplish three objectives:

1. Shift from a maximum day IBT calculation to IBT calculated as the daily average of a calendar month, per the changes to NCGS 143-215.22L (Regulation of surface water transfers) based on Session Law 2013-388.
2. Include, at the request of NCDWR, transfers to the Cape Fear River subbasin (consumptive uses in the Town of Apex service area), so that the modified certificate addresses transfers from the Haw River subbasin to both the Neuse River and Cape Fear River subbasins.
3. Base the certificate term on a 30-year planning period, ensuring the modified certificate term addresses IBT through 2045 (the previous IBT certificate was based on a 30-year planning period ending in 2030).

The Towns expect to request that the modified certificate allow transfers up to 33 mgd from the Haw River subbasin, calculated as a daily average of a calendar month. Concurrent with the certificate modification, the Towns have requested increased water supply allocations from Jordan Lake, also based on a 30-year planning horizon through 2045. The Towns intend to continue to use their three existing WRFs, as well as the new Western Wake Regional Water Reclamation Facility (WWRWRF) to treat wastewater.

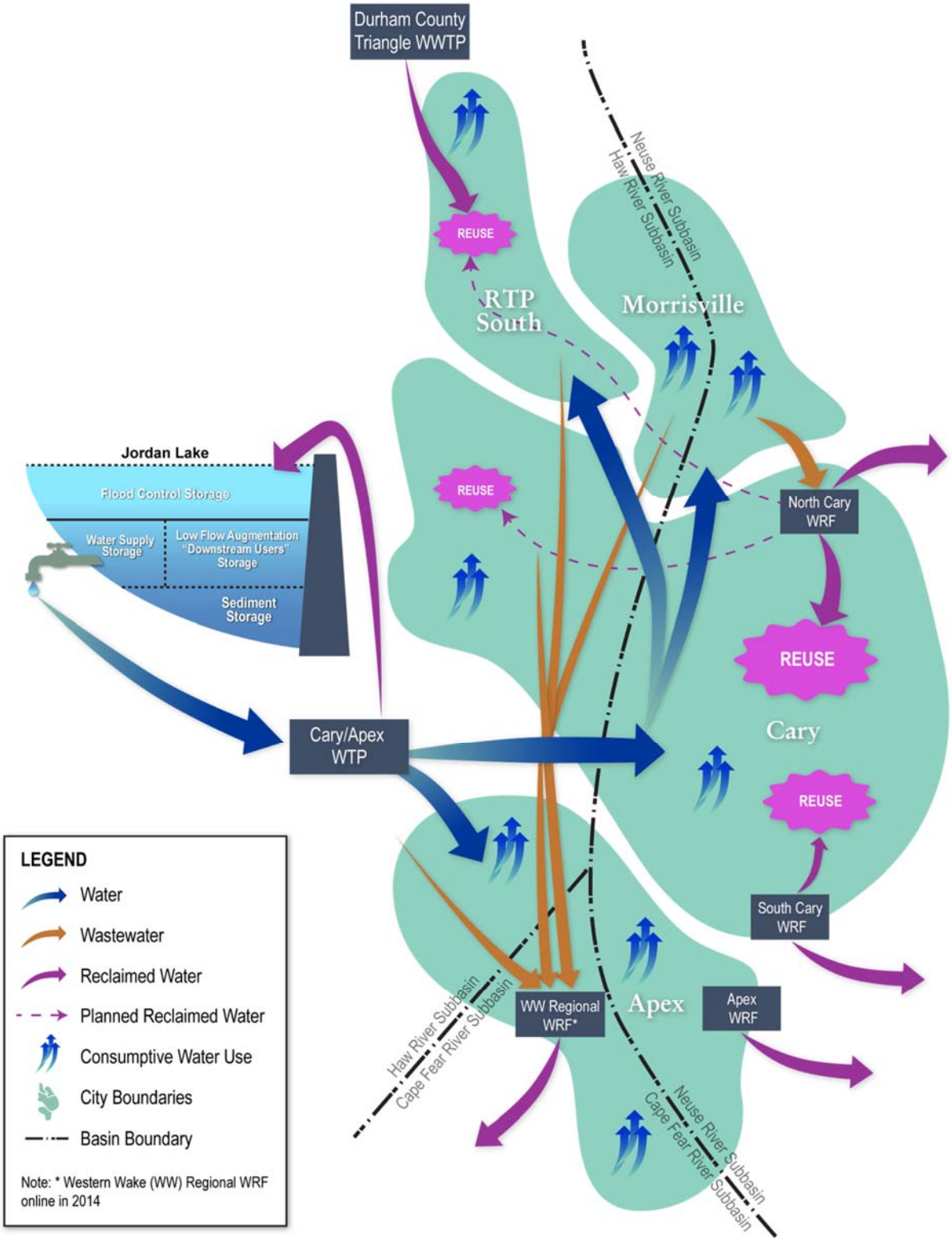
It should be noted that there is no alternative to modifying the Town's current IBT certificate to meet the first two objectives listed above – to comply with new law and to satisfy a request from NCDWR. These objectives could be addressed by administrative update to the Towns' certificate based on the 2013 updates to the IBT statute, NCGS 143-215.22L (v). Alternatives discussed in this memorandum are alternatives to the requested IBT as a result of extending the planning period to 2045.

Purpose of the Technical Memorandum

The purpose of this technical memorandum (TM) is to summarize the results of the hydrologic model used to evaluate impacts of the IBT. This evaluation is being completed to support the development of a State Environmental Policy Act (SEPA) Environmental Assessment (EA), required under NCGS 143-215.22L for an IBT certification modification. The remainder of this memorandum is organized as follows:

- Hydrologic Modeling Analysis Overview
- Modeling Scenarios
- Modeling Results
- Summary and Conclusions

FIGURE 1
Water Movement Illustration



Hydrologic Modeling Analysis Overview

The Cape Fear-Neuse River Basin Hydrologic Model (CFNRBHM), developed by HydroLogics, Inc. for NCDWR, was used to evaluate the potential impacts from the Towns' increased IBT.

Background on the CFNRBHM

NCDWR originally developed individual hydrologic models for the Cape Fear River and Neuse River basins. In 2012, to recognize the numerous interconnections between the two basins, they contracted with HydroLogics, Inc. to develop a combined Cape Fear River basin and Neuse River basin hydrologic model. This revised model was completed in January 2014. The resulting system is modeled using the OASIS water resources program which combines graphical representations of components such as river sections, withdrawals and discharges with logical statements which describe their behavior. These statements, including operational rules, demand values, and elevation-storage relationships are evaluated within a linear programming environment to determine the state of each component within the system (HydroLogics, Inc., 2006).

The CFNRBHM includes all withdrawals and discharges in both river basins greater than 100,000 gallons per day (gpd, or 0.1 mgd). A schematic of the CFNRBHM showing the model layout and all model nodes is provided in Figure 2. The model schematic shows reservoirs represented as red triangles. The blue squares represent surface water withdrawals, and yellow circles represent collection nodes or surface water discharges.

CH2M HILL obtained the CFNRBHM OASIS model from NCDWR to evaluate the hydrologic impacts of the proposed IBT certificate modification on water resources in the Cape Fear River basin. The "JLP2" scenario dated January 23, 2014 was developed by the Triangle J Council of Governments and HydroLogics for the Jordan Lake Partnership, based on scenarios from NCDWR, and was used for the basis of this analysis.

Model Structure

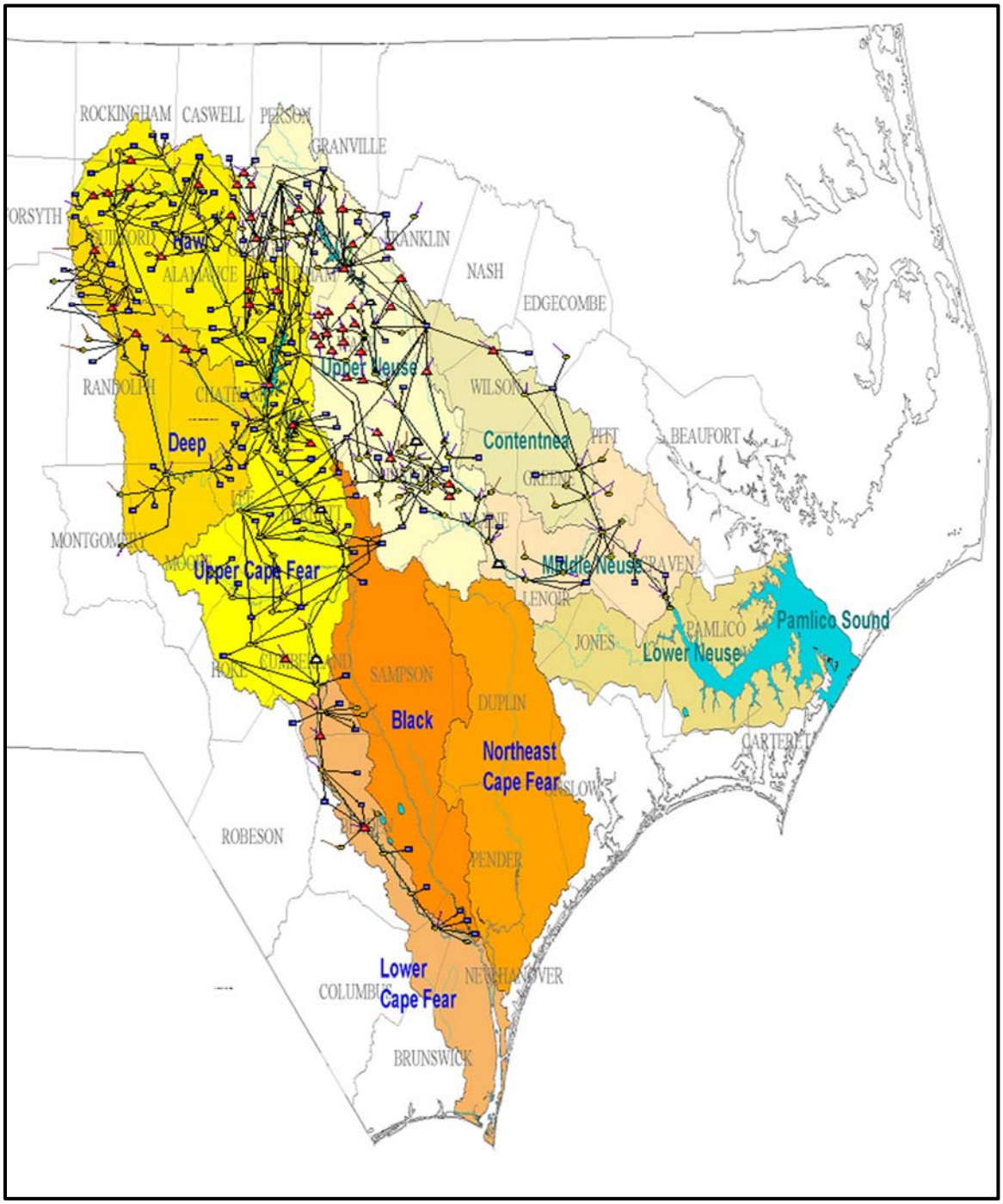
The CFNRBHM model structure greatly increases the spatial resolution of the model over previous versions for the Cape Fear River basin alone. A major focus of the model development was to explicitly specify and directly link withdrawals and discharges for individual entities, including municipalities and industries. This linkage allows for a better representation of the many regular and emergency interconnections used to meet water demands.

As part of the model development, HydroLogics, Inc. also extended the simulation period to include the time frame from January 1930 through September 2011. This period covers a wide range of hydrologic conditions. This was an important update because in the last ten years, North Carolina experienced two of the most extreme droughts on record. Both droughts included periods of exceptional drought, the most extreme drought classification. The exceptional drought of the 1950's is also included in the simulation period, which is the most severe drought of record for the period.

Watershed inflows are specified on a daily basis through an underlying database. Withdrawals and discharges can be specified in the model, typically as monthly values. The model can predict instream flow and reservoir storage for each component of the model

structure on a daily, weekly, or monthly basis. Hydrologic analyses were run on a daily time step.

FIGURE 2
Schematic Showing the Cape Fear - Neuse River Basin Hydrologic Model Layout and Nodes



Jordan Lake Drought Contingency Plan

As part of the CFNRBHM development, HydroLogics, Inc. incorporated the latest version of the Jordan Lake Drought Contingency Plan into the model; this plan was revised by the US Army Corp of Engineers (USACE) in 2008. The Jordan Lake drought levels, triggers and the modified flow targets at the Lillington United States Geologic Survey (USGS) flow gaging station are presented in Table 1. This plan was developed after the USACE and other stakeholders recognized during the 2001-2002 drought that the previous plan was not sufficient to manage the lake for its intended uses during such extreme conditions, and made a significant difference in the lake elevations during the 2007-2008 drought. It should be noted that incorporation of this new Drought Contingency Plan causes large differences between model results from current scenarios and those from modeling scenarios presented in the 2000 EIS supporting the current IBT certificate.

TABLE 1

Jordan Lake Drought Contingency Plan – Drought Level, Drought Triggers and Flow Targets

Drought Level	Drought Triggers Water Quality Storage Pool Remaining (percent)	Flow Targets Lillington USGS Gaging Station Flows (cfs)
0	> 80	600 ± 50
1	60 – 80	450 -600 ± 50
2	40 - 60	300 - 450 ± 50
3	20 - 40	None; minimum release of 200 cfs
4	0 - 20	None; minimum release of 100 cfs

Water Shortage Response Plans

All municipalities in NC are required, by the State, to have a Water Shortage Response Plan (WSRP) to effect reduction of water use during dry to extreme drought conditions; the Towns are further required to have drought management plans by both their Jordan Lake allocation and their IBT certificate. The WSRPs must include an expected reduction in demand resulting from water restrictions which are implemented based on a set of triggers such as stream flow or reservoir level. WSRPs for public water suppliers in the Cape Fear River and Neuse River basins were incorporated into the CFNRBHM model by HydroLogics, Inc. during the model development, with the ability to turn the WSRPs "on" and "off".

For the hydrologic analyses presented in this TM the WSRPs were turned "on". Therefore, the modeling results include the effect of the WSRPs reducing withdrawals from surface waters during low flow periods. The effect of the Towns' WSRPs will also reduce the influence of their water supply transfers out of the Haw River subbasin.

Current and Future Withdrawals and Discharges

Current Withdrawals and Discharges

Estimates of existing withdrawals and discharges were compiled by NCDWR from sources including, but not limited to, Local Water Supply Plans (LWSP), information provided

directly from municipalities, national pollutant discharge elimination system (NPDES) reporting, water withdrawal and transfer registration, and from the Department of Agriculture. These estimates, as part of NCDWR's existing conditions model scenario, were provided for public review on September 6, 2013. As part of the review process, Cary, Apex, other members of Jordan Lake Partnership, as well as other municipalities within the basins, reviewed the model and provided comments to NCDWR. The model scenario used to represent existing conditions reflects modifications made as part of this review process.

NCDWR stated that the baseline "existing conditions" model scenario, for purposes of comparisons, will be representative of 2010 withdrawals and discharges and therefore is used in this TM to represent current conditions.

Future Projections

Water withdrawal and discharge projections for future periods, including the year 2045, were compiled from LWSPs and information provided directly from municipalities by NCDWR. These estimates, as part of NCDWR's future conditions model scenarios, were provided for public review on September 6, 2013. As part of the review process, Cary, Apex, other members of Jordan Lake Partnership, as well as others municipalities within the basins reviewed the model and provided comments to NCDWR.

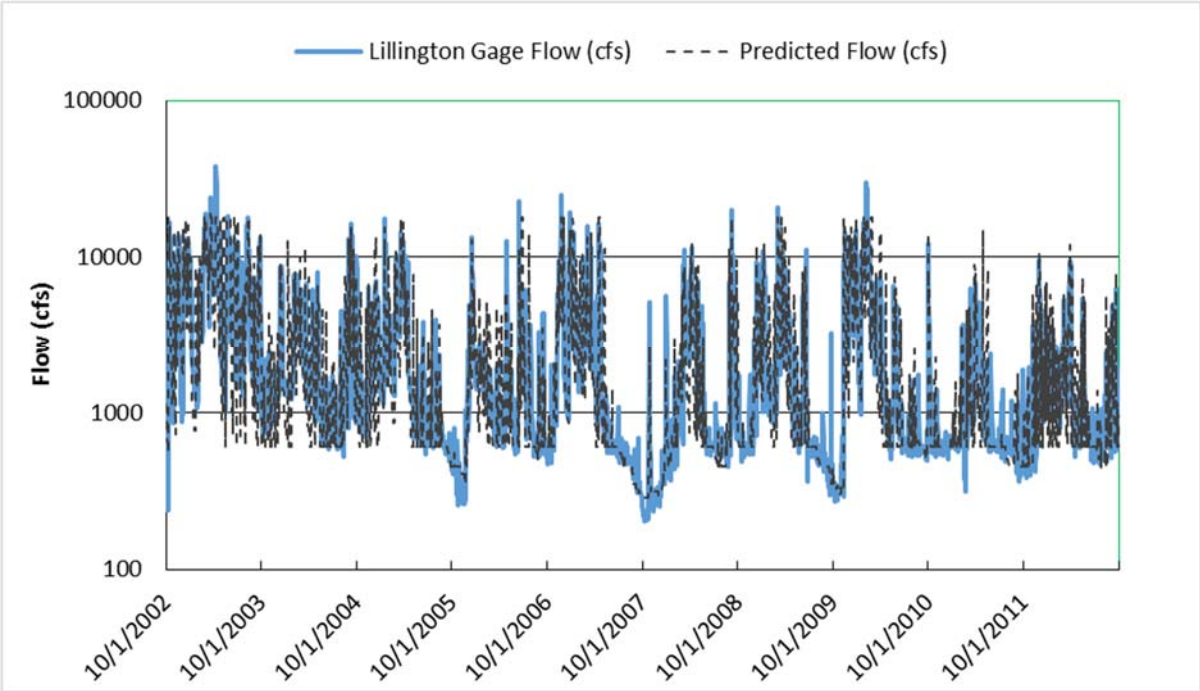
The withdrawal and discharge projections for the Towns of Apex, Cary and Morrisville and RTP South utilized in the CFNRBHM are as presented in the Towns' Long Range Water Resources Plan (LRWRP) (CH2M HILL, 2013).

The CFNRBHM model scenario developed to represent the 2045 conditions was used in the hydrologic modeling analysis presented in this TM.

Model Review

As described above, the original CFNRBHM model was revised to incorporate up to date withdrawal and discharge information provided by municipalities in the basins. HydroLogics, Inc. incorporated these changes into a revised model and calibrated the model by comparing historic and predicted flows at multiple locations. Plots and statistics were developed by HydroLogics, Inc. and reviewed by NCDWR to ensure appropriate alignment with model calibration tolerances. An example of these calibration results is provided in Figure 3.

FIGURE 3
Example of Model Calibration (Flow at Lillington from 2002 - 2012)



Model Use for Evaluating IBT

A process to evaluate the potential changes in key hydrologic impact indicators, water levels (elevation) and flows was developed by CH2M HILL in collaboration with NCDWR. The approach for this process was based on the use of the CFNRBHM to evaluate key hydrologic indicators, including:

- Jordan Lake elevation
- Water Quality Pool volume (%)
- Water Supply Pool volume (%)
- Cape Fear River flow at Lillington
- Cape Fear River flow at Fayetteville

These same indicators were used in the 2000 EIS that was used to analyze impacts of the currently permitted IBT. Indicators were examined based on various combinations of flow/level duration curves, time series plots, and results during extreme conditions. Overall, the process included the development of an assessment strategy, development of alternative future scenarios, revision of the CFNRBHM (to reflect the alternative scenarios), and evaluation of differences under the alternative future scenarios.

Modeling Scenarios

The CFNRBHM model was used to evaluate the impacts of the proposed IBT certificate modification. The specifics of the modeling scenarios were developed through discussions with NCDWR.

Environmental Assessment Alternatives

Alternatives to be evaluated as part of a SEPA EA in support of the Towns' proposed IBT certification modification include the following:

1. No action:
    a. The Towns pursue no increase in water supply from Jordan Lake and no increase in IBT to meet 2045 demands.
2. Modify IBT certificate:
    a. With an increase in IBT to meet 2045 demands (Proposed Alternative)
        i. Towns increase their Jordan Lake water supply allocation and continue the planned use of the Towns' 4 WRFs.
    b. With an increase in IBT to meet 2045 demands and fully use current permitted wastewater capacity
        i. Towns increase their Jordan Lake water supply allocation and continue the planned use of the Towns' 4 WRFs but utilize the full permitted capacity of the South Cary WRF (16 mgd).
        ii. This alternative represents an increased Neuse discharge IBT scenario based on the currently permitted capacity of the Towns' WRFs located within the Neuse River basin and projected future wastewater flows.
3. Avoid IBT certificate modification by:
    a. Transferring untreated wastewater from the Neuse River Basin to the WWRWRF, which discharges to the Cape Fear River Basin
        i. Towns increase their Jordan Lake water supply allocation and continue the planned use of the Towns' 4 WRFs, in addition to transferring raw untreated wastewater to the WWRWRF to avoid an increase in IBT.
    b. Transferring treated wastewater effluent from the Neuse River Basin to the Cape Fear River Basin
        i. Towns increase their Jordan Lake water supply allocation and continue the planned use of the Towns' 4 WRFs, in addition to transferring treated wastewater effluent to be discharged in the Cape Fear River basin avoiding an increase in IBT.
    c. Using a water supply source in the Neuse River Basin
        i. No expansion of the Towns' Jordan Lake water supply allocation, future water supply needs would be met by a new Neuse River basin water supply or interconnection with another utility with an existing water supply in the Neuse River basin.

d. Using groundwater as a water supply source

    i. Development of a groundwater supply source.

e. Utilizing additional Water Resources Management Tools

    i. Implementation of measures to minimize and/or offset potable water demand to avoid additional IBT.

The above alternatives represent alternatives to the proposed IBT certificate modification related to the extension of the planning period through 2045. The specific details on each alternative will be presented in the SEPA EA.

Hydrologic Model Scenarios

Four hydrologic model scenarios were used to evaluate the various EA alternatives, described in the preceding section. These model scenarios were developed in partnership with NCDWR to represent the EA alternatives and allow for a comparative evaluation of the alternatives to the Towns' proposed increased Jordan Lake water supply withdrawal and IBT. These model scenarios provide a comprehensive understanding of the effects from an increased withdrawal and IBT, and the results from EA alternatives not explicitly included in the model scenarios would be similar. In the case of EA alternatives that may increase discharges within the Cape Fear River, there may be a small increased benefit to the lowest flow periods (downstream of Jordan Lake) but a significant portion of the low flow hydrograph for the river will be controlled by the operational targets at the Lillington USGS gage dictating the releases from the Jordan Lake water quality pool. Table 2 provides an outline of the model scenarios representing each EA alternative.

Appendix A contains a table of model inputs for each scenario that includes the withdrawals, discharges and monthly patterns for the Cary/Apex system. The following sections provide a summary of each model scenario.

2010 Baseline

The 2010 Baseline scenario represents existing conditions for the Cary/Apex system and the Cape Fear and Neuse River basins. This scenario is an unmodified version of the final 2010 CFNRBHM scenario (model file JLP2_2010, which is the same as a current model version Simbase_Jan_2014). Water supply withdrawals and discharges throughout the basins are set to actual 2010 levels. Table 3 outlines the 2010 Jordan Lake withdrawals in the CFNRBHM 2010 scenario.

2045 Baseline (EA Alternative 1 and Alternative 3a through 3e)

The 2045 Baseline scenario is intended to approximate 2045 conditions without the proposed IBT certificate modification, and is based on the withdrawal and discharge values used in the 2000 Environmental Impact Statement (EIS) - the basis of the Towns' current IBT certificate. The objective of this model scenario is to represent EA alternatives where the Towns do not increase their IBT above the current IBT certificate limit, adjusted to an average day of a calendar month basis. This objective could be simulated by either constraining the water supply withdrawn from Jordan Lake (the 2045 Baseline scenario) or by increasing the discharge/return to the Cape Fear River basin with an increased

TABLE 2
Modeling Scenarios Representing EA Alternatives

Alternative Number	EA Alternative	EA Alternative Description	Modeling Scenario Representing an EA Alternative
Baseline		Baseline	2010 Baseline
2. Modify IBT certificate	2a	With an increase in IBT to meet 2045 demands (Proposed Alternative)	2045 Requested IBT
	2b	With an increase in IBT to meet 2045 demands and fully use current permitted wastewater capacity in the Neuse River Basin	2045 Increased Neuse Discharge IBT
1. No action & 3. Avoid IBT certificate modification	1	No Action	2045 Baseline
	3a	Transferring untreated wastewater from the Neuse River Basin to the WWRWRF, which discharges to the Cape Fear River Basin	
	3b	Transferring treated wastewater effluent from the Neuse River Basin to the Cape Fear River Basin	
	3c	Using a water supply source in the Neuse River Basin	
	3d	Using groundwater as a water supply source	
	3e	Utilizing additional Water Resources Management Tools	

Jordan Lake withdrawal. Alternatives 3a and 3b represent future scenarios with an increased discharge to the Cape Fear River basin, but ultimately the results for model scenarios explicitly representing these alternatives would be very similar to the 2045 Baseline model scenario. There may be a small increased benefit to the lowest flow periods (downstream of Jordan Lake), but a significant portion of the low flow hydrograph for the river will be controlled by the operational targets at the Lillington USGS gage dictating the releases from the Jordan Lake water quality pool. Therefore, the EA Alternatives that do not increase the Towns' IBT (1 and 3a through 3e) are all represented by the 2045 Baseline model scenario.

The CFNRBHM model structure is significantly different from that of the model used for the 2000 EIS. To the extent possible, the 2045 Baseline scenario was set up to replicate the Cary/Apex system components from the 2000 EIS. To achieve this, withdrawals, discharges, and the associated monthly patterns for the Cary/Apex system are specified to replicate the assumptions of the 2000 EIS (CH2M HILL, 2000). Withdrawals and discharges for the remainder of the Cape Fear and Neuse River basins are specified based on the projected 2045 conditions.

This model scenario is a modified version of the final CFNRBHM 2045 scenario (JLP2_Year2045). Table 3 outlines the 2045 Baseline scenario Jordan Lake withdrawals.

2045 Requested IBT (EA Alternative 2a)

The 2045 Requested IBT scenario represents 2045 conditions for the Cary/Apex system and the Cape Fear and Neuse River basin, with withdrawals and discharges as projected by the municipalities, and would result in the requested IBT.

This model scenario is the final CFNRBHM 2045 scenario (model file JLP2_Year2045). Table 3 outlines the 2045 Requested IBT scenario Jordan Lake withdrawals.

2045 Increased Neuse Discharge IBT (EA Alternative 2b)

The 2045 Increased Neuse Discharge IBT scenario is similar to the 2045 Requested IBT scenario with the one modification - some wastewater flow is redirected from the WWRWRF to the South Cary WRF to utilize the entire permitted capacity of the South Cary WRF (16 mgd). This scenario represents 2045 conditions for the Cary/Apex system and the entire Cape Fear and Neuse River basins, with withdrawals and discharges as projected by the basin municipalities.

This model scenario is a modified version of the final CFNRBHM 2045 scenario (JLP2_Year2045). Table 3 outlines the 2045 Increased Neuse Discharge IBT scenario Jordan Lake withdrawals.

TABLE 3
Current and Future Jordan Lake Allocation Holders - Average Day Water Supply Withdrawals

	2010 Baseline Scenario Actual Use	2045 Baseline Scenario Projected Use	2045 Requested IBT Scenario Projected Use	2045 Increased Neuse Discharge IBT Scenario Projected Use
		EA Alternative 1, 3a – 3e	EA Alternative 2a	EA Alternative 2b
Cary/Apex	18.4 [a]	25.3[b]	39.2 [c]	39.2 [c]
RTP South	0.6 [a]	2.5[b]	3.2 [c]	3.2 [c]
Morrisville	1.7 [a]	5.0[b]	3.5 [c]	3.5 [c]
Chatham County	2.2 [a]	13.1[c]	13.1[c]	13.1[c]
OWASA	0.0	5.0 [c]	5.0 [c]	5.0 [c]
Orange County	0.0	1.5 [c]	1.5 [c]	1.5 [c]
City of Durham	0.0	16.5 [c]	16.5 [c]	16.5 [c]
Hillsborough	0.0	1.0 [c]	1.0 [c]	1.0 [c]
Holly Springs	0.0	2.0 [c]	2.0 [c]	2.0 [c]
Pittsboro	0.0	6.0 [c]	6.0 [c]	6.0 [c]
Sub-total	**22.9**	**77.9**	**91.0**	**91.0**
Other	0.0	22.1	9.0	9.0
Total	**22.9**	**100.0**	**100.0**	**100.0**

[a] Data source: CFNRBHM Version JLP2_2010
[b] Data source: CH2M HILL, 2000 (Town of Apex and Cary IBT EIS)
[c] Data source: TJCOG, 2014

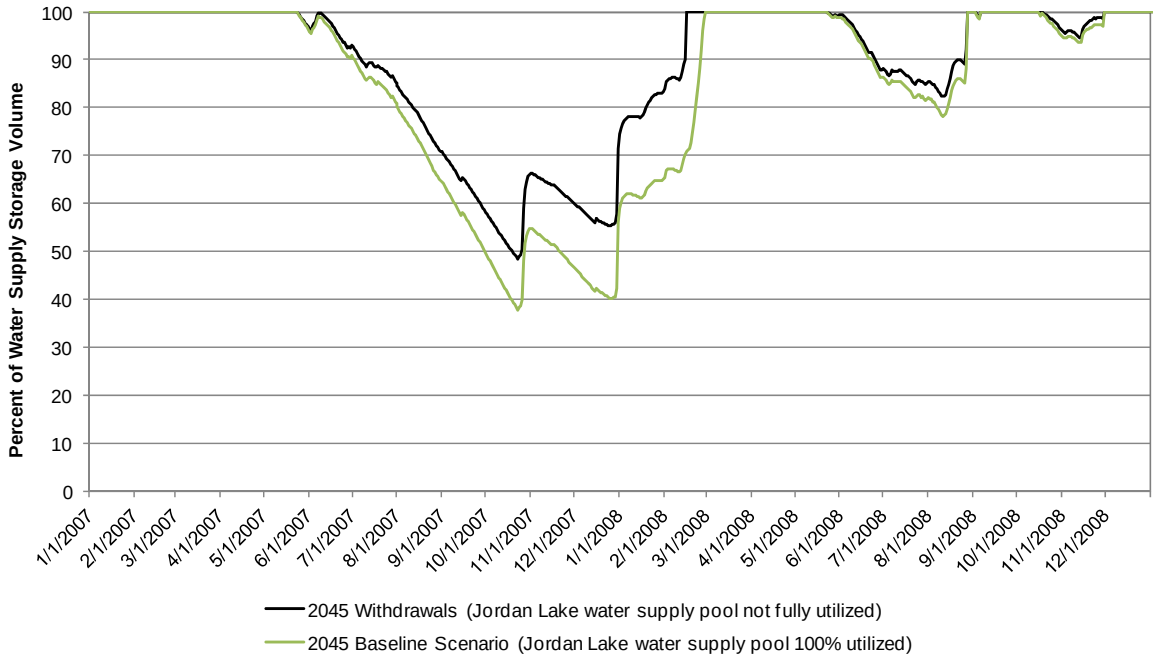
Other Jordan Lake Withdrawal Assumptions

In order to isolate increased IBT impacts from the impacts of increased use of the Jordan Lake water supply pool, all of the 2045 scenarios assume full allocation and use of the Jordan Lake water supply pool (total average annual demand = 100 mgd). For all scenarios, except the 2010 Baseline scenario, withdrawals from Jordan Lake total 100 mgd on an average annual basis.

Table 3 provides a summary of the projected water use by all current and future Jordan Lake allocation holders in 2045; the difference between the 100 mgd Jordan Lake water supply and the allocation holders projected use defines the "Other" Jordan Lake withdrawals (also presented in Table 3). It was assumed that 50 percent of the Other Jordan Lake withdrawals are returned downstream of Jordan Lake dam.

Figure 4 presents a comparison of the 2045 model results without full utilization of the water supply pool and the 2045 Baseline scenario with the full utilization of the water supply pool, showing the influence of the full utilization.

FIGURE 4
Jordan Lake Water Supply Pool Utilization Comparison



Scenario Descriptions

Descriptions of the hydrologic model scenarios are provided in Table 4.

TABLE 4
Summary of Hydrologic Model Scenario Components

Component	Model Scenario [a]			
	2010 Baseline	2045 Baseline	2045 Requested IBT	2045 Increased Neuse Discharge IBT
		EA Alternative 1, 3a – 3e	EA Alternative 2a	EA Alternative 2b
Continue Existing IBT	Yes	Yes	Yes	Yes
Increased IBT	No	No	Yes	Yes
Jordan Lake Drought Contingency Plan – Turned on in CFNRBHM	Yes	Yes	Yes	Yes
Water Shortage Response Plans – Turned on in CFNRBHM	Yes	Yes	Yes	Yes
Cary/Apex Jordan Lake Average Day Withdrawal (mgd)[b]	20.7	32.8	45.9	45.9
Non-Cary/Apex Projected Jordan Lake Average Day Withdrawal (mgd)[c]	2.2	45.1	45.1	45.1

TABLE 4
Summary of Hydrologic Model Scenario Components

Component	Model Scenario [a]			
	2010 Baseline	2045 Baseline	2045 Requested IBT	2045 Increased Neuse Discharge IBT
		EA Alternative 1, 3a – 3e	EA Alternative 2a	EA Alternative 2b
Other Jordan Lake Average Day Withdrawal (mgd)	N/A	22.1	9.0	9.0
Total Jordan Lake Average Day Demands (mgd)	22.9	100.0	100.0	100.0
Cary/Apex Water Treatment Plant Process Water - Average Day Discharges (mgd)	3.1	2.6[d]	6.6	6.6
Cary/Apex Cape Fear River Basin Average Day WRF Discharges (mgd)	2.1	12.7	12.8	5.0
Cary/Apex Neuse River Basin Average Day WRF Discharges (mgd)	14.1	8.4	22.3	30.1
Cary/Apex Average Day IBT (mgd)[e, f]	16	15	24	32
Cary/Apex Maximum Month Average Day IBT (mgd) [e, f]	19	22	33	44

N/A – Not applicable

[a] Numbers have been rounded

[b] Includes the Town of Apex, Cary, Morrisville and RTP South

[c] Includes Chatham County, Hillsborough, Orange County, Orange Water and Sewer Authority, Pittsboro, Holly Springs, and the City of Durham as listed in Table 3

[d] Based on 8% WTP process water loss (2000 EIS analysis assumption)

[e] IBT values have been rounded to whole numbers.

[f] 2010 IBT value based on input data to CFNRBHM; 2045 IBT values projected based on forecasting data provided in the Towns' LRWRP (CH2M HILL, 2013).

Modeling Results

Each scenario was run using the CFNRBHM and scenario results were compared. The model was run on a daily time step and included the Jordan Lake Drought Contingency Plan.

Numerical and graphical methods were used to evaluate the differences between each scenario. The key hydrologic indicators, previously described, were evaluated by running the scenarios and doing a direct day to day comparison of reservoir elevations and discharges for each scenario; e.g., 2010 Baseline vs. 2045 Baseline vs. 2045 Requested IBT.

Scenario Comparisons

Tabular comparisons and plots are provided in this section for the key hydrologic indicators to illustrate the similarities or differences that were calculated between the scenarios. The results included are time series and frequency (duration) curves. The time series plots include the details on the following:

- Entire simulation (period of record)
- 1950's drought
- 2002 drought
- 2007 drought

Jordan Lake Elevation

A summary of the average and minimum reservoir water surface elevations for the period of record and the drought periods is provided in Table 5.

TABLE 5

Model Scenario Comparison – Jordan Lake Water Surface Elevation

Scenario	Elevation Over the Period of Record (feet)		Elevation During the 1950's Drought (feet)		Elevation During the 2002 Drought (feet)		Elevation During the 2007 Drought (feet)	
	Average	Minimum	Average	Minimum	Average	Minimum	Average	Minimum
2010 Baseline	216.3	209.7	215.4	210.1	214.8	209.7	215.3	210.2
2045 Baseline	216.0	207.5	214.8	207.5	214.2	208.4	214.5	207.7
2045 Requested IBT	215.9	207.3	214.7	207.3	214.2	208.0	214.4	207.4
2045 Increased Neuse Discharge IBT	215.9	207.2	214.7	207.2	214.1	207.9	214.4	207.3

The normal operating pool for Jordan Lake is 216 feet above mean sea level (MSL). The average for the period of record is consistently maintained at the normal operating level for all scenarios. A review of the lake elevations during drought conditions shows average elevations approximately one foot below the normal operating level. The largest difference during the drought periods is greatest between the 2010 and 2045 baseline scenarios. This difference, as well as the difference in the minimum elevations presented in Table 5, can be attributed primarily to the growth in future withdrawals in the Cape Fear River basin, as well as the assumed full utilization of the Jordan Lake water supply pool in 2045.

Figures 5 through 8 present the time series plots for the full period of record and the 1950's, 2002, and 2007 drought periods, respectively.

An elevation-duration plot of Jordan Lake is provided in Figure 9. This plot shows the percent of time that the reservoir level falls below a certain elevation.

FIGURE 5
Period of Record Jordan Lake Elevation Comparison

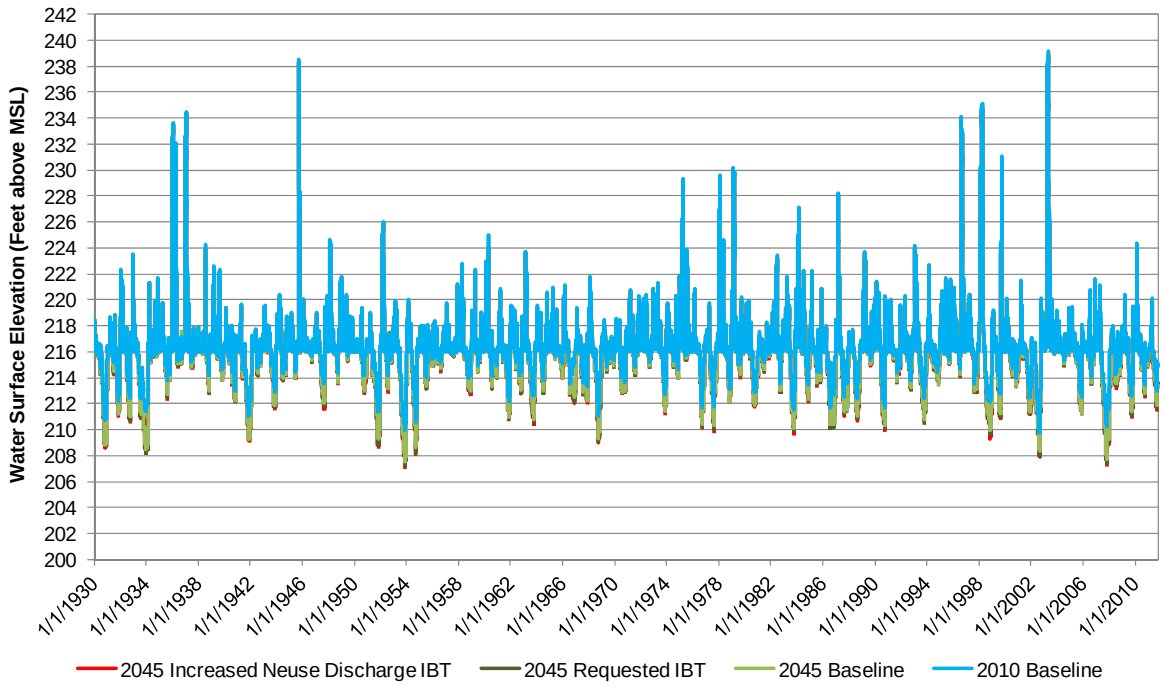


FIGURE 6
1950's Drought Jordan Lake Elevation Comparison

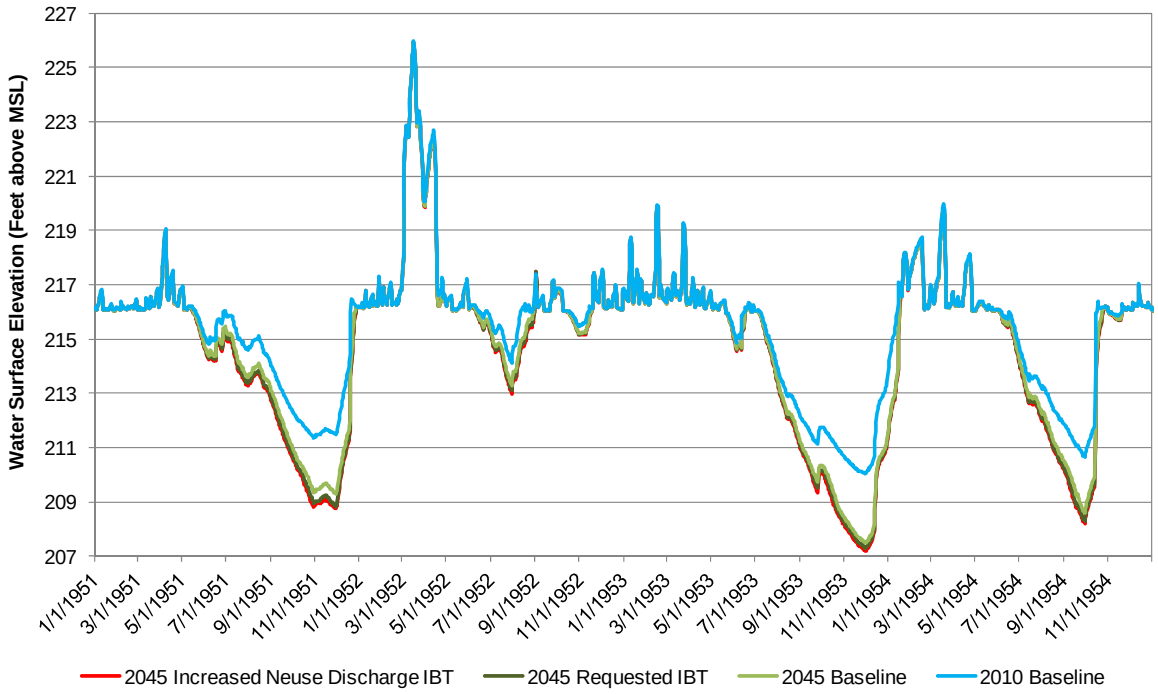


FIGURE 7
2002 Drought Jordan Lake Elevation Comparison

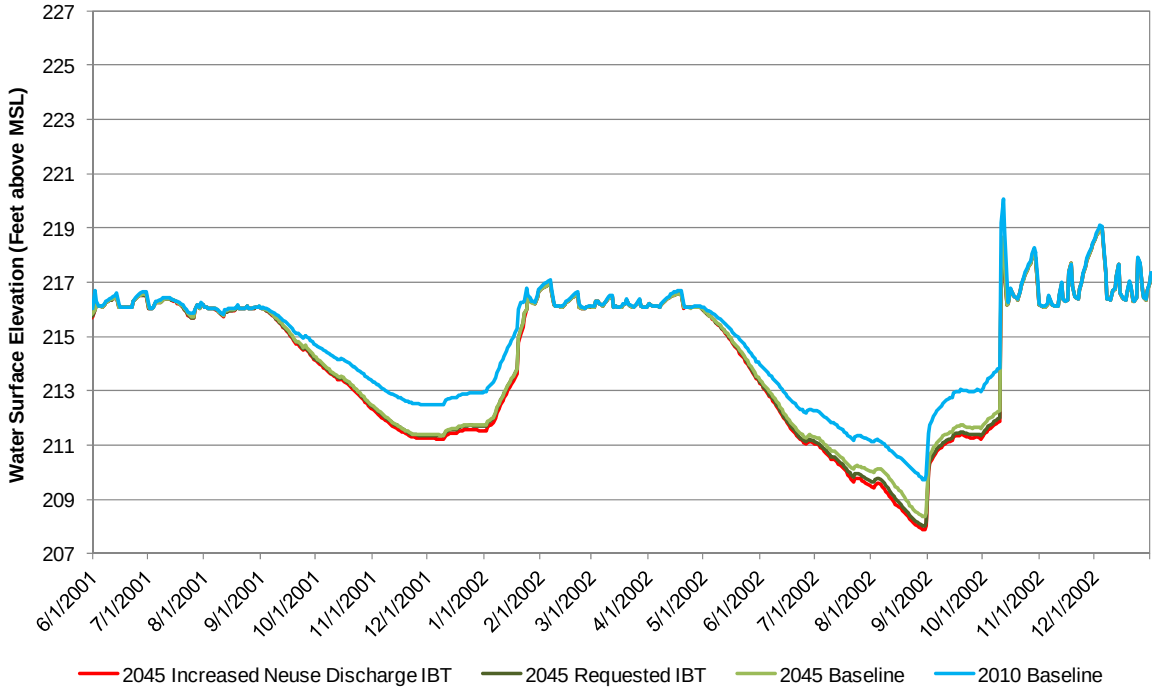


FIGURE 8
2007 Drought Jordan Lake Elevation Comparison

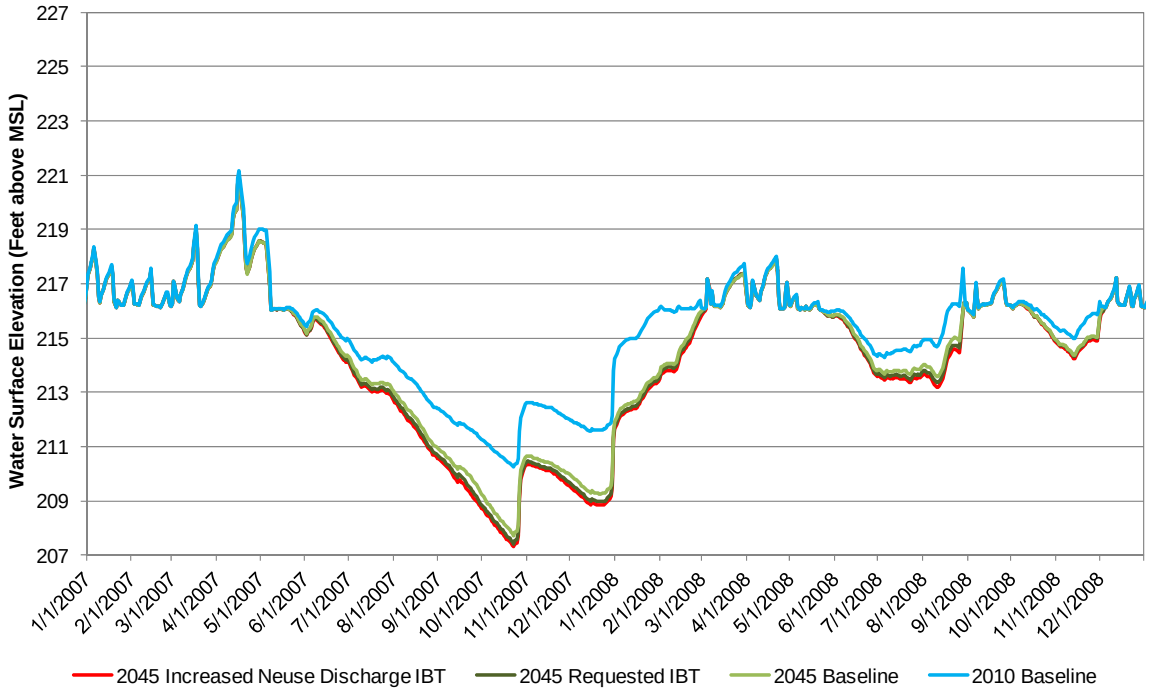
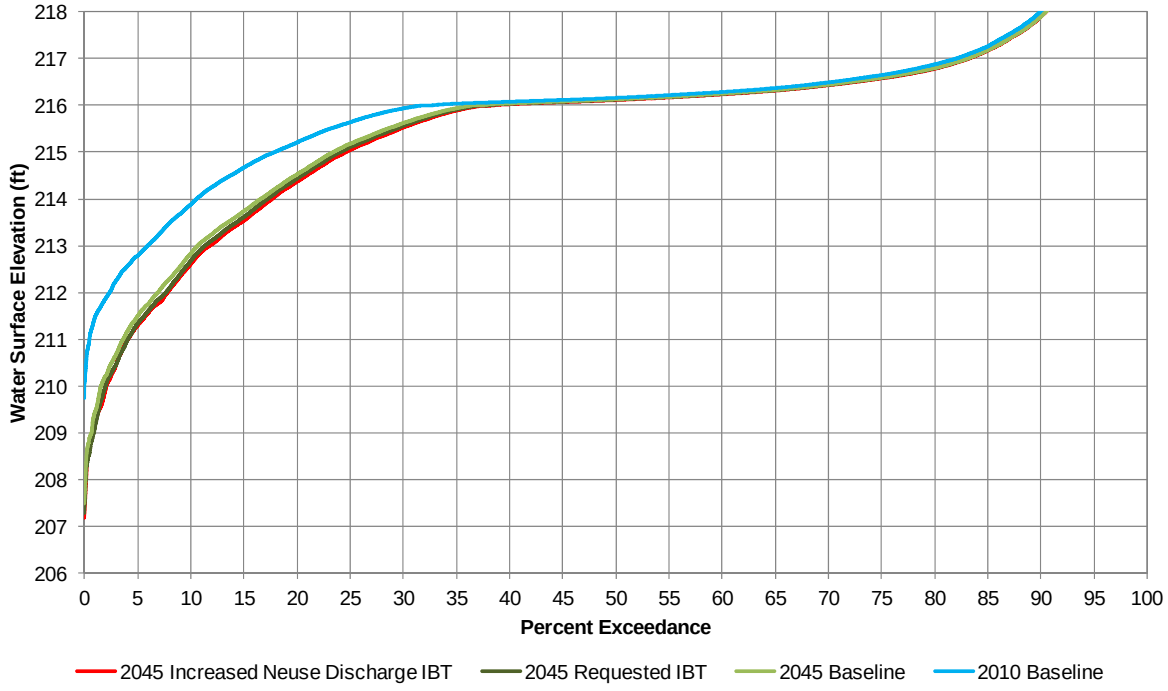


FIGURE 9
Period of Record Jordan Lake Elevation Duration Comparison



Water Quality Pool

Table 6 provides a summary of the average and minimum percentage of water quality pool storage volume during the period of record and drought periods.

TABLE 6
Model Scenario Comparison - Water Quality (WQ) Pool Percent of Storage Volume

Scenario	WQ Pool Storage Over the Period of Record (percent)		WQ Pool Storage During the 1950's Drought (percent)		WQ Pool Storage During the 2002 Drought (percent)		WQ Pool Storage During the 2007 Drought (percent)	
	Average	Minimum	Average	Minimum	Average	Minimum	Average	Minimum
2010 Baseline	93.3	21.0	85.3	22.3	80.7	21.0	85.6	26.7
2045 Baseline	92.6	33.1	85.5	33.5	81.7	37.7	84.4	33.1
2045 Requested IBT	92.3	31.9	85.0	32.4	81.2	36.4	83.7	31.9
2045 Increased Neuse Discharge IBT	92.1	30.9	84.5	31.5	80.6	35.4	83.1	30.9

The average water quality pool storage volume percentage for the period of record is similar for all scenarios, approximately 93 percent, with the 2045 Increased Neuse Discharge IBT scenario closer to 92 percent. A review of the percentage of storage volume during drought conditions shows that for the simulated 1950's and 2002 drought periods, the 2010 Baseline scenario water quality pool volume is actually lower than the 2045 Baseline and 2045 Requested IBT scenarios. This can be attributed to the return of wastewater effluent to the Cape Fear River from the WWRWRF discharge. This return counts as a direct credit to the target flows at Lillington, requiring a smaller discharge from Jordan Lake and effectively preserving the water quality pool storage volume.

Figures 10 through 13 present the time series plots for the full period of record and the 1950's, 2002, and 2007 drought periods, respectively.

A storage volume-duration plot for the water quality pool is provided in Figure 14. This plot shows the percent of time that the water quality pool is below a certain percentage of the pool's total storage volume.

FIGURE 10
Period of Record Water Quality Pool Storage Volume Percent Comparison

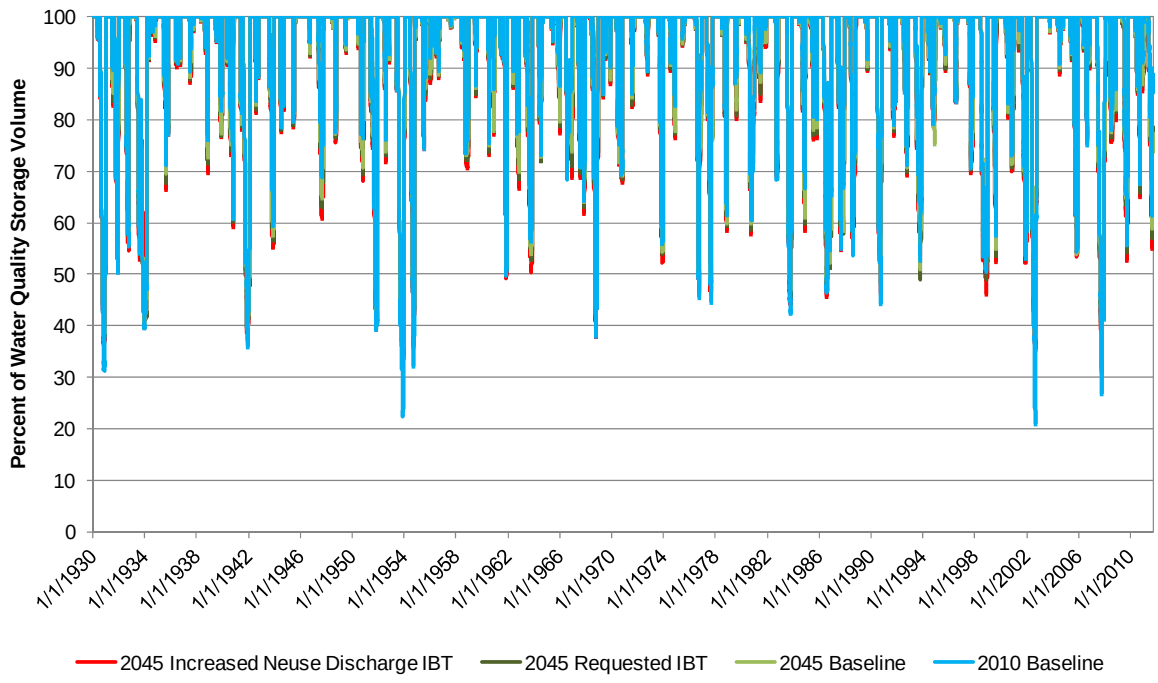


FIGURE 11
1950's Drought Water Quality Pool Storage Volume Percent Comparison

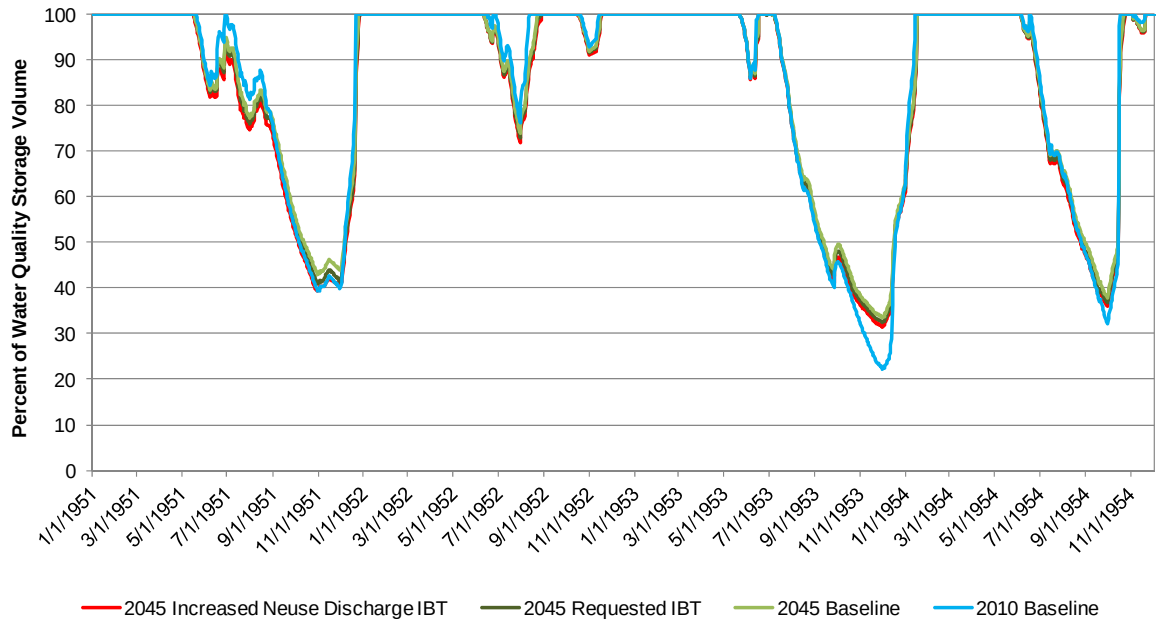


FIGURE 12
2002 Drought Water Quality Pool Storage Volume Percent Comparison

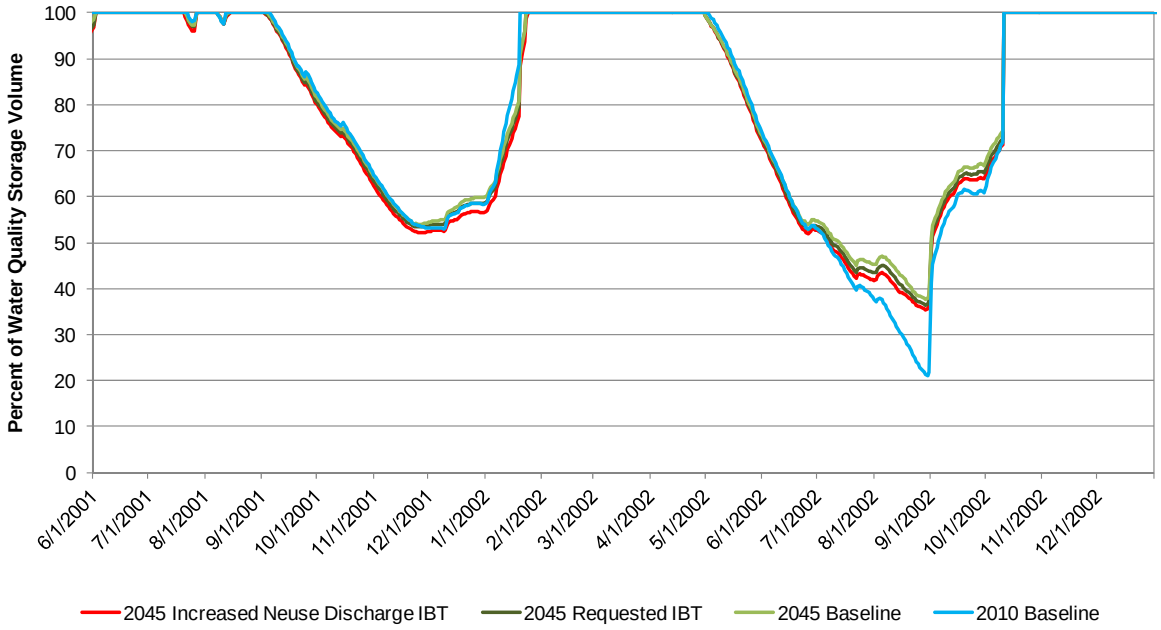


FIGURE 13
2007 Drought Water Quality Pool Storage Volume Percent Comparison

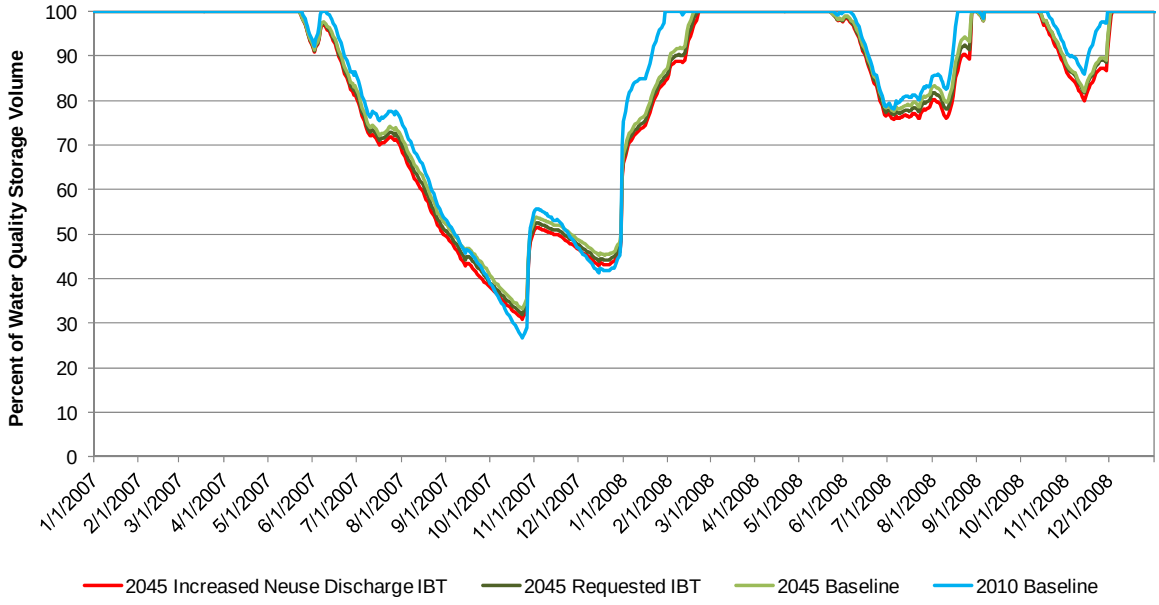
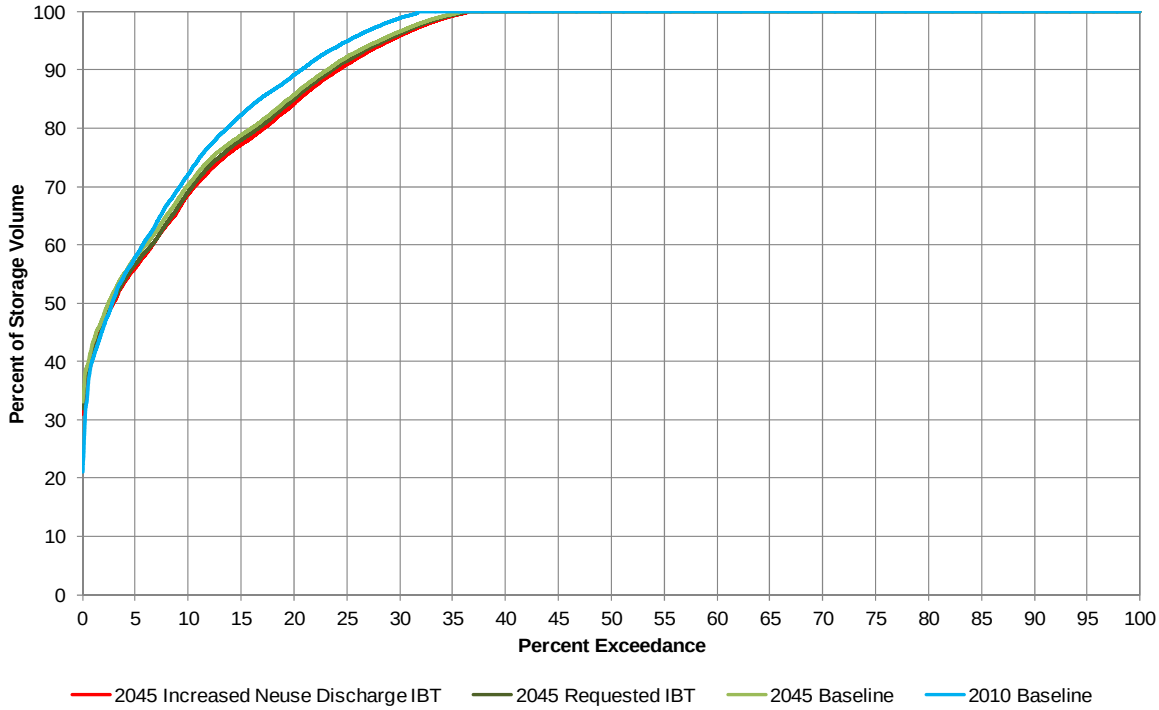


FIGURE14
Period of Record Water Quality Pool Storage Volume Duration Comparison



Water Supply Pool

Table 7 provides a summary of the average and minimum percentage of water supply pool storage volume during the period of record and drought periods.

TABLE 7

Model Scenario Comparison - Water Supply (WS) Pool Percent of Storage Volume

Scenario	WS Pool Storage Over the Period of Record (percent)		WS Pool Storage During the 1950's Drought (percent)		WS Pool Storage During the 2002 Drought (percent)		WS Pool Storage During the 2007 Drought (percent)	
	Average	Minimum	Average	Minimum	Average	Minimum	Average	Minimum
2010 Baseline	99.8	90.7	99.2	90.7	99.3	93.8	99.7	94.4
2045 Baseline	94.1	32.1	86.8	32.6	85.7	38.8	85.1	37.8
2045 Requested IBT	93.7	31.4	86.0	31.4	85.1	34.9	84.0	35.0
2045 Increased Neuse Discharge IBT	93.7	31.4	85.9	31.4	85.1	34.9	83.9	35.0

The average and minimum water supply pool storage volume percentage for the period of record is similar for all 2045 scenarios, with the largest difference between with 2045 scenarios and the 2010 Baseline scenario being attributed to the assumed full utilization of the water supply pool (100 mgd) in 2045. A review of the percentage of storage volume during drought conditions shows a similar pattern as that for the period of record, but with lower average storage volumes. No current or future allocation holder's Jordan Lake water supply allocation was affected by the minimum percentages presented in Table 7.

Figures 15 through 18 present the time series plots for the full period of record and the 1950's, 2002, and 2007 drought periods, respectively.

A storage volume-duration plot for the water supply pool is provided in Figure 19. This plot shows the percent of time that the water supply pool is below a certain percentage of the pool's total storage volume.

FIGURE 15
Period of Record Water Supply Pool Storage Volume Percent Comparison

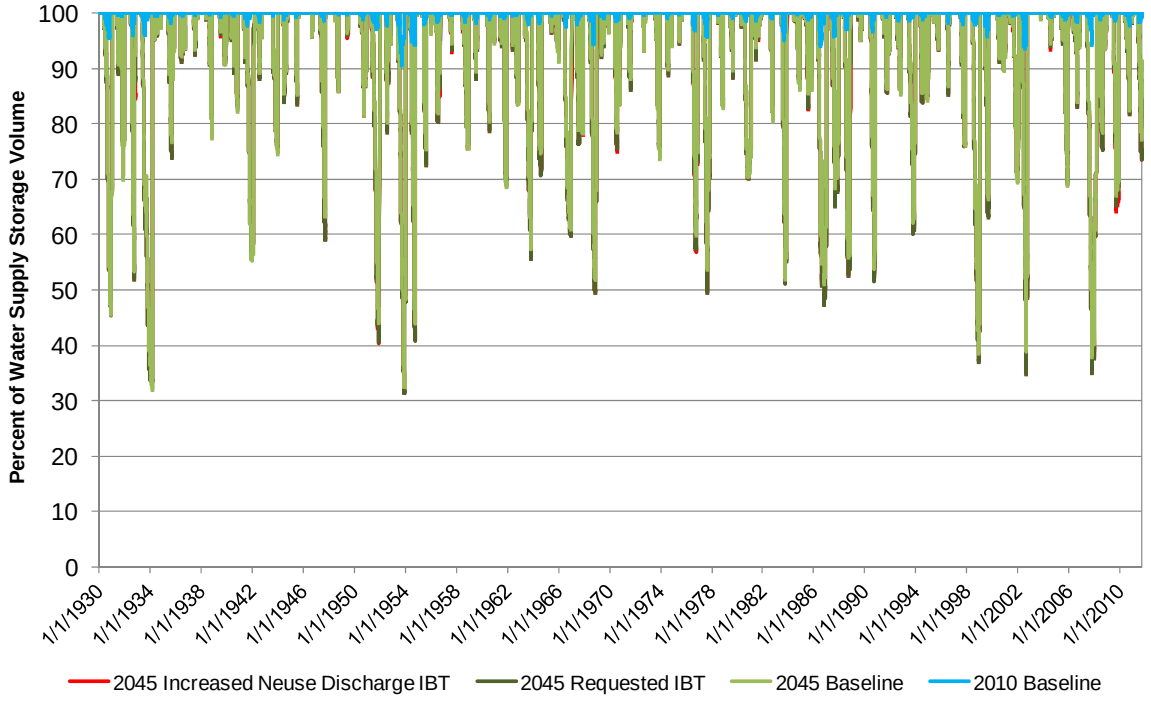


FIGURE 16
1950's Drought Water Supply Pool Storage Volume Percent Comparison

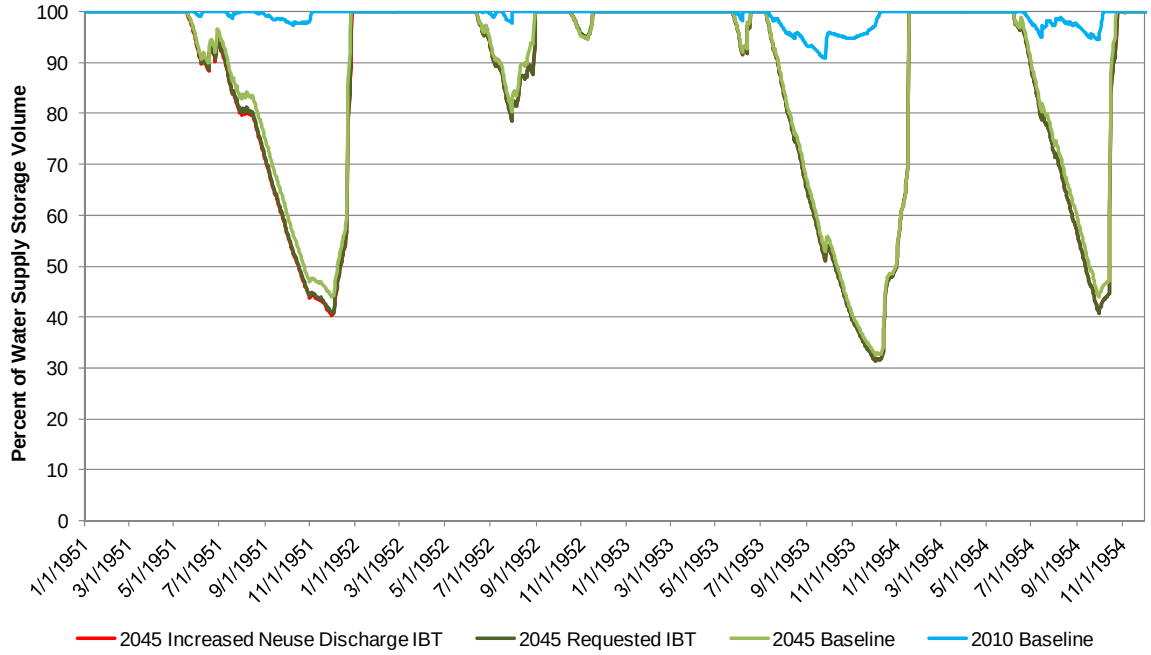


FIGURE 17
2002 Drought Water Supply Pool Storage Volume Percent Comparison

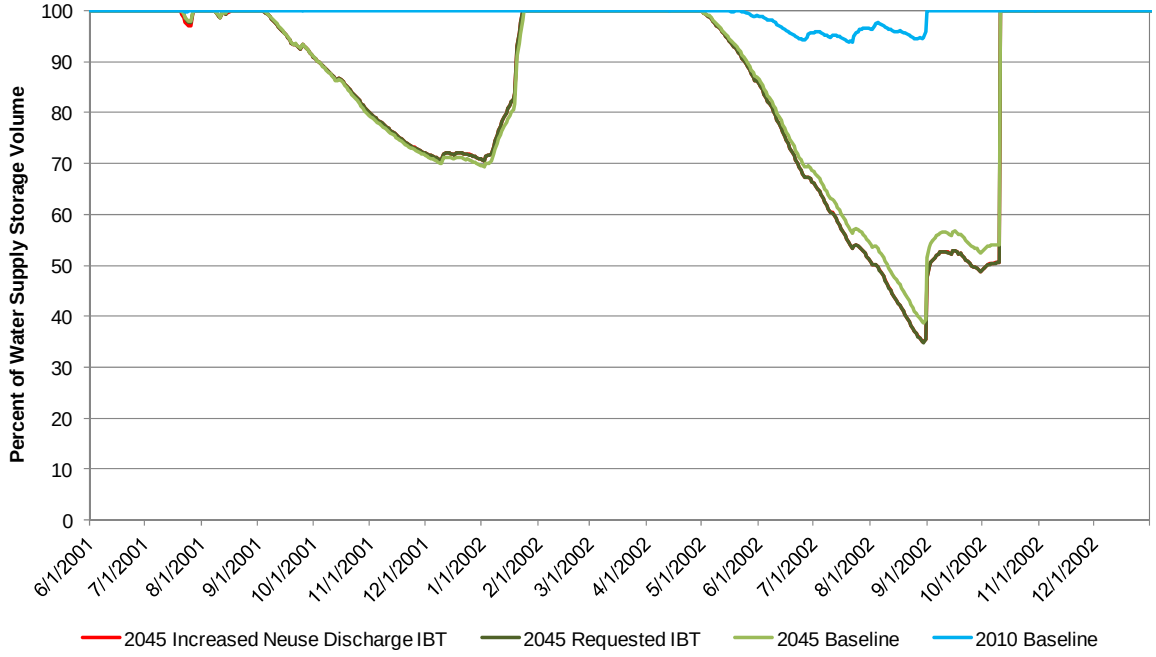


FIGURE 18
2007 Drought Water Supply Pool Storage Volume Percent Comparison

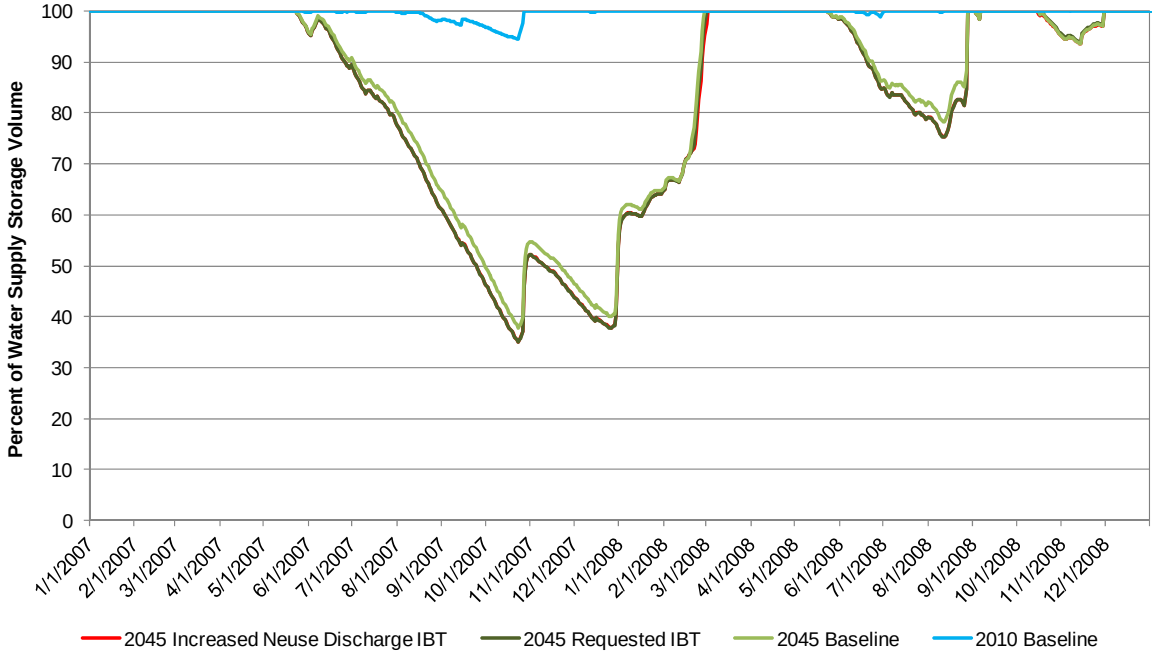
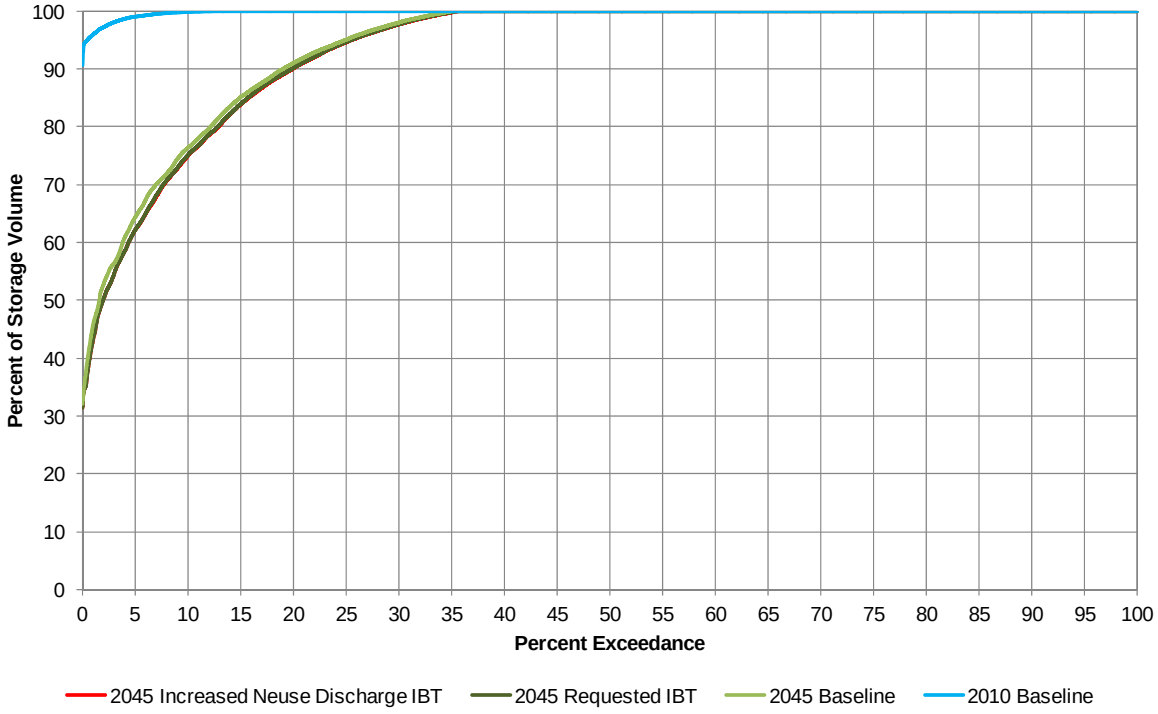


FIGURE 19
Period of Record Water Supply Pool Storage Volume Percent Duration Comparison



Cape Fear River Flows at Lillington and Fayetteville

Table 8 and 9 provide a summary of the Cape Fear River average flows and low flows at Lillington and Fayetteville, respectively, during the period of record and drought periods.

TABLE 8
Model Scenario Comparison – Cape Fear River Average and Low Flows at Lillington

Scenario	Average Period of Record Flow (cfs)	Percent of time below 550 & 250 cfs during the 1950's Drought		Percent of time below 550 & 250 cfs during the 2002 Drought		Percent of time below 550 & 250 cfs during the 2007 Drought	
		550 cfs	250 cfs	550 cfs	250 cfs	550 cfs	250 cfs
2010 Baseline	3,148	22.0%	0.0%	35.6%	0.0%	30.8%	0.0%
2045 Baseline	3,048	24.2%	2.2%	36.4%	1.2%	34.3%	4.9%
2045 Requested IBT	3,038	24.6%	3.0%	36.8%	2.1%	34.9%	6.8%
2045 Increased Neuse Discharge IBT	3,026	25.1%	4.3%	37.3%	2.8%	35.0%	8.9%

NOTE: 550 cfs and 250 cfs were selected for presentation based on the Jordan Lake Drought Contingency Plan flow targets at the Lillington USGS gage.

TABLE 9

Model Scenario Comparison – Cape Fear River Average and Low Flows at Fayetteville

Scenario	Average Period of Record Flow (cfs)	Percent of time below 600 cfs during the 1950's Drought	Percent of time below 600 cfs during the 2002 Drought	Percent of time below 600 cfs during the 2007 Drought
2010 Baseline	4,190	12.5%	18.3%	16.4%
2045 Baseline	4,100	12.7%	19.5%	16.6%
2045 Requested IBT	4,090	12.9%	19.9%	16.8%
2045 Increased Neuse Discharge IBT	4,079	13.1%	20.2%	17.1%

NOTE: 600 cfs was selected for presentation to provide an indication of the frequency of low flow events in the Cape Fear River near Fayetteville.

A comparison of river flows for the 2010 Baseline scenario and 2045 scenarios was performed for flows at Lillington and Fayetteville. As shown in Tables 8 and 9, the largest difference in average period of record flow (approximately 100 cubic feet per second [cfs]) is between the 2010 and 2045 Baseline scenarios due to the increased future withdrawals within the Cape Fear River basin and the assumed full utilization of the Jordan Lake water supply pool. There is an increase in frequency of lower flows in the Cape Fear River at both locations, but similar to the average flows the largest difference is related to increased future withdrawals in the basin and the assumed full utilization of the water supply pool.

The Jordan Lake operating rules, which are built into the CFNRBHM, focus on maintaining flood control capabilities and river flows below the dam. For this reason, river flows are predominantly the same in all scenarios over the full range of flows in the Cape Fear River; Figures 20 through 27 presents the time series plots for the full period of record and the 1950's, 2002, and 2007 drought periods, for Cape Fear River flows below 600 cfs at Lillington and Fayetteville.

A flow-duration plot for the Cape Fear River flows, below 600 cfs, at Lillington and Fayetteville is provided in Figure 28 and 29, respectively. This plot shows the percent of time that river flow is above a specified flow rate. Figures 20 through 29 present flows below 600 cfs (the normal Jordan Lake operations flow target at Lillington is 600 ± 50 cfs) to provide the ability to review the results of each model scenario for low flows at Lillington and Fayetteville.

FIGURE 20
Period of Record Lillington Flows Comparison (Flow less than 600 cfs)

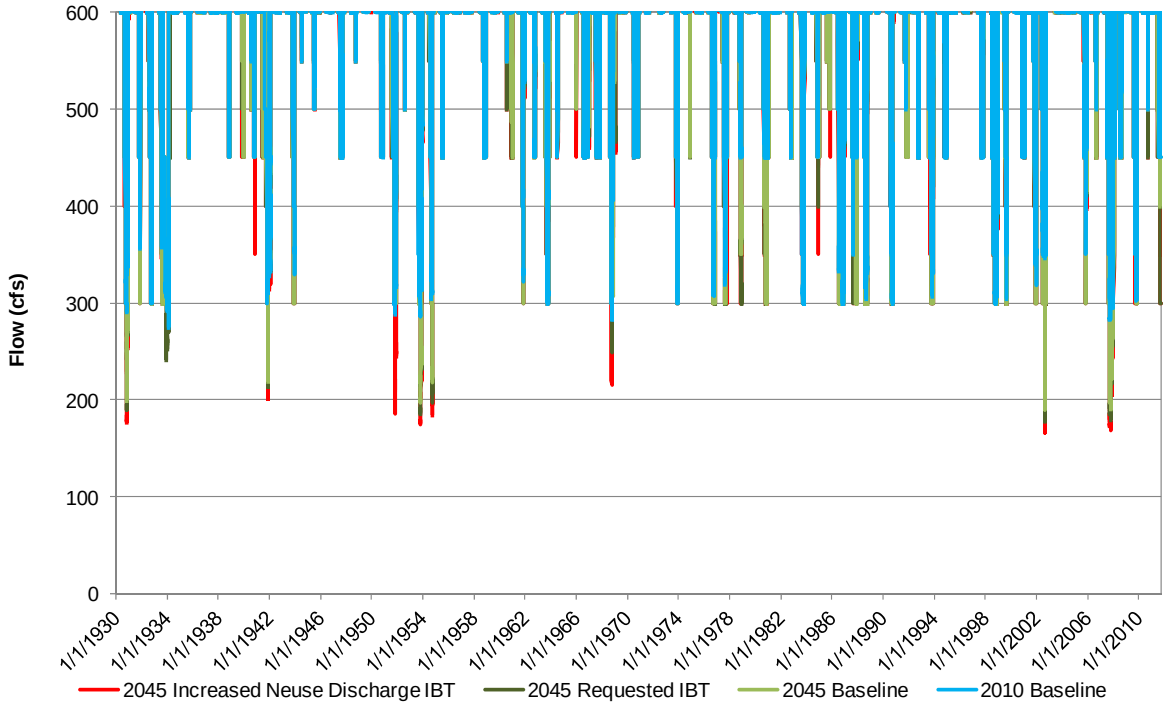


FIGURE 21
1950's Drought Lillington Flows Comparison (Flow less than 600 cfs)

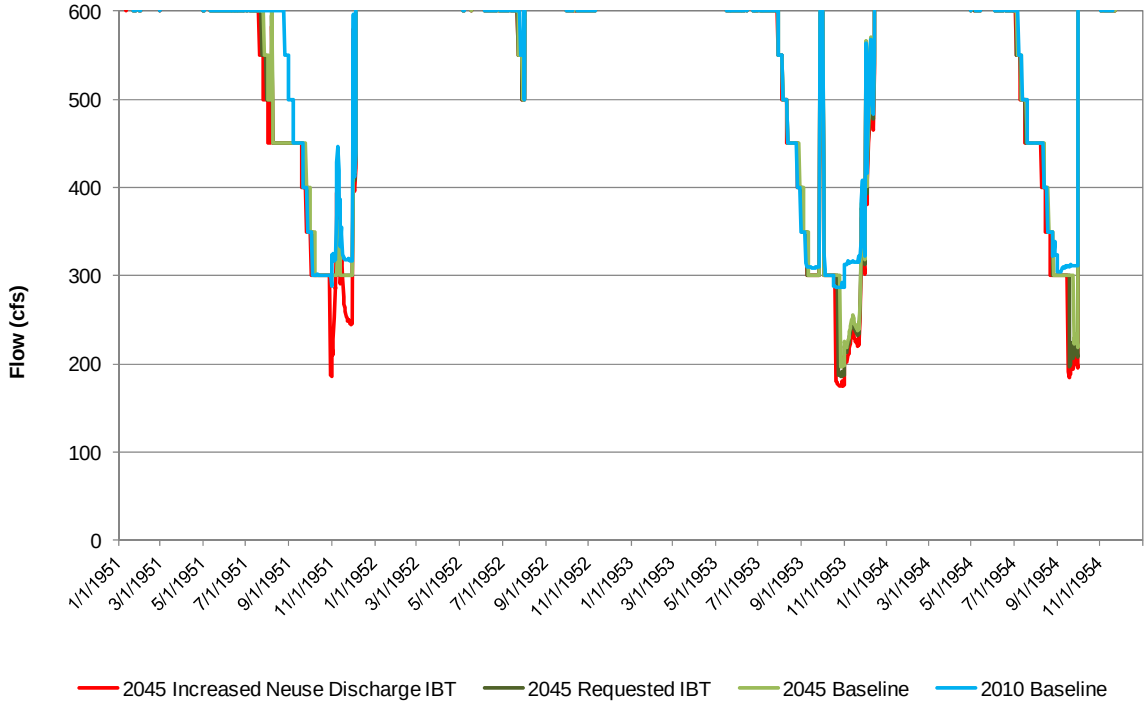


FIGURE 22
2002 Drought Lillington Flows Comparison (Flow less than 600 cfs)

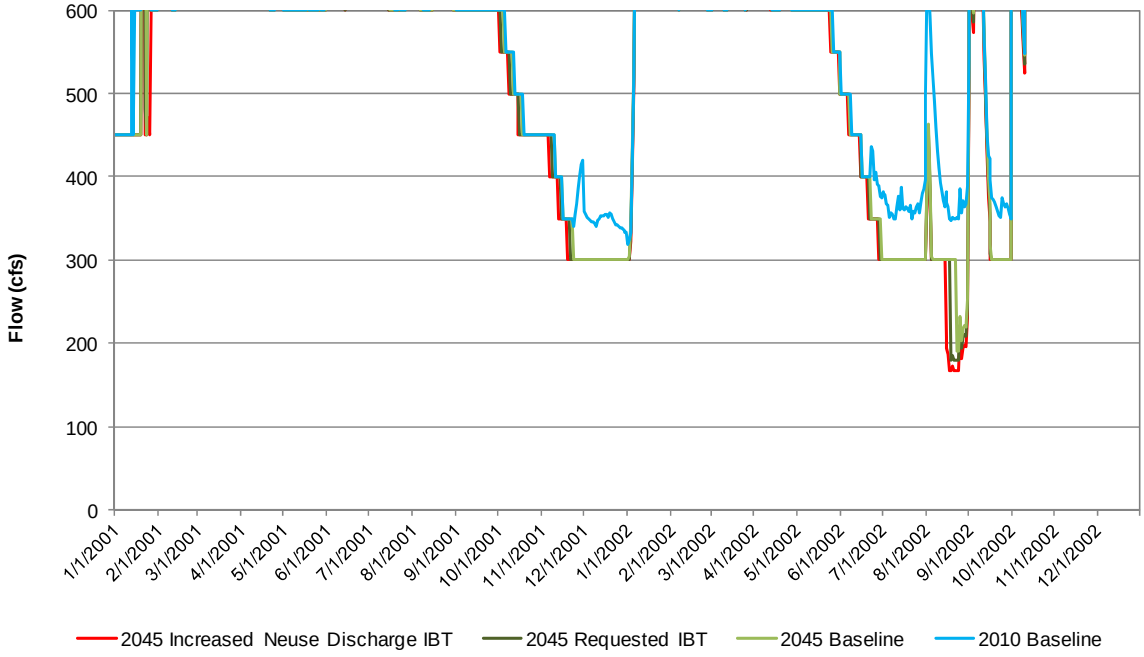


FIGURE 23
2007 Drought Lillington Flows Comparison (Flow less than 600 cfs)

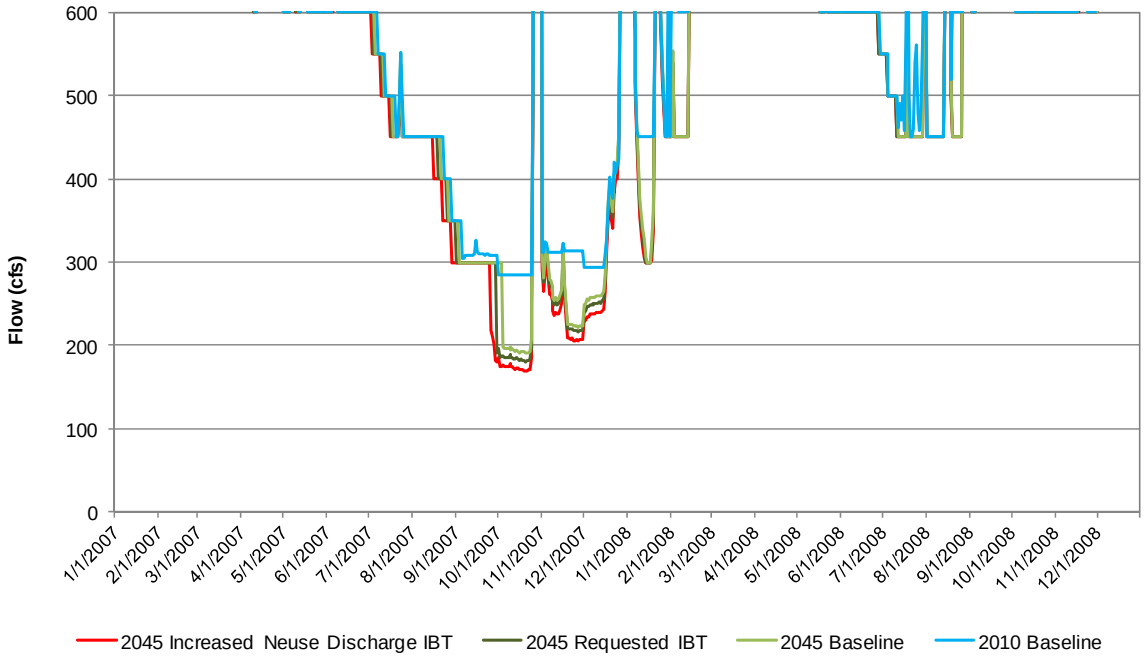


FIGURE 24
Period of Record Fayetteville Flows Comparison (Flow less than 600 cfs)

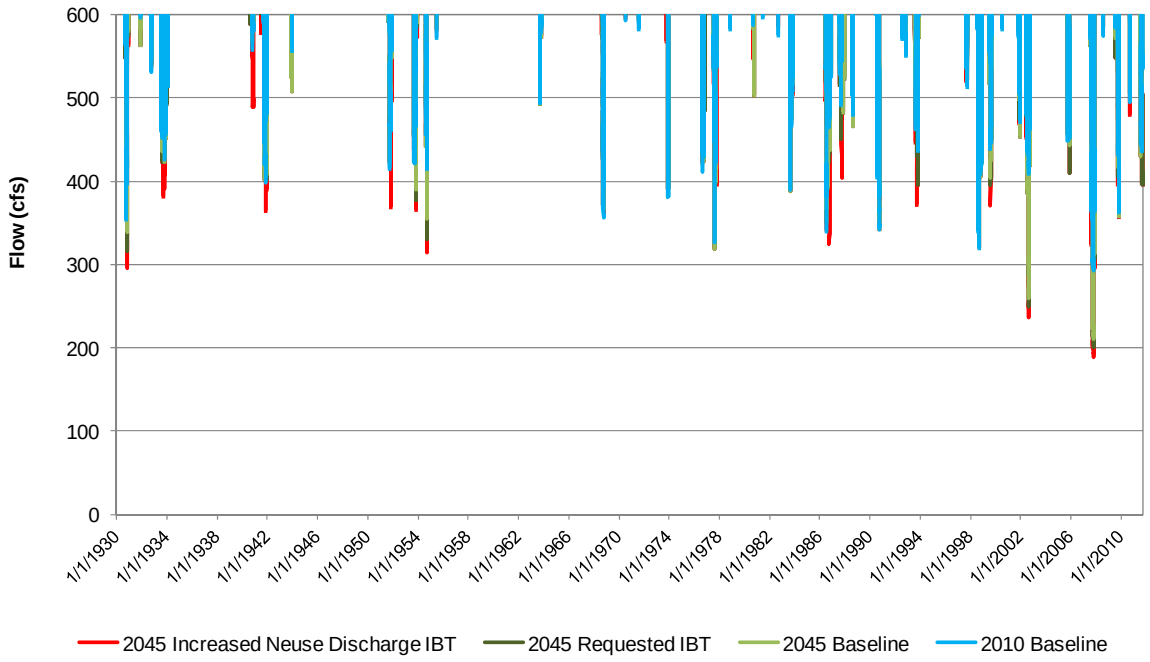


FIGURE 25
1950's Drought Fayetteville Flows Comparison (Flow less than 600 cfs)

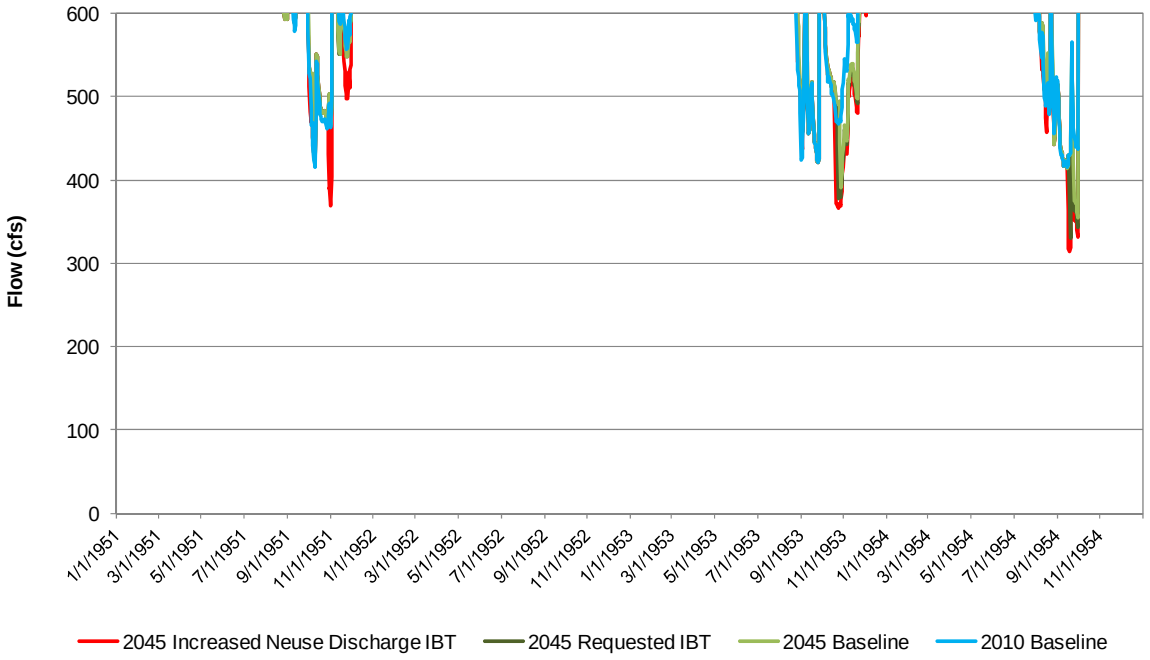


FIGURE 26
2002 Drought Fayetteville Flows Comparison (Flow less than 600 cfs)

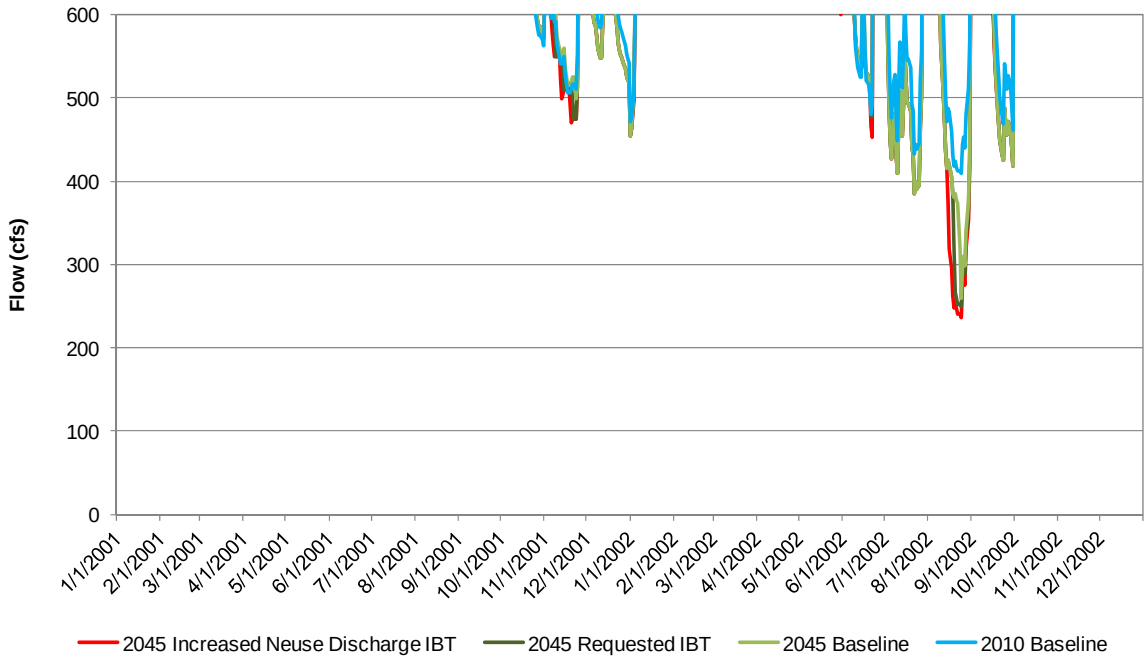


FIGURE 27
2007 Drought Fayetteville Flows Comparison (Flow less than 600 cfs)

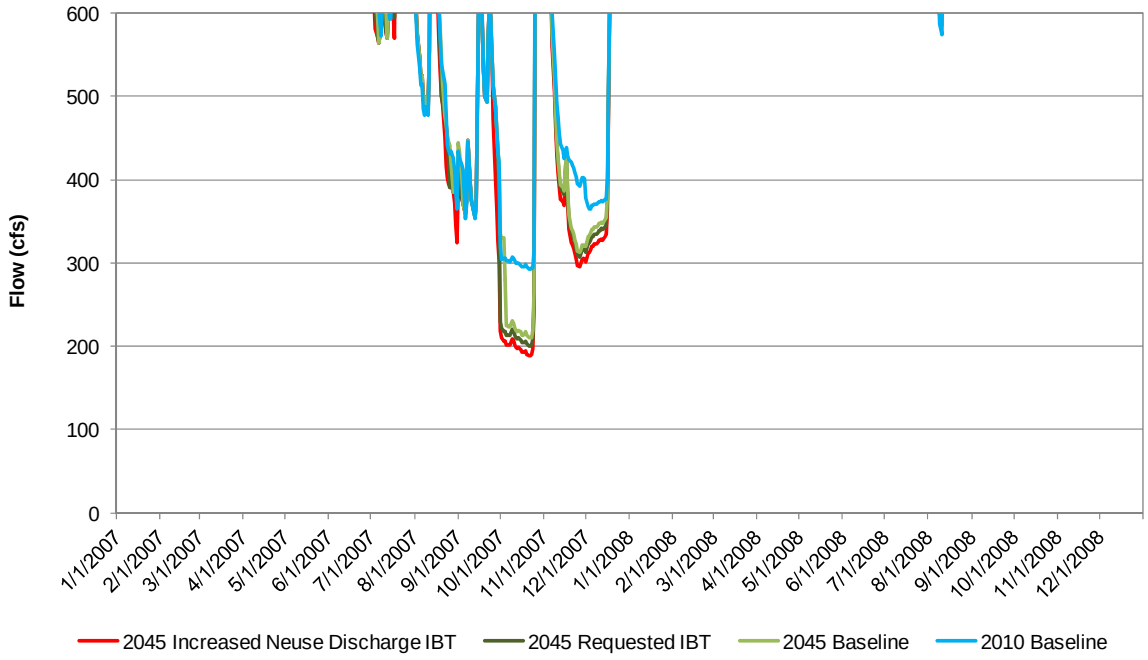


FIGURE 28
Flow Duration Curve for Lillington (Flow less than 600 cfs)

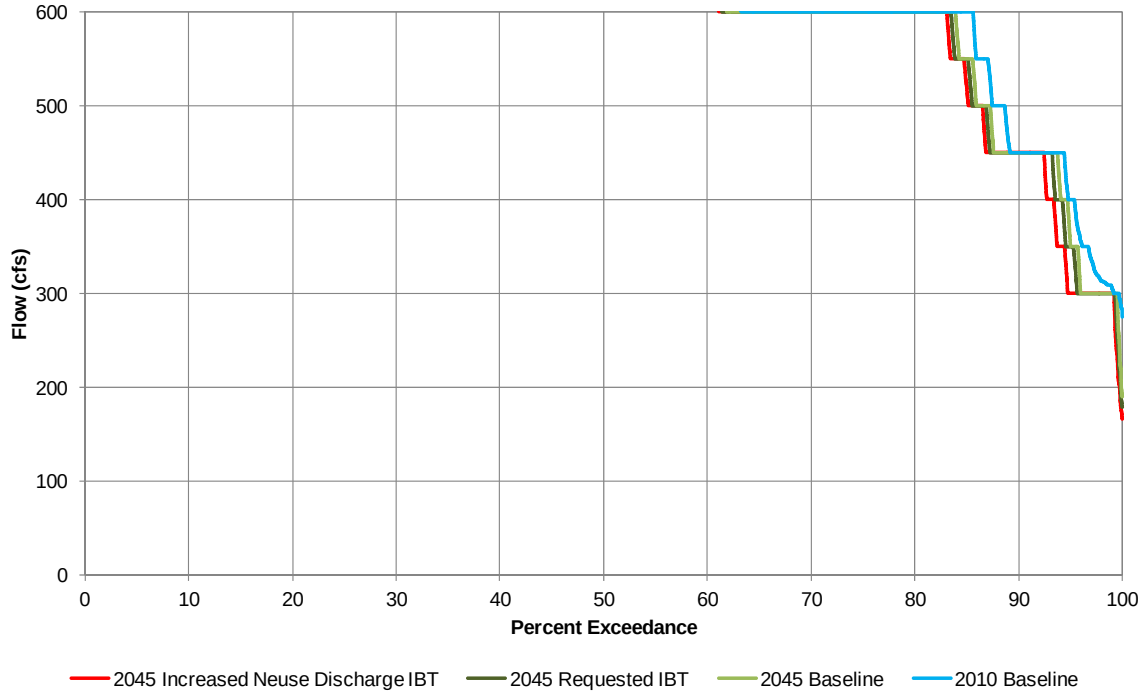
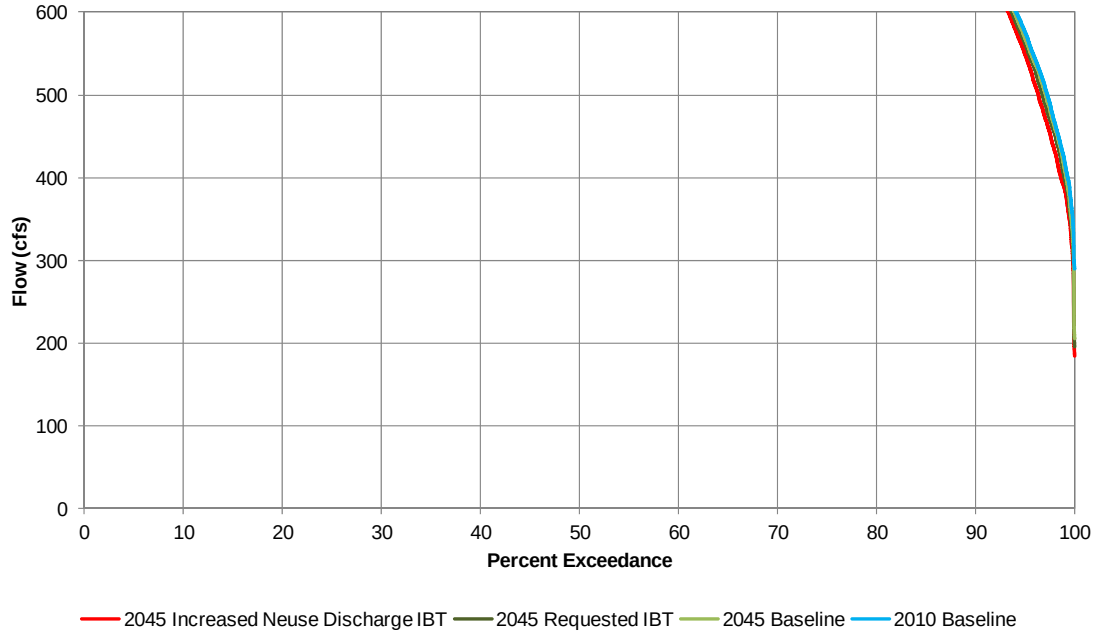


FIGURE 29
Flow Duration Curve for Fayetteville (Flow less than 600 cfs)



Jordan Lake Drought Stages

The most recent version of the CFNRBHM allows for the review of the duration and frequency of occurrence of the drought stages within the Jordan Lake Drought Contingency Plan, outlined in a previous section. Figures 30 through 33 present the drought stage time series plots for the full period of record and the 1950's, 2002, and 2007 drought periods, respectively.

FIGURE 30
Period of Record Jordan Lake Drought Stages

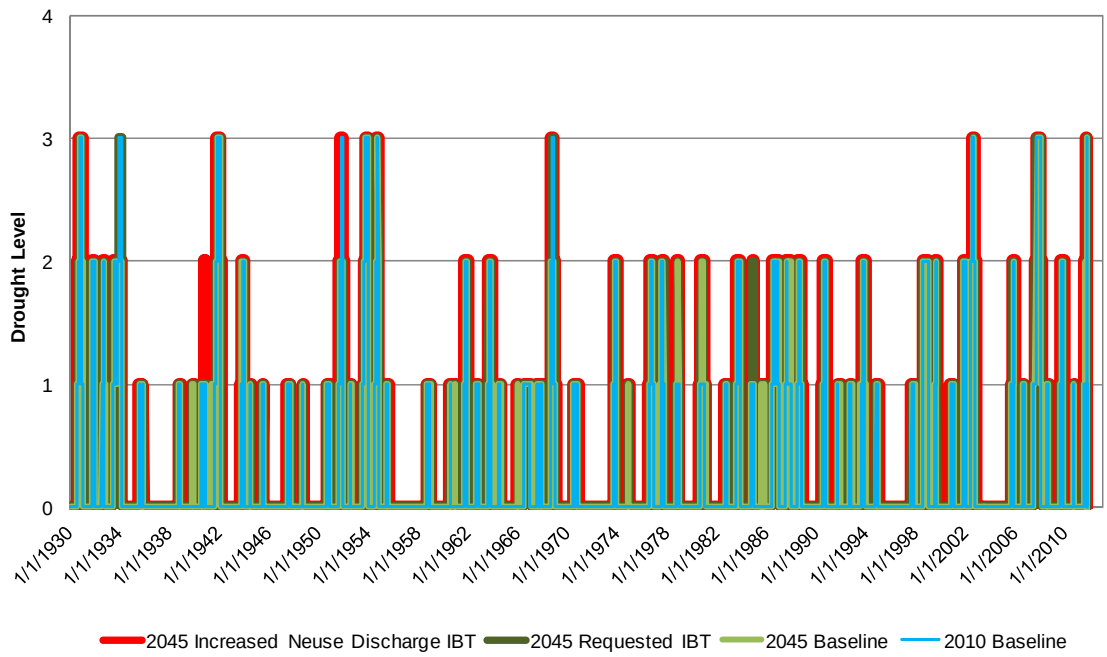


FIGURE 31
1950's Drought Jordan Lake Drought Stages

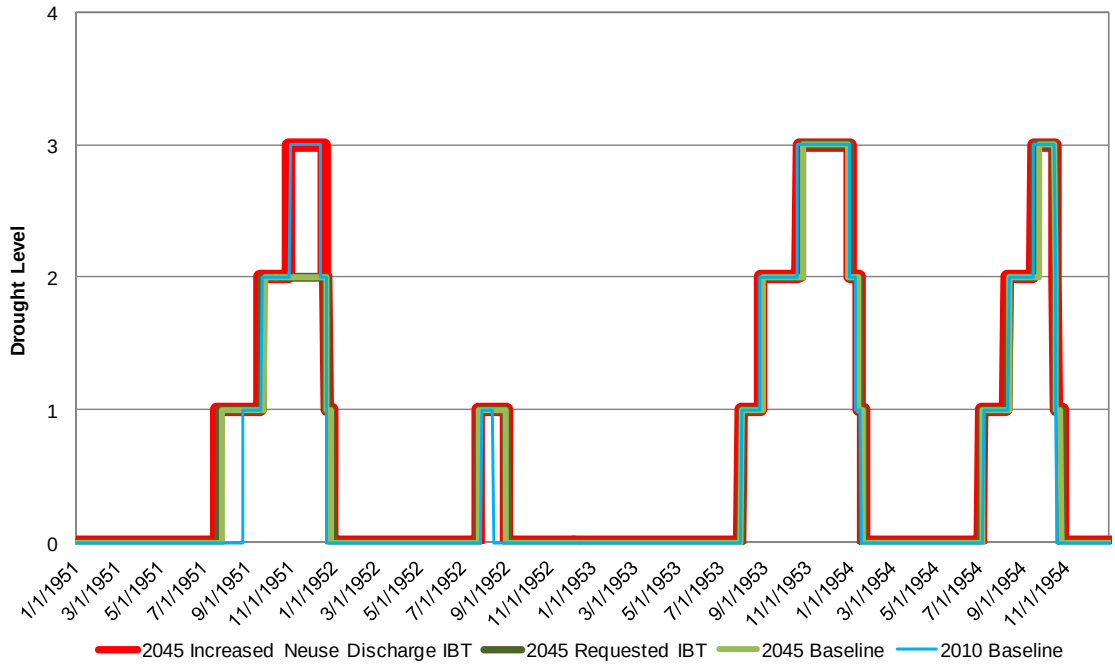


FIGURE 32
2002 Drought Jordan Lake Drought Stages

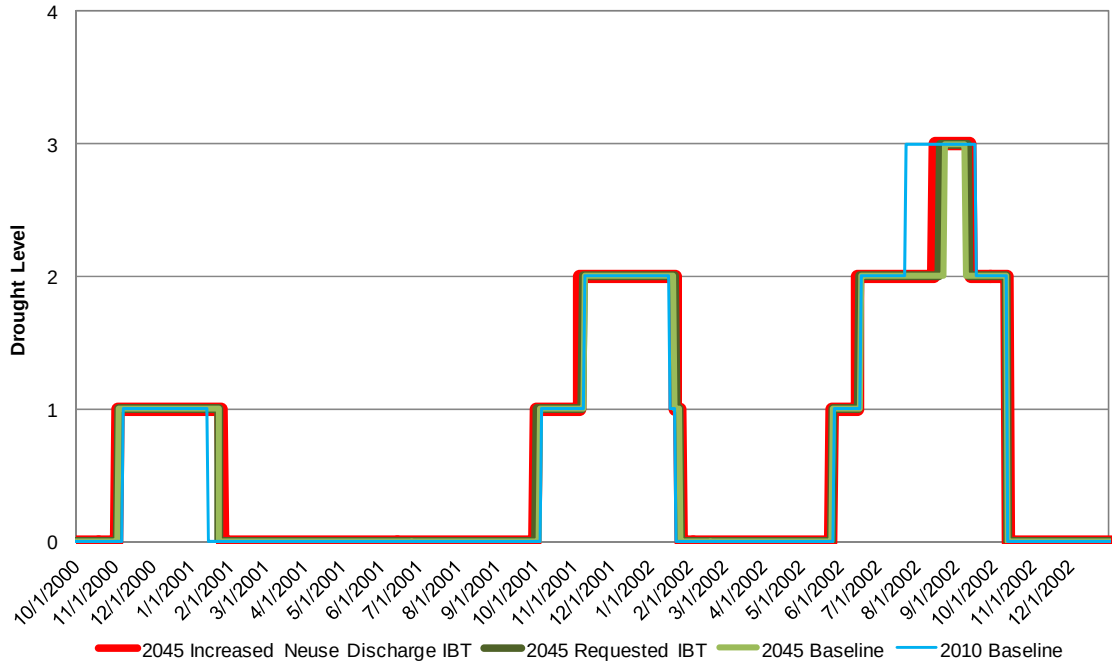
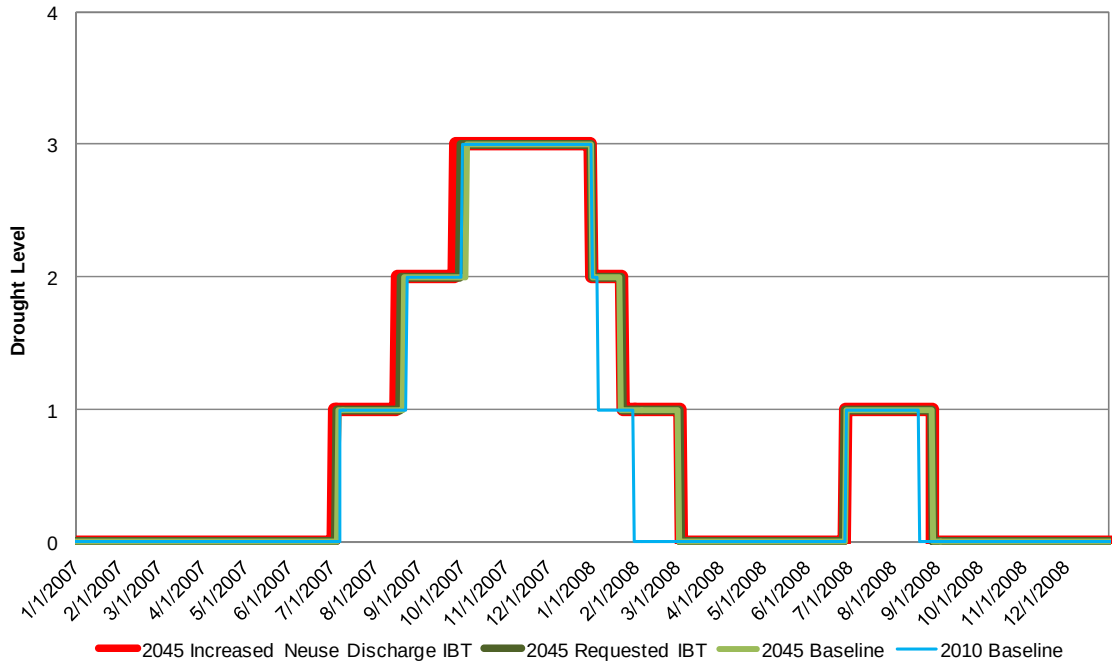


FIGURE 33
2007 Drought Jordan Lake Drought Stages



For all scenarios, both for the period of record and all drought periods, there is no occurrence of a Stage 4 Drought. The frequency and duration of Drought Stages 1 and 2 for all 2045 scenarios are greater than the 2010 Baseline, as would be expected based on the increased withdrawals within the Cape Fear River basin and the assumed full utilization of the water supply pool. The 2045 scenarios have a lower frequency of Stage 3 Drought occurrences as compared to the 2010 Baseline scenario; this can be attributed to the increase in wastewater discharge to the Cape Fear River from the WWRWRF; which is a similar finding to the small positive effect of this discharge on the water quality pool storage volume.

Downstream Users Water Supply Availability

Using the CFNRBHM the availability of water supply for users downstream of Jordan Lake was evaluated. Table 10 provides a summary of the percentage of the period of record water supply for each downstream user is available for full withdrawal. Based on the model results, all downstream demands were met 100 percent of the time for all scenarios. No shortages were seen as a result of future demands or an increase in IBT.

TABLE 10
Comparison of the Downstream User Water Supply Availability

	Percentage of Time Full Water Supply Withdrawal is Available			
	2010 Baseline	**2045 Baseline**	**2045 Requested IBT**	**2045 Increased Neuse Discharge IBT**
City of Sanford	100%	100%	100%	100%
Harnett County	100%	100%	100%	100%
Fayetteville PWC	100%	100%	100%	100%
City of Dunn	100%	100%	100%	100%
Smithfield Foods	100%	100%	100%	100%
Lower Cape Fear Water and Sewer Authority	100%	100%	100%	100%
Cape Fear Public Utility Authority	100%	100%	100%	100%

Downstream Users Water Shortage Response Plans

The most recent version of the CFNRBHM allows for the review of the duration and frequency of occurrence of the drought stages within a public water supply system's (PWSS) water shortage response plan (WSRP), if the WSRP has been built into the model. It should be noted that not all PWSS's WSRPs have river flow or reservoir level specific drought stage triggers that enable them to be built into the CFNRBHM.

Currently, only one of the seven downstream users on the Cape Fear River have a WSRP built into the CFNRBHM, the City of Dunn. The City of Dunn's WSRP has 6 stages; with each increasing stage there are more stringent requirements for reduced water consumption (ranging from voluntary reductions (Stage I) to water rationing (Stage VI). A review of the model scenario results indicates the following for the simulation of Dunn's WSRP:

- 2010 Baseline: No occurrences of the City's WSRP initiated during the period of record.
- 2045 Baseline: 6 total occurrences of the City's WSRP initiated during the period of record, 4 at Stage I and 2 at Stage II.
    - Most occurrences are between 5 to 6 days with 1 occurrence of 3 weeks in duration during the 2007 drought.
- 2045 Requested IBT: 6 total occurrences of the City's WSRP initiated during the period of record, 2 at Stage I and 4 at Stage II.
    - Most occurrences are between 10 to 12 days with 1 occurrence of 3.5 weeks in duration during the 2007 drought.
- 2045 Increased Neuse Discharge IBT: 7 total occurrences of the City's WSRP initiated during the period of record; 1 at Stage I, 4 at Stage II and 1 at Stage III
    - Most occurrences between 10 to 12 days, 1 occurrence of Stage II for 3 weeks in duration during the 1950's drought and 1 occurrence of Stage III for 4 weeks in duration during the 2007 drought.

Fayetteville PWC's and Harnett County's WSRPs are not built into the CFNRBHM, but each has one explicit flow based trigger within its WSRP. Their WSRP Water Conservation Stage II, Water Shortage Warning, are triggered when flow in the Cape Fear River, at the Lillington USGS gage, falls below 250 cfs. A review of the model scenario results (focusing on non-transient events lasting longer than 3 days) outside of the CFNRBHM indicates the following for the frequency and duration of occurrence for Stage II of Fayetteville PWC's and Harnett County's WSRPs:

- 2010 Baseline: No occurrences of the Fayetteville PWC or the Harnett County WSRP Water Conservation Stage II.
- 2045 Baseline: 9 total occurrences of the Fayetteville PWC and Harnett County WSRP Water Conservation Stage II over the period of record.
    - Occurrences range between 2 and 22 days in duration and are primarily during the simulated historic drought periods (e.g. 1950's, 2002, and 2007).
- 2045 Requested IBT: 10 total occurrences of the Fayetteville PWC and Harnett County WSRP Water Conservation Stage II over the period of record.
    - Occurrences range between 1 and 24 days in duration and are primarily during the simulated historic drought periods.
- 2045 Increased Neuse Discharge IBT: 13 total occurrences of the Fayetteville PWC and Harnett County WSRP Water Conservation Stage II over the period of record.
    - Occurrences range between 4 and 25 days in duration and are primarily during the simulated historic drought periods.

The increase in WSRP implementation occurrences for Dunn, Fayetteville PWC and Harnett County from the 2010 Baseline scenario to the 2045 scenarios is attributed to the increase in water supply withdrawals within the Cape Fear River basin, including the assumed full utilization of the Jordan Lake water supply pool. The 2045 Requested IBT model scenario is not significantly different in frequency or duration of WSRP implementation occurrences when compared to the 2045 Baseline scenario.

Summary and Conclusions

To summarize the results of the hydrologic modeling, Table 11 shows the frequency with which the following conditions occur for each model scenario:

- Jordan Lake Levels < 210 ft. MSL (lower limit for boat ramp use)
- Jordan Lake Levels < 210 ft. MSL (lower limit for boat ramp use); between Memorial Day and Labor Day
- Water Quality Pool < 80% (Stage 1 Drought trigger, per Drought Contingency Plan)
- Water Quality Pool < 60% (Stage 2 Drought trigger, per Drought Contingency Plan)
- Water Quality Pool < 40% (Stage 3 Drought trigger, per Drought Contingency Plan)
- Water Quality Pool < 20% (Stage 4 Drought trigger, per Drought Contingency Plan)
- Water Supply Pool < 50%
- Cape Fear River Flow at Lillington < 550 cfs (normal target flow is 600 ± 50 cfs)
- Cape Fear River Flow at Fayetteville < 600 cfs

TABLE 11
Comparison of the Percentage of the Period of Record that the Key Hydrologic Indicators are Met

	Scenario			
	2010 Baseline	**2045 Baseline**	**2045 Requested IBT**	**2045 Increased Neuse Discharge IBT**
Hydrologic Indicator	**Baseline**	**EA Alternative 1 & 3a-e No Action & Avoid IBT Certificate Modification**	**EA Alternative 2a Modify IBT Certificate (Proposed Alternative)**	**EA Alternative 2b Modify IBT Certificate (Increased Neuse Discharge IBT)**
Jordan Lake Level < 210 ft. MSL	0.0%	1.6%	2.0%	2.0%
Jordan Lake Level < 210 ft. MSL, Memorial Day to Labor Day	0.0%	0.2%	0.3%	0.4%
Water Quality Pool <80%	13.5%	15.8%	16.4%	16.9%
Water Quality Pool <60%	5.6%	5.9%	6.4%	6.5%
Water Quality Pool <40%	0.9%	0.5%	0.7%	0.8%
Water Quality Pool <20%	0.0%	0.0%	0.0%	0.0%
Water Supply Pool <50%	0.0%	1.6%	1.9%	1.9%
Flow at Lillington < 550 cfs	13.9%	15.6%	15.9%	16.4%
Flow at Fayetteville < 600 cfs	5.9%	6.1%	6.3%	6.7%

The results presented throughout this TM and summarized in Table 11 show a small shift in lake level and Cape Fear River flow from the 2010 to 2045 Baseline scenarios, as well as a potential for increases in WSRP implementation for downstream PWSSs; all of these factors are attributed to the assumed full utilization of the Jordan Lake water supply pool and the increase in upstream water withdrawals. A small shift in lake level and the amount of time the water storage pool is below 50 percent is seen between the 2045 Baseline, and 2045 Requested IBT and Neuse River Discharge IBT scenarios. The remainder of the indicators shows negligible difference between the model scenarios, or in the case of the water quality pool indicator the potential for a small positive impact primarily as a result of the Towns' return of water to the Cape Fear River via the WWRWRF.

References

CH2M HILL. 2013. Long Range Water Resources Plan. Prepared for the Towns of Cary, Apex and Morrisville and Wake County.

CH2M HILL. 2000. Final Environmental Impact Statement for RTP South and the Towns of Cary, Apex and Morrisville for Increase in Interbasin Transfer from the Haw River Basin to the Neuse River Basin. Prepared for the Towns of Cary, Apex and Morrisville and Wake County.

Hydrologics. 2006. *User Manual for OASIS with OCL*. Raleigh, NC.

NC General Assembly. 2009. § 143-215.22L. *Regulation of surface water transfers*. Raleigh, NC.

Triangle J Council of Governments (TJCOG). 2014. Draft Triangle Regional Water Supply Plan Volume 2: Regional Water Supply Alternatives Analysis. Prepared for the Jordan Lake Partnership.

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Appendix E
Agency Correspondence

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Comment Response Matrix

Environmental Assessment - Towns of Cary, Apex, and Morrisville and Wake County Interbasin Transfer Certificate Modification

DENR Internal # 1612

EA provided for review by: NC Department of Environment and Natural Resources (NCDENR), NC Department of Public Safety Emergency Management, US Fish and Wildlife Services (USFWS), US Army Corps of Engineers (USACE)

Division	Point of Contact	Role/Office	Comment	Response to comment
NC Wildlife Resources Commission	Vann Stancil	Research Coordinator, Habitat Conservation	Maintaining appropriate flows in the Cape Fear River is important for anadromous fish such as striped bass, American shad, and hickory shad, as well as resident aquatic species. The Cape Fear River is designated as a Primary Nursery Area (PNA) below Buckhorn Dam. Increased withdrawals from Jordan Reservoir and increased IBT to the Neuse River basin have the potential to reduce the amount of water released from Jordan Reservoir in the spring and impact anadromous fish. The NCWRC recommends that as much water as practically possible be returned to the Cape Fear River basin. Directing future infrastructure expansion to support the transport of wastewater to the Western Wake RWRF will help further increase the proportion of wastewater returned to the Cape Fear River.	Comment noted. Downstream flow releases will remain subject to USACE release regimes, limiting the potential for cumulative impact of water withdrawals and IBT. However, this concern will be noted in the cumulative impacts discussion as any potential hydrological changes to the Cape Fear River would be a result of the use of the 100 mgd water supply storage allocation of Jordan Lake.
NC Wildlife Resources Commission	Vann Stancil	Research Coordinator, Habitat Conservation	The limited analysis presented here indicates that more water demand per capita is expected in the future; this assumption runs counter to the data presented in Exhibit 3-3 that shows a decline in water demand. More information is needed in the EA to explain how water demand forecasts were derived and why projected demand appears to increase in the future.	Comment noted. Projected per capita use remains low when compared to other similar utilities and the national average, as discussed briefly in Section 3.9. The development of water demand projections for the Town's LRWRP and used in this EA was based on future development and land use information and took into account the need for reliability in meeting water demands in 2045. Water demand values presented in Exhibit 2-4 are as a forecast: a statistical measure of the outcome under conditions of future variability and uncertainty. The forecasting effort does not assume that per capita usage will increase; instead it incorporates variability of several uncertain yet influential components of the demand forecast projection including population and growth rate, annual variability in water use due to weather, non-revenue water usage, and maximum usage peaking factors. This approach is discussed in more detail in Section 2 and Appendix A3 of the LRWRP, which is available on the Town's website. As stated throughout the LRWRP and this EA, the Towns remain committed to their existing water resources management tools (those measures that have resulted in the reduced unit demands identified in Exhibit 3-3) and implementing new programs as appropriate for the communities in the future, as recommended in the LRWRP. These programs will increase the reliability with which the Towns can meet customer demands and comply with a modified IBT certificate.
NC Department of Public Safety Risk Management Section	Dan Brubaker	NFIP Engineer	The floodplain section should include text that indicates any development, new utility infrastructure, or other encroachments within the Floodway or Non-Encroachment Area of the Special Flood Hazard Area (SFHA) will require a site-specific hydraulic impact analysis to assure there will be no increase in flood levels at any existing structures.	Comment noted. This information is included in 6.2.5 of the Town's SCI Master Management Plan, which is referenced in this EA.
NCDENR-Division of Waste Management (DWM), Solid Waste Section	Dennis Shackleford	Eastern District Supervisor	The Section's review has seen no adverse impact on the surrounding community and likewise knows of no situations in the community, which would affect this project.	Comment noted.
NCDENR-Division of Waste Management (DWM)	Jim Bateson	Superfund Section Chief	CERCLIS and other contaminated sites under the jurisdiction of the Superfund site that are located within the project study area. Since the preferred alternative for this project includes increasing the amount of water withdrawn from Jordan Lake for use by the Towns and Wake County, it is unlikely that the increased withdrawal would impact any known sites or vice versa.	Comment Noted. The Town exercises due diligence when planning for infrastructure and when acquiring land.
NCDENR Raleigh Regional Office		Division of Air Quality	No comments.	

Comment Response Matrix

Environmental Assessment - Towns of Cary, Apex, and Morrisville and Wake County Interbasin Transfer Certificate Modification

DENR Internal # 1612

EA provided for review by: NC Department of Environment and Natural Resources (NCDENR), NC Department of Public Safety Emergency Management, US Fish and Wildlife Services (USFWS), US Army Corps of Engineers (USACE)

Division	Point of Contact	Role/Office	Comment	Response to comment
NCDENR Raleigh Regional Office		Division of Water Resources - WQROS	No permitting comments to offer.	
NCDENR Raleigh Regional Office		Division of Water Resources - Public Water Supply	No comments.	
NCDENR Raleigh Regional Office		DEMLR (LQ & SW)	The plans appear to adequately address the relevant issues associated with our specific programs. The applicable governments have established local programs addressing potential impacts associated with development of the affected areas.	Comment noted.
NCDENR Raleigh Regional Office		Parks & Recreation	No comments.	
NCDENR Raleigh Regional Office		Waste Management, Hazardous Waste Section	No comments.	
NCDENR Raleigh Regional Office		DWM - UST	No comments.	
US Fish and Wildlife Service (USFWS)	Sarah McRae	Fish and Wildlife Biologist	Based on information provided and other information available, the Service concludes that the proposed project is not likely to adversely affect any federally-listed endangered or threatened species, their formally designated critical habitat, or species currently proposed for listing under the Endangered Species Act. Please note for future projects that if you determine that the proposed action will have no effect (i.e., no beneficial or adverse, direct or indirect effect) on federally listed species, then you are not required to contact our office for concurrence (unless an EIS is prepared). We believe the requirements of section 7(a)(2) of the Act have been satisfied.	Comment noted.

NCDENR

North Carolina Department of Environment and Natural Resources

Pat McCrory
Governor

John E. Skvarla, III
Secretary

MEMORANDUM

TO: Harold Brady
Division of Water Resources

FROM: Lyn Hardison
Division of Environmental Assistance and Customer Service
Permit Assistance & Project Review Coordinator

RE: Final - Draft Environmental Assessment
Town of Cary, Apex, Morrisville and Wake County Interbasin Transfer Certificate Modification
Wake County
DENR Internal # 1612

Date: December 8, 2014

The NC Department of Public Safety Emergency Management requested to participate in NC Department Environment and Natural Resources internal review process and it was granted essentially to help expedite the environmental document for the applicant.

Both departments have reviewed the proposal for the referenced project. Based on the information provided, the agencies have identified permits that may be required and offered some valuable information that will assist the applicant in preparing the necessary environmental document. The comments are attached for the applicant's consideration.

The Department agencies will continue to be available to assist the applicant through the environmental review and permitting processes.

Thank you for the opportunity to respond.

Attachments

North Carolina Wildlife Resources Commission

Gordon Myers, Executive Director

MEMORANDUM

TO: Lyn Hardison
NCDENR Division of Environmental Assistance & Outreach

FROM: Vann F. Stancil
Research Coordinator
Habitat Conservation

DATE: December 5, 2014

SUBJECT: Comments on Final – Draft EA for Cary, Apex, Morrisville, & Wake Co. IBT Certificate Modification, Wake Co. Project No. 1612.

Biologists from the North Carolina Wildlife Resources Commission (NCWRC) have reviewed the proposed project description. Our comments are provided in accordance with certain provisions of the NC Environmental Policy Act (G.S. 113A-1 through 113A-10; 1 NCAC 25) and the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.).

The Towns of Apex, Cary, and Morrisville (Towns) and Wake County seek to modify their existing interbasin transfer (IBT) certificate. The current IBT certificate was issued by the Environmental Management Commission on July 12, 2001 and allows up to 24 million gallons per day (MGD), calculated on a daily maximum basis, to be transferred from the Haw River basin (Jordan Reservoir) to the Neuse River basin. The 2001 IBT certificate included eight conditions; notably that after 2010 a portion of treated wastewater would be returned to the Haw or Cape Fear river basins. In August 2014 the Western Wake Regional Water Reclamation Facility (Western Wake RWRF) began discharging treated wastewater to the Cape Fear River below Buckhorn Dam.

The Towns and Wake County request a modification of the 2001 IBT certificate to meet three objectives: 1) modify the IBT limit from a maximum daily calculation to a daily average of a calendar month to comply with rule changes, 2) include transfers to the Cape Fear River subbasin as requested by the Division of Water Resources, and 3) increase the allowed amount to

Mailing Address: Division of Inland Fisheries • 1721 Mail Service Center • Raleigh, NC 27699-1721
Telephone: (919) 707-0220 • **Fax:** (919) 707-0028

reflect planning needs through 2045. The applicants have assessed several alternatives to meet their water needs for the next 30 years and request a modification to the 2001 IBT certificate that will allow up to 33 MGD to be transferred from the Haw River subbasin.

Alternatives considered include sending treated water or untreated wastewater to the Western Wake RWRF to reduce the amount of water that is transferred to the Neuse River basin. These alternatives would require additional infrastructure and not maximize the use of current wastewater treatment infrastructure in the Neuse River basin.

Flows in the Cape Fear River depend on releases from Jordan Reservoir. The applicant assessed potential hydrological changes to the Cape Fear River as a result of increased withdrawal and IBT from Jordan Reservoir. The analysis summarized in Exhibit 5-2 shows an increase in the percentage of time that flows will be < 550 cfs at Lillington and < 600 cfs at Fayetteville when comparing the requested IBT increase of 33 MGD with 2010 baseline conditions.

Maintaining appropriate flows in the Cape Fear River is important for anadromous fish such as striped bass, *Morone saxatilis*, American shad, *Alosa sapidissima*, and hickory shad, *A. mediocris*, as well as resident aquatic species. Anadromous fish depend on high flows during the spring to ascend rivers to spawn and eggs and larval are affected by flow regimes as they travel downstream during early development. The Cape Fear River is designated as a Primary Nursery Area (PNA) downstream of Buckhorn Dam. Increased withdrawals from Jordan Reservoir and increased IBT to the Neuse River basin have the potential to reduce the amount of water released from Jordan Reservoir in the spring and impact anadromous fish.

The NCWRC recommends that as much water as practically possible be returned to the Cape Fear River basin. Exhibit 2-5 indicates that 5 MGD of the total 19.3 MGD or 26 % of the annual average daily wastewater flow forecasted for 2015 will be returned to the Cape Fear River at the Western Wake RWRF. Over time the proportion returned to the Cape Fear River is projected to increase up to 37 % (13.0 of 35.4 MGD) in 2045. Directing future infrastructure expansion to support the transport of wastewater to the Western Wake RWRF will help further increase the proportion of wastewater returned to the Cape Fear River watershed and minimize the IBT to the Neuse River basin. This will remain important as future water demands are forecasted beyond the current 30 year planning period and plans derived to further expand water supplies.

Exhibit 3-3 shows that per capita water use for the Town of Cary has declined since 1995. Furthermore, water conservation approaches have kept water use for the Town of Cary well below the national per capita average. Accurate population growth projections and water demand projections are vital for predicting future water needs. Exhibit 2-3 gives population forecasts for Cary and Apex; Exhibit 2-4 forecasts raw water demand through 2045. Using the data provided in these two tables, the per capita raw water demand for 2012 was 85 gallons for Apex and 111 gallons for Cary. Using the forecasted population and raw water demand estimates, the per capita raw water demand for Apex will peak at 105 gallons in 2020 and remains near 100 gallons per person through 2045. For Cary, the per capita raw water demand increases to 139 gallons in 2040. The applicant refers to the Long Range Water Resource Plan published in 2013 for more information on the population and water demand forecasts but

provides limited information in the EA about the assumptions used for these forecasts. The limited analysis presented here indicates that more water demand per capita is expected in the future; this assumption runs counter to the data presented in Exhibit 3-3 that shows a decline in water demand. More information is needed in the EA to explain how water demand forecasts were derived and why projected demand appears to increase in the future.

Thank you for the opportunity to review and comment on this project. Please do not hesitate to contact me at vann.stancil@ncwildlife.org or 919-284-5218 if you have any questions or concerns about these project comments.

ec: Gabriela Garrison, NCWRC

Hardison, Lyn

From: Brubaker, Dan <Dan.Brubaker@ncdps.gov>
Sent: Wednesday, December 03, 2014 8:51 AM
To: Hardison, Lyn
Cc: Ashe, Ken (NCEM); Gerber, John (NCEM)
Subject: DENR REVIEW #1612 INTERBASIN TRANSFER WAKE COUNTY - CARY, APEX, & MORRISVILLE

Good morning, Lyn. Ken Ashe and I have reviewed the documentation for the Interbasin Transfer EA for Cary, Apex, and Morrisville.

The floodplain section [5.1.4 Topography] should include text that indicates any development, new utility infrastructure, or other encroachments within the Floodway or Non-Encroachment Area of the Special Flood Hazard Area (SFHA) will require a site-specific hydraulic impact analysis to assure there will be no increase in flood levels at any existing structures. All encroachments in these areas will require either a No-Rise Certification (for projects that do not cause an increase in flood levels during the base flood discharge) or a Conditional Letter of Map Revision (for projects that cause an increase in flood levels during the base flood discharge) approved prior to final permitting and construction. All encroachments in the SFHA will require a Floodplain Development Permit issued by the governing municipality prior to construction.

Please let me know if you have any questions.

Best regards,

Dan Brubaker

John D. Brubaker, PE, CFM
NFIP Engineer
NC Department of Public Safety
Risk Management Section
4218 Mail Service Center
Raleigh, NC 27699-4218
(919) 825-2300
dan.brubaker@ncdps.gov
www.ncdps.gov

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North Carolina Department of Environment and Natural Resources

Pat McCrory
Governor

John E. Skvarla, III
Secretary

MEMORANDUM

TO: Linda Culpepper, Division Director through Kathleen Lance

FROM: Dennis Shackelford, Eastern District Supervisor
Division of Waste Management, Solid Waste Section

DATE: November 13, 2014

SUBJECT: SEPA Review - Project #1612, Wake County, NC
Towns of Apex, Cary, Morrisville and Wake County Interbasin Transfer

The Division of Waste Management, Solid Waste Section (Section) has reviewed the Draft Environmental Assessment for the Towns of Apex, Cary, Morrisville and Wake County Interbasin Transfer. The Section's review has seen no adverse impact on the surrounding community and likewise knows of no situations in the community, which would affect this project.

Questions regarding solid waste management should be directed to Ms. Shawn McKee, Environmental Senior Specialist, Solid Waste Section, at (919-707-8284).

cc: Jason Watkins, Field Operations Branch Head
Shawn McKee, Environmental Senior Specialist
Jessica Montie, Compliance Officer

NCDENR

North Carolina Department of Environment and Natural Resources

Pat McCrory
Governor

John E. Skvarla, III
Secretary

Date: December 4, 2014

To: Linda Culpepper, Director
Division of Waste Management

Through: Jim Bateson, Superfund Section Chief

From: Pete Doorn, Special Remediation Branch Head

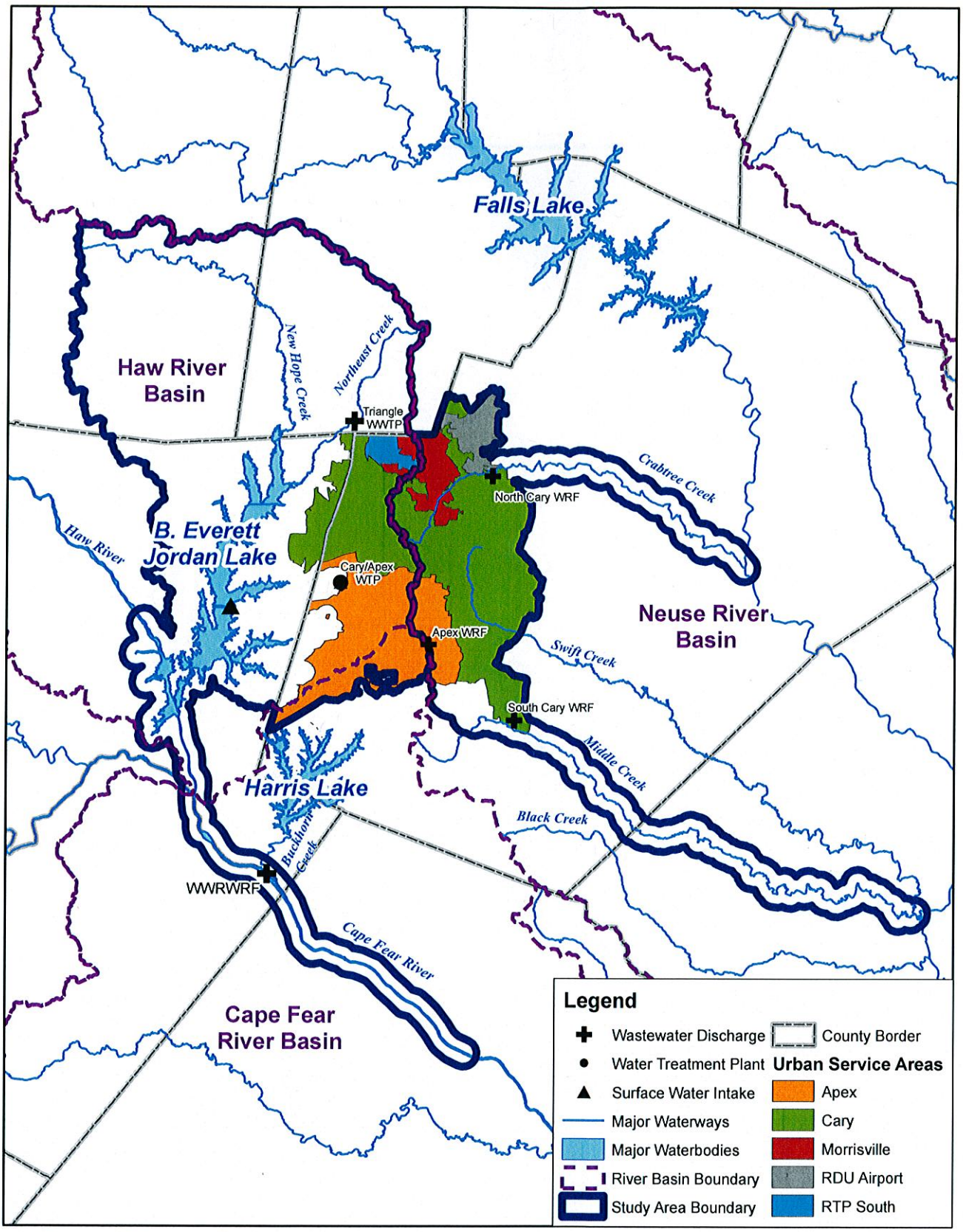
Subj: SEPA Project #1612, Proposed Interbasin Transfer Certificate Modification for the Towns of Cary, Apex and Morrisville and Wake County, North Carolina

A review of the proposed Interbasin Transfer (IBT) Certificate Modification for the Towns of Cary, Apex and Morrisville and Wake County by the Superfund Section has been completed. The Towns and Wake County are requesting a modification of the 2001 IBT Certificate to: (i) amend the calculation method for the IBT limit to meet current regulations; (ii) include, at the request of DWR, transfers to the Cape Fear River subbasin (from consumptive uses in the Town of Apex service area), and (iii) base the certificate term on a 30-year planning period through 2045 and allow increased transfers (from Jordan Lake) of up to 33 million gallons/day to meet the area's needs through 2045.

CERCLIS and other contaminated sites under the jurisdiction of the Superfund Section are located within the project study area which is depicted in the attached Exhibit 1-3. Since the preferred alternative for this project includes increasing the amount of water withdrawn from Jordan Lake for use by the Towns and Wake County, it is unlikely that the increased withdrawal would impact any known sites or vice versa. However, if the Towns and Wake County re-consider non-preferred alternatives that rely on groundwater as a supplemental water supply, it is recommended that the locations of known sources of contamination be re-evaluated. The Superfund Section's website: http://portal.ncdenr.org/web/wm/sf, is a resource that includes location information for contaminated sites and access to online records.

Please contact me at 919.707.8369 if you have any questions.

Cc: Jim Bateson



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0 10 20 Miles

EXHIBIT 1-3
Study Area Map
Interbasin Transfer (IBT) Environmental Assessment

CH2MHILL

State of North Carolina
Department of Environment and Natural Resources
INTERGOVERNMENTAL REVIEW - PROJECT COMMENTS

Reviewing Office: Raleigh Regional Office

Project Number __-1612 Due Date: 12/4/2014
County Wake

After review of this project it has been determined that the ENR permit(s) and/or approvals indicated may need to be obtained in order for this project to comply with North Carolina Law. Questions regarding these permits should be addressed to the Regional Office indicated on the reverse of the form. All applications, information and guidelines relative to these plans and permits are available from the same Regional Office.

	PERMITS	SPECIAL APPLICATION PROCEDURES or REQUIREMENTS	Normal Process Time (statutory time limit)
☐	Permit to construct & operate wastewater treatment facilities, sewer system extensions & sewer systems not discharging into state surface waters.	Application 90 days before begin construction or award of construction contracts. On-site inspection. Post-application technical conference usual.	30 days (90 days)
☐	NPDES - permit to discharge into surface water and/or permit to operate and construct wastewater facilities discharging into state surface waters.	Application 180 days before begin activity. On-site inspection. Pre-application conference usual. Additionally, obtain permit to construct wastewater treatment facility-granted after NPDES. Reply time, 30 days after receipt of plans or issue of NPDES permit-whichever is later.	90-120 days (N/A)
☐	Water Use Permit	Pre-application technical conference usually necessary	30 days (N/A)
☐	Well Construction Permit	Complete application must be received and permit issued prior to the installation of a well.	7 days (15 days)
☐	Dredge and Fill Permit	Application copy must be served on each adjacent riparian property owner. On-site inspection. Pre-application conference usual. Filling may require Easement to Fill from N.C. Department of Administration and Federal Dredge and Fill Permit.	55 days (90 days)
☐	Permit to construct & operate Air Pollution Abatement facilities and/or Emission Sources as per 15 A NCAC (2Q.O100 thru 2Q.0300)	Application must be submitted and permit received prior to construction and operation of the source. If a permit is required in an area without local zoning, then there are additional requirements and timelines (2Q.0113).	90 days
☐	Permit to construct & operate Transportation Facility as per 15 A NCAC (2D.0800, 2Q.0601)	Application must be submitted at least 90 days prior to construction or modification of the source.	90 days
☐	Any open burning associated with subject proposal must be in compliance with 15 A NCAC 2D.1900	N/A	60 days (90 days)
☐	Demolition or renovations of structures containing asbestos material must be in compliance with 15 A NCAC 20.1110 (a) (1) which requires notification and removal prior to demolition. Contact Asbestos Control Group 919-707-5950.		
☐	Complex Source Permit required under 15 A NCAC 2D.0800		
☐	The Sedimentation Pollution Control Act of 1973 must be properly addressed for any land disturbing activity. An erosion & sedimentation control plan will be required if one or more acres to be disturbed. Plan filed with proper Regional Office (Land Quality Section) At least 30 days before beginning activity. A fee of **$65** for the first acre or any part of an acre. An express review option is available with additional fees.		20 days (30 days)
☐	Sedimentation and erosion control must be addressed in accordance with NCDOT's approved program. Particular attention should be given to design and installation of appropriate perimeter sediment trapping devices as well as stable stormwater conveyances and outlets.		(30 days)
☐	Mining Permit	On-site inspection usual. Surety bond filed with ENR Bond amount varies with type mine and number of acres of affected land. Any are mined greater than one acre must be permitted. The appropriate bond must be received before the permit can be issued.	30 days (60 days)
☐	North Carolina Burning permit	On-site inspection by N.C. Division Forest Resources if permit exceeds 4 days	1 day (N/A)
☐	Special Ground Clearance Burning Permit - 22 counties in coastal N.C. with organic soils	On-site inspection by N.C. Division Forest Resources required "if more than five acres of ground clearing activities are involved. Inspections should be requested at least ten days before actual bum is planned."	1 day (N/A)
☐	Oil Refining Facilities	N/A	90-120 days (N/A)
☐	Dam Safety Permit	If permit required, application 60 days before begin construction. Applicant must hire N.C. qualified engineer to: prepare plans, inspect construction. certify construction is according to ENR approved plans. May also require permit under mosquito control program. And a 404 permit from Corps of Engineers. An inspection of site is necessary to verify Hazard Classification. A minimum fee of $200.00 must accompany the application. An additional processing fee based on a percentage or the total project cost will be required upon completion.	30 days (60 days)

Project Number: __-1612 Due Date: 12/4/2014			Normal Process Time (statutory time limit)
	PERMITS	SPECIAL APPLICATION PROCEDURES or REQUIREMENTS	
☐	Permit to drill exploratory oil or gas well	File surety bond of $5,000 with ENR running to State of NC conditional that any well opened by drill operator shall, upon abandonment, be plugged according to ENR rules and regulations.	10 days N/A
☐	Geophysical Exploration Permit	Application filed with ENR at least 10 days prior to issue of permit. Application by letter. No standard application form.	10 days N/A
☐	State Lakes Construction Permit	Application fee based on structure size is charged. Must include descriptions & drawings of structure & proof of ownership of riparian property.	15-20 days N/A
☐	401 Water Quality Certification	N/A	60 days (130 days)
☐	CAMA Permit for MAJOR development	$250.00 fee must accompany application	55 days (150 days)
☐	CAMA Permit for MINOR development	$50.00 fee must accompany application	22 days (25 days)
☐	Several geodetic monuments are located in or near the project area. If any monument needs to be moved or destroyed, please notify: N.C. Geodetic Survey, Box 27687 Raleigh, NC 27611		
☒	Abandonment of any wells, if required must be in accordance with Title 15A. Subchapter 2C.0100.		
☐	Notification of the proper regional office is requested if "orphan" underground storage tanks (USTS) are discovered during any excavation operation.		
☐	Compliance with 15A NCAC 2H 1000 (Coastal Stormwater Rules) is required.		45 days (N/A)
☐	Tar Pamlico or Neuse Riparian Buffer Rules required.		
☐	Plans and specifications for the construction, expansion, or alteration of a public water system must be approved by the Division of Water Resources/Public Water Supply Section prior to the award of a contract or the initiation of construction as per 15A NCAC 18C .0300 et. seq. Plans and specifications should be submitted to 1634 Mail Service Center, Raleigh, North Carolina 27699-1634. All public water supply systems must comply with state and federal drinking water monitoring requirements. For more information, contact the Public Water Supply Section, (919) 707-9100.		30 days
☐	If existing water lines will be relocated during the construction, plans for the water line relocation must be submitted to the Division of Water Resources/Public Water Supply Section at 1634 Mail Service Center, Raleigh, North Carolina 27699-1634. For more information, contact the Public Water Supply Section, (919) 707-9100.		30 days

Other comments (attach additional pages as necessary, being certain to cite comment authority)

Division	Initials	No comment	Comments	Date Review
DAQ	ddm	☒		11/19/14
DWR-WQROS (Aquifer & Surface)	ds rb	☐ ☐	no permitting comments to offer	12/ / 11/26/14
DWR-PWS	WAH	☒		11/25/14
DEMLR (LQ & SW)	JLH	☐	The plans appear to adequately address the relevant issues associated with our specific programs. The applicable local governments have established local programs addressing potential impacts associated with development of the affected areas.	12/3/14
DWM - UST	MRP	☒		12/3/14

REGIONAL OFFICES

Questions regarding these permits should be addressed to the Regional Office marked below.

☐ **Asheville Regional Office**
2090 US Highway 70
Swannanoa, NC 28778
(828) 296-4500

☐ **Mooresville Regional Office**
610 East Center Avenue, Suite 301
Mooresville, NC 28115
(704) 663-1699

☐ **Wilmington Regional Office**
127 Cardinal Drive Extension
Wilmington, NC 28405
(910) 796-7215

☐ **Fayetteville Regional Office**
225 North Green Street, Suite 714
Fayetteville, NC 28301-5043
(910) 433-3300

☒ **Raleigh Regional Office**
3800 Barrett Drive, Suite 101
Raleigh, NC 27609
(919) 791-4200

☐ **Winston-Salem Regional Office**
585 Waughtown Street
Winston-Salem, NC 27107
(336) 771-5000

☐ **Washington Regional Office**
943 Washington Square Mall

Department of Environment and Natural Resources
Project Review Form

Project Number	County	Date Received	Date Response Due
# 1612	Wake	11/12/2014	12/4/2014

Final - Draft Environmental Assessment for the Town of Cary, Apex and Morrisville, Wake County Interbasin Transfer Certificate modification

This project is being reviewed as indicated below:

Regional Office	Sections	In-House Review
☐ Asheville	☒ Air	☐ Marine Fisheries ☐ Coastal Management
☐ Fayetteville	☒ DWR – All Water Programs	☒ Waste Mgmt (Haz, solid, Inactive, Superfund & UST)
☐ Mooresville	☒ Land Quality & Stormwater Programs	☒ Air Quality ☒ CC & PS Div. of Emergency Mgmt.
☒ Raleigh	☒ UST	☒ Water Resources Management (Public Water, Planning & Water Quality Program)
☐ Washington	☒ Public Water	☐ Shellfish Sanitation
☐ Wilmington		☒ Parks & Recreation
☐ Winston-Salem		☐ DWR – Transportation Unit _____
		☒ Wildlife Vann/Gabriela
		☐ Wildlife (DOT) _____

Regional Coordinator Sign-off:	Date:	In-House Reviewer/Agency:
	12/2/14	Connie J. Horne

Response (check all applicable)

☒ No objection to project as proposed ☒ No comment

☐ Insufficient information to complete review ☐ Other (specify or attach comments)

RETURN TO:
Lyn Hardison – Lyn.Hardison@ncdenr.gov, 252-948-3842
943 Washington Square Mall
Washington N C 27889
Courier No. 16-04-01

Department of Environment and Natural Resources
Project Review Form

Project Number	County	Date Received	Date Response Due
# 1612	Wake	11/12/2014	12/4/2014

Final - Draft Environmental Assessment for the Town of Cary, Apex and Morrisville, Wake County Interbasin Transfer Certificate modification

This project is being reviewed as indicated below:

Regional Office	Sections	In-House Review
☐ Asheville ☐ Fayetteville ☐ Mooresville ☒ Raleigh ☐ Washington ☐ Wilmington ☐ Winston-Salem	☒ Air ☒ DWR – All Water Programs ☒ Land Quality & Stormwater Programs ☒ UST ☒ Public Water	☐ Marine Fisheries ☐ Coastal Management ☒ Waste Mgmt (Haz, solid, Inactive, Superfund & UST) ☒ Air Quality ☒ CC & PS Div. of Emergency Mgmt. ☒ Water Resources Management (Public Water, Planning & Water Quality Program) ☐ Shellfish Sanitation ☒ Parks & Recreation ☐ DWR – Transportation Unit _____ ☒ Wildlife Vann/Gabriela ☐ Wildlife (DOT) _____

Regional Coordinator Sign-off:	Date: 11/12/14	In-House Reviewer/Agency: Justin Ellis NDPR

Response (check all applicable)

☐ No objection to project as proposed ☑ No comment

☐ Insufficient information to complete review ☐ Other (specify or attach comments)

RETURN TO:
Lyn Hardison – Lyn.Hardison@ncdenr.gov, 252-948-3842
943 Washington Square Mall
Washington N C 27889
Courier No. 16-04-01

Department of Environment and Natural Resources
Project Review Form

Project Number	County	Date Received	Date Response Due
# 1612	Wake	11/12/2014	12/4/2014

Final - Draft Environmental Assessment for the Town of Cary, Apex and Morrisville, Wake County Interbasin Transfer Certificate modification

This project is being reviewed as indicated below:

Regional Office	Sections	In-House Review
☐ Asheville ☐ Fayetteville ☐ Mooresville ☒ Raleigh ☐ Washington ☐ Wilmington ☐ Winston-Salem	☒ Air ☒ DWR – All Water Programs ☒ Land Quality & Stormwater Programs ☒ UST ☒ Public Water	☐ Marine Fisheries ☐ Coastal Management ☒ Waste Mgmt (Haz, solid, Inactive, Superfund & UST) ☒ Air Quality ☒ CC & PS Div. of Emergency Mgmt. ☒ Water Resources Management (Public Water, Planning & Water Quality Program) ☐ Shellfish Sanitation ☒ Parks & Recreation ☐ DWR – Transportation Unit _____ ☒ Wildlife Vann/Gabriela ☐ Wildlife (DOT) _____

Regional Coordinator Sign-off:	Date:	In-House Reviewer/Agency:
	12/3/14	Jenny Patterson / Hazardous Waste Section

Response (check all applicable)

☐ No objection to project as proposed

☒ No comment Jenny Patterson

☐ Insufficient information to complete review

☐ Other (specify or attach comments)

RETURN TO:
Lyn Hardison – Lyn.Hardison@ncdenr.gov, 252-948-3842
943 Washington Square Mall
Washington N C 27889
Courier No. 16-04-01

Department of Environment and Natural Resources
Project Review Form

Project Number: 15-0293 **County: Burke** **Date Received: 11/10/2014**

Due Date: 12/5/2014

Project Description: Environmental Assessment/Finding of No Significant Impact - Proposed project is for the construction of Sienna Apartments. The project will be 76 units of affordable rental housing and consisting of one, two and three bedroom units.

This Project is being reviewed as indicated below:

Regional Office	Regional Office Area	In-House Review	
✓ Asheville	✓ Air	___ Air Quality	___ Coastal Management
___ Fayetteville	✓ DWR-Surface Water	✓ Parks & Recreation	___ DCM-Marine Fisheries
___ Mooresville	✓ DWR-Aquifer	✓ Waste Mgmt	___ Military Affairs
___ Raleigh	✓ DEMLR (LQ & SW)	___ Water Resources Mgmt (Public Water, Planning & Water Quality Program)	___ DMF-Shellfish Sanitation
___ Washington	✓ UST		✓ Wildlife Andrea Leslie
___ Wilmington	✓ DWR-Public Water	___ DWR-Transportation Unit	___ Wildlife - DOT
___ Winston-Salem			

Manager Sign-Off/Region:	Date:	In-House Reviewer/Agency:
	12/1/14	Brent S. Busch / Wildlife

Response (check all applicable)

___ No objection to project as proposed. ✓ No Comment

___ Insufficient information to complete review ___ Other (specify or attach comments)

If you have any questions, please contact:

Lyn Hardison at lyn.hardison@ncdenr.gov or (252) 948-3842
943 Washington Square Mall Washington NC 27889
Courier No. 16-04-01

Robinson, Jaime/CLT

From: Sharpe, Adam/RAL
Sent: Thursday, December 11, 2014 2:27 PM
To: Robinson, Jaime/CLT; Kreutzberger, Bill/CLT
Subject: Fwd: Town of Cary & Apex Interbasin Transfer (IBT) Certificate Modification Environmental Assessment

Sent from my iPhone

Begin forwarded message:

> **From:** "McRae, Sarah" <sarah_mcrae@fws.gov>
> **Date:** December 11, 2014 at 1:57:59 PM EST
> **To:** <Adam.Sharpe@ch2m.com>
> **Subject: Re: Town of Cary & Apex Interbasin Transfer (IBT) Certificate Modification Environmental Assessment**
>
> Dear Mr. Sharpe,
>
> Thank you for your email, dated November 13, 2014, requesting comments from the U.S. Fish and Wildlife Service (Service) on the Town of Cary & Apex Interbasin Transfer Certificate Modification Environmental Assessment. Our comments are submitted pursuant to, and in accordance with, provisions of the Endangered Species Act of 1973, as amended (16 U.S.C. 1531 et seq.) (Act).
>
> Based on the information provided and other information available, the Service concludes that the proposed project is not likely to adversely affect any federally-listed endangered or threatened species, their formally designated critical habitat, or species currently proposed for listing under the Act. Please note for future projects that if you determine that the proposed action will have no effect (i.e., no beneficial or adverse, direct or indirect effect) on federally listed species, then you are not required to contact our office for concurrence (unless an Environmental Impact Statement is prepared).
>
> We believe that the requirements of section 7(a)(2) of the Act have been satisfied. Please remember that obligations under section 7 consultation must be reconsidered if: (1) new information reveals impacts of this identified action that may affect listed species or critical habitat in a manner not previously considered; (2) this action is subsequently modified in a manner that was not considered in this review; or, (3) a new species is listed or critical habitat determined that may be affected by the identified action.

Thank you for your cooperation with our agency in protecting federally listed species. If you have any questions or comments, please contact me at this email address, or at 919-856-4520x16.

Sincerely,

Sarah McRae

On Thu, Nov 13, 2014 at 4:32 PM, <Adam.Sharpe@ch2m.com> wrote:

> Jean/Sarah,
>
> Harold Brady/NCDWR has asked me to forward to both of you the Draft EA for the Towns of Cary & Apex Interbasin Transfer (IBT) Certificate Modification for review and comment. I have posted this EA to our FTP site, see instructions below for access.
>
> A quick overview for you both:
>
> Last year, Session Law 2013-388 updated the NC General Statue (GS) that regulates IBT in NC, one of the updates to the GS provides the opportunity for the communities with an existing IBT certificate to request a certificate modification. One of the requirements, as outlined in the GS, for a modification is the completion of an EA. This EA has been drafted for the Towns' requested certificate modification, reviewed by DWR and is now out for full DENR Agency review.
>
> The EA specifically addresses the modification of the Towns' current IBT certificate, there is no new infrastructure directly associated with the certificate modification and therefore none addressed within this EA. Any future infrastructure developed will be reviewed under an independent environmental review process. In addition, as you are both aware the Towns' Secondary and Cumulative Impact Master Management Plan (SCIMMP) has just completed the public review period and is in process of being finalized.

The 30-day Agency review period for this Draft EA will end on December 12th, 2014; so please provide your comments by the 12th or earlier if possible (if you get through it before the 12th). If you have no comments please be sure to let us know that as well.

Please feel free to contact me with questions. I will touch base with you both via phone, tomorrow, to make sure you have received this email and are good with access to the EA.

Thanks,

Adam

Adam Sharpe

CH2M HILL

3120 Highwoods Boulevard

Suite 214 - Magnolia Building

Raleigh, NC 27604

Office: 919-875-4311

Direct: 919-760-1772

Mobile: 919-389-0372

www.ch2m.com

FTP Site Access:

Client Access Instructions for the 'pub' FTP folder

1. Click on https://transfer.ch2m.com

2. Log on with "EXT\" directly in front of the username
   Username = **ext\2015SCIMMP**
   Password = **CH2MHill**

3. Enter the password and click OK

4. Navigate to the folder and double click on the folder to open "**2015_SCIMMP**"; **(then open the "Apex-Cary_IBT_EA" folder)**

5. Double click the file to read or use the "Upload" button to add a file to this folder (copy and pasting a file to this location is not available as this is a website)

--

Sarah McRae
Aquatic Endangered Species Biologist
US Fish and Wildlife Service
PO Box 33726
Raleigh, NC 27636-3726

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